(No Model.) 9 Sheets—Sheet 1.

H. COOPER.

MACHINE FOR AGITATING AND CIRCULATING AIR IN ROOMS, &c.

No. 455,660. Patented July 7, 1891.

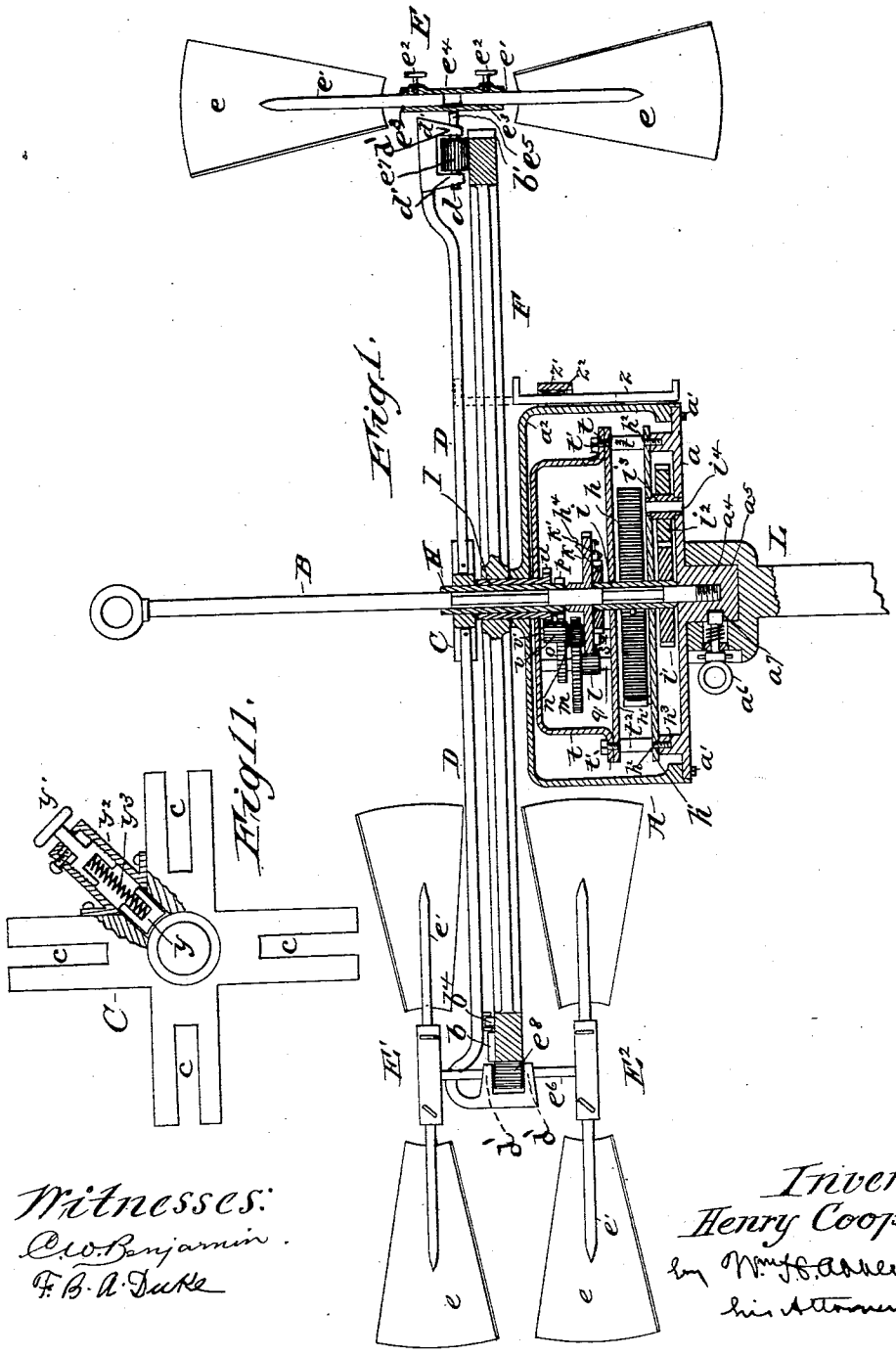


Fig. 1.

Fig. 11.

Witnesses:
C. C. Benjamin.
F. B. A. Dake

Inventor:
Henry Cooper.
by Wm. F. Allerton
his Attorney.

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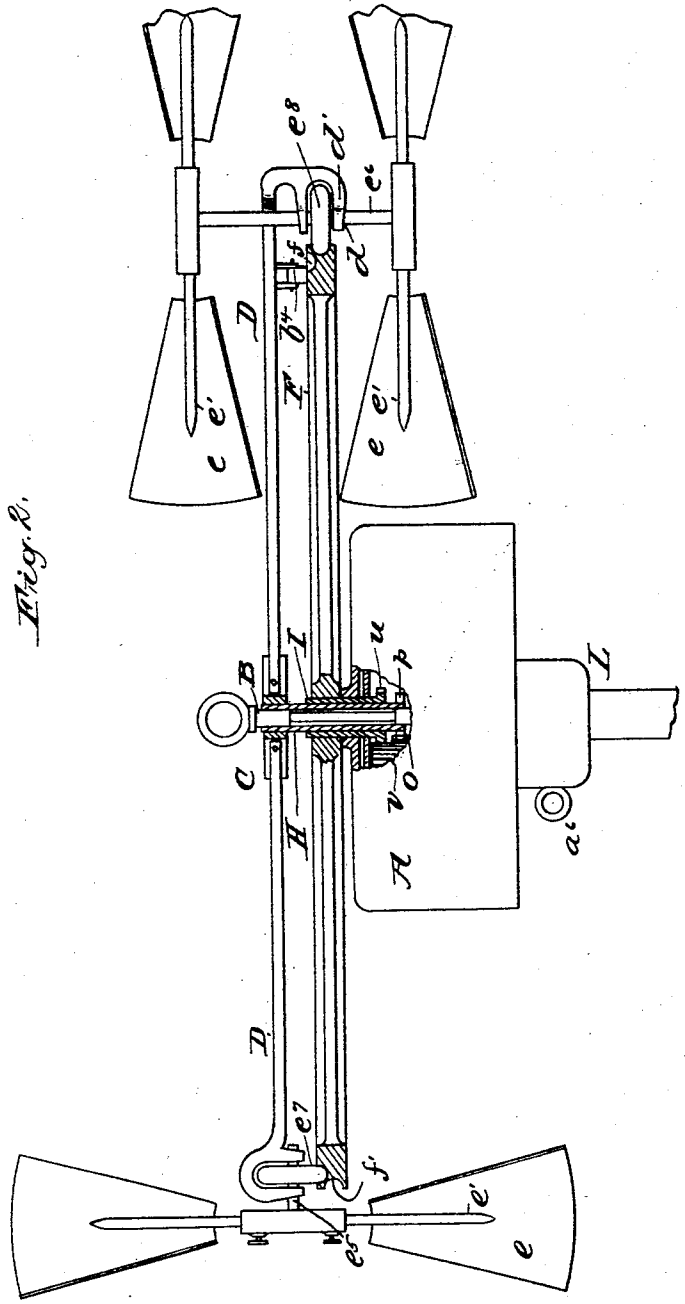
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H. COOPER.

MACHINE FOR AGITATING AND CIRCULATING AIR IN ROOMS, &c.

No. 455,660. Patented July 7, 1891.

Fig. 2.



Witnesses
C. W. Benjamin
F. B. A. Duke

Inventor
Henry Cooper
by Wm. G. Ashley
his Attorney.

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H. COOPER.

MACHINE FOR AGITATING AND CIRCULATING AIR IN ROOMS, &c.

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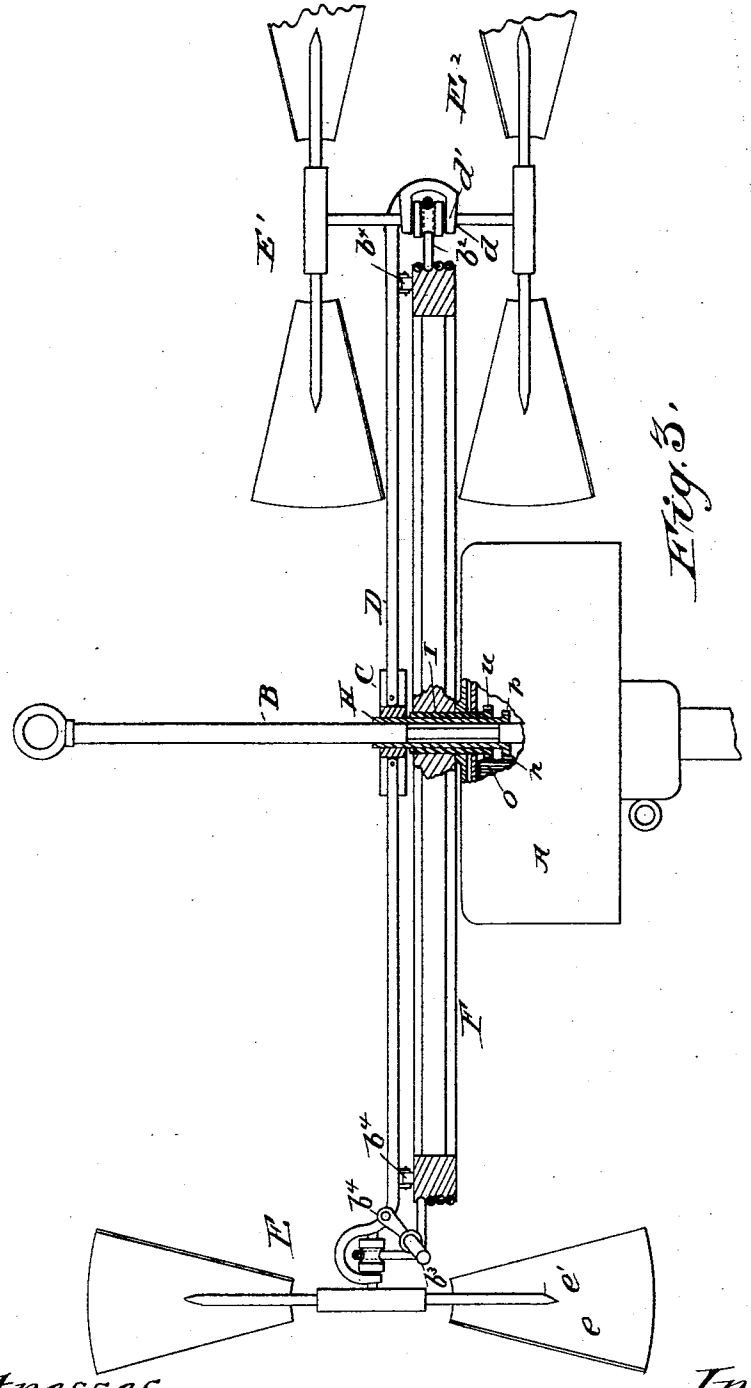


Fig. 3.

Witnesses
C. W. Benjamin
F. B. A. Dukt

Inventor
Henry Cooper
by Wm. Hamilton
his Attorney.

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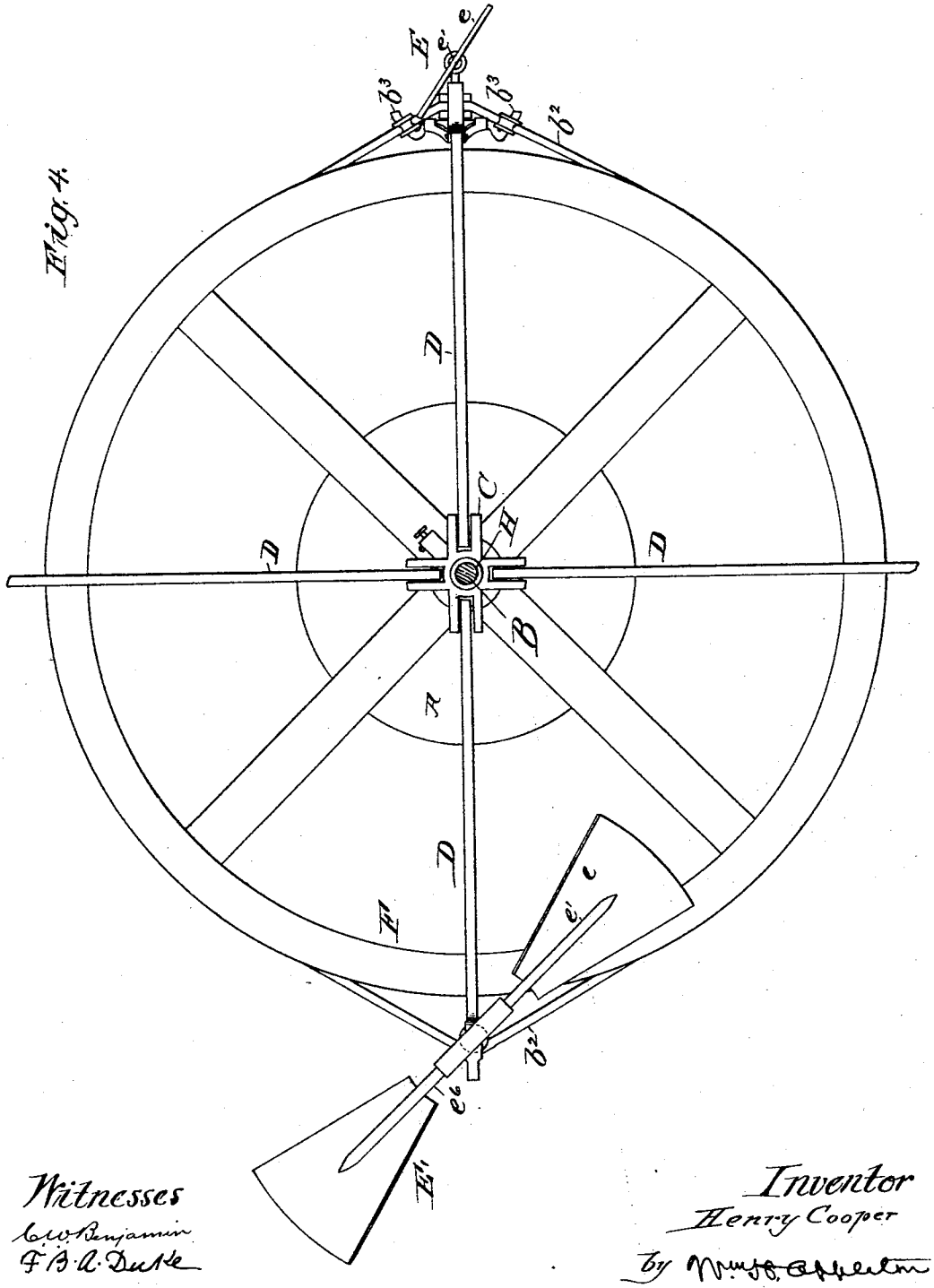
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H. COOPER.

MACHINE FOR AGITATING AND CIRCULATING AIR IN ROOMS, &c.

No. 455,660. Patented July 7, 1891.

Fig. 4.



Witnesses
C. W. Benjamin
F. B. A. Duke

Inventor
Henry Cooper
by Wm. J. O'Sullivan
his Attorney

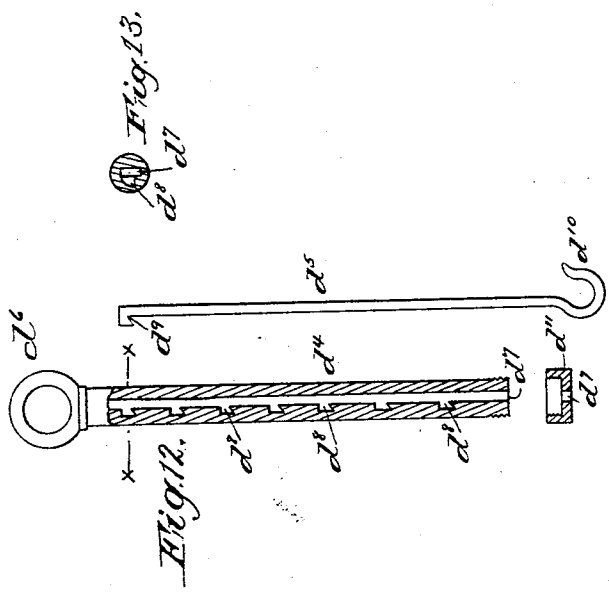
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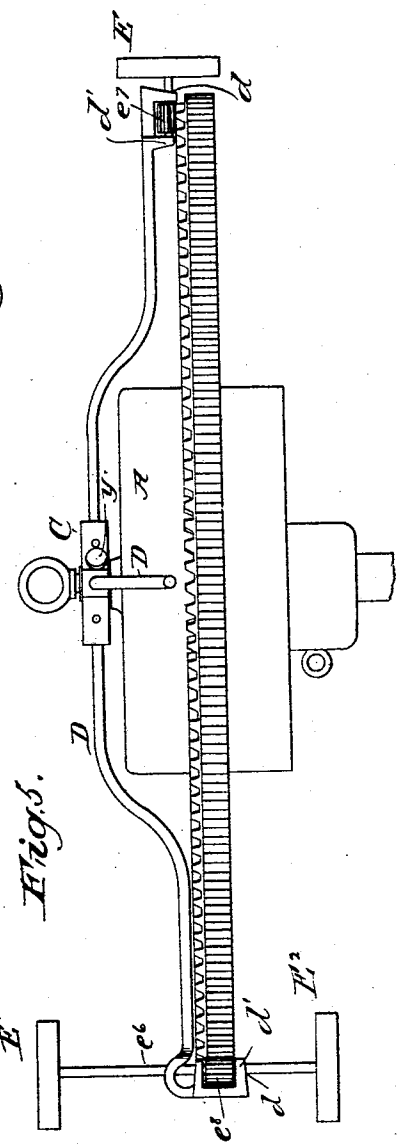
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H. COOPER.

MACHINE FOR AGITATING AND CIRCULATING AIR IN ROOMS, &c.

No. 455,660. Patented July 7, 1891.





Witnesses
C. W. Benjamin
F. B. A. Duke

Inventor
Henry Cooper
By Wm. G. Skelton
his Attorney

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(No Model.) 9 Sheets—Sheet 6.

H. COOPER.

MACHINE FOR AGITATING AND CIRCULATING AIR IN ROOMS, &c.

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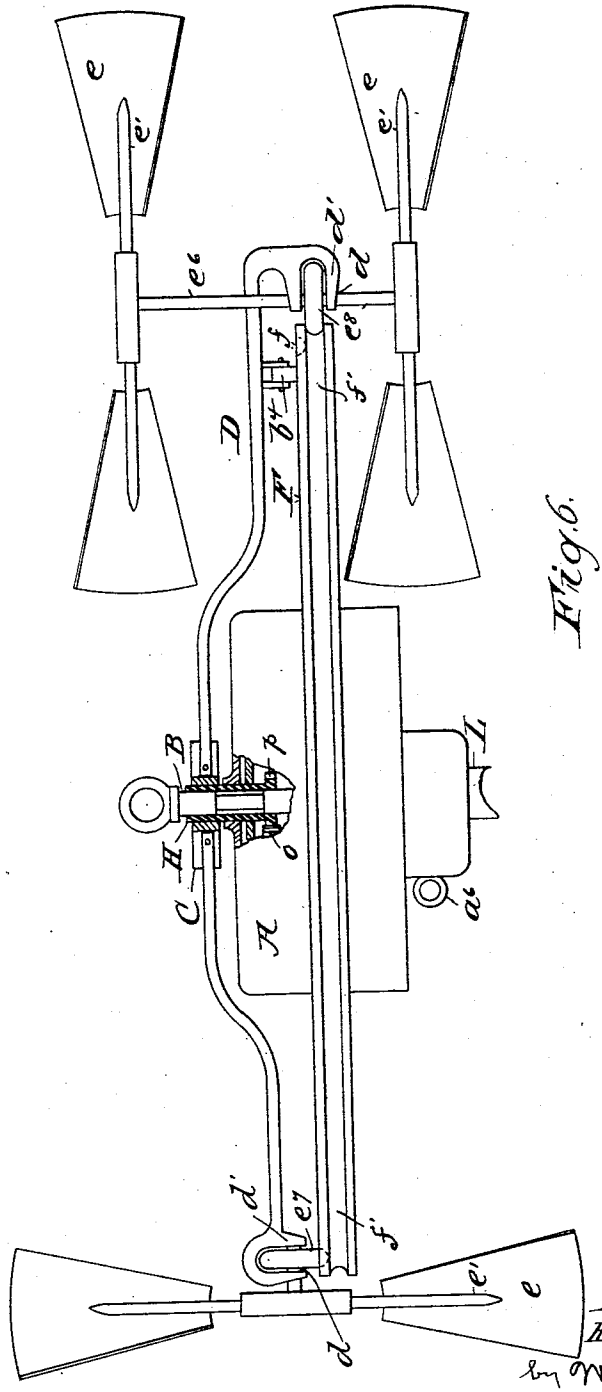


Fig. 6.

Witnesses
C. W. Benjamin
F. B. A. Dickie

Inventor
Henry Cooper.
by Wm. G. Appleton,
his Attorney.

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(No Model.) 9 Sheets—Sheet 7.

H. COOPER.

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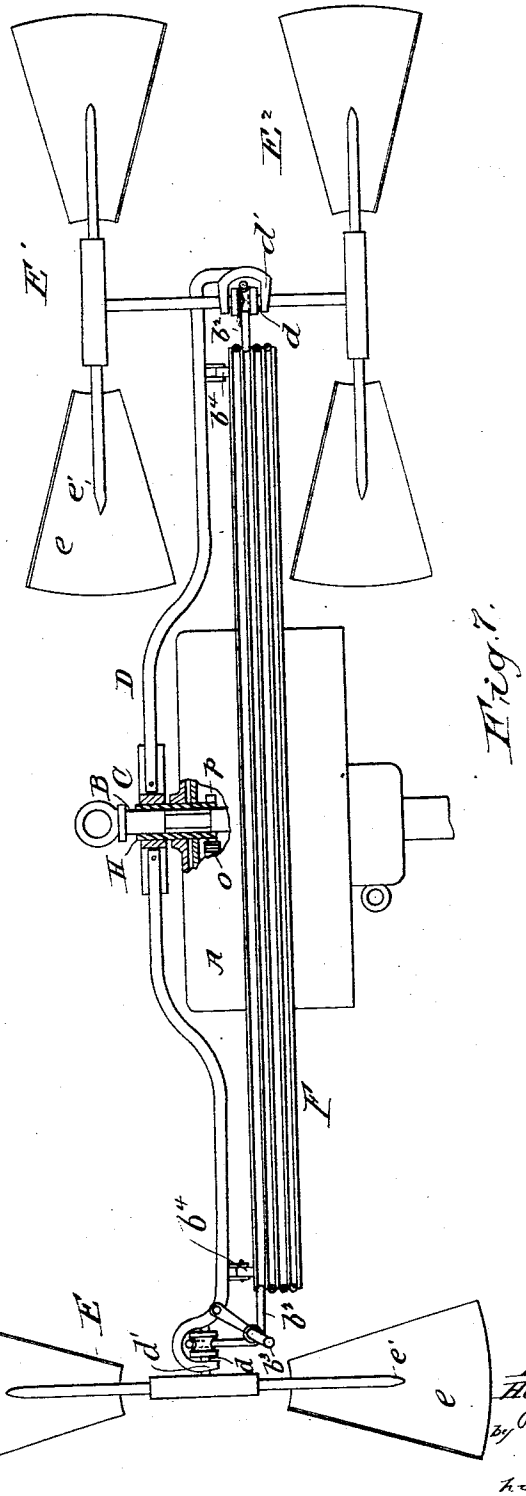


Fig. 1.

Witnesses
C. W. Benjamin
F. B. A. Duke

Inventor
Henry Cooper
By [illegible]
his Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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H. COOPER.

MACHINE FOR AGITATING AND CIRCULATING AIR IN ROOMS, &c.

No. 455,660. Patented July 7, 1891.

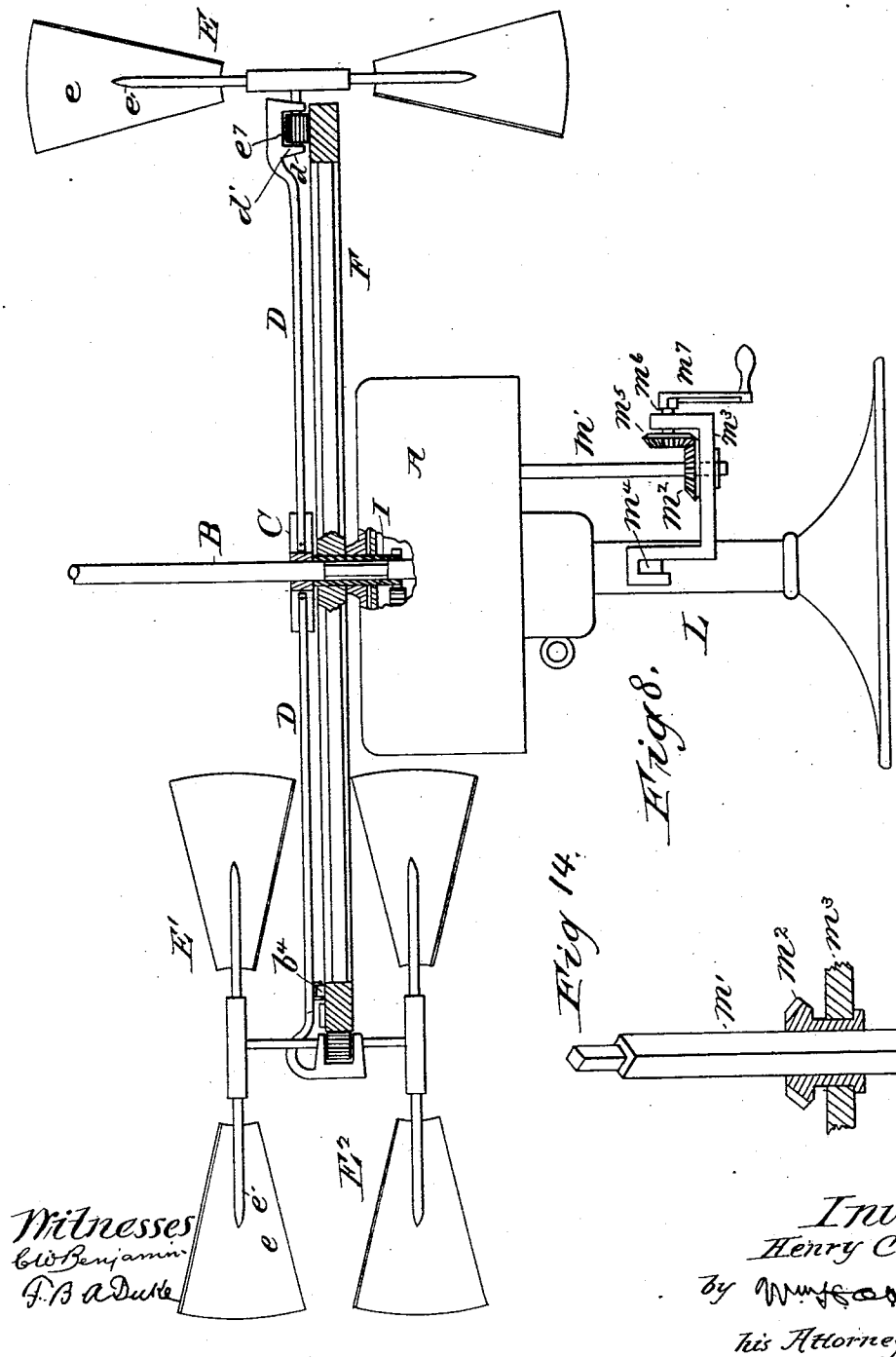


Fig 8.

Fig 14.

Witnesses
C. W. Benjamin
F. B. a Dutke

Inventor
Henry Cooper
by Wm. Singleton
his Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 9 Sheets—Sheet 9.

H. COOPER.

MACHINE FOR AGITATING AND CIRCULATING AIR IN ROOMS, &c.

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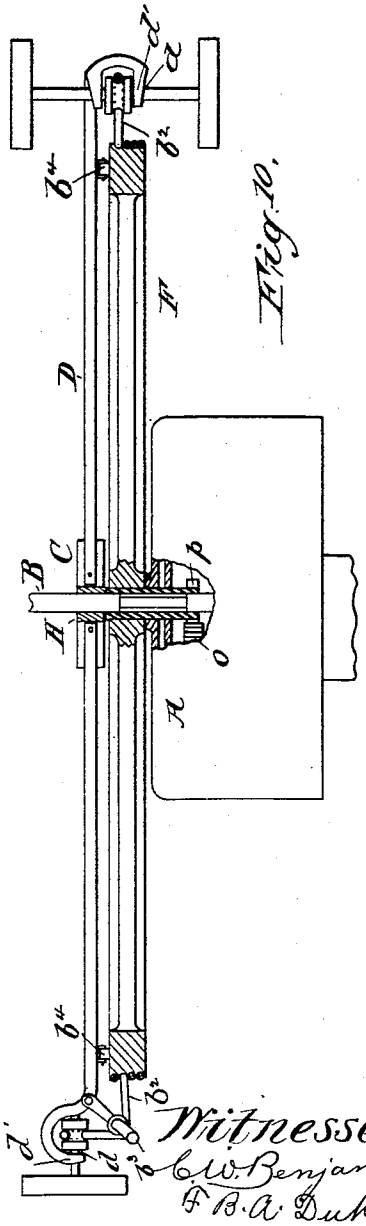


Fig. 10.

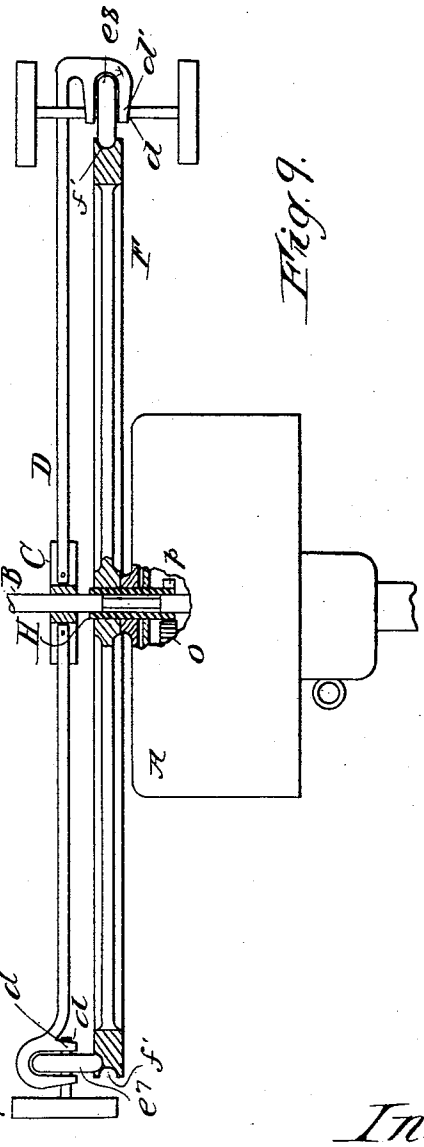


Fig. 9.

Witnesses
C. W. Benjamin
F. B. A. Duke

Inventor
Henry Cooper
by Wm. H. Hamilton
his Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HENRY COOPER, OF BROOKLYN, NEW YORK.

MACHINE FOR AGITATING AND CIRCULATING AIR IN ROOMS, &c.

SPECIFICATION forming part of Letters Patent No. 455,660, dated July 7, 1891.

Application filed December 16, 1889. Serial No. 333,797. (No model.)

To all whom it may concern:

Be it known that I, HENRY COOPER, a subject of the Queen of Great Britain, and a resident of the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Machines for Agitating and Circulating Air in Rooms and other Apartments, of which the following is a specification.

My invention relates to that class of machines through which the agitation and circulation of the air are effected by means of blades or fans which are appropriately operated to accomplish the desired results through the instrumentality of a suitable motor, and has for its object the production of a mechanism of this class which shall not only be simple in construction, but more efficient in operation and less liable to get out of order than those heretofore in use.

To these ends my invention consists, first, in a series of fans and in the means whereby they are each caused to rotate around its own axis; second, in a series of fans and in the means whereby they are not only caused to rotate around their own axis, but with the others to revolve around a common axis; third, in the peculiarities of the means made use of for imparting the desired movements to said fans, and, fourth, in various other constructions, combinations, and arrangements of parts subsidiary thereto, all as will hereinafter more fully appear.

Referring to the accompanying drawings, which form a part of this specification, Figure 1 is a sectional elevation of a machine embodying my invention, the section being taken in a plane passing through the main axis thereof, which is shown in elevation; Figs. 2, 3, 5, 6, 7, 8, 9, and 10, elevations, respectively, of modifications of such mechanism, in all of which figures, with the exception of Fig. 5, parts are broken away or shown in sections for greater clearness of illustration; Fig. 4, a plan of the mechanism shown in Fig. 3; Fig. 11, a sectional detail showing a spider in which the arms supporting the fans are journaled, as well as a brake whereby to regulate the velocity with which such fans or wheels rotate; Fig. 12, a sectional detail showing devices by means of which the machine may be suspended from the ceiling or other convenient support and its altitude regulated; Fig. 13, a transverse section of the part shown in Fig. 12, taken in the line $x\,x$ of said figure; and Fig. 14, a detail showing a portion of one form of mechanism by means of which the motor-spring, when one is employed, may be wound up.

In all the figures like letters are employed to designate corresponding parts.

A indicates the housing, in and upon which the various parts of the machine are or may be mounted, the same consisting of a suitably-fashioned base-plate a, to the upper side of which is secured by means of screws a' an inverted-cup-shaped top or cover a^2 and forming with it a box-like structure, for a purpose to be presently explained.

Fixedly secured to the base-plate a near the center thereof is a rod or stud B, which extends upward through the top or cover a^2 and receives above the same the spider C in suitable slots c, formed in the wings of which are secured the inner ends of the arm D, that support at their outer extremities the fans E E′ E², through the instrumentality of which the agitation and circulation of the air are directly effected. These fans, in the preferred form of construction, consist of a plurality of blades or wings e, the cylindrical stems e' of which are adjustably secured by means of screws e^2 in correspondingly-shaped sockets e^3, formed radially in a body or hub-like portion e^4, whereby to permit of the adjustment of such blades to bring their faces into different angles with respect to the plane of rotation of the fans, as may be desired. As thus constructed, these fans are secured to the ends of shafts which are mounted in suitable bearings d, formed in lugs d', projecting from the outer ends of the arms D. I propose in practice to employ a series of these fans in each machine, three being shown in the present instance, of which the fan E is secured to the outer end of the horizontal shaft e^5 and the remaining fans E′ E² to the upper and lower ends, respectively, of the vertical shaft e^6.

Located below the arm D is a wheel F, through the instrumentality of which and the wheels e^7 and e^8, with which it is in gear, the rotation of the fans is effected, the wheels e^7 e^8 being fast upon the shafts e^5 and e^6, respect-

ively. This wheel F is made of the proper diameter to carry its rim outward from the axis of the rod or stud B to near the outer extremity of the arms D, and engages with the wheels e^7 e^8, either by means of teeth, by friction, or by a band or cord, the proper relation of the arms D with respect to the wheel F being at all times insured by rolls b^4, which, journaled in suitable hangers depending from the under side of the former, rest against and roll upon the upper surfaces of the latter. In Figs. 1, 5, and 8 this engagement is illustrated as accomplished by means of teeth, the wheel F being provided with teeth b b' upon its upper side and periphery, which engage with appropriately-shaped teeth formed in the periphery of the wheels e^7 e^8. In Figs. 2, 6, and 9 this engagement is shown as effected by friction, the wheel F in this example being provided in its upper side and in its periphery with appropriately-shaped grooves f f', in which the correspondingly-shaped peripheries of the wheels e^7 e^8 are respectively held by suitable pressure, the grooves and peripheries in such cases either being left smooth or serrated, as may be desired, while in Figs. 3, 4, 7, and 10 the engagement between such parts is shown as effected through the instrumentality of a cord, which, passing around the periphery of the wheel F the proper number of times, also embraces the wheels e^7 e^8, suitably-arranged idlers b^3, mounted in a bracket b^{14}, secured to the arm D, being employed for properly guiding the cord to and from the wheel e^8. As thus constructed and arranged, the rotation of the fans, as will be seen, may be effected either by, first, revolving the arms D, and with them the fans E E′ E^2, around the rod or stud B while the wheel F is held stationary; second, by rotating the wheel F upon its axis while the arms D are held stationary, and, third, by revolving the arms D and rotating the wheel F at the same time, but in opposite directions.

In Figs. 5, 6, and 7 is shown an arrangement of parts whereby the arms D and fans are revolved while the wheel F is held stationary, the spider C in this example being fixedly secured to a sleeve H, which is fitted to rotate upon the fixed rod or stud B, and the wheel F is rigidly secured to the housing A.

In Figs. 8, 9, and 10 is illustrated an arrangement in which the wheel is rotated and the arms D are held stationary, the wheel F in this arrangement being fixedly secured to a sleeve I, which is fitted to rotate upon the rod or stud B as an axis, and the spider C is rigidly secured to said rod or stud, while in Figs. 1, 2, and 3 is shown a still further arrangement in which both the arms D are revolved and the wheel F rotated, the spider supporting the former being secured to the upper end of the sleeve H and the wheel F being similarly secured to the upper end of the sleeve I. The arms D, through the spider C, being thus secured to the sleeve H, or the wheel F being secured to the sleeve I, or both the wheel and arms being secured to said sleeves, respectively, it follows that when one or the other or both of these sleeves is or are rotated the arms D, the wheel F, or both said arms and wheel, will be carried around with it or them and the rotation of the fans thereby attained. To effect the rotation of these sleeves, various means may be employed—such, for instance, as a band or bands from any convenient source of power. (Not shown.) I prefer, however, to make use of a spring-motor for this purpose, and for the sake of convenience and compactness to locate the same in the box-like housing A.

In the construction of this motor I preferably employ a volute spring h, which, surrounding a sleeve i, loosely mounted upon the rod or stud B, has its inner end fixedly secured to said sleeve and its outer end firmly attached to the plate h', which in turn is secured by screws h^2 to lugs or stands h^3, projecting upward from the base-plate a. From the sleeve i rotary motion is communicated to the sleeve H through the instrumentality of a train of wheels k, l, m, n, o, and p, the gear k being mounted upon the rod or stud B and connected to the sleeve i through the intermediaries of a ratchet h^4 and pawls k', whereby to provide for the winding up of the spring, when required, without rotating such gear and through it the train of wheels intermediate the same and the sleeve H. The wheels l m and n o, on the other hand, are fixedly secured to shafts q s, respectively, which are journaled in the frame t, secured by screws t' to suitable lugs or studs t^2, also projecting upward from the base-plate a, while the wheel p is fixedly secured to or formed in one piece with the sleeve H.

With a motor as thus described provision is made for the rotation of but a single sleeve, as H. When, however, a second sleeve I is made use of, as is the case when both the arms D and wheel F are rotated, additional wheels u and v become necessary, the former of which is secured to the lower end of such sleeve, while the latter is supported upon a suitable stud v', depending from the frame t, as shown, and meshing with the wheels o and u serves to communicate a rotary motion to said sleeve in a direction opposite to that imparted to the sleeve H. In most instances the employment of a single sleeve H will be sufficient, as a duplex sun-and-planet motion will thereby be communicated to the fans. When, however, a greater velocity of rotation of the fans is required than is possible with a stationary wheel, the additional sleeve I will be made use of, and through it the said wheel will be caused to rotate, but, as before remarked, in an opposite direction to that of the arms D. To provide for winding up the spring h when required, the sleeve i extends down through the plate h' and is provided at its lower end with a gear i', which meshes with a gear i^2, secured to the shaft i^3, that is

journaled in the plates a h'. This shaft, in the preferred form of construction, is provided with a polygonally-shaped socket i^4, extending axially through the same for reception of a suitable key, by means of which it may be rotated.

In Fig. 11 I have shown a means whereby the velocity of the fans may be regulated, and in Fig. 1 a device whereby their rotation may be wholly arrested, the former consisting of a suitable brake y, which may be applied to either the spider C or hub of the wheel F, as desired, and held in contact with the rod or stud B by yielding pressure through the intervention of a screw y', fitted to a socket y^2, and acting through the intermediary of a spring y^3, and the latter consisting of a bar or rod z, fitted to slide in a loop z' in such a manner as to be raised above the line of movement of the wheel F and arm D or depressed below the same, as indicated, respectively, by dotted and full lines in Fig. 1, the bar being held in adjusted position by means of a spring z^2.

As thus constructed, the machine may be either suspended from above or supported from below, as preferred, and for this purpose I provide the rod or stud B with a ring at its upper end, and the base-plate a with a depending shank a^4, with the former of which may be employed a hook secured to the ceiling or other convenient support, and with the latter a stand L, having formed in its upper end a socket a^5, in which the shank a^4 may be received and held by the spring locking-bolt a^6, engaging with a groove a^7, formed therein.

The hook which I prefer to employ when suspending the machine from the ceiling or from above is best shown in Figs. 12 and 13, and consists of the body portion d^4 and the hook or stem portion d^5. The body portion d^4 is provided with a ring d^6 at its upper end for engagement with a suitable support, and also with an axial orifice d^7, the same being formed of the proper shape in cross-section to permit of the portion d^5 sliding longitudinally therein. From the orifice d^7 in the walls thereof, at different elevation, is formed circumferentially a series of grooves d^8, into which the hook d^9 on the upper end of the portion d^5 may be turned and there held, its disconnection therefrom being effected by rotating it slightly in the opposite direction and sliding it either up or down, as desired. To the lower end of the portion d^5 is formed a hook d^{10}, with which the ring on the upper end of the rod or stud B may engage, and in order to prevent the withdrawal of the portion d^5 from the orifice d^7 the portion d^4 is provided with a suitable cap d^{11}, screwed to its lower end and having an orifice through its center of a size and shape to loosely fit the body of the portion d^5, so that while permitting of such portion being rotated and slid therein the hook or projection on its upper end will be incapable of passing therethrough.

The hook above described, however, while showing a convenient form of device for suspending the machine from above, constitutes no part of my present invention, but may be dispensed with, if desired, and any other form of hook employed in lieu thereof.

In Figs. 8 and 14 I have illustrated an appliance by which the winding up of the spring h may be effected. In the construction of this device I make use of a polygonally-shaped shaft m', which is adapted to fit the socket i^4, formed in the shaft i^3, and slide freely through a correspondingly-shaped orifice formed in a bevel-gear m^2, mounted in a suitable frame m^3, which in turn is adapted to engage with and be supported by lugs m^4, projecting from the stand L. Meshing with the gear m^2 is a second bevel-gear m^5, which is secured to the end of the shaft m^6, also mounted in the frame m^3, and provided at its outer end with a winch m^7 or other convenient means, whereby its rotation may be attained. By thus mounting the several parts on the frame m^3 I provide a convenient means for winding up the spring, which, while efficient for that purpose, may be removed from the machine when not required.

From the foregoing it will be seen that I produce a machine for agitating and circulating air in rooms and apartments which is not only simple in construction and automatic in its action, but admirably adapted to the purpose for which it is intended.

While in the preceding I have described the best means contemplated by me for carrying my invention into practice, I wish it distinctly understood that I do not limit myself strictly thereto, as it is obvious that I may modify the same in various ways without departing from the spirit thereof—as, for instance, instead of employing a single spring for operating the motor I may employ a plurality of such springs and so dispose them that they may operate together or in sequence. So, too, in the train of mechanism intermediate the spring and the sleeve to be driven I may add or remove one or more wheels, whereby the parts may be operated for a longer or shorter period from the same spring, and, finally, in place of the mechanism described for winding up the spring I may employ an ordinary clock-key, the end of which is adapted to fit the socket in the shaft i^3.

Having described my invention and the best means contemplated by me for carrying it into practice, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination, with the horizontal shaft e^5, having the fan E secured to its outer end, the vertical shaft e^6, provided with a fan E′ at its upper end and a fan E² at its lower end, a series of arms constructed with bearings in their outer extremities, in which such

shafts are mounted, and a stationary rod or stud for supporting these arms, of a wheel secured to each of said shafts, and a second wheel mounted upon the rod or stud in proper relation to the first-mentioned wheels to co-operate therewith, whereby to impart to them a rotary movement, substantially as described.

2. The combination, with the horizontal shaft e^5, having the fan E secured to its outer end, the vertical shaft e^6, provided with a fan E′ at its upper end and a fan E^2 at its lower end, a series of arms constructed with bearings in their outer extremities, in which such shafts are mounted, and a stationary rod or stud for supporting these arms, of a wheel secured to each of said shafts, a second wheel mounted upon the rod or stud in proper relation to the first-mentioned wheels with which it co-operates, and means for revolving said arms around the supporting rod or stud, substantially as described.

3. The combination, with the horizontal shaft e^5, having the fan E secured to its outer end, the vertical shaft e^6, provided with a fan E′ at its upper end and a fan E^2 at its lower end, a series of arms constructed with bearings in their outer extremities, in which such shafts are mounted, a sleeve to which the inner ends of said arms are secured, and a stationary rod or stud upon which the sleeve is mounted, of a wheel arranged in relation to the first-mentioned wheels and co-operating therewith, and a motor for rotating said sleeve, substantially as described.

4. The combination, with a series of independent fans, shafts upon which they are mounted provided with wheels thereon, a housing provided with a stationary vertical rod or stud extending upward from its upper side, a sleeve mounted on this rod or stud, and radial arms, in the outer ends of which said shafts are journaled, secured to said sleeve, of a wheel F, arranged in relation to the first-mentioned wheels, a second sleeve mounted upon the former sleeve and secured to the wheel F, and mechanism for rotating the two sleeves in opposite directions, substantially as described.

5. The combination, with a rod or stud, a series of arms radiating from a common center mounted thereon and provided with bearings at their outer extremities, shafts journaled in said bearings and provided with wheels, and fans secured thereto, of a wheel F, mounted on said rod or stud below the arms for co-operation with the first-mentioned wheels, and rolls carried by said arms and resting upon the upper surface of the wheel F to maintain the arms in proper relation to the wheel, substantially as described.

6. The combination, with the housings A, provided with a stationary rod or stud B, and the rotatable arms D and wheel F, both mounted upon said rod or stud, of a stop for arresting the movement of either of the arms, the wheel, or both, substantially as described.

7. The combination, with the housings A, provided with a stationary rod or stud B, and the rotatable arms D and wheel F, both mounted upon the said rod or stud, of a bar z, loop z', and spring z^2, arranged in relation to said arms and wheel, whereby their rotation may be arrested, substantially as described.

8. The combination, with the stationary rod or stud B and the spider C, of the brake y, screw y', case y^2, and spring y^3, substantially as described.

9. The combination, with the stand L, provided with lugs m^4 and frame m^3, of the bevel-gears m^2 m^5, shaft m^6, winch m^7, and polygonally-shaped shaft m', fitted to slide axially through the gear m^2 and adapted to engage the socket i^4 in the shaft i^3, substantially as described.

In testimony whereof I have hereunto set my hand this 25th day of November, 1889.

HENRY COOPER.

Witnesses:
F. B. A. DUKE,
WM. H. APPLETON.