No. 876,481. PATENTED JAN. 14, 1908.

M. J. MURDOCH & J. P. LUDT.

HOT AIR FURNACE.

APPLICATION FILED JULY 1, 1905. RENEWED SEPT. 5, 1907.

2 SHEETS—SHEET 1.

Fig. 1.

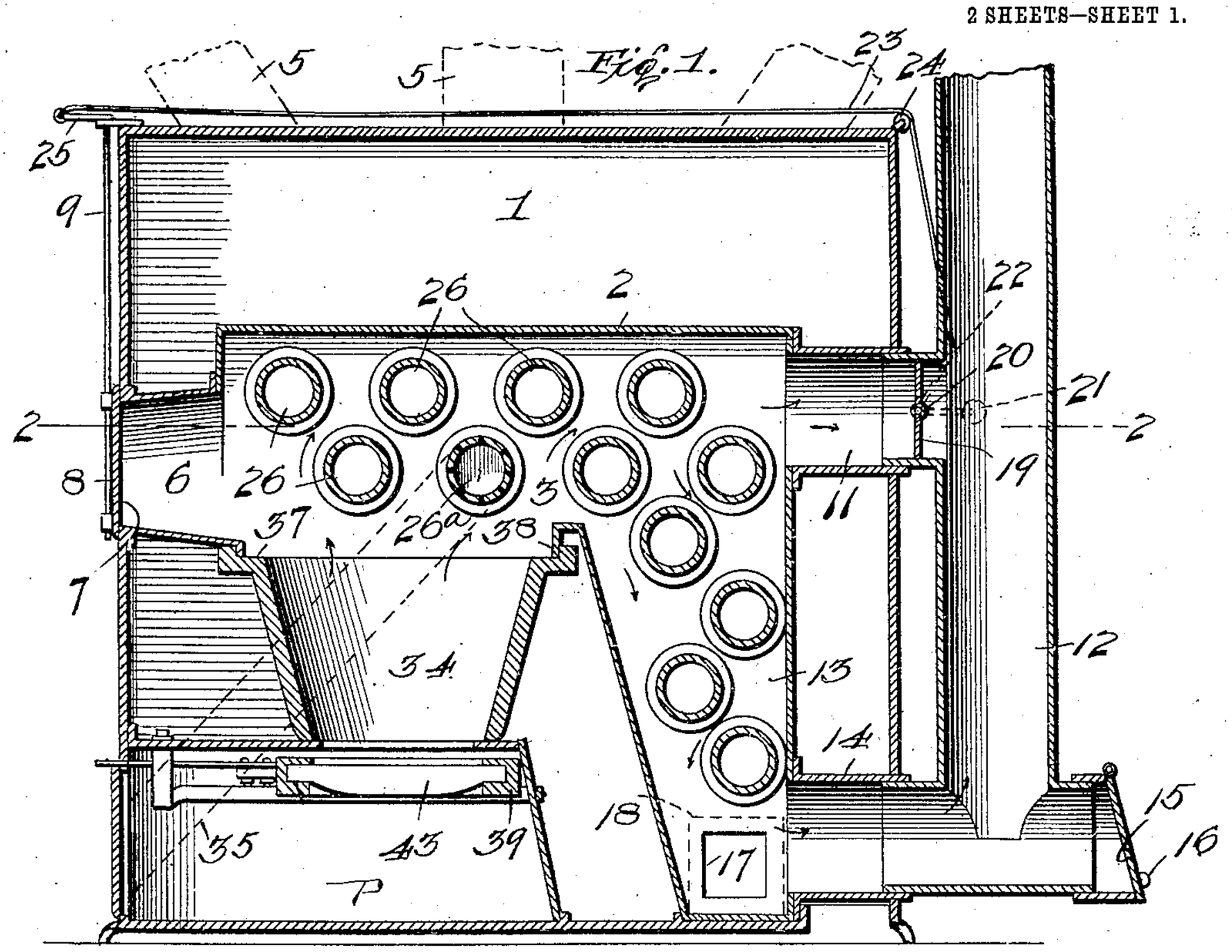
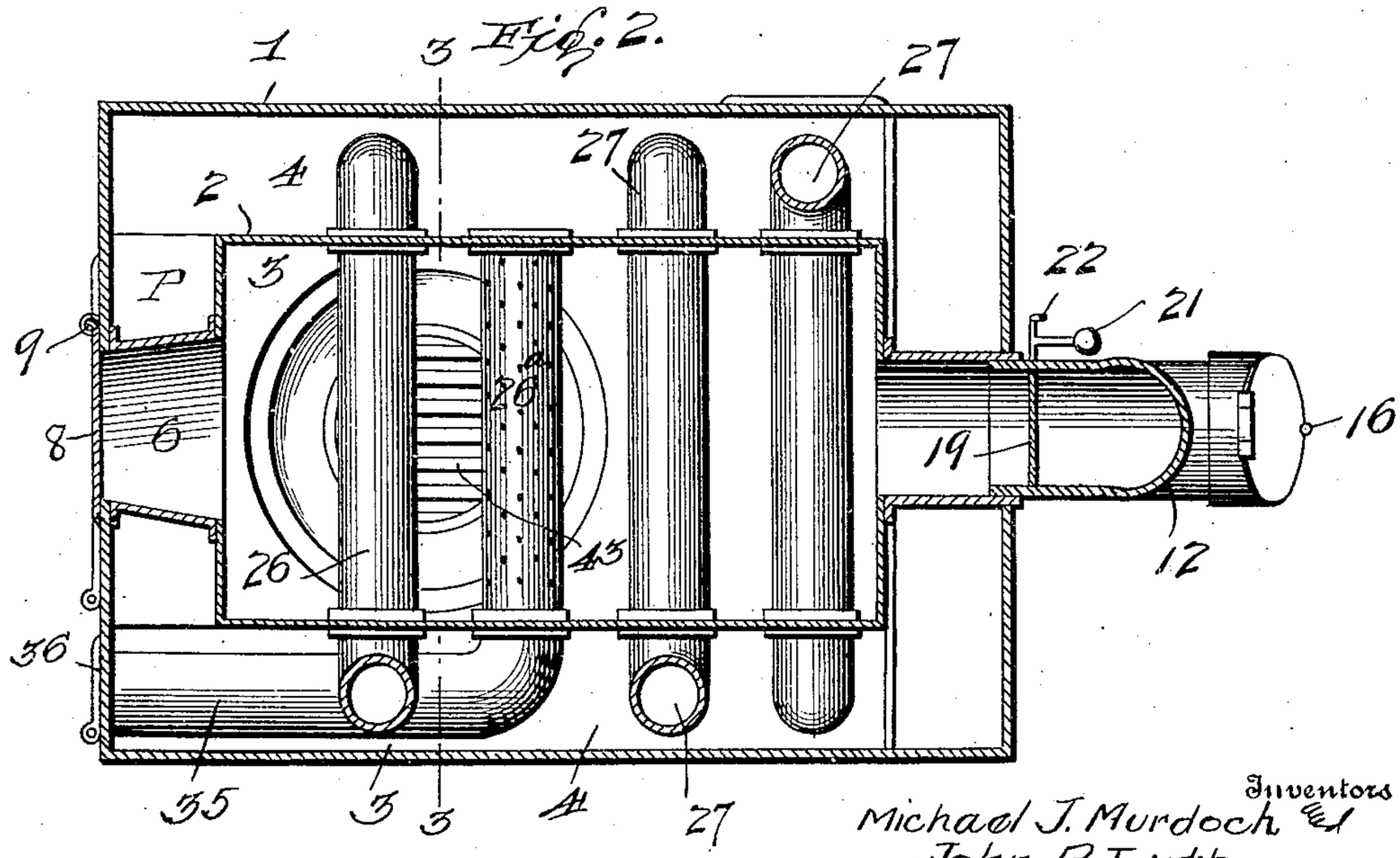


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 6.

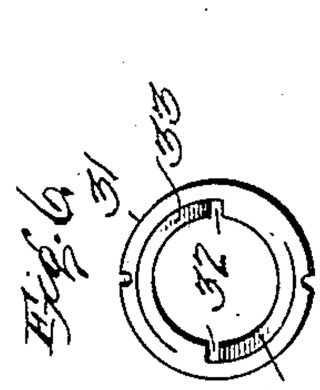


Fig. 4.

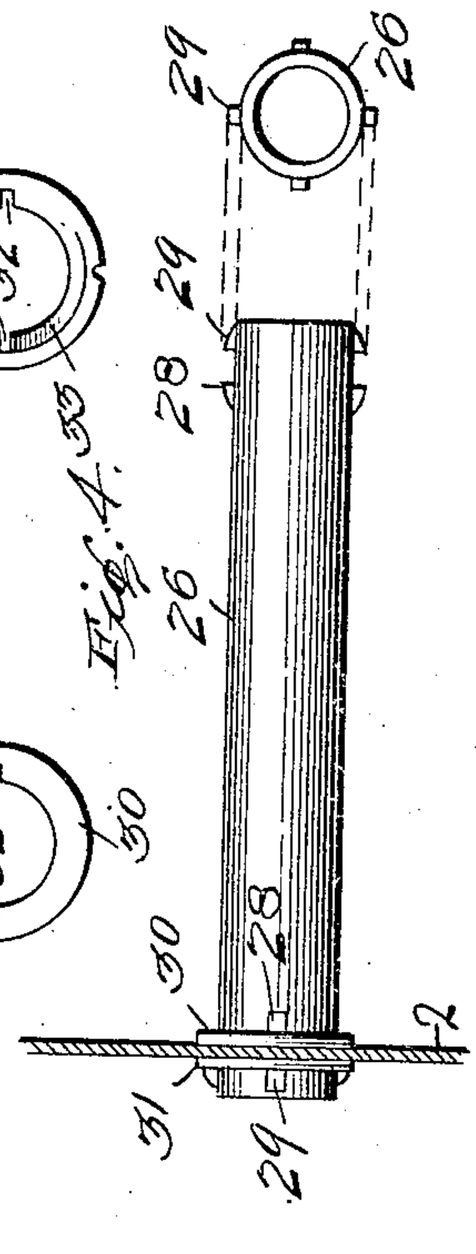
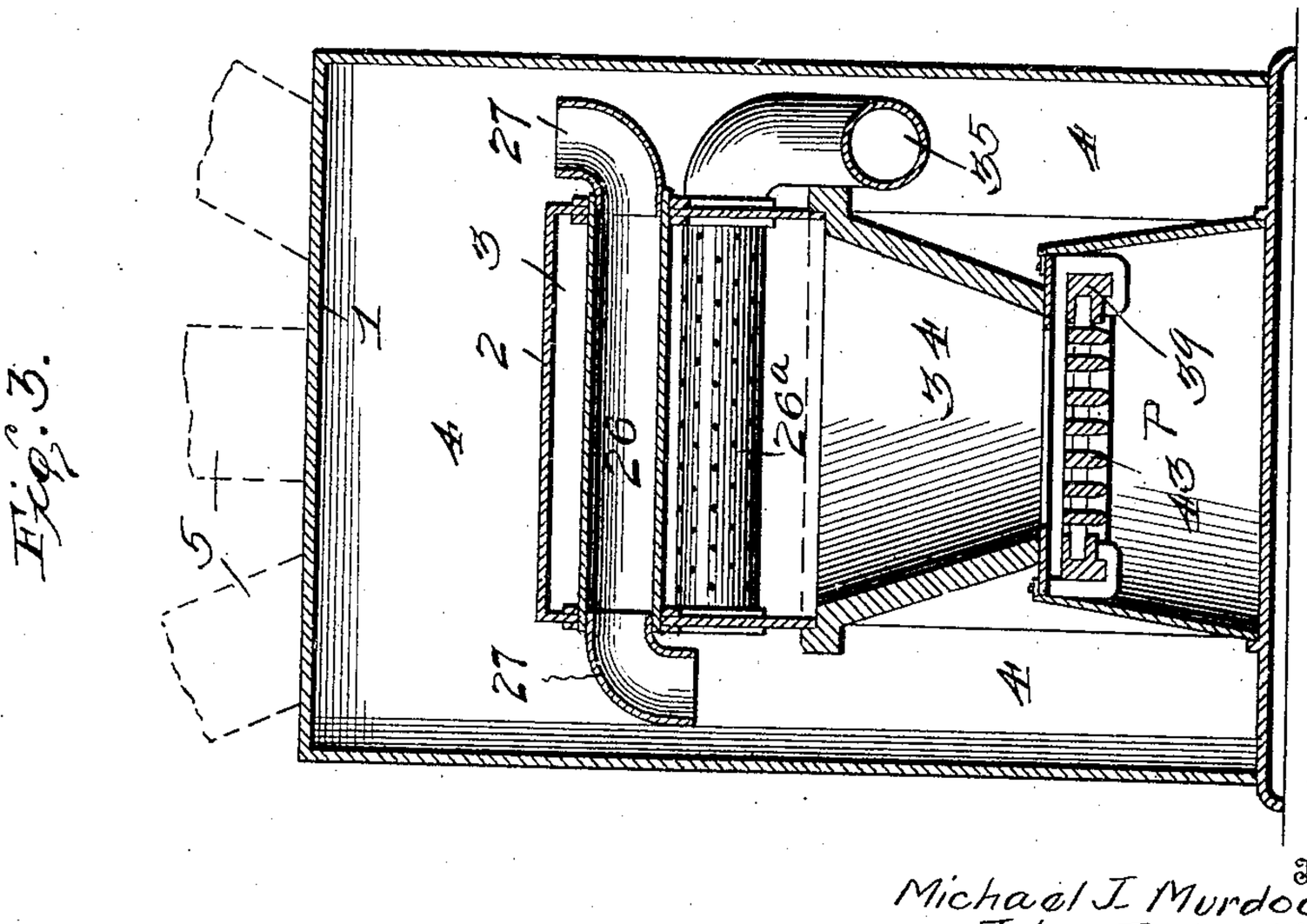


Fig. 5.

Fig. 3.



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UNITED STATES PATENT OFFICE.

MICHAEL J. MURDOCH AND JOHN P. LUDT, OF YOUNGSTOWN, OHIO.

HOT-AIR FURNACE.

No. 876,481. Specification of Letters Patent. Patented Jan. 14, 1908.

Application filed July 1, 1905, Serial No. 267,949. Renewed September 5, 1907. Serial No. 391,511.

To all whom it may concern:

Be it known that we, MICHAEL J. MURDOCH and JOHN P. LUDT, citizens of the United States, residing at Youngstown, in the county of Mahoning and State of Ohio, have invented certain new and useful Improvement in Hot-Air Furnaces, of which the following is a specification.

This invention relates to heating apparatus, and has special reference to an improved hot-air furnace embodying a novel construction designed to secure a maximum heating effect, while at the same time improving the general structural and functional features of a furnace of this general type.

With these and other objects in view which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts, which will be hereinafter more fully illustrated, and claimed.

The essential features of the invention, involved in carrying out the general object indicated, are necessarily susceptible to structural change without departing from the scope of the invention, but a preferred embodiment thereof is shown in the accompanying drawings, in which—

Figure 1 is a vertical central longitudinal sectional view of a hot-air furnace constructed in accordance with the present invention; Fig. 2 is a horizontal sectional view on the line 2—2 of Fig. 1; Fig. 3 is a vertical transverse sectional view on the line 3—3 of Fig. 2; Fig. 4 is a detail view partly in section showing the separable fastening connection between one of the hot-air tubes and the side wall of the fire chamber casing; Figs. 5 and 6 are detail views respectively of the inner and outer washers forming a part of the fastening connection for the hot-air tubes.

Like reference numerals designate corresponding parts in the several figures of the drawings.

The furnace, forming the subject matter of the present application, includes in its general organization an outer casing 1 of suitable dimensions to accommodate the interior parts of the structure. This outer casing 1 has arranged therein, in spaced relation to its side and end walls an inner fire chamber casing 2 preferably of a sheet-metal formation and inclosing therein a fire chamber 3 of an extended area.

The inner fire chamber casing 2 is arranged horizontally within the outer casing 1 and by reason of being spaced from the side and end walls of the latter has provided between the casings 1 and 2 a hot-air chamber 4 having a suitably arranged cold-air-inlet or inlets at the bottom of the outer casing 1 and is adapted to discharge the heated air into the heating system through the usual hot-air flues 5 connected with the top of the outer furnace casing 1, as indicated in Figs. 1 and 3 of the drawings.

In its structural formation the inner fire chamber 3 is somewhat in the form of an oblong box or case extending approximately the full length of the outer furnace casing 1 from the front of the inner walls of the latter, and at the front end the said chamber 3 is provided with a fuel receiving throat 6 joined to the front wall of the casing 1 and in communication with the fire door opening 7, covered and uncovered by the front fire door 8, the hinged rod of which fire door has a damper controlling extension 9 for the purpose hereinafter explained.

At its rear end in substantially the same horizontal plane as the front receiving throat 6, the inner fire chamber 3 is provided with an upper outlet flue 11 extending through the rear wall of the main casing 1 and coupled to the smoke escape pipe 12 conveniently arranged exteriorly of the furnace casing at the rear side thereof. In addition to the said upper outlet flue 11 at the rear end thereof, the fire chamber 3 is provided at its rear end with a pendent circulating leg 13 which is dropped from the lower side of the main portion of the casing 2 to the bottom of the main casing 1, and at its lower end the said pendent or drop leg 13 of the fire chamber has extended rearwardly therefrom, the lower outlet flue 14, which is extended through the back wall of the main furnace casing and is coupled to the lower end of the smoke escape pipe 12. In this connection it will be observed that the extreme outer end of the lower outlet flue 14 is provided with an auxiliary draft opening 15 which is designed to be covered and uncovered by a hinged check draft valve 16 to be opened and closed in any suitable manner, either by manual or automatic manipulation. The pendent or drop leg 13 is also provided at the extreme lower end thereof with a clean-out opening 17 formed in one side thereof and adapted to be covered and uncovered by the cleaning door 18 which is

accessible through the side of the main furnace casing 1.

To provide for controlling the draft through the fire chamber 3 the upper outlet flue or neck 11 thereof has arranged therein an automatic draft controlling damper 19. This damper 19 may be of the butterfly or equivalent type, but preferably is mounted and operated in the manner shown in the drawings. This consists in arranging the damper 19 on a hinge rod 20, one extremity of which projects to the exterior of the flue and has mounted thereon a weighted arm 21 and an adjusting lever arm 22, the latter of which has connected thereto one end of a flexible controlling connection or chain 23 arranged to pass over suitable guides 24 and having its other end connected to a lever or equivalent arm 25 carried at the upper end of the hinge rod extension 9 of the front fire door 8. By reason of this construction it will be observed that when the door 8 is closed and a tension thus placed on the connection or chain 23, the damper 19 is held closed, thereby compelling all of the fire and other products of combustion to pass down through the pendent or drop leg 13 of the fire chamber casing and out through the lower outlet flue 14; but, when the door 8 is open and the tension on the connection or chain 23 thereby relaxed, the weighted arm 21 forces the damper open and this provides direct communication with the smoke pipe through the upper flue 11. At this point it will be observed that by reason of the flue 11 being substantially in line with the fire door, when such door is open there will be no smoke, gas, or other products of combustion escape from the door, but, on the contrary, will be carried by the extra draft out through the flue 11 into the escape pipe 12.

One of the distinctive features of the present invention resides in providing the fire chamber with a multiplicity of hot-air tubes 26. These tubes extend transversely across the interior of the fire chamber 3 and projecting through the side walls of the casing 2 communicate with the opposite side portions of the hot-air chamber 4. These tubes are arranged throughout the main horizontal portion of the chamber 3 and are also distributed through the pendent or drop circulating leg 13, as very plainly shown in Fig. 1 of the drawings.

It is preferable in carrying out the invention to provide each of the tubes 26 at the opposite ends thereof with deflecting elbows 27, the elbow at one end of the tube being turned downward, and that at the opposite end of the same tube being turned upward, as shown in Figs. 2 and 3 of the drawings, thereby insuring a better and freer circulation of air into, through, and out of the tubes. In connection with the deflecting elbows, it is preferable that those of succeeding pipes be disposed alternately up and down at each side of the fire box casing, thus insuring uniformity in circulation of the cold and hot air at both sides of the fire chamber casing.

In order to secure a maximum heating effect and at the same time a full and free air circulation about the drop leg 13 of the inner fire chamber, it will be observed by reference to the drawings that the lower closed end of said drop leg extension, contiguous to the flue connection 14 therewith, is seated on the rear edge portion of the bottom wall of the main casing 1, said rear edge portion of the bottom wall terminating short of the back wall of the furnace casing and providing an air inlet at this point through which the supply of cold air may be admitted, the same first circulating about the flue 14 and then about the drop leg extension 13 as it becomes heated and rises in the casing. In this connection, it will be further observed that the front inclined wall of the drop leg extension 13 acts as a guide for deflecting products of combustion toward the bottom flue connection 14, while at the same time it lies in a position spaced from the back wall of the closed ash pit P, thereby leaving a large air chamber or space at this point which is entirely surrounded by heated surfaces.

The invention also contemplates improved means for removably supporting the individual hot-air tubes 26 in place, while at the same time securely locking them to the side walls of the fire chamber casing 2.

Referring particularly to the details shown in Figs. 4, 5 and 6 of the drawings, it will be observed that each hot-air tube 26 is provided at the ends thereof with inner and outer sets of holding lugs 28 and 29 respectively, said inner and outer sets being arranged in spaced relation to accommodate therebetween not only the sheet-metal side of the fire chamber casing 2 but also the inner and outer washers 30 and 31 constituting a part of the locking device.

As the fastening for each end of the tube is the same, a description for one end will suffice for the other, and by referring to the figures of the drawing mentioned, it will be noted that the inner and outer washers 30 and 31 are both provided in their inner edges with the clearance notches 32 arranged at diametrically opposite points and permitting such washers to be readily slipped over the outer lugs 29, and while the inner washer is plain upon both sides, the outer washer, which constitutes the locking washer, is provided upon its outer face about the inner edge thereof with oppositely arranged wedge inclines 33 adapted to be turned against the inner sides of the outer lugs 29. In setting up the fastening for one end of the tube 26 (referring to the group of Figs. 4 to 6, inclusive), it will be observed that the inner abutment washer 30 is first passed over the outer

lugs 29 and then given a quarter turn to throw the clearance notches 32 thereof out of alinement with both the inner and outer lugs. Then the sheet-metal side is positioned against the inner abutment washer 30, and the outer washer 31 placed over the lugs 29 may be also turned to throw its notches 32 out of alinement with the said lugs; the turning of the outer washer 31 by a wrench or equivalent device causes the inclines 33 to wedge tightly against the outer lugs 29 and thereby securely lock the parts together. The hole through the sheet-metal wall or side of the casing for the reception of each hot-air tube is preferably provided with clearance notches corresponding to those of the washers, where it is desired to have the hot-air tube fit snugly within the opening of the sheet-metal plate.

In order to obtain a maximum heating effect the hot-air tubes 26 are preferably arranged throughout the chamber 3 and its leg 13 in separate rows, with the tubes disposed in staggered relation. In connection with these tubes it should be noted at this point that one of the same, designated by the reference number 26[a] is perforated and arranged directly over the fire pot 34 and constitutes a hot blast tube, one end of which has connected therewith a hot blast pipe 35 which extends obliquely and downwardly from the tube 26[a], through the hot-air chamber 4 and connects at its lower end with the door-covered hot blast opening 36 which is preferably located at the lower right-hand corner of the front end of the furnace casing. A decided advantage is claimed for this arrangement of the hot blast inasmuch as the same is less liable to smoke and will draw much better than having the hot blast terminate above the furnace, as is usually the case.

The fire pot 34 is arranged directly beneath the main horizontal portion of the inner fire chamber 3 contiguous to the front end of the latter, and at its upper side the fire pot is formed with a flange seat 37 receiving the flange 38 surrounding the fire opening provided in the bottom of the main horizontal portion of the casing 2. Beneath the fire pot 34 is arranged a grate frame 39 carrying a grate 43.

From the foregoing it is thought that the construction, operation, and many advantages of the herein described furnace may be readily apparent to those familiar with the art.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent, is—

1. In a furnace of the class described, the combination of an outer casing having a bottom supporting wall, a closed ash pit chamber arranged within the front lower corner of the casing, a fire pot surmounting the closed ash pit chamber and having a seat at its upper edge, an inner fire chamber casing, having in its lower side a fire opening, received within the seat of the fire pot and provided with a front receiving throat and in rear of the fire pot with a downwardly tapering drop leg extension having a front inclined wall and also a closed lower end seated on the bottom wall of the furnace casing, the front inclined wall of the drop extension being spaced from the fire pot and also from the rear wall of the ash pit chamber, said fire chamber being also provided with an upper outlet flue in the horizontal plane of the receiving throat and at the bottom of the drop leg extension with a lower outlet flue, a plurality of hot air tubes extending transversely across the fire chamber and its drop leg extension, one of said tubes having a sealed connection at one end with a side wall of the fire chamber and provided with apertures communicating with said fire chamber, and at its other end having a pipe connection extending to the front of the outer casing at the bottom thereof, the other of said hot-air tubes being provided at their ends with deflecting elbows lying between the fire chamber and the main outer casing.

2. In a furnace, an outer casing having a bottom wall whose rear edge terminates short of its back wall, an ash pit chamber arranged within the outer casing, a fire pot surmounting the ash pit chamber, an inner fire chamber casing in communication with the fire pot and provided in rear of the latter with a drop leg extension spaced from the fire pot and the ash pit chamber and provided with a closed lower end seated on the rear edge portion of the bottom wall of the outer casing, and a plurality of hot-air tubes extending transversely across the fire chamber and its drop leg extension.

In testimony whereof we affix our signatures in presence of two witnesses.

MICHAEL J. MURDOCH.
JOHN P. LUDT.

Witnesses:
EDWARD MCGARVEY,
JOHN W. BOEMEW.