

No. 713,457.

Patented Nov. 11, 1902.

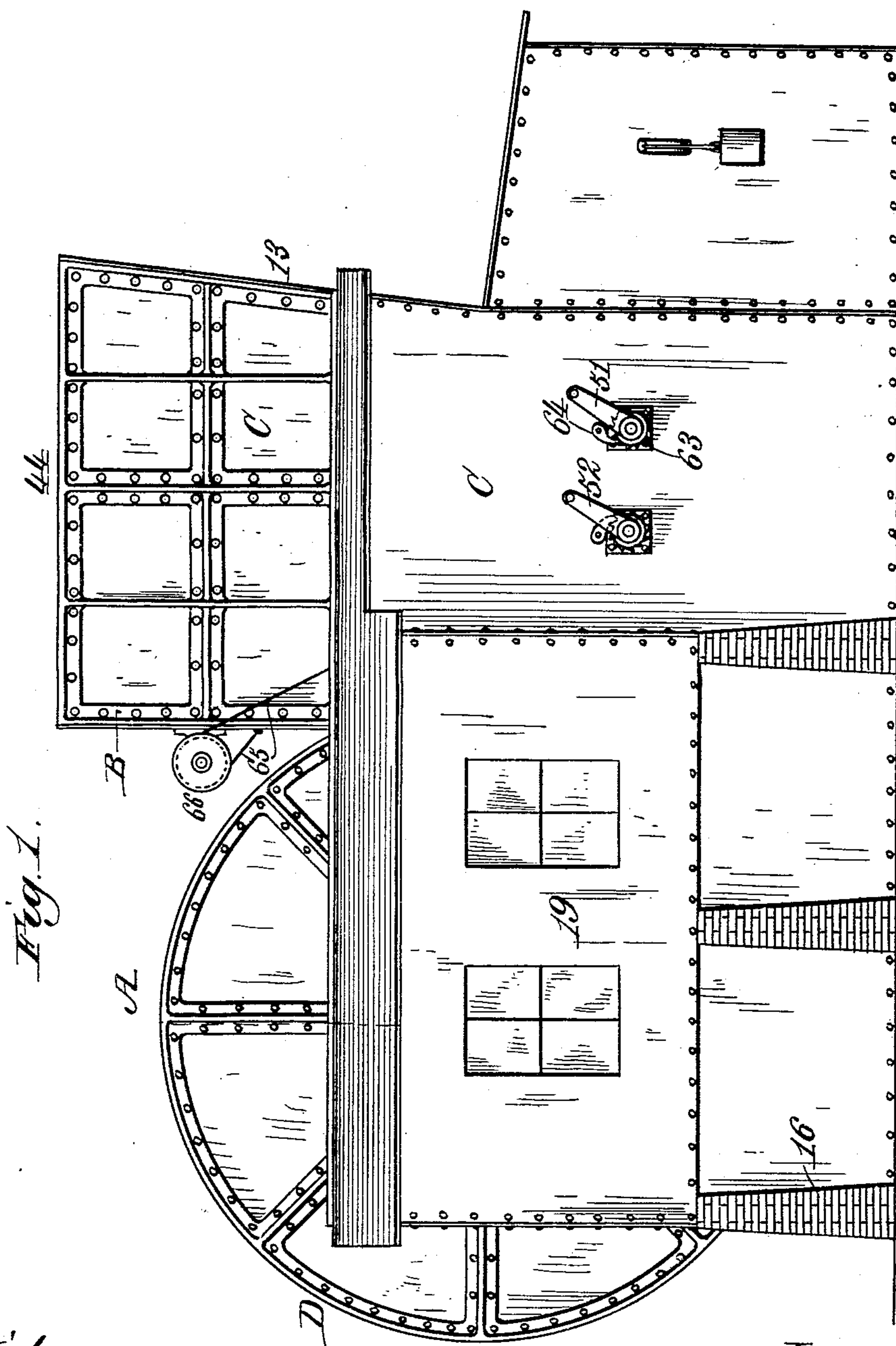
C. KUDERER.

APPARATUS FOR VENTILATING MINES.

(Application filed Nov. 30, 1901.)

(No Model.)

4 Sheets—Sheet 1.



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Inventor,
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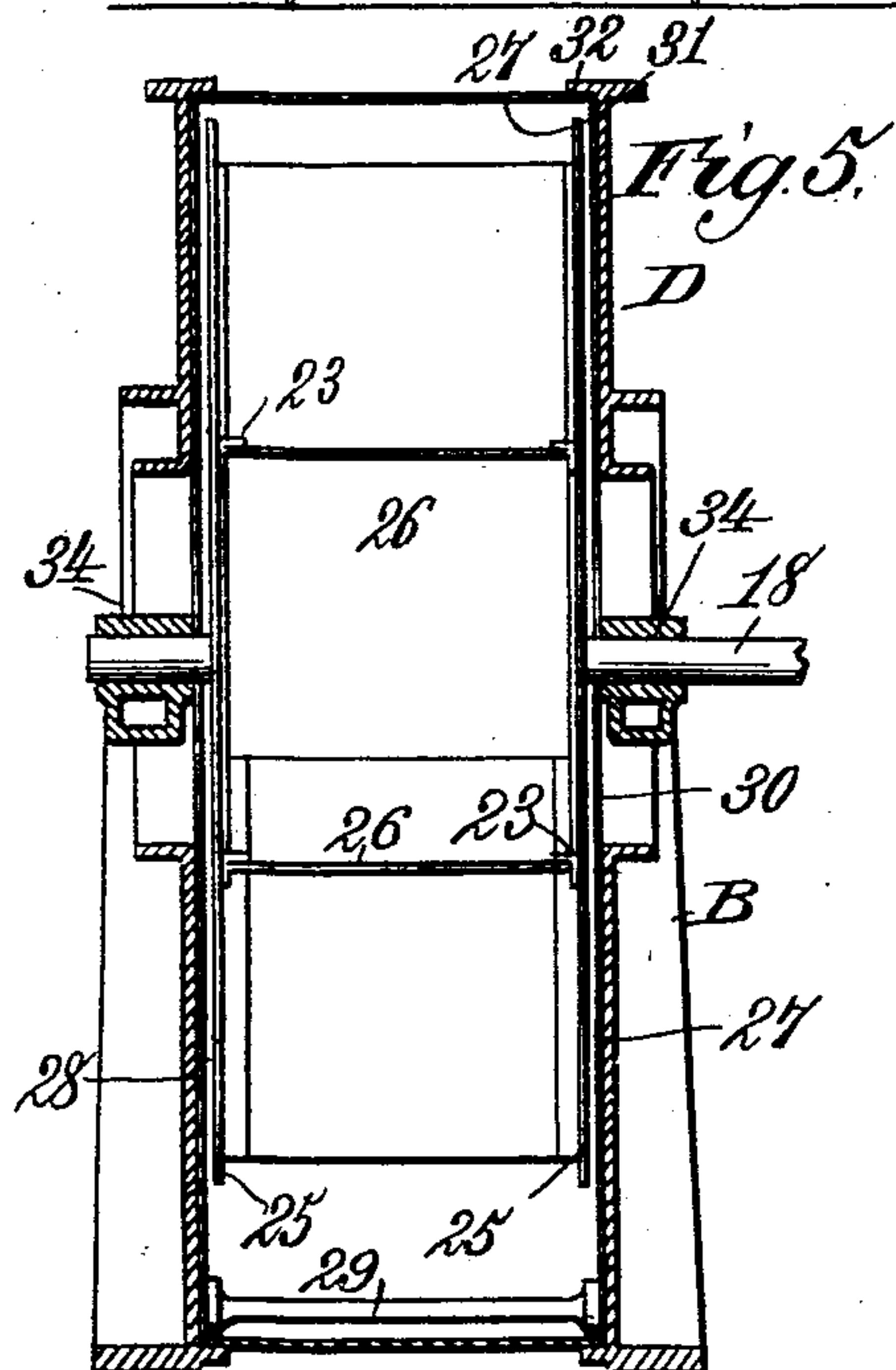
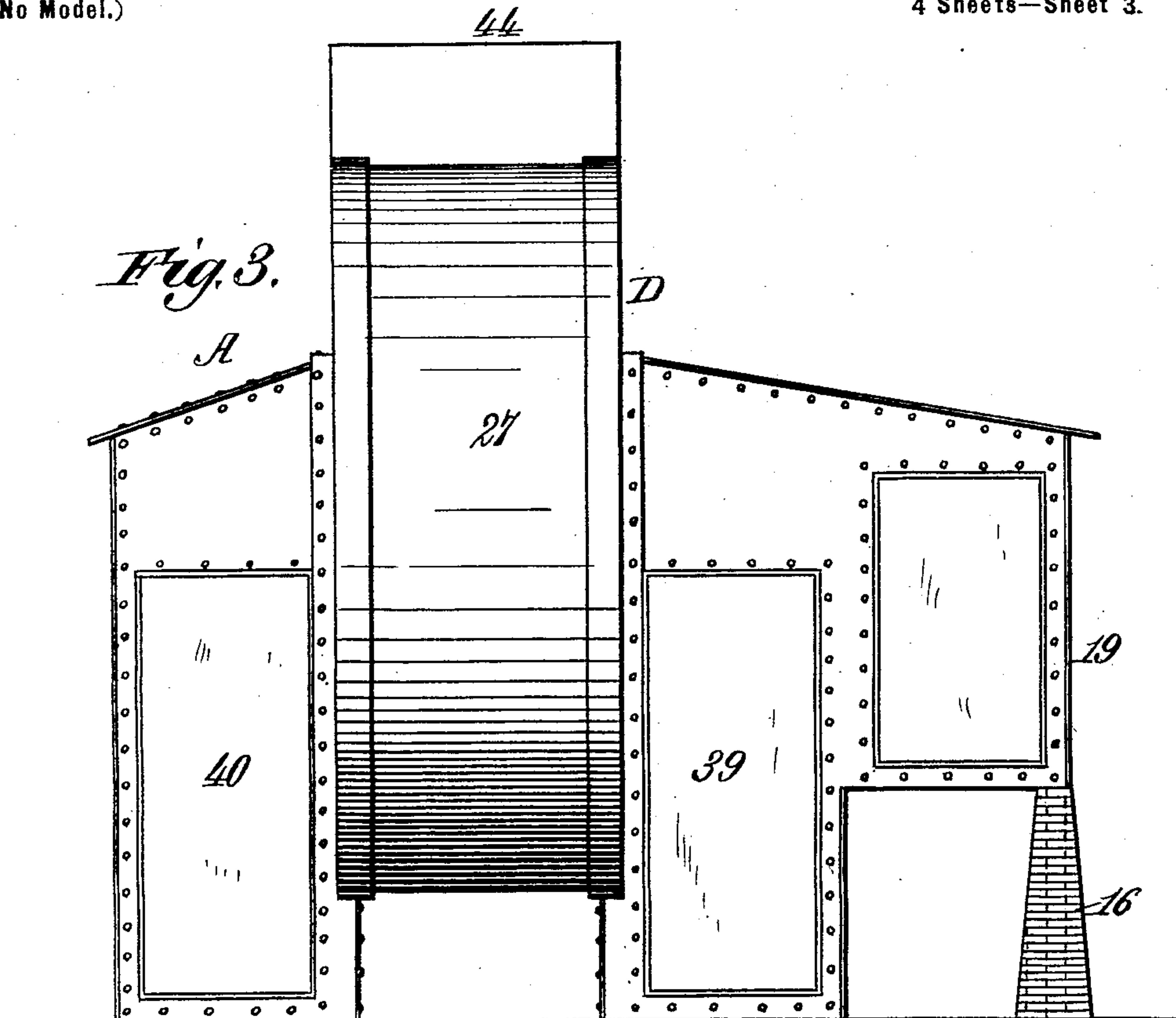
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(No Model.)

4 Sheets—Sheet 3.



Witnesses,
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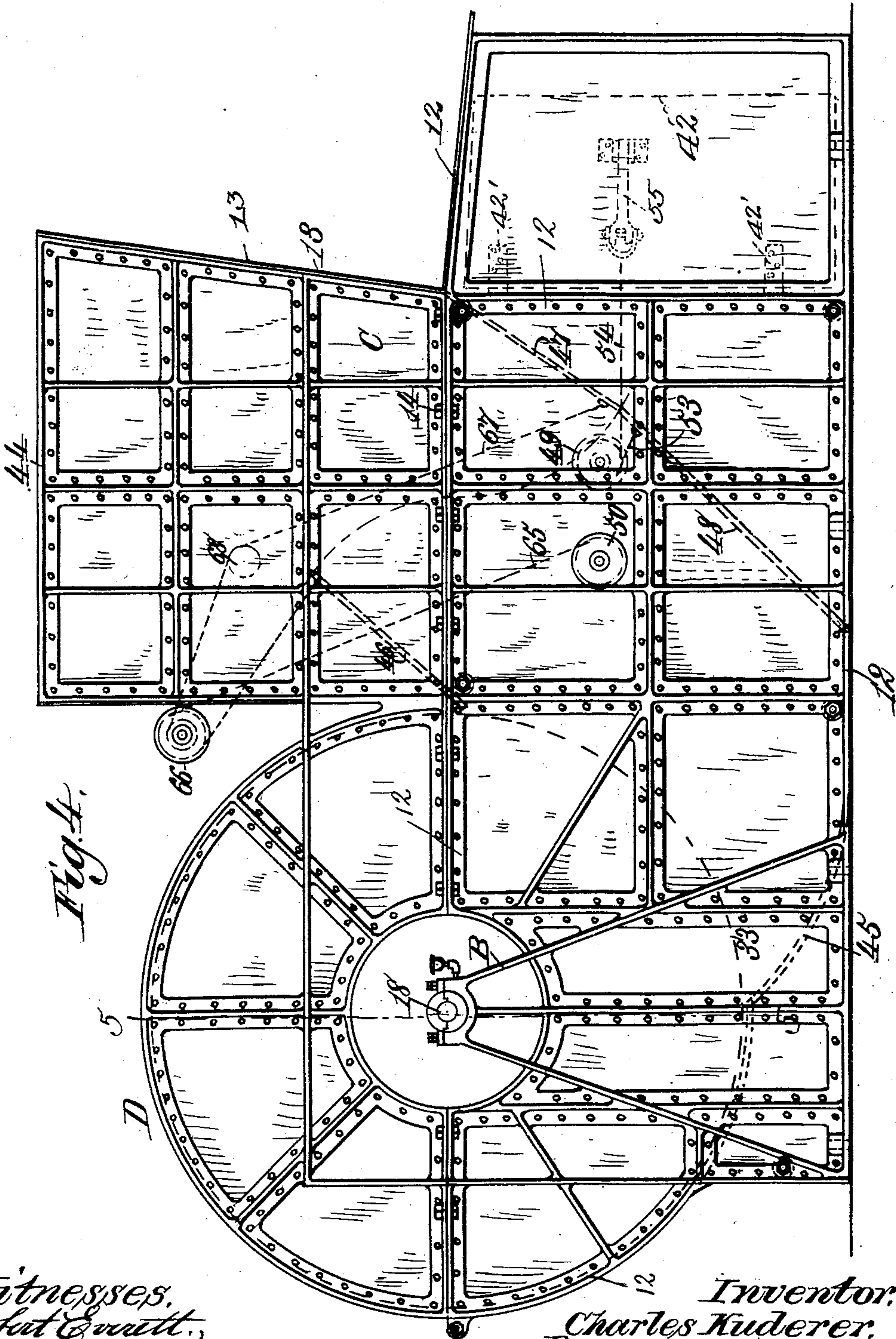
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APPARATUS FOR VENTILATING MINES.

(Application filed Nov. 30, 1901.)

(No Model.)

4 Sheets—Sheet 4.



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UNITED STATES PATENT OFFICE.

CHARLES KUDERER, OF ALLEGHENY, PENNSYLVANIA.

APPARATUS FOR VENTILATING MINES.

SPECIFICATION forming part of Letters Patent No. 713,457, dated November 11, 1902.

Application filed November 30, 1901. Serial No. 84,204. (No model.)

To all whom it may concern:

Be it known that I, CHARLES KUDERER, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Apparatus for Ventilating Mines, of which the following is a specification.

This invention relates to an apparatus for ventilating mines; and the apparatus is simple in construction, light, yet thoroughly strong in its several parts, highly efficient, and capable of installation at a minimum cost.

The apparatus includes in its construction a house for inclosing the fan and other parts of the apparatus, which consists of a plurality of properly-disposed frames, preferably of cast metal, to which plates can be bolted, riveted, or otherwise fastened to obtain a thoroughly substantial air-tight structure. This house also incloses a series of doors, gates, or valves, which may be manually operated from outside the house, so as to secure changes in direction of flow of the air—that is, either to force or pump fresh air into a mine or to exhaust or effect the discharge of the foul air therefrom—and these operations can be readily secured without reversing the engine that drives the fan, and as the prime actuating means for the doors, gates, or valves are located outside the house it is not necessary to enter such house in order to cause either the supply or exhaust.

The fan forming part of the apparatus is of peculiar construction, and it includes a spider or center, the spokes or arms of which are flat and set angularly to the air passing through the intakes, so as to decrease to the lowest possible extent the resistance to the passage of air.

The invention also involves other advantageous features, which, with the foregoing, will be set forth in the following description, while the novelty thereof will form the basis of the claims appended to said description.

I do not limit the invention to the particular parts nor to their relation in the manner hereinafter set forth, for many changes may be adopted within the scope of my claims, and for the purpose of indicating clearly the nature of my invention I have shown the same

in one simple and convenient embodiment thereof in the accompanying drawings, in which—

Figure 1 is a side elevation of a mine-ventilating apparatus including my improvements. Fig. 2 is a plan view of said apparatus and an airway of a mine, the latter being in section. Fig. 3 is a rear elevation of the same. Fig. 4 is a side elevation of the fan, its casing, certain of the doors, and coacting parts. Fig. 5 is a transverse sectional elevation, the section being taken in the line 5 5, Fig. 4.

Like characters refer to like parts in all the figures.

While I have entitled the present invention as an "Apparatus for ventilating mines," this being for convenience, it will be evident that the same can be used with equal facility in other connections, though it is shown and described in conjunction with a mine.

The apparatus has a house, as A, in which the ventilating-fan, operating-motor therefor, and other devices hereinafter more particularly described are mounted. Said house consists of a framing, as B, and a plurality of plates, as C, connected thereto. The framing B is of skeleton form and consists of companion base-pieces, as 12, arranged in parallelism and at opposite sides of the house, and top pieces, as 13, respectively mounted on the base-pieces, the sides being suitably spaced or separated laterally. The several frame-pieces 12 and 13 are of metal and preferably cast, each being flanged along its edges, so that the superimposed parts at opposite sides of the structure can be bolted together, the bolts being indicated by 14. The walls of the house consist of plates, as C, bolted or otherwise secured to the frame B, the said house being substantially of rectangular shape and forming a light and substantial structure, which is also wholly air-tight. Said house A is mounted upon masonry or brickwork, as 16, in proximity to the airway of a mine or like chamber, said airway being connected to the house at one side thereof, so that the fan can exhaust foul or stale air from the mine through the airway and also deliver fresh air to said mine through said airway which is drawn from the atmosphere,

and these several functions can be secured without reversing the motor which actuates the fan by means hereinafter set forth.

The fan is denoted in a general way by D, 5 and its shaft 18 is supported by bearings upon the framework B, and said fan may be operated by a motor (not shown) in the house and which motor may be located in the offset portion 19 of said house.

10 The spokes of the fan are denoted by 23, and they are suitably connected with the circular sides 25 of said fan, said sides having central openings registering with the intakes of the fan-casing.

15 The blades of the fan are designated by 26, and they consist of flat plates secured to the spokes 23 and circular sides 25, respectively.

The casing of the fan is designated by 27 and includes the circular side pieces 28, connected at suitable intervals by the cross-stays 20 29 and having central openings or intakes 30 for the passage of air.

The rim of the fan-casing is denoted by 31, the side pieces having intumed flanges 32, 25 to which the rim is riveted or otherwise attached. The rim, and hence the flanges, are partly circular, an opening 33 being thereby left in the rim, through which fresh air can be supplied to the mine, as will hereinafter 30 appear.

The frame of the house A has bearings, as 34, for the shaft 18 of the fan.

As hereinbefore stated, the present apparatus is primarily intended for the ventilat- 35 ing of mines, it being adapted to either supply fresh air to said mine or exhaust the foul air therefrom, and these results may be accomplished without reversing the motor, (not shown,) they being secured by the operation 40 of doors or gates, and though these doors or gates may be operated in any convenient manner they are shown as shiftable by hand, so as to be actuated at the will of an attendant, and the primary actuating device is located outside the house A, so as to be readily 45 accessible without the necessity of entering said house.

In Fig. 2 of the drawings I have shown the airway of a mine, the same being denoted by 50 35 and being in communication with the interior of the house A, and through this airway the fresh air from the atmosphere is supplied to the mine, and the foul or stale air is also exhausted through the same, these 55 operations being alternately secured by an attendant or engineer in charge of the fan-actuating motor. The airway opens into the house A, it communicating directly with the transverse passage 36 through the opening 60 36' in said house at the end thereof in proximity to said airway. This passage 36 extends entirely across the house, and passages, as 37 and 38, open into the opposite ends of the same, the passages 37 and 38 being dis- 65 posed longitudinally of the house at opposite sides thereof and ending at the end of the house farthest from the airway 35. Said lon-

gitudinal passages 37 and 38, which, it will be understood, communicate with the face-in- 70 take, open into the atmosphere, as at 37' and 38', and said openings are shown at the left in Fig. 2 and are considered as the inlets thereof and have doors, as 39 and 40, hinged at their inner edges in adjacency to such openings or inlets and adapted, as will here- 75 inafter appear, to close said inlets at certain times. The house A has interiorly thereof a third passage or duct, as 41, extending longitudinally thereof and situated centrally be- 80 tween the other longitudinal passages or ducts 37 and 38, and the peripheral opening 33 of the fan-casing communicates directly with one end of the central passage or duct 41, herein shown as the left end. The oppo- 85 site end of said central passage or duct is provided with doors or valves, as 42 and 43, which are hinged at 42' at their inner edges just inside the central passages, and said doors when closed are adapted to have their outer edges abut, as shown in Fig. 2, so as to 90 present in plan an acute angular structure, the angle of which is intersected by the longitudinal axis of the airway 35, so that the exhaust-air drawn from the mine when it strikes the doors thus arranged is split into 95 two parts, which are diverted thereby into the longitudinal side passages and traversing the same enter and pass the fan-casing and are subsequently delivered to a chimney to be dis- 100 charged into the atmosphere, as will hereinafter appear. A chimney or discharge-conduit, as 44, connects with the central passage or duct 41, and said chimney is vertically disposed, its upper end opening into the atmos- 105 phere, and through this chimney the foul air sucked from the mine is expelled. A plate, as 45, extends across the central passage or duct 41, the plate constituting, in effect, one end of said passage and being slightly curved and extending downwardly from the lower edge of 110 the opening 33 and at a slight inclination forwardly toward the right end of the said passage, while a door, as 46, is hinged at its lower edge near the upper edge of said opening 33. The chimney 44 opens directly into said cen- 115 tral passage, and the hinge of the door is located approximately at the junction of said chimney and passage, a companion door, as 47, being hinged at the opposite side of such junction and in line with the door 46, and 120 these doors 46 and 47 when brought into line, which line in the present case is a horizontal one, will close the entrance to the chimney and will separate the same from the central passage or duct 41. The doors 46 and 47 are 125 therefore adapted to cooperate when it is desired to close the chimney, and said door 47 is adapted to cooperate with a third door, as 48. In Fig. 4 the door 47 is shown as being diagonally disposed and as being in alinement 130 with the door 48, and said door in this relation extends entirely across the passage 41. Said door 48 is hinged at its lower end substantially centrally of the length of said pas-

sage, and means hereinafter described are provided for actuating certain of the several doors hereinbefore described in unison.

It will be assumed that the motor is in operation and that the fan D is being rotated in the direction shown by the arrow in Fig. 6 and that it is desired to supply the mine with fresh air. To do this, the doors 42 and 43 will be spaced apart and brought into line with the side walls of the central passage 41 and the doors 39 and 40 will be opened and the doors 46 and 47 will be brought into horizontal alinement to close the chimney 44, while the door 48 will be swung down to a horizontal position, thereby opening communication between the central longitudinal passage 41 and the cross-passage 36. Air will then be drawn by the fan D from the atmosphere through the openings 37' and 38', passing then into the fan-wheel through spiders and from thence into the fan-casing 27 and being delivered from the same into the central passage 41, transverse passage 36, and leaving the latter will enter the mine through the airway 35. Now suppose it is desired to exhaust the foul air from the mine. To do this, the doors 39 and 40 will be closed, the doors 47 and 48 will be thrown into angular alinement, while the door 46 will be lifted until it assumes the desired position, such relation being shown in Fig. 4. The doors 42 and 43 will then be brought into engagement, as shown in Fig. 2, so as to prevent the entrance of exhaust-air to the central passage 41, and with the doors 46, 47, and 48 occupying the position shown in Fig. 4 the chimney 44 is in communication with the passage 41, while the doors 47 and 48 farther close the passage 41 against the entrance of the exhaust from the passage 41 to the passage 36. The fan following the direction indicated will then suck the air from the airway 35 into the transverse passage, where it strikes the V-arranged doors 42 and 43, which separates the air into two bodies, which traverse the passages 37 and 38, respectively, and enter the fan-casing 27 and are discharged through the opening 33 into the central passage 41 until the doors 47 and 48 are reached. These angularly-placed and alined doors then divert the air into the chimney 44, from which it passes to the atmosphere.

The house carries windlasses, as 49 and 50, the shafts of which outside the house A are furnished with hand - cranks, as 51 and 52, respectively. A rope, cable, or like connection, as 53, is adapted to be wound upon the windlass 49, it extending therefrom and being suitably connected to the door 48 near the free or upper edge thereof, while a like rope or analogous connection, as 54, is also wound on said windlass and extends therefrom and is united to the jointed links 55 and 56, connected, respectively, to the doors 42 and 43 upon the inner faces of said doors. Ropes or similar connections, as 57 and 58, are attached to the opposite faces of said doors and

extend oppositely from said doors and pass through openings in the sides of the house and over the grooved guide-wheels 59 and 60, mounted in said openings, and said ropes 57 and 58 carry weights, as 61 and 62, which serve normally to swing the doors 42 and 43 away from each other and into line with the side walls of the passage 41, which action, however, is governed by suitable detent mechanism, such as a pawl and a ratchet. The shaft of the windlass 49 has a ratchet, as 63, fixed thereto, the coacting pawl being of the gravity kind and being denoted by 64. When the parts are in the position shown in Fig. 4 and when the pawl 64 is lifted, the door 48 is free to fall into a horizontal position, while the weights 61 and 62 by dropping will, through the intermediate connections, swing the doors 42 and 43 away from each other, so as to open communication between the transverse passage 36 and central passage 41. By rotating the hand-crank 51 the door 48 can be put into the position shown in said Fig. 4, while at the same time the doors 42 and 43 can be placed in the position shown in Fig. 2, the ropes 53 and 54 being wound side by side on the windlass 49 while the weights 61 and 62 are lifted. When the parts are put into the desired position, they will be held by the pawl 64. The windlass 50 has the rope 65 wound thereon, such rope extending upwardly therefrom and being wound upon a drum 66, mounted outside the house A. The drum has a plurality of sections, as is customary with those carrying a series of ropes, the rope 65 being on one of these sections, while a rope, as 67, is wound on the other section, the ends of said rope being connected, respectively, with the doors 46 and 47 to thereby secure the simultaneous operation of said doors. One of the branches of the rope 67 passes over a guide-roller 68, suitably mounted in the chimney 44.

The rope 65 is in the nature of a power-transmitting factor, for when the windlass 50 is operated by its hand-crank 52 the drum 66 through the intermediate rope 65 is caused to rotate, so as to either bring the doors 46 and 47 into horizontal alinement to cut off the chimney 44 or to force them in the position shown in Fig. 4, in accordance with the direction of rotation of said hand-crank 52.

The hand-cranks 51 and 52 are placed in proximity to each other, so that they may be actuated together and by one person.

The principal benefit derived from my apparatus is the proper and adequate supply of fresh air to workmen or miners working underground in coal-mines or tunnels, and I can secure almost instantaneously changes from forcing the fresh air into the mine or exhausting the stale air therefrom, and vice versa, and these functions can be secured while the fan is under full speed in about twenty-five seconds, while with certain existing apparatus it takes from ten to fifteen minutes to obtain these results, and to do so the fan must be stopped. This great saving of time is of

decided importance when it is necessary, due to mine explosions, to quickly supply fresh air to the mine.

Having described the invention, what I claim is—

1. In an apparatus of the class described, a housing having a fan, passages at opposite sides of the fan each one communicating with a fan-intake, the airway of a mine, and the atmosphere outside of said housing, a central passage between said other passages adapted to communicate with said airway and with the fan, a chimney opening into said central passage, doors hinged approximately at the junction of the central passage and chimney at opposite sides thereof, said doors being arranged to be alined with each other to close the chimney, a third door adapted to cooperate with one of the other doors to bridge said central passage, and means independent of said doors for opening or closing the central passage.
2. In an apparatus of the class described, a housing having a fan, passages at opposite sides of the fan each one communicating with a fan-intake, the airway of a mine, and the atmosphere outside of said housing, a central passage between said other passages adapted to communicate with said airway and with the fan, a chimney opening into said central passage, doors hinged approximately at the junction of the central passage and chimney at opposite sides thereof, said doors being arranged to be alined with each other to close the chimney, a third door adapted to cooperate with one of the other doors to bridge said central passage, a pair of doors hinged in proximity to one end of the central passage at opposite sides thereof and arranged to converge beyond said central passage, means serving to positively swing the doors away from each other, and means for holding said pair of doors in contact.
3. In an apparatus of the class described, a housing having a fan, passages at opposite sides of the fan each one communicating with a fan-intake, the airway of a mine, and the atmosphere outside of said housing, a central passage between said other passages adapted to communicate with said airway and with the fan, a chimney opening into said central passage, doors hinged approximately at the junction of the central passage and chimney at opposite sides thereof, said doors being arranged to be alined with each other to close the chimney, a third door adapted to cooperate with one of the other doors to bridge said central passage, a pair of doors hinged in proximity to one end of the central passage at opposite sides thereof, and arranged to converge beyond said end, links connected to the doors and to each other, means connected with the links and serving to normally hold the last-mentioned doors in contact, and weights connected with the latter and adapted to swing the same out of contact.
4. In an apparatus of the class described,

a housing having a fan, passages at opposite sides of the fan each one communicating with a fan-intake, the airway of a mine, and the atmosphere outside of said housing, a central passage between said other passages and adapted to communicate with said fan, a chimney opening into said central passage, doors hinged approximately at the junction of the central passage and chimney at opposite sides thereof, said doors being arranged to be alined with each other to close the chimney, a third door adapted to cooperate with one of the other doors to bridge said central passage, a transverse passage in communication with said other passages and also adapted to communicate with the airway of a mine, and means for opening or closing communication between said transverse passage and said central passage.

5. In an apparatus of the class described, a housing having a fan, passages at opposite sides of the fan each one communicating with a fan-intake, the airway of a mine, and the atmosphere outside of said housing, a central passage between said other passage and adapted to communicate with said airway and with the fan, a chimney opening into said central passage, doors hinged approximately at the junction of the central passage and chimney at opposite sides thereof, said doors being arranged to be alined with each other to close the chimney, connections between said door for operating the same in unison, means accessible from outside the housing for operating one of said doors, a third door adapted to cooperate with one of the other doors to bridge said central passage, and means independent of said doors for opening or closing the central passage.

6. In an apparatus of the class described, a housing having a fan, passages at opposite sides of the fan each one communicating with a fan-intake, the airway of a mine, and the atmosphere outside of said housing, a central passage between said other passages and adapted to communicate with said airway and with the fan, a chimney opening into the said central passage, doors hinged approximately at the junction of the central passage and chimney at opposite sides thereof, said doors being arranged to be alined with each other to close the chimney, a shaft, a second shaft having a drum, a band wound on said drum and connected with the first shaft and also with one of said doors, detent mechanism for controlling said first shaft, means located outside the housing for operating the latter, a third door adapted to cooperate with one of the other doors to bridge said central passage, means for operating the third door, and means independent of said doors for opening or closing the central passage.

7. In an apparatus of the class described, a housing having a fan, passages at opposite sides of the fan each one communicating with a fan-intake, the airway of a mine, and the atmosphere outside of said housing, a central

passage between said other passages adapted to communicate with said airway and with the fan, a chimney opening into said central passage, doors hinged approximately at the junction of the central passage and chimney at opposite sides thereof, said doors being arranged to be alined with each other to close the chimney, a third door adapted to cooperate with one of the other doors to bridge said central passage, and means accessible from outside the housing for effecting the simultaneous operation of said doors.

8. In an apparatus of the class described, a housing having a fan, passages at opposite sides of the fan each one communicating with a fan-intake, the airway of a mine, and the atmosphere outside of said housing, a central

passage between said other passages and adapted to communicate with said airway and with the fan, a chimney opening into said central passage, doors shiftable into position to cut off communication between said central passage and chimney, a third door adapted to cooperate with one of the other doors to bridge said central passage, and means for opening or closing the central passage.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES KUDERER.

Witnesses:

MARCUS KOPLAN;
A. W. KIMMINS.