No. 683,935. Patented Oct. 8, 1901.

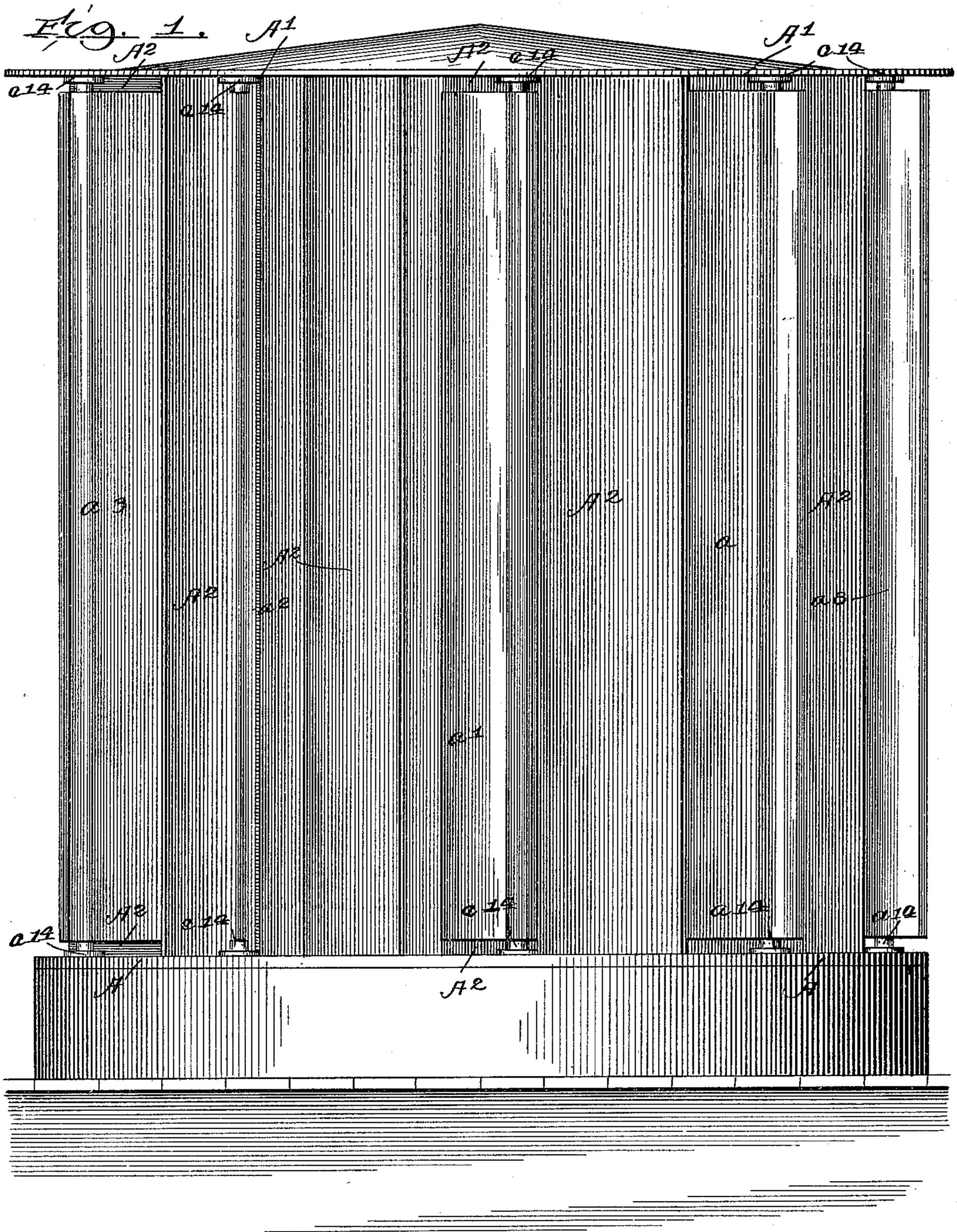
J. A. HENSEL.

AIR CURRENT MOTOR.

(Application filed May 12, 1900.)

(No Model.) 7 Sheets—Sheet 1.

Fig. 1.



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No. 683,935. Patented Oct. 8, 1901.

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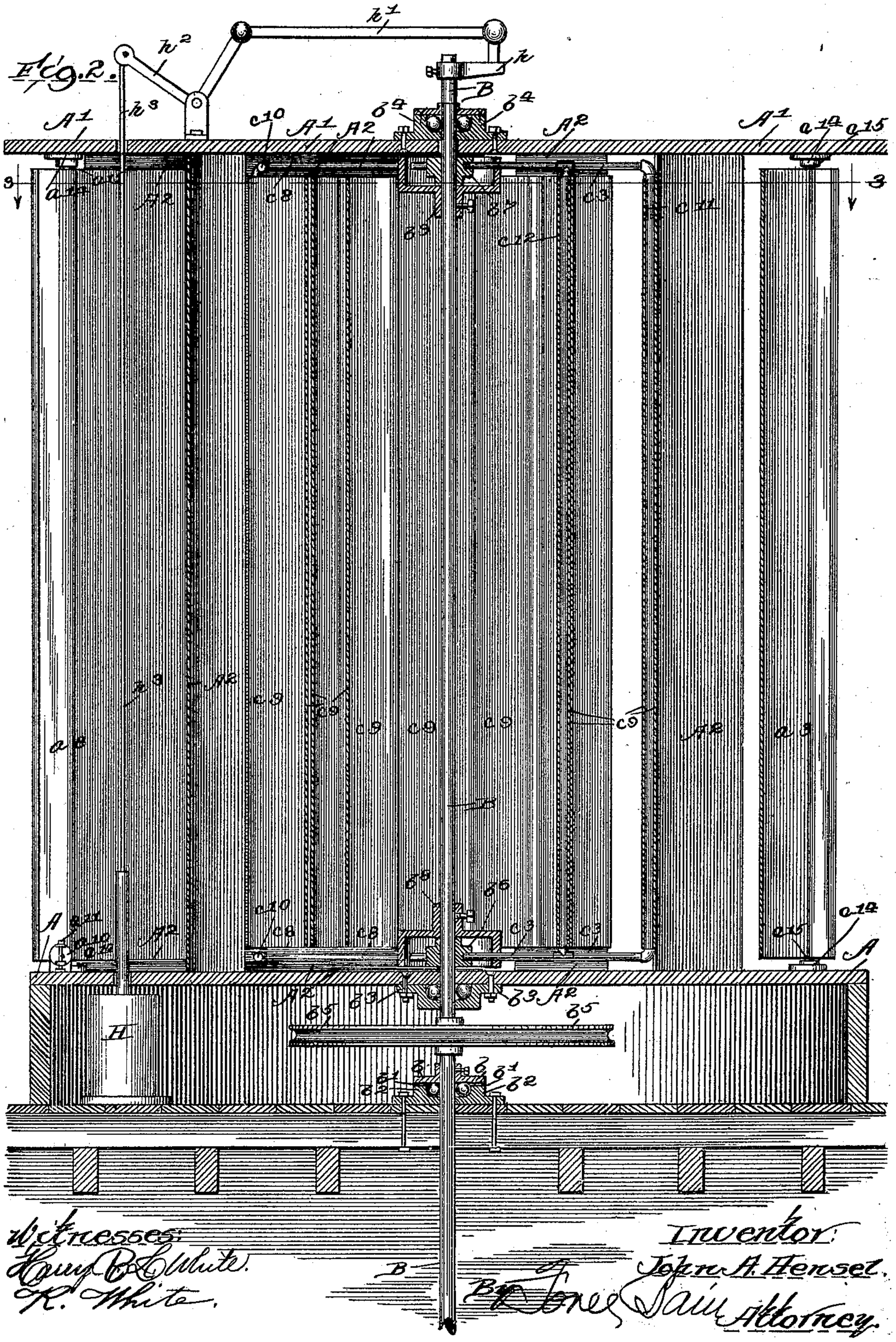
(No Model.) 7 Sheets—Sheet 2.

FIG. 2.



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No. 683,935. Patented Oct. 8, 1901.

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AIR CURRENT MOTOR.

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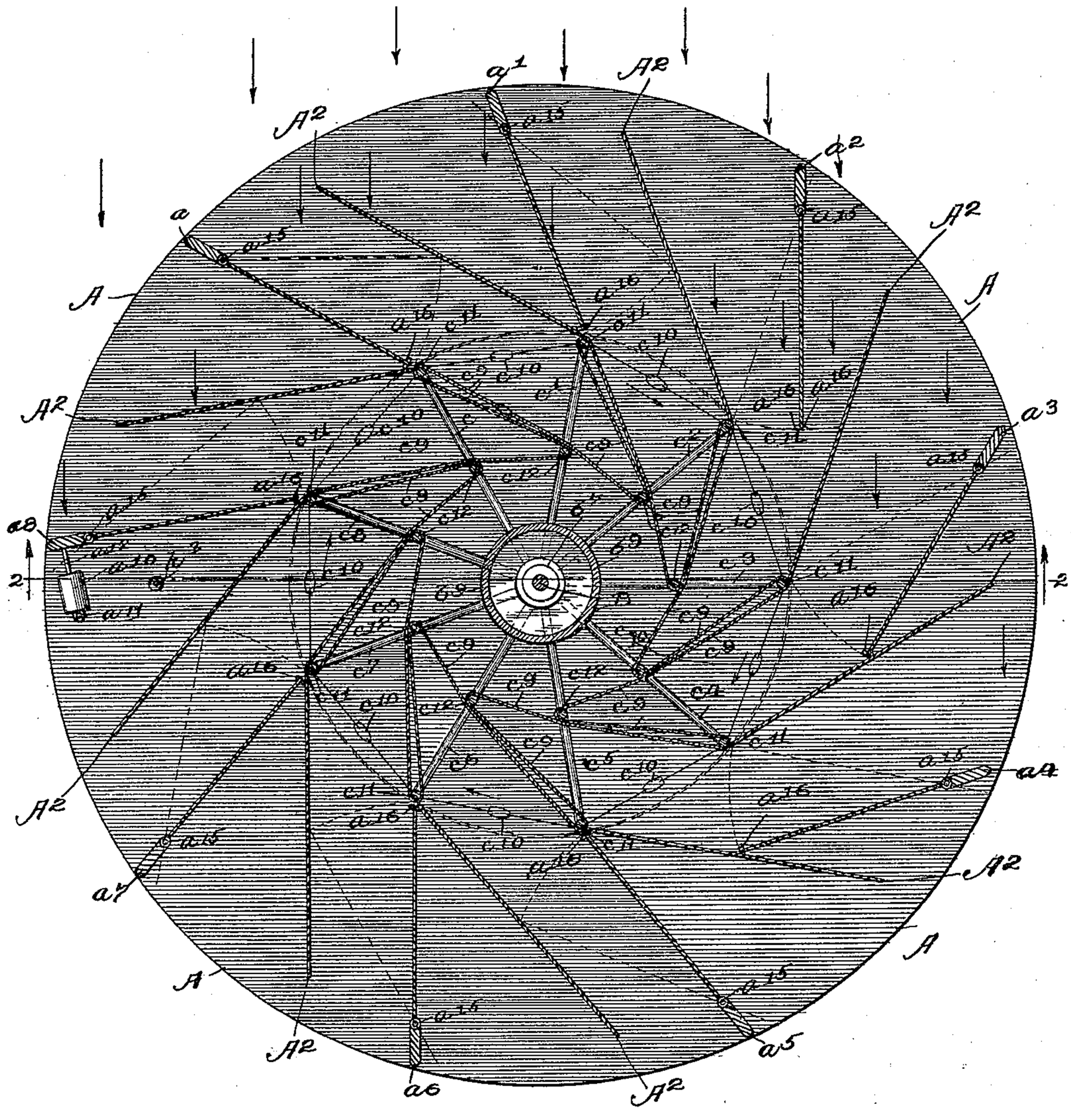
(No Model.) 7 Sheets—Sheet 3.

Fig. 3.



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No. 683,935. Patented Oct. 8, 1901.

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AIR CURRENT MOTOR.

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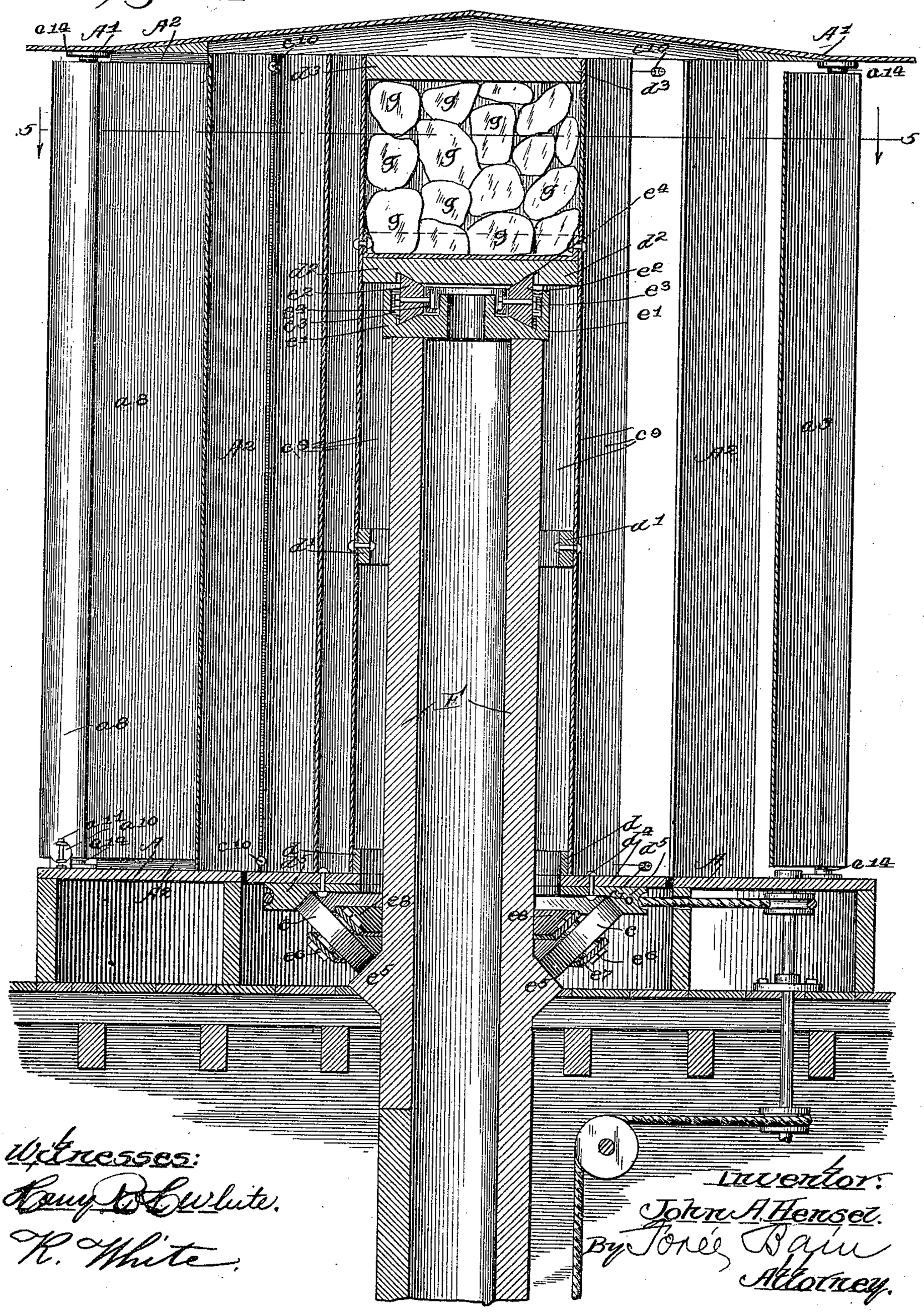
(No Model.) 7 Sheets—Sheet 4.

Fig. 4.



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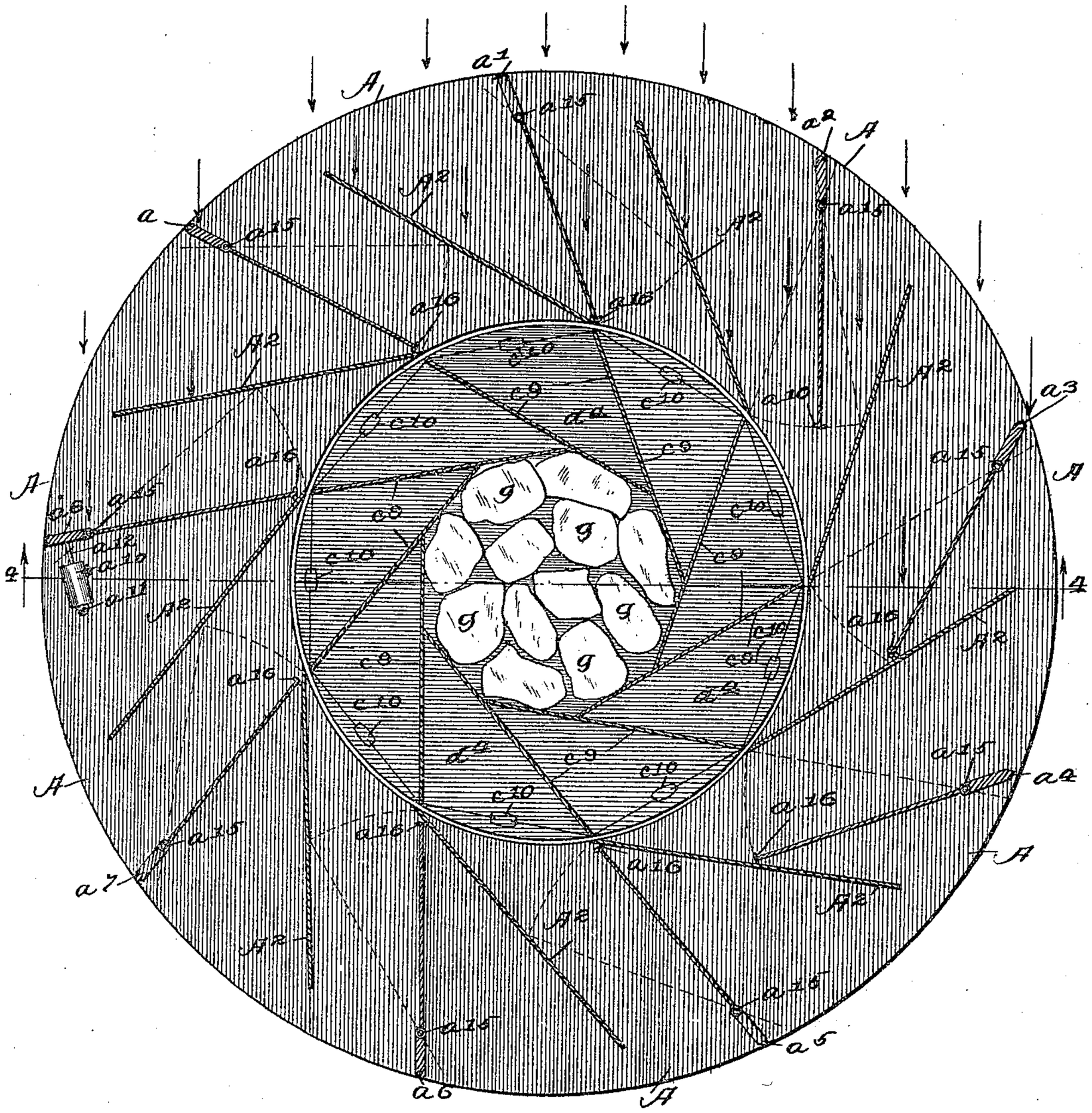
J. A. HENSEL.

AIR CURRENT MOTOR.

(Application filed May 12, 1900.)

(No Model.) 7 Sheets—Sheet 5.

Fig. 5.



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No. 683,935. Patented Oct. 8, 1901.

J. A. HENSEL.

AIR CURRENT MOTOR.

(Application filed May 12, 1900.)

(No Model.) 7 Sheets—Sheet 6.

Fig. 10.

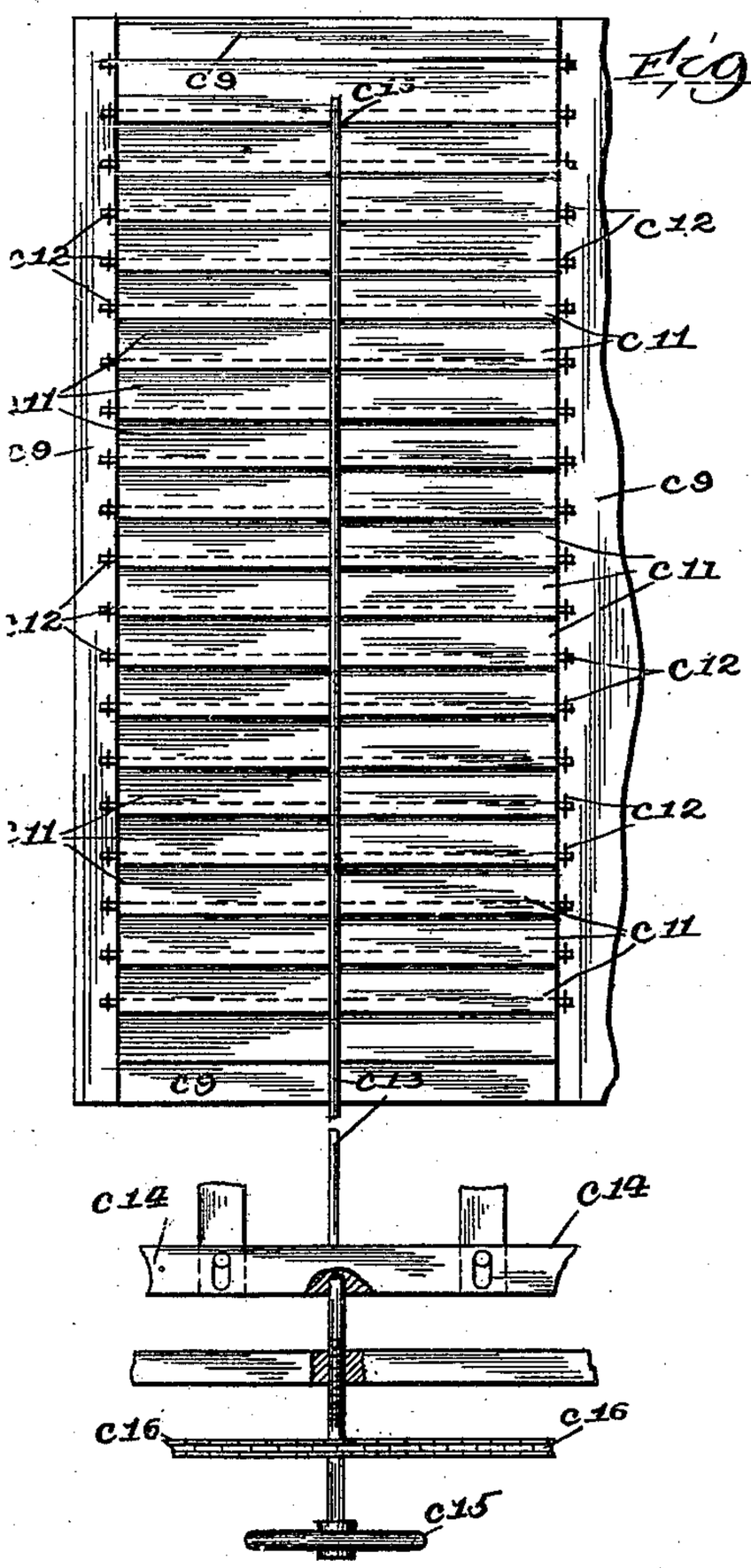


Fig. 11.

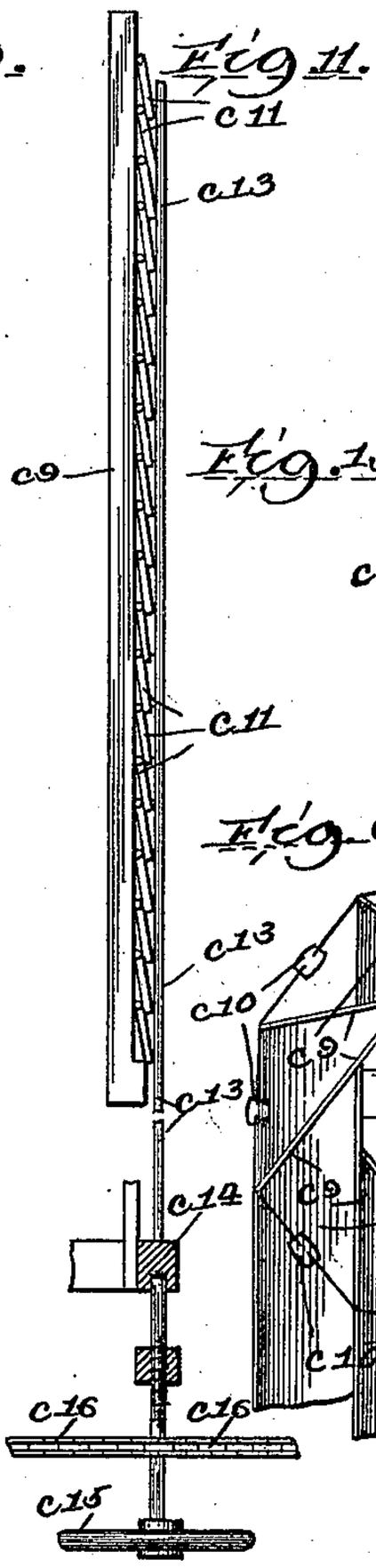


Fig. 12.

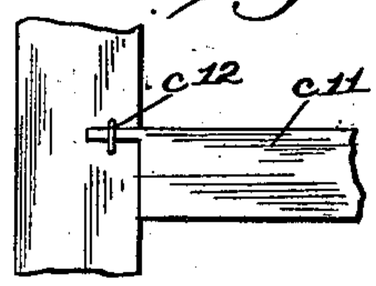


Fig. 13.

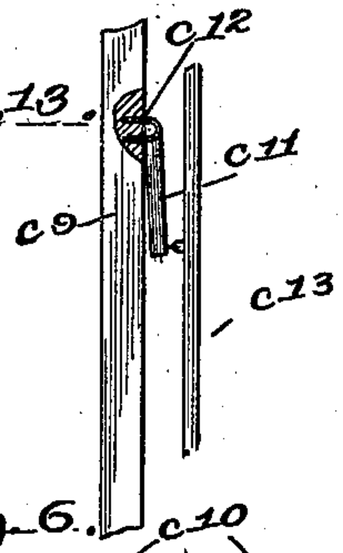


Fig. 6.

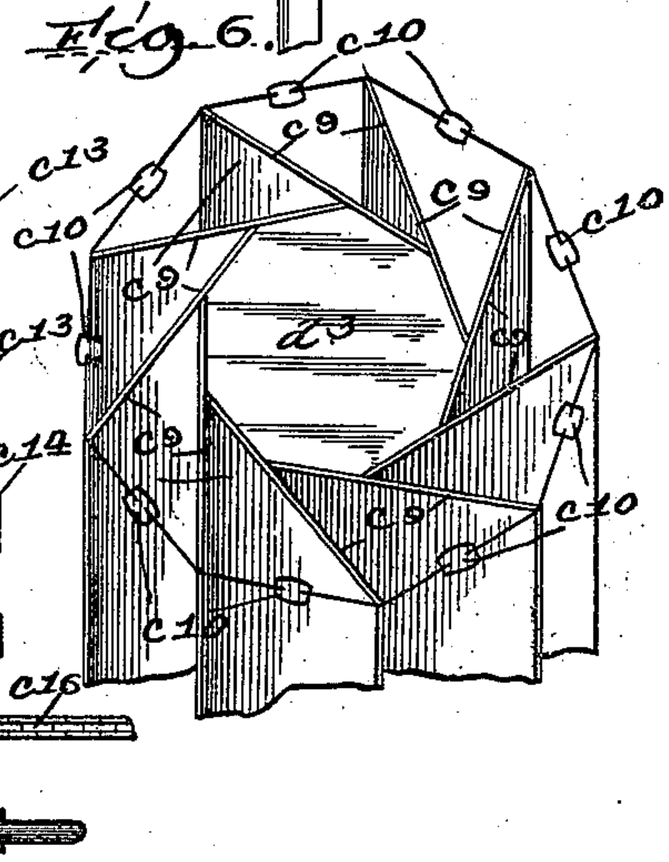


Fig. 2.

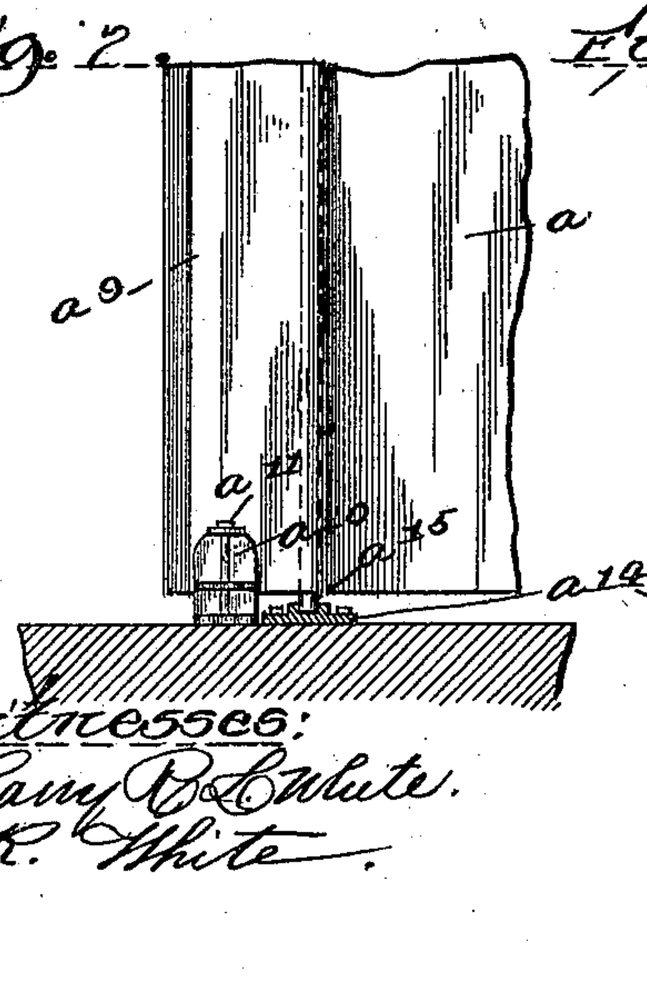


Fig. 8.

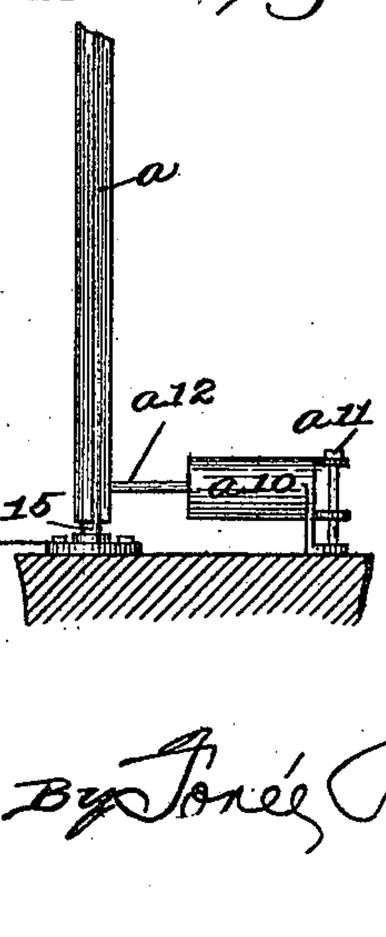
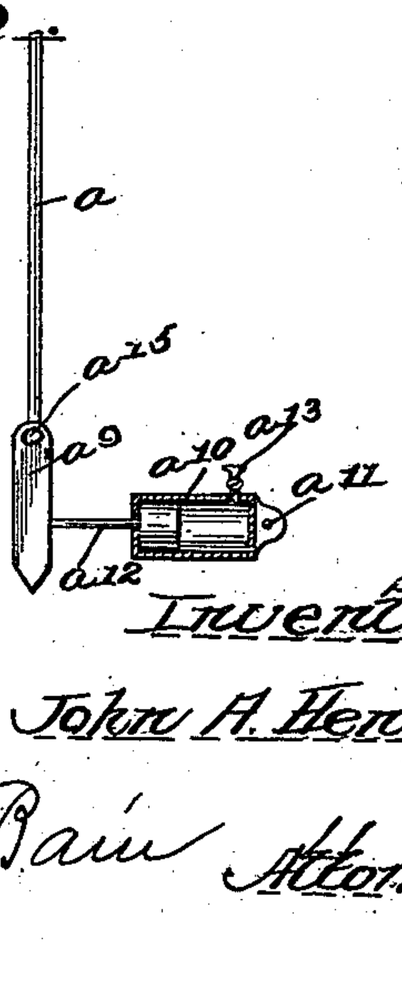


Fig. 9.



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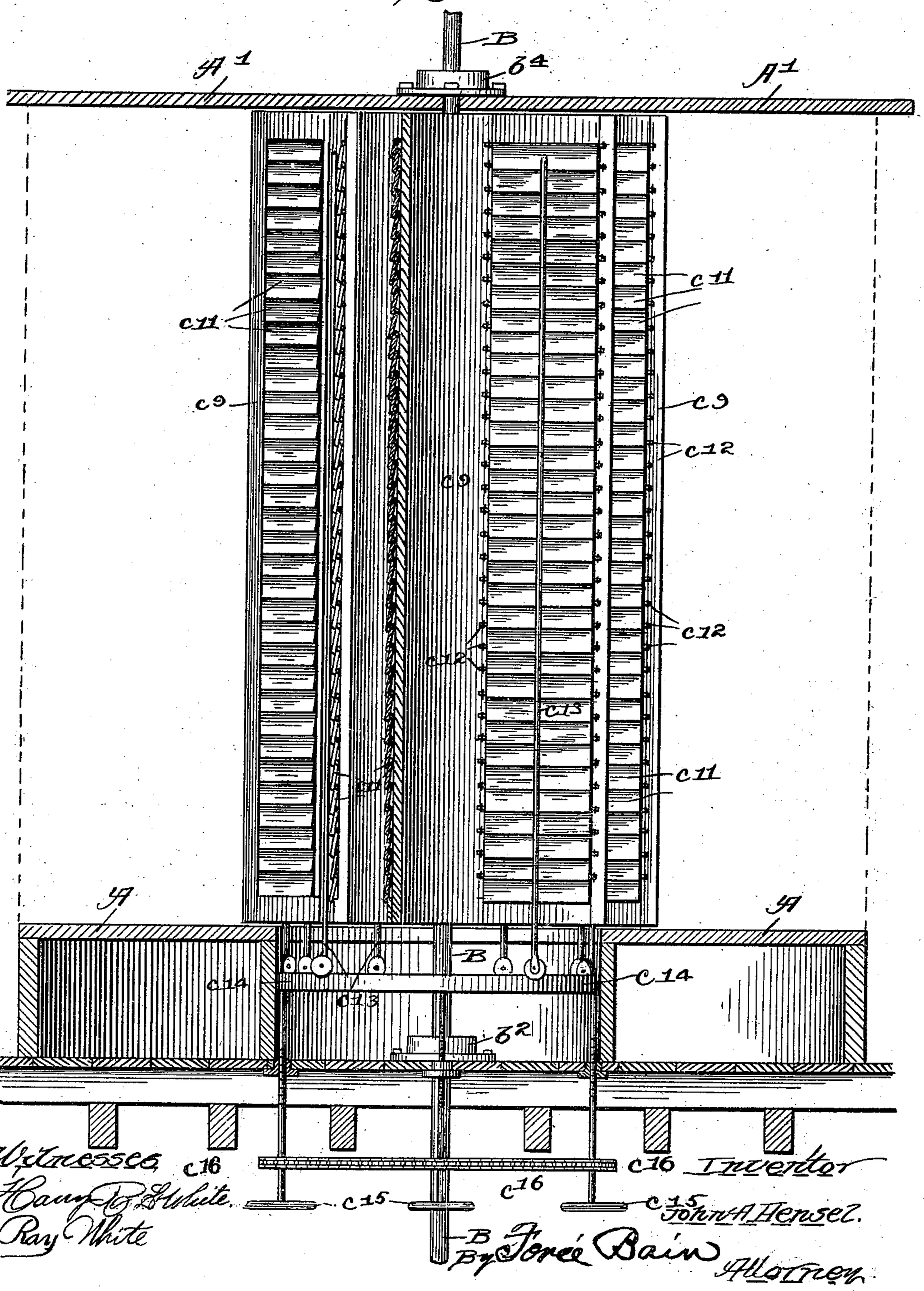
(No Model.) 7 Sheets—Sheet 7.

Fig. 14.



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Inventor
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By Jones Bain
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UNITED STATES PATENT OFFICE.

JOHN ADAM HENSEL, OF CHICAGO, ILLINOIS.

AIR-CURRENT MOTOR.

SPECIFICATION forming part of Letters Patent No. 683,935, dated October 8, 1901.

Application filed May 12, 1900. Serial No. 16,536. (No model.)

To all whom it may concern:

Be it known that I, JOHN ADAM HENSEL, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Air-Current Motors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable persons skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in air-current motors of a class wherein the wheel is placed in a vertical position and by means of which the highest degree of efficiency is obtained.

The object of my invention is to provide a construction that is simple, cheap to erect, not easily disarranged, which will continue to operate uninterruptedly without requiring a great deal of attention for its maintenance, and which will absorb only a small portion of the power by friction of the moving parts.

A further object of my invention is to provide an air-current motor that is immediately responsive to the movement of air without regard to the direction in which the air-currents are moving or to the fickleness of the moving currents in changing direction, my motor being at all times in condition to respond to the air-currents without regard to the direction from which the currents are proceeding and without it being necessary for the motor to be bodily moved in order to be in a responsive position every time the direction of the air-currents change.

In the drawings, Figure 1 is a view of an elevation of the motor as it appears when erected in position. Fig. 2 is a vertical section taken through line 2 2 of Fig. 3. Fig. 3 is a cross-section taken through lines 3 3 of Fig. 2. Fig. 4 is a vertical section of a modification taken on lines 2 2 of Fig. 3. Fig. 5 is a cross-section of a modification taken on lines 5 5 of Fig. 4. Fig. 6 is a broken-away perspective view of my wheel looking from the top and from one side. Figs. 7, 8, and 9 are broken-away detail views of the movable wings or vanes that are located within the casing that surrounds the wheel and that act as valves for directing the course of the air into the wheel and the dash-pot for dampening the motion of the wings. Fig. 10 is a modification of one of the blades of the wheel and a means for varying the quantity and effect of the current of air that impinges against it for the purpose of regulating the motion or power of the wheel. Fig. 11 is a side view of the same. Fig. 12 is a detail showing the manner in which the slats are hinged thereon. Fig. 13 is a similar view showing the manner in which each slat is hinged to a vertical rod that is common to all of the slats on a given wing. Fig. 14 is an elevation of the wheel, composed of the parts shown in Figs. 10, 11, 12, and 13.

In all of the views like letters of reference are used to designate similar parts.

In Fig. 2 a housing A is the base of the wheel-casing. This base may be located on top of the building or tower especially erected for the purpose in or near which it is desirable to utilize the power of the motor.

While a casing may offer suitable protection from rain, yet in climates where snow and ice are plentiful it is not so desirable and can practically be dispensed with (so as to prevent the oscillating vanes from clogging by ice and show) by substituting a framework of steel or wood for supporting the deflecting-plates and vanes in their relative positions to the wheel. Furthermore, it will more readily admit of the deflecting-plates being made to oscillate also by adding suitable stops, so as to more directly convey the air-currents into the wheel. A top plate A′ covers the entire top of the wheel and the surrounding casing. A series of vertically-placed tangential deflecting-plates A^2 are regularly spaced around the wheel and are fixed to both the top plate A′ and the bottom plate A, which, with the said top and bottom plates, form the casing around the wheel. These plates may be secured to the top and bottom by means of angle-irons and may be stiffened by means of vertical corrugations or by rods, to which they may be attached. Intermediate of each plate and the next succeeding one a movable vane wing or valve is pivoted. I have designated these vanes a, a', a^2, a^3, a^4, a^5, a^6, a^7, and a^8. The dotted lines show the region over which they are adapted to oscillate. Within this region they will move in a direction always tending to place themselves in line with the direction

on which the air-currents are moving. They may be made of any suitable material—such as wood, sheet-iron, or a suitable frame covered with fabric will answer the purpose. Each vane is partially counterweighted by means of the thickened portion a^9. (Shown more plainly in Figs. 7, 8, and 9.)

To prevent too sudden movement of the vanes, I prefer to dampen their movement by means of an air or liquid dash-pot to be connected to each vane. I have shown only one of such in the drawings, the cylinder of which, a^{10}, has swiveled connections with the base by means of pin a^{11}. The piston is connected to the vane by means of the stem a^{12}. a^{13} is an air-exhaust cock, by means of which the dampening effect of the device may be regulated. A flange a^{14} forms a step for the pivot a^{15}. A similar flange is fixed to the top plate A'. To prevent a noise when the vanes strike against the tangent plates, small rubber surfaces a^{16} are fixed to the inner edges of the vanes.

In Figs. 3 and 5 the vanes are shown in the position they will occupy when the air is moving in the direction indicated by the arrows shown in the upper portion of the figures.

The outside casing in Fig. 3, which I have just described, is practically the same as that shown in Fig. 5.

Referring now to Fig. 2, a vertical shaft B passes freely through central perforations in the plates A and A'. A step or bearing-disk b is substantially fixed to the shaft and supports the weight of the wheel upon ball-bearings b', that are connected within a runway b^2. Similar runways b^3 and b^4, each containing a suitable number of balls for supporting the shaft in its vertical position, are attached to the plates A and A', respectively. A power-wheel b^5, in this case designed for rope transmission, is fixed to the shaft B. Just inside of the plates A and A' hubs b^6 and b^7 are firmly fixed to the shaft. Other hubs, b^8 and b^9, one at each end of the shaft, are properly fixed to the shaft by set-screws or otherwise and are each provided with an annular enlargement which extends to a greater diameter and which surrounds the hubs b^6 and b^7, respectively. A series of spokes c, c', c^2, c^3, c^4, c^5, c^6, c^7, and c^8 are screwed into the inner hubs b^6 and b^7 and are supported by the ring extension of the outer hubs b^8 and b^9, through which the spokes pass. I prefer to make these spokes of thin light metal tubing; but they may be made of other material. The spokes in the respective hubs are joined by vertical corresponding tubes c^{11} at their respective ends and again by other vertical tubes c^{12} at points midway between the said ends and the inner hubs.

The before-described hubs, radial spokes, and vertical tubes or rods comprise the skeleton of my rotating motor-wheel.

c^9 represents a wing, which may be made of a continuous band of pliable fabric, such as duck or canvas, which may be previously treated, if desirable, to render it more durable and not so changeable by atmospheric conditions. This band of fabric should extend between the radial spokes, which are located at each extremity of the wheel. When it has been wound around the vertical tubes, as plainly shown in Fig. 3, a series of wings are thus produced. These wings are not radial from the center of the wheel; but, as will be noticed, they are tangential from an inner drum, which in this case is formed of canvas where it passes around the intermediate vertical tubes or rods.

The manner of constructing the wheel is a desirable one, yet I do not wish to be limited strictly to the construction shown.

The wing c^9 may be made of suitable material in a four-sided frame, as shown in Fig. 10. A series of overlapping slats or valves c^{11} extend from one side to the other. The slats are hinged at their upper edges by means of staples c^{12} or otherwise, as shown in detail in Figs. 12 and 13. All of the slats are hinged in the same manner to a vertical rod c^{13}. When the rod c^{13} is elevated, all of the slats c^{11} are brought to a horizontal position, in which position only their edges are presented to the wind, and large openings through the wing c^9 are provided between the adjoining slats, and thereby the surface of the wing is reduced, and it is plainly evident that any intermediate position will reduce the surface proportionately. In the modifications shown in Figs. 4 and 5 the wings c^9 are not like those shown in either Figs. 3 or 10, but are simple flat plates. A stationary ring c^{14} is placed under the wheel within the path of the vertical rods c^{13}. The ring is adapted to be lifted by means of a series of screw-wheels c^{15}, which are placed around and under the said ring. The screw-wheels c^{15} are connected together by means of a link belt or chain c^{16}, so that when one of the screw-wheels are turned they will all be correspondingly revolved and the annular ring will be equally raised or lowered on all sides. It is evident that when the ring c^{14} is raised the rods c^{13}, that rest thereon, are also raised and the slats c^{11}, that are connected thereto, will be proportionately separated, and spaces or openings will be thereby provided through which the wind will pass without much resistance, and for this reason the wheel will be less powerfully propelled. A pocket of a peculiar shape is thus provided between the adjacent wings. This construction admits of another distinct function to the effect that when said slats or valves are not raised by said mechanism when under operation slats c^{11} act as valves to overcome any possible fanning resistance on the back of the wings produced by the rapid motion of the wheel, so that all the valves or slats c^{11} not under direct pressure on their face-surface will therefore prevent any resisting pressure and automatically open the valves by reason of the resistance it affords. Turnbuckles c^{10} are

provided between the adjacent spokes of the wheel for strengthening them. The turnbuckles are for the purpose of adjusting the tension between the spokes.

The simple construction which I have just described constitutes my rotary motor-wheel, the source from which all of the power of my device proceeds. It is simple, inexpensive, light, and highly efficient and may be knocked down for transportation and easily assembled on the ground where the wheel is to be erected.

My wheel is shown in Figs. 4 and 5. In this case a series of vertical sheet-metal plates are joined tangentially by rivets, screws, or the like to two rings d and d' and to two disks d^2 and d^3. I have designated these vertical plates which form the wing of the wheel c^9. A disk d^4 is fixed to the lower ring d and provides a floor, to which the plates c^9 are firmly attached. A power-wheel d^5, which may be an integral part of the disk d^4 or may be attached to it, as shown, also carries a bearing-surface for the wheel e. A hollow stationary shaft F, which may be made of masonry, an iron pipe, or by any convenient means, is capped on top by a metal plate e'. This plate contains a bearing-surface tapering toward the center of the shaft. A series of correspondingly-tapered wheels e^2 are held in a circular position by means of studs e^3, that are fixed to a ring e^4. The plate d^2, which is a part of the revolving wheel, is provided with bearing-surfaces for the wheel e^2, which rolls thereon. The groove which is cut into the disk e' for the bearing-surfaces may be filled with lubricating oil or grease, and by that means the bearing may be automatically lubricated. It will be noticed that the sides of the groove extend above the studs e^3 of the wheels e^2 and that a considerable quantity of oil for that reason may be contained therein. An enlargement of the shaft F below the wheel is provided with bearing-surfaces e^5, or the bearing-surfaces e^5 may be contained on a ring which may be slipped over and attached to the shaft F. The series of wheels e are contained on studs e^6 between the rings e^7 and e^8 and roll around on the bearing-surfaces e^5 and support the lower end of the wheel on the bearing-surfaces provided on the wheel d^5.

In order to make the wheel as light as possible, I may place bags properly inflated with a buoyant gas in the upper compartment of the drum or in any convenient manner attach them to the wheel. I have designated these bags g. In lieu of bags the entire compartment, in which they are shown, may be filled with a buoyant gas for the purpose described.

In Figs. 10, 11, 12, and 13 I have shown several views of a device whereby the surface of the wings c^9, upon which the moving currents of air impinge, may be varied automatically or otherwise for the purpose of varying the speed or power of the wheel with a given current of air.

The rods c^{13} are provided with grooved rollers or wheels on their lower ends, which will travel with less friction than the end of the rod upon the top surface of the ring. The ring c^{14} is preferably rounded upon its top surface, and the wheels are adapted to slightly project on either side in virtue of the annular screw.

I have shown in Fig. 2 a pump H and a means by which it may be operated from the shaft B. To the top end of this shaft a crank-arm h is attached. A horizontal connecting-rod h' has a ball-and-socket connection with the said crank-arm and also with a bell-crank h^2. One of the bell-crank arms is attached to the vertical reciprocating shaft h^3, and that in turn is connected to or is an extension from the piston of the pump H. When the shaft B is revolved, the rod h' is vibrated, and by this means the bell-crank h^2 is oscillated, which in turn imparts a reciprocating motion to the piston-rod h^3. By this means any device requiring a reciprocating intermittent motion may be operated. As before stated, continuous rotary motion may be taken from the power-wheel b^5. A similar method of transmission is shown in Fig. 4.

The operation of my air-current motor is as follows: In Figs. 3 and 5 the arrows show the direction of the air-currents. The arrows on the wheel show the direction of rotation of the wheel. The vane a is pressed over in the position shown by the air impinging thereon. It is in such a position that all of the air striking its face-surface will be thereby projected into the wheel. If this vane were removed, there would be a great loss of energy, for the air would strike the deflecting-plate against which the vane a is pressing, and it would thereby be projected from the wheel instead of into it, as this plate is inclined away from the wheel. The position of the vane a' will depend upon the pressure on either side. The air entering the pocket just in front of vane a^3 will be more directly projected into the wheel than it would be without the vane. The pocket provided in the wheel between the adjacent wings thereof is of such a shape that the air that impinges on the wings c^9 does not exert a pressure against the wheel tending to increase its bearing friction on the side opposite to that from which the air-currents come. This effect is neutralized by the tangential position of the wing, the pressure thereon having a tendency to press the wheel in the opposite direction to that stated, whereby the side bearing friction is practically eliminated.

I do not desire to be limited to the exact construction shown, as a very great latitude of variation therefrom may be made without departing from the spirit and scope of my invention.

Having described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. An air-current motor comprising a wheel, a casing surrounding said wheel, a series of

deflecting-plates regularly spaced in the said casing and around the said wheel, and a series of vanes adapted to be automatically oscillated, alternating in position with the said deflecting-plates, substantially as set forth.

2. An air-current motor comprising a wheel, a casing surrounding said wheel, a series of deflecting-plates in said casing, a series of vanes adapted to be oscillated, alternating in position with said deflecting-plates, and dampening devices for regulating the motion of the said vanes, substantially as set forth.

3. In an air-current motor a casing, a vertical wheel within said casing, a central drum within said wheel, open only at its lower end, a supporting stationary shaft extending into said drum, a bearing-plate upon the top of the shaft, a bearing-plate within said drum and a series of wheels adapted to rotate between the two bearing-plates, substantially as set forth.

4. In an air-current motor a casing, a vertical wheel within said casing, a central drum within said wheel provided with an internal bearing-surface, a supporting, stationary shaft provided with bearing-surfaces upon its upper end, extending into said drum, a series of wheels between the said bearing-surfaces, a bearing-surface supported by said shaft near the bottom of said wheel, a bearing-surface fixed to the said wheel, and a series of wheels between the two latter bearing-surfaces, substantially as set forth.

5. In an air-current motor a vertical wheel, a central drum, a series of wings projecting tangentially and outwardly from a central drum, each of said wings comprising an independent quadrilateral frame, a series of overlapping slats hinged to each side of said frame, a rod hinged to each of said slats and extending below said frame, an annular support below said wheel and in the path of the said rods, a means for raising the said annular support for lifting the said rods whereby said slats are opened and maintained in this position while the wheel is being revolved, substantially as set forth.

6. In an air-current motor a vertical wheel, a casing around said wheel, a series of deflecting-plates around said wheel within said casing, a series of shifting vanes between said deflecting-plates, a pivot near one edge of said vane, and a counterweight near said pivot, substantially as set forth.

7. In an air-current motor a casing, a vertical wheel within said casing, a central drum within said wheel, open at its lower end, a supporting stationary shaft extending into said drum, and bearings on said shaft for supporting said wheel, substantially as set forth.

In testimony whereof I have signed this specification, in the presence of two subscribing witnesses, this 4th day of May, A. D. 1900.

JOHN ADAM HENSEL.

Witnesses:
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M. F. ALLEN.