(No Model.)

3 Sheets—Sheet 1.

G. H. BURROWS.

VENTILATING APPARATUS.

No. 445,878. Patented Feb. 3, 1891.

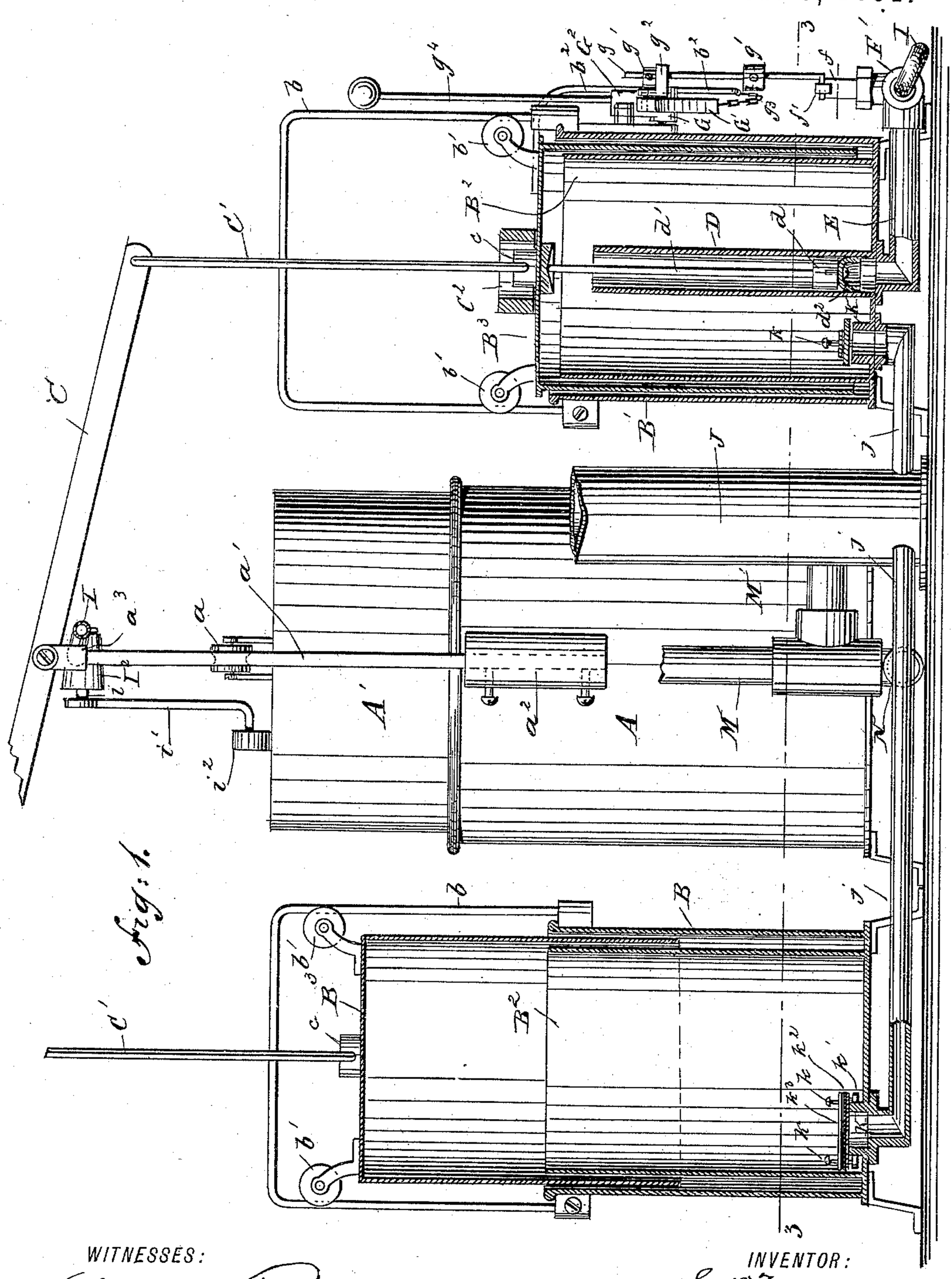

Fig. 1.

WITNESSES:

Chas. Nida.

C. Sedgwick

INVENTOR:

G. H. Burrows

BY Munn & Co

ATTORNEYS

(No Model.)

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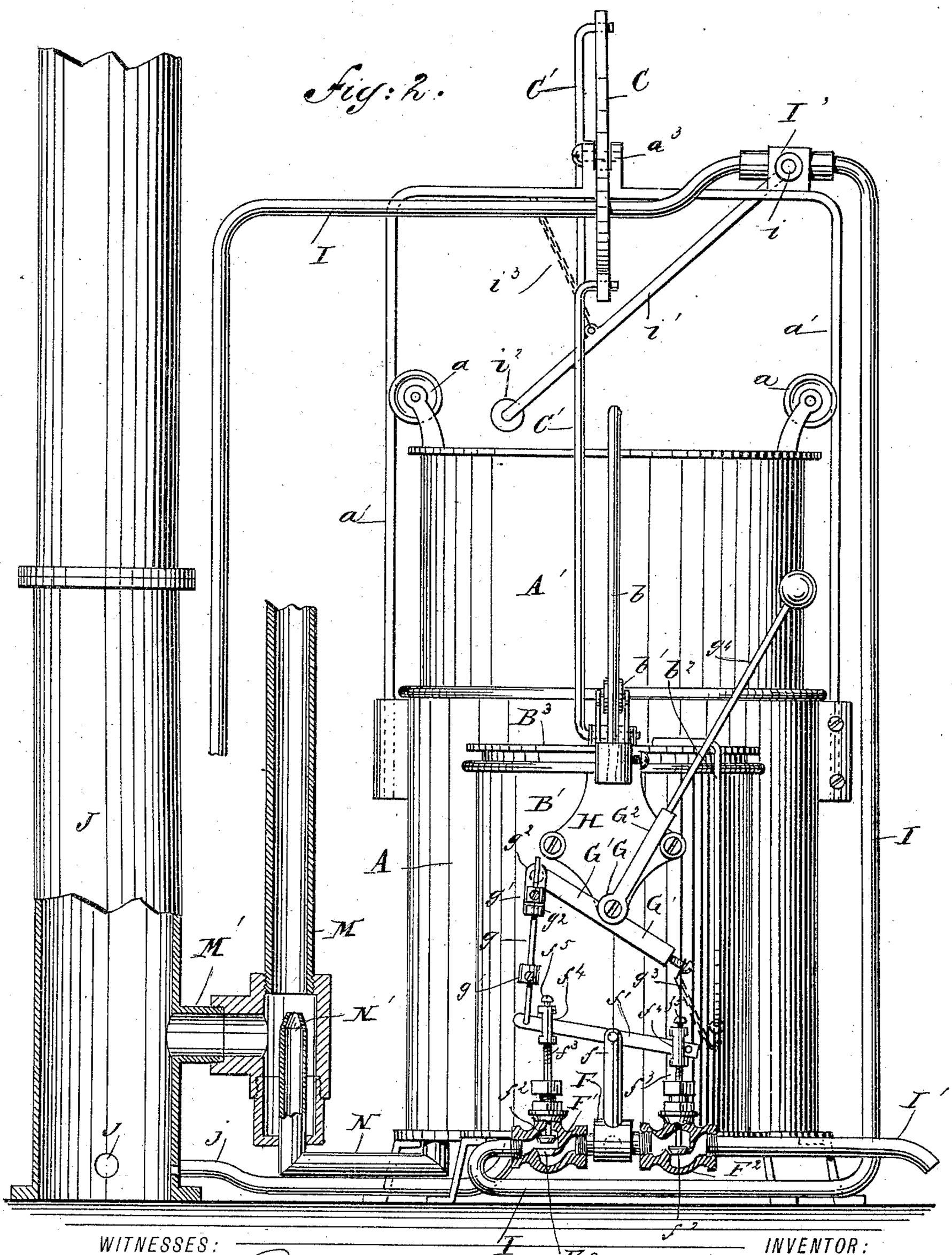
Fig: 2.



WITNESSES:

Chas. Nichols.

C. Sedgwick

INVENTOR:

G. H. Burrows

BY Munn & Co.

ATTORNEYS

(No Model.)

3 Sheets—Sheet 3.

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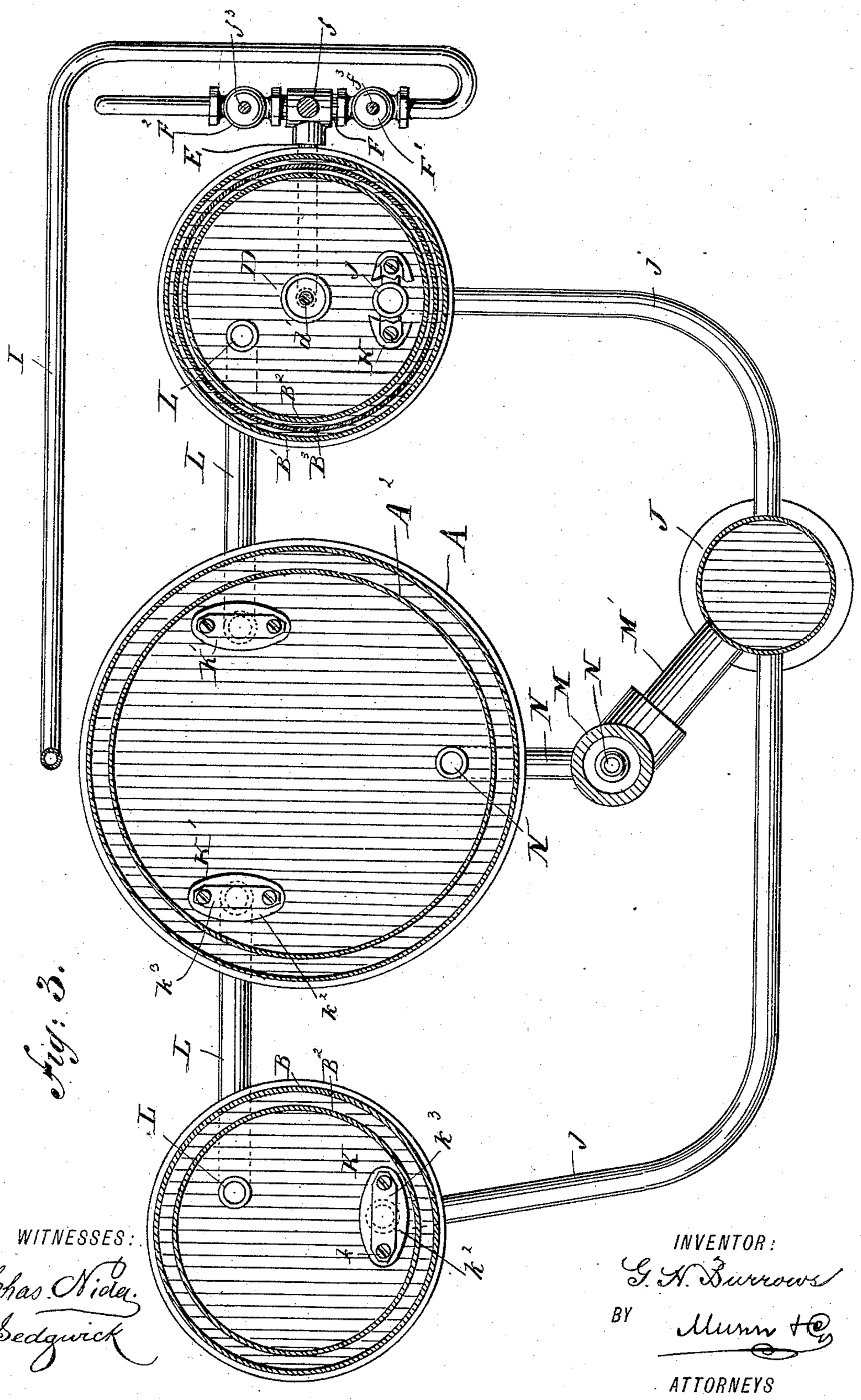

Fig. 3.

WITNESSES:

Chas. Nida.

C. Sedgwick

INVENTOR:

G. H. Burrows

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

GEORGE H. BURROWS, OF SOMERVILLE, MASSACHUSETTS.

VENTILATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 445,878, dated February 3, 1891.

Application filed June 26, 1890. Serial No. 356,819. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. BURROWS, of Somerville, in the county of Middlesex and State of Massachusetts, have invented a new and Improved Ventilating Apparatus, of which the following is a full, clear, and exact description.

My invention relates to improvements in ventilating apparatus; and the object of my invention is to provide means for taking pure air from an elevation and delivering it in desired quantities into a room or rooms either with or without passing the air through a heater.

My invention will be hereinafter fully described, and specifically pointed out in the claims.

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

Figure 1 is a broken side elevation of the device with the air-pumps in vertical section. Fig. 2 is a broken end view with the pump-operating valves and the connections between the air supply and delivery pipes shown in vertical section, and Fig. 3 is a horizontal section on the line 3 3 of Fig. 1.

The expansible air tank or reservoir is constructed on the principle of a gasometer, it consisting of an outer cylinder or shell A open at the top, an inner annular partition A^2, and a bell A′, closed at the top and open at the bottom, said bell being adapted to move vertically between the outer shell and the inner partition A^2. The bell A′ has mounted on opposite sides thereof grooved trucks *a*, which project slightly beyond the sides of the frame of the cylinder and run upon the vertical frame *a*′, which is adjustably mounted on the sides of the air-reservoir. The frame *a*′ is of an inverted-U shape, and centrally fixed upon the upper part thereof is a bifurcated lug a^3, in which the walking-beam of the pumps is pivoted. The pump-cylinders B and B′ are similar in size and are arranged on opposite sides of the air-reservoir. The cylinders are each provided with an inner annular partition B^2 and with a bell B^3, closed at the top, which moves vertically between the cylinders B B′ and the partitions B^2.

A walking-beam C is centrally pivoted in the lug a^3 on the frame *a*′, said walking-beam being connected at each end by a rod C′ with the bell B^3. The rods C′ are of the same length, and it will thus be seen that when the bell B^3 in the pump-cylinder B is raised the bell in the pump B′ will be depressed. The bell in the pump B′ is provided with a weight C^2 to enable it to drop quickly after being raised, as hereinafter described.

The pump-cylinders B and B′ are each provided with upwardly-extending U-shaped frames *b*, said frames being attached to opposite sides of the cylinders, and the bells B^3 are provided with grooved pulleys *b*′, which fit closely upon the frames, and thus serve as guides for the bells. The bells B^3 are also provided upon the top with suitable lugs *c*, to which the rods C′ are attached.

Centrally located in the pump-cylinder B′ is a vertical pipe D, which opens through the bottom of the cylinder, within which pipe and vertically movable in the same is a piston *d*, having a suitable piston-rod *d*′ connected therewith and extending upwardly to the top of the bell B^3. Fixed to the under side of the piston *d* is a depending flexible flange d^2, made, preferably, of rubber, the flange being attached in such a manner as to give it an inverted-cup shape, as shown in Fig. 1. The flange will thus adapt itself to any inequalities in the pipe D, and it will enable the water which enters the pipe to easily raise the piston A pipe E enters the cylinder B′ from the bottom and in alignment with the pipe D, said pipe E connecting at its outer end with a pipe F, which is arranged at right angles with the same. The pipe F has fixed to one end a valve F′ and to the other a valve F^2, said valves being similar in construction but reversely connected with the pipe. The valves F′ and F^2 have each a horizontal valve-seat with a vertical perforation F^3 through the same. A vertical support *f* is mounted upon the pipe F, and centrally pivoted upon said support is a walking-beam *f*′, adapted to operate the valves, as described below. The valves F′ F^2 are each provided with a vertically-movable piston f^2, adapted to open and close the perforation in the valve-seat, the stems of said pistons being con-

nected with the screw-threaded rods f^3, which are provided at the top with slotted frames f^4, adapted to engage the walking-beam f'. The lower ends of the slotted frames f^4 are screw-threaded to fit the rods f^3, and extending through the top of the frames are screws f^5, so that by manipulating the frames and the screws the frames may be adjusted upon the walking-beam so as to regulate the stroke of the pistons f^2.

A sleeve G is pivoted upon a plate H, which is attached to the pump-cylinder B', said sleeve being in vertical alignment with the support f. The sleeve G is provided with oppositely-extending arms G' and with an upwardly-extending arm G^2 at right angles to said arms. One of the arms G' is connected with one end of the walking-beam f' by a rod g, said rod having collars g' adjustably fixed thereon. The arm G' is connected with the rod g by means of the angled plate g^2, said plate being pivoted to the end of the arm and being mounted loosely on the rod g between the collars g'. The plate will thus move upon the rod, and by striking alternately the collars will actuate the walking-beam f' and operate the valves F' F^2. The opposite arm G' is connected by a chain g^3 with a depending arm b^2, which is fixed to the top of the bell B^3, which moves in the cylinder B'. A weighted rod g^4 extends upwardly from the arm G^2 and assists in tilting the sleeve G and operating the valve mechanism, as described above.

A water-supply pipe I extends over the top of the air-reservoir adjacent to the top of the frame a' and passes down the side of the reservoir and enters the valve F', and a waste-pipe I' connects with the opposite valve F^2. The water-supply pipe is provided with a suitable valve I^2, which is arranged above the air-reservoir, and the valve-stem i of said valve is provided with a depending lever i', carrying a truck i^2, the weight of the lever and truck being sufficient to turn the valve-stem and close the valve. The lever i' is prevented from dropping too far by the chain i^3, which is attached to the lever and to the frame a'.

An air-supply pipe J is mounted adjacent to the pumps and air-reservoir, and is adapted to extend upwardly through the top of the building, the pipe being extended sufficiently high to reach pure air, the height of course varying with different localities. The air-supply pipe J connects with each of the pump-cylinders B and B' by a pipe j, said pipe opening from the lower portion of the air-pipe and entering at the bottom of the cylinders through valves K. The valves K have upon opposite sides upwardly-extending studs or screws k, which are attached to lugs k' on opposite sides of the valve, and the top of the valve is covered by a thin flexible strip k^2, said strip being re-enforced by a thin metallic plate k^3. The valve thus operates as a check-valve, permitting the air to enter the cylinder, but preventing its escape. Each of the cylinders B and B' is also connected with the air-reservoir A by the pipes L, said pipes opening from the air-pump cylinders and entering the air-reservoir through valves K', said valves being constructed like the valves K, already described.

The delivery-pipe M is arranged opposite to the air-supply pipes J in the air-reservoir, said pipe extending to a point where the air is delivered, which may be into a room or any number of rooms, or may be into the air-box of a furnace. The delivery-pipe M is connected with the air-reservoir by a pipe N, said pipe opening from the bottom of the air-reservoir and entering through the bottom of the delivery-pipe, the said pipe N having a reduced end N' within the delivery-pipe. The delivery-pipe M is also connected with the air-supply pipe J by a pipe M', said pipe entering the delivery-pipe opposite the end N' of the pipe N. By arranging the pipes in this manner the air entering the pipe M from the pipe N under pressure will draw into the pipe N large quantities of air from the air-supply pipe J, the pipes operating upon the air in the same manner that a boiler-injector operates upon the water which is to be forced into a boiler.

The spaces between the reservoir A and partition A^2 and between the cylinders B and B' and the partition B^2 are filled with water in order to form an air-tight seal, and the apparatus operates as follows: The water from the pipe I enters the valve F' when the piston f^2 is raised, as shown in Fig. 2. The water then passes through the pipe E and into the pipe D and raises the piston d and the bell B^3 of the pump B'. When this bell B^3 is raised, the air enters the cylinder B' through valve K, and the bell B^3, opposite pump B, is depressed by means of the walking-beam connection and the air forced therefrom into the air-reservoir. As the piston d nears the end of its stroke, the bell B^3, by means of the arm b^2 and chain g^3, tilts the arms G' and sleeve G, thus forcing the rod g and walking-beam f' downwardly and closing the valve F' until the bell A' again falls sufficiently to permit arm i' to again fall and open the valve i, and so on indefinitely. The weight C^2 then forces down the bell B^3 in the pump B', and the water in the pipe D passes out through the pipe E, valve F^2, and waste-pipe I', the piston in the valve F^2 being raised when the piston in the opposite valve is depressed. When one of the bells B^3 is raised, a vacuum will be created in the bell B or B', in which the cylinder B^3 is located, so that air will enter the bell through the pipe j, and when the cylinder is depressed the air will be forced through the pipe L and valve K' into the air-reservoir A. As the air-reservoir fills, the bell A' will be raised by the pressure of air within, and striking the truck i^2 will raise the lever i' and close the valve I^2. The pumps will then cease to operate until the air in the

air-reservoir becomes somewhat exhausted, thus permitting the bell A′ to drop, when the weight of the lever i' and truck i^2 opens the valve I^2 and again sets the pump in operation. The weight of the bell A′ is sufficient to give the necessary pressure to the air, so as to force it through the pipe M to the point of delivery.

From the foregoing description it will be seen that a constant supply of air will be furnished to the air-reservoir, and consequently to the room or rooms connected therewith, and that one of the pumps will be constantly in operation, so that the air-reservoir will be very easily supplied.

In practice the air-supply pipe J may be run to any desired point, so as to obtain a supply of pure air, and the delivery-pipe M may be connected with the furnace or may connect directly with the rooms to be ventilated. In either case it will be found that the supply of air is abundant, and the amount of air entering a room or the furnace may be regulated by valves in the usual manner.

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

1. In a ventilating apparatus, the combination, with an air-reservoir and with suitable pumps adapted to fill the same with air, of an air-supply pipe connected with the pumps, an air-delivery pipe, a smaller pipe connected with the air-reservoir and entering the delivery-pipe, and a pipe connecting with the air-supply pipe and entering the delivery-pipe adjacent to the end of said smaller pipe, substantially as described.

2. In a ventilating apparatus, the combination, with the pump-cylinder B′, having a vertical pipe D centrally located therein, and the bell B^3, adapted to move in the bell B′ and having connection with a similar cylinder, as described, of the pipe E, opening through the cylinder B and into the pipe D, the cross-pipe F, connecting with said pipe E, the valve F′, attached to one end of the cross-pipe and to a water-supply pipe, the valve F^2, attached to the opposite end of the cross-pipe and to a waste-pipe, the walking-beam f', mounted on the support f, as shown, the vertically-movable valve-pistons f^2, adapted to close the valve-seats and adjustably connected with the walking-beam, the three-armed sleeve G, pivoted on the side of cylinder B′, the rod g, connecting one arm of the sleeve with the walking-beam f', said rod having collars g' thereon, the angle-plate g^2, connecting the rod with an arm G′, means, as chain g^3 and bent arm b^2, for connecting the opposite arm G′ with the bell B^3, and the weighted rod g^4, attached to the sleeve-arm G^2 and adapted to regulate the movement of the sleeve, substantially as described.

3. A ventilating apparatus comprising an air-reservoir having a bell, said reservoir being provided with an upwardly-extending U-shaped frame connected by guide-pulleys with the said bell, pump-cylinders located on opposite sides of the reservoir and having vertically-movable bells mounted therein, a walking-beam pivoted on the reservoir-frame and connected with the movable bells of the air-pumps, an air-supply pipe connecting with the air-pump, an air-delivery pipe opening from the reservoir and from the air-supply pipe, a vertically-movable piston mounted in a pipe in one air-pump and connected with the movable bell of the pump, a water-pipe opening into the piston-pipe, inlet and outlet valves connected with said pipe, a lever mechanism for opening and closing the valves by the movement of the pump-bells, a water-supply pipe connected with the inlet-valve, a valve located in the water-supply pipe, and a lever connected with the valve-stem of the water-supply-pipe valve and extending above the bell of the air-reservoir, so that the movement of said bell will regulate the water-supply, substantially as described.

GEORGE H. BURROWS.

Witnesses:
W. B. HURRUB,
WILLIAM P. HAMMOND.