H. S. BROWN.

OSCILLATING ELECTRIC FAN.

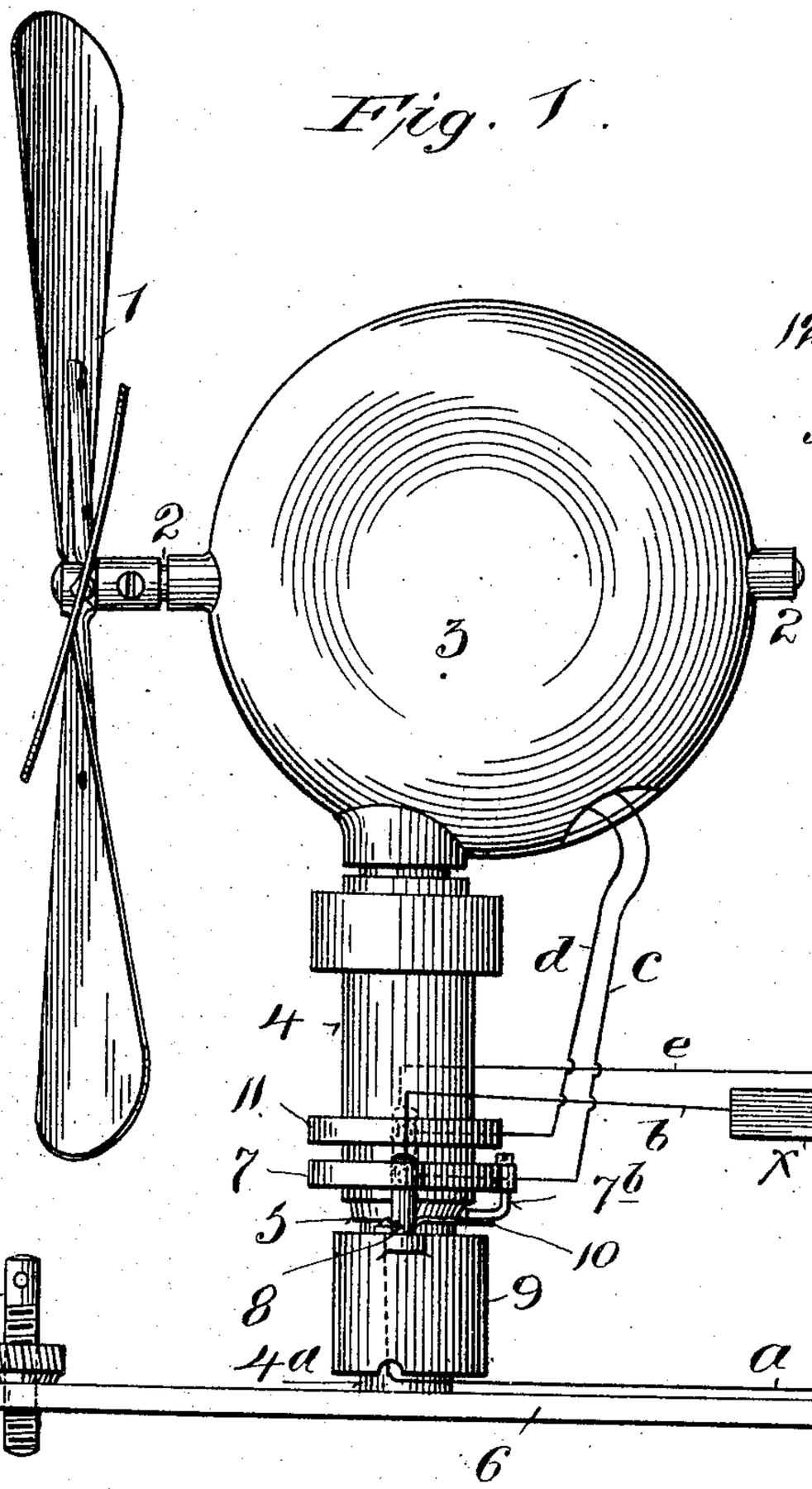
APPLICATION FILED JAN. 5, 1906.

908,736.

Patented Jan. 5, 1909.

4 SHEETS—SHEET 1.

Fig. 1.



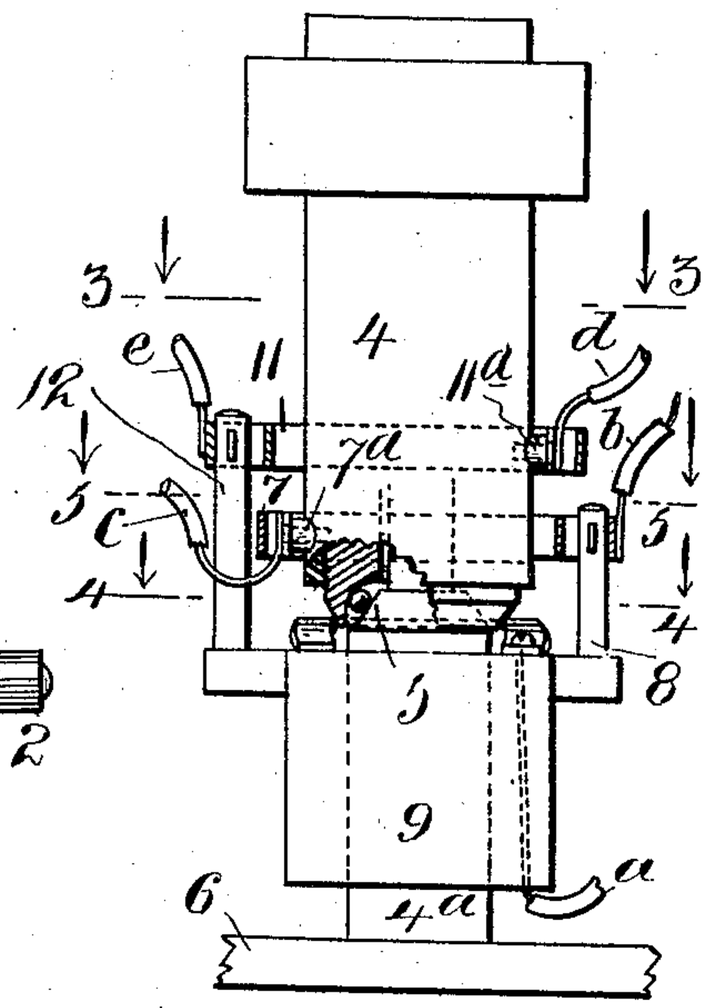


Fig.

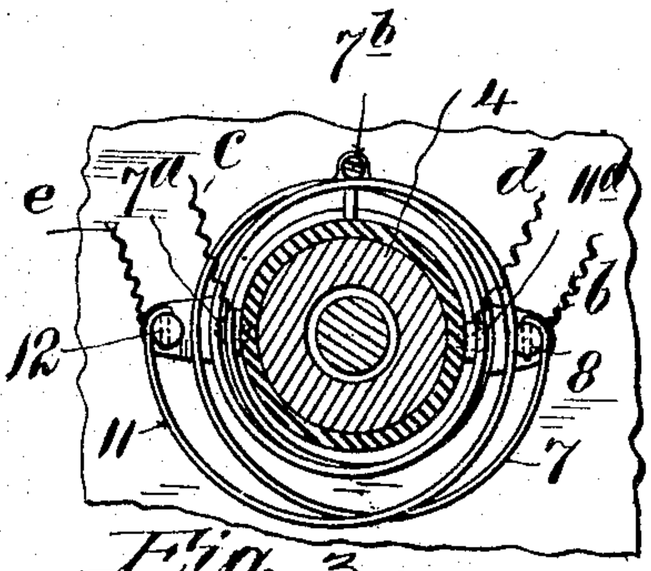


Fig. 3.

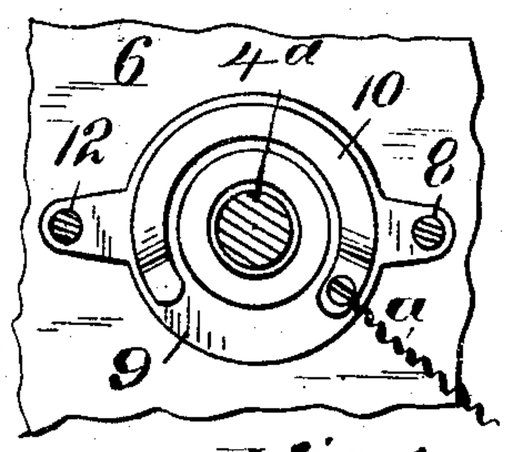


Fig. 4

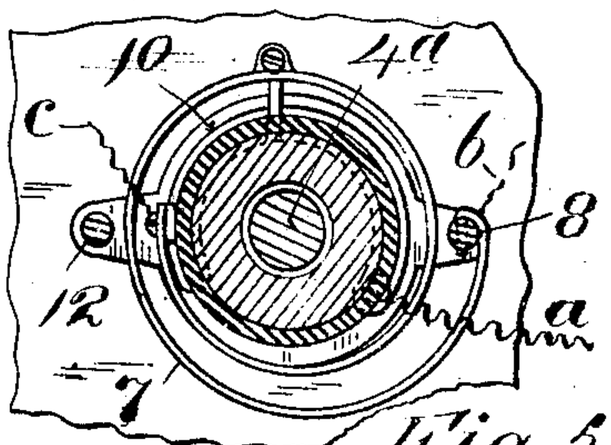


Fig. 5.

Witnesses
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4 SHEETS—SHEET 2.

Fig. 6.

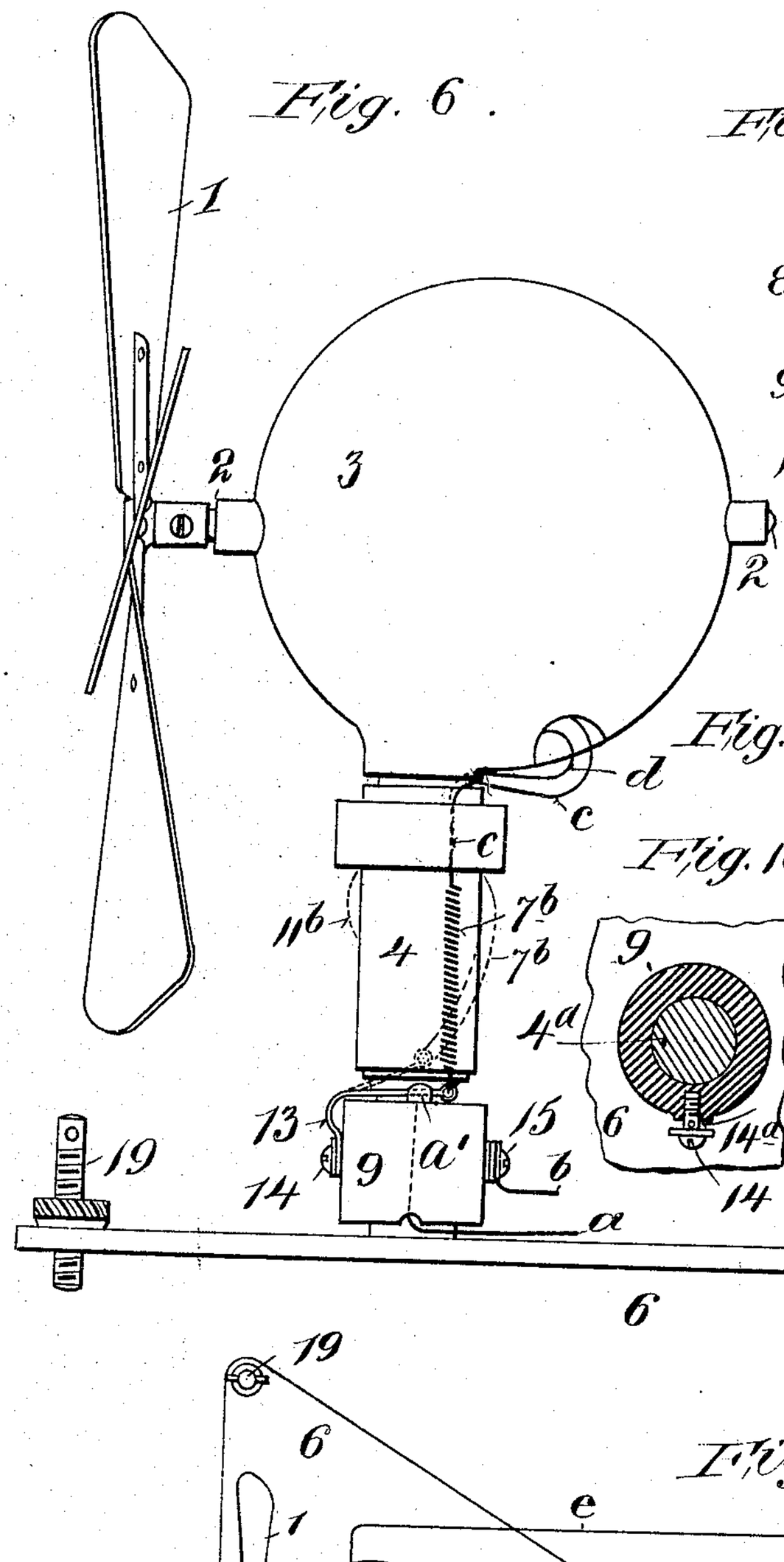

Fig. 7.

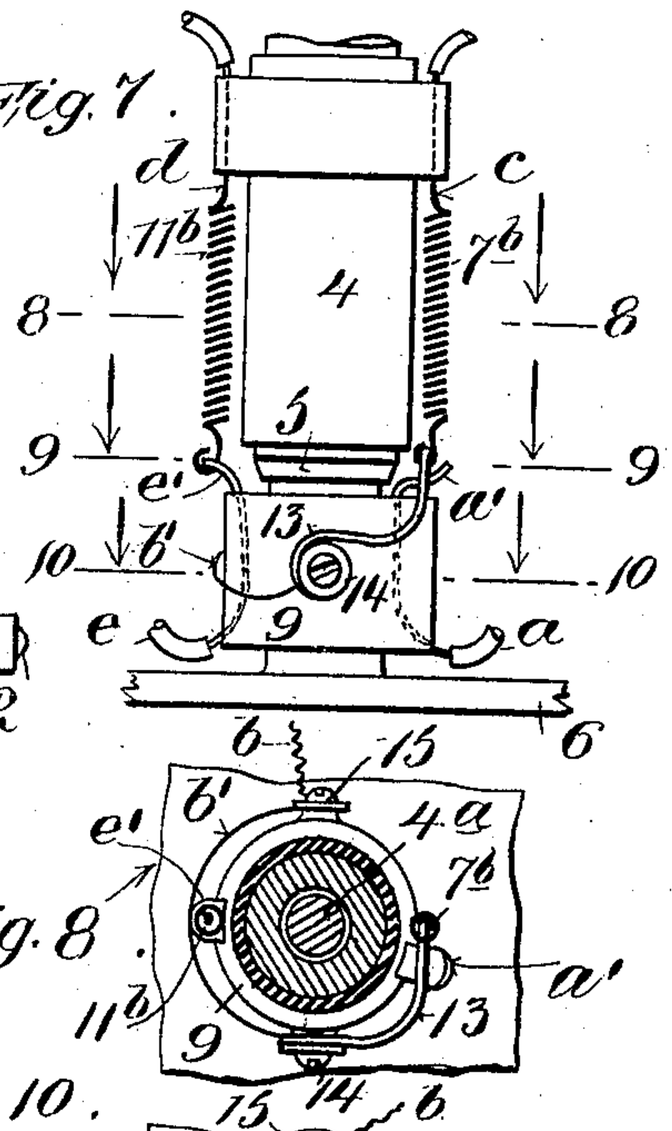

Fig. 8.

Fig. 10.

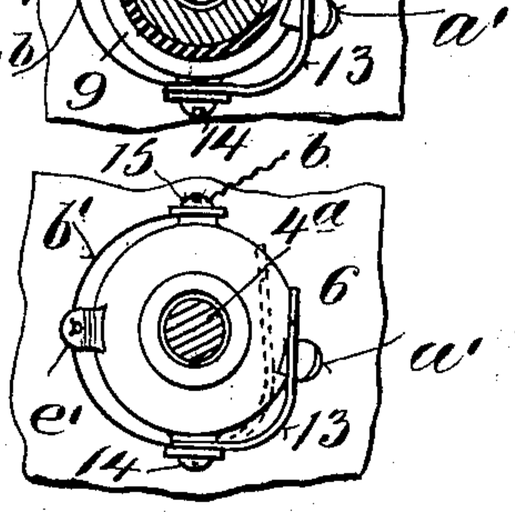

Fig. 9.

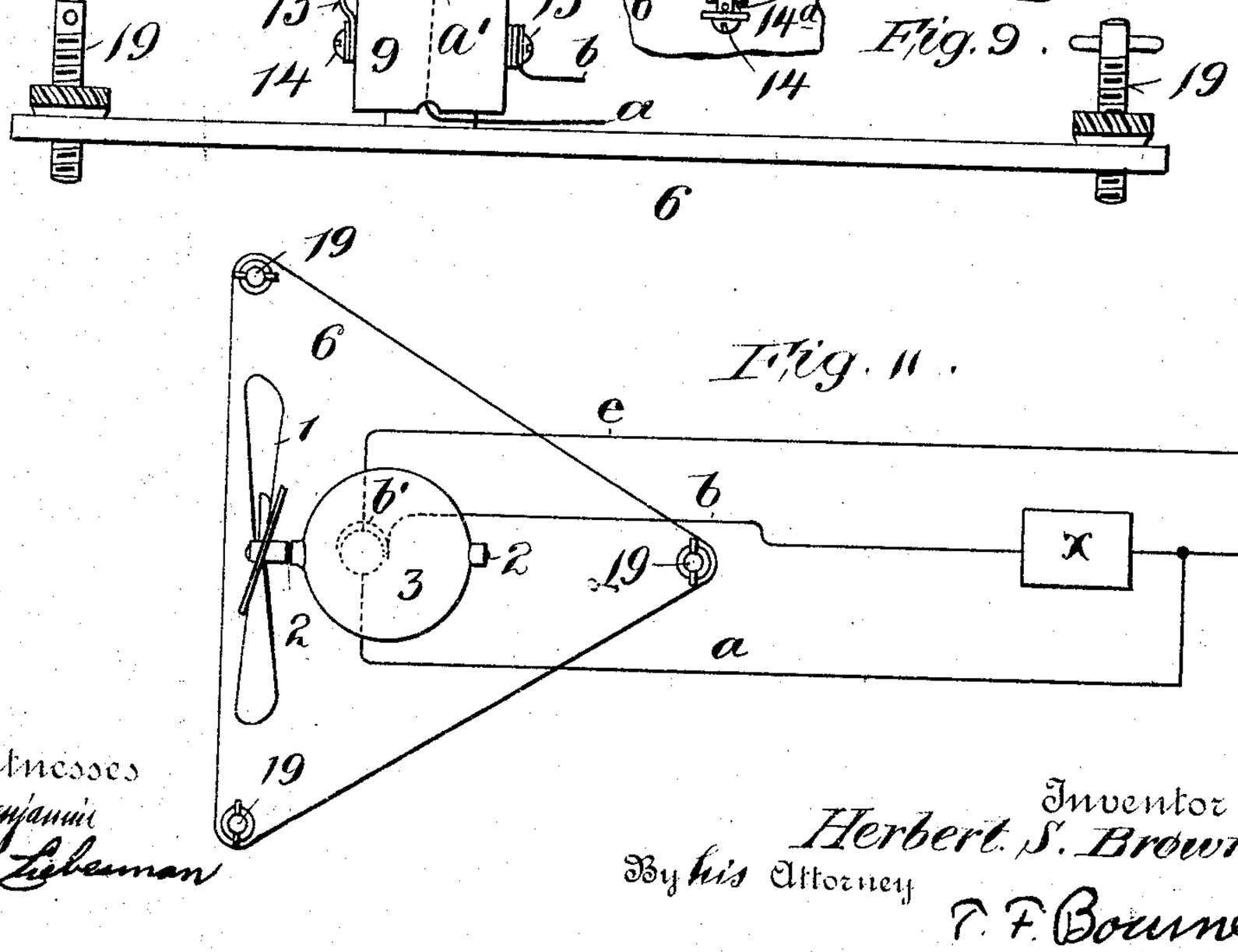

Fig. 11.

Witnesses

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4 SHEETS—SHEET 3.

Fig. 13.

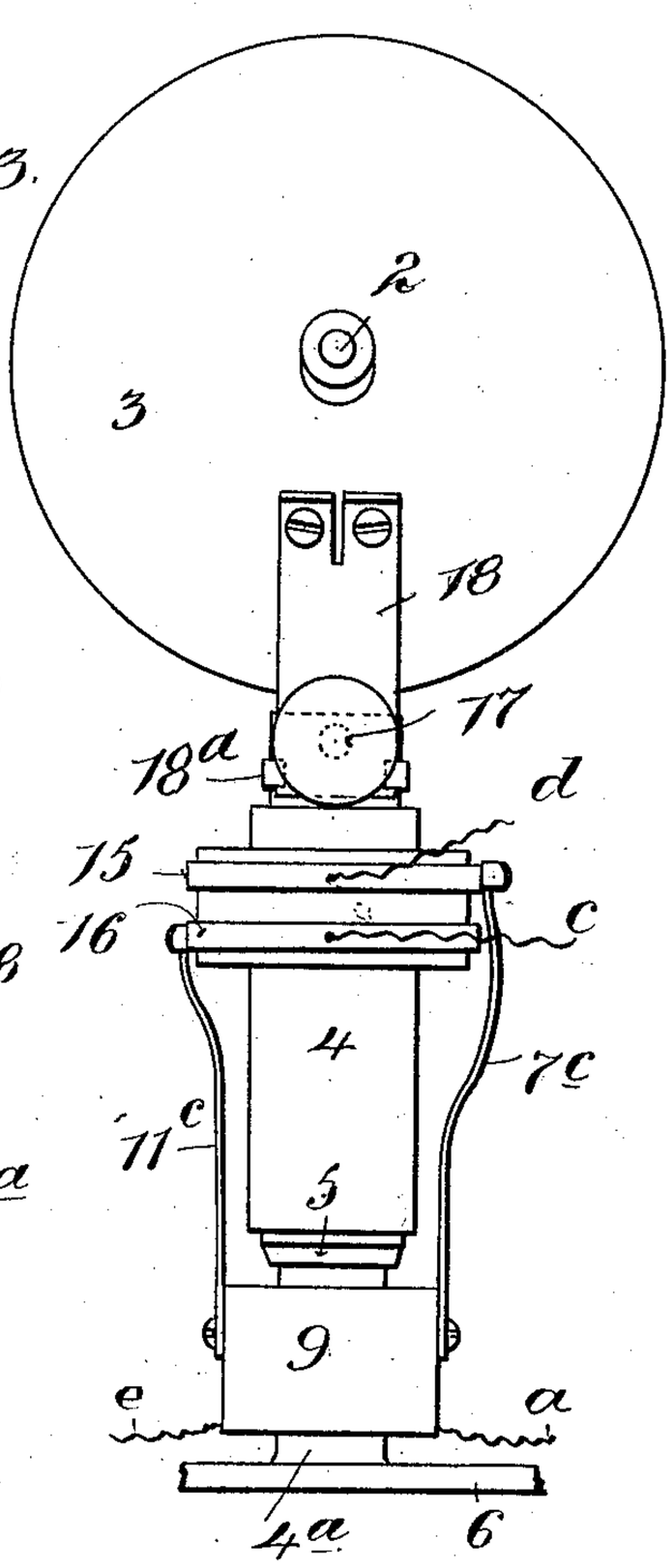
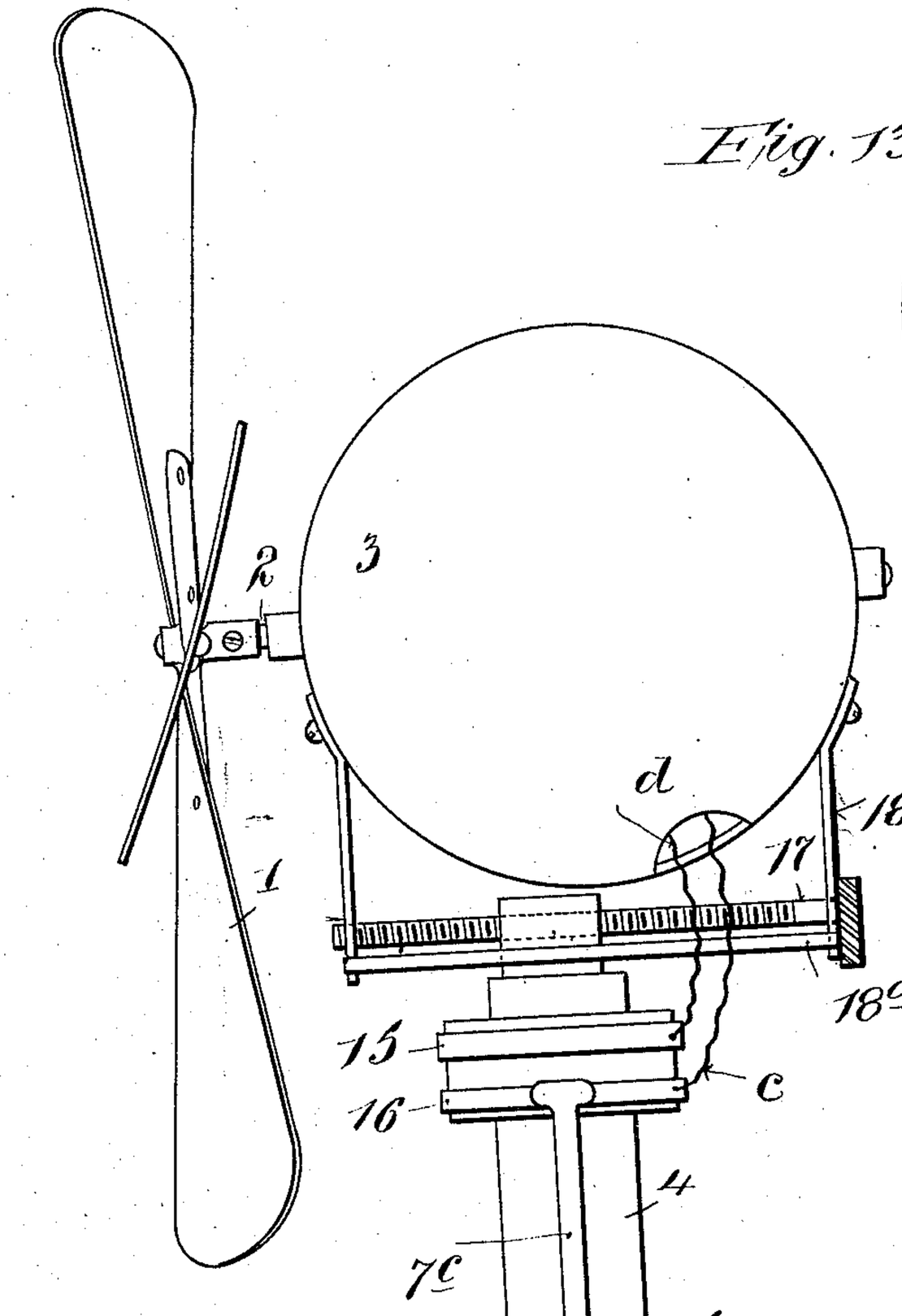


Fig. 12.



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4 SHEETS—SHEET 4.

Fig. 16.

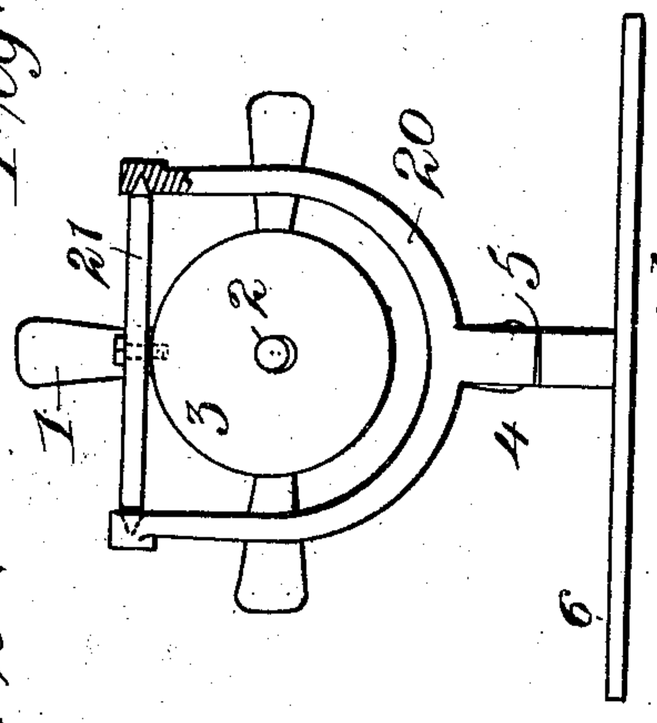


Fig. 20.

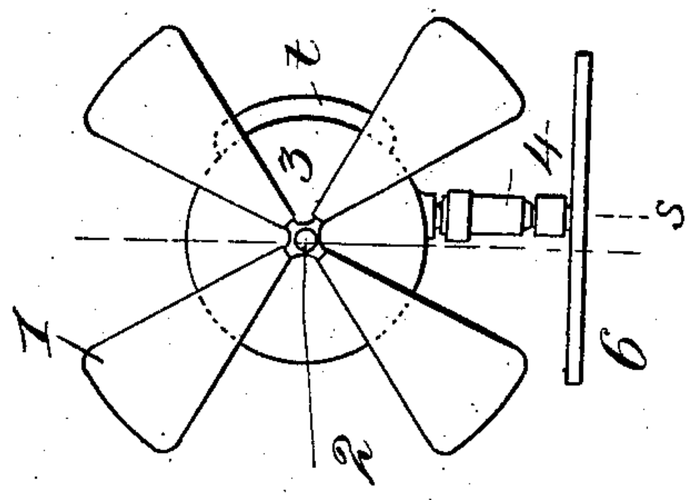


Fig. 15.

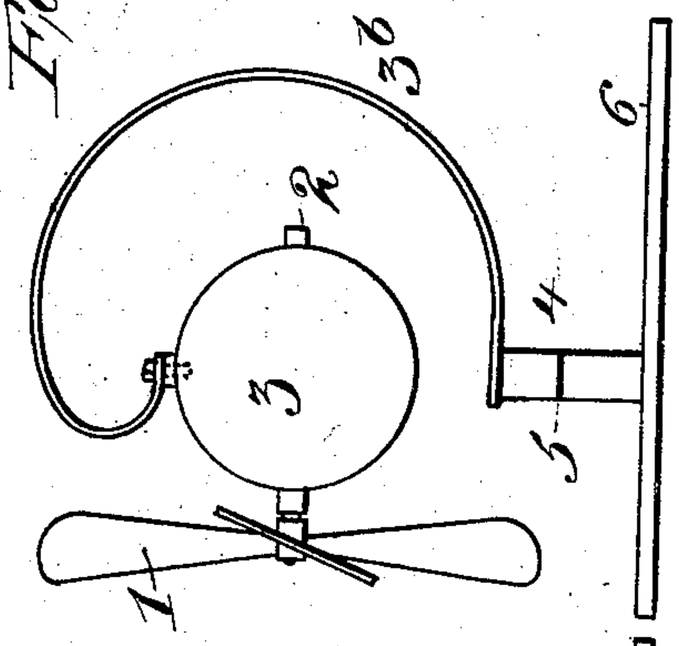


Fig. 19.

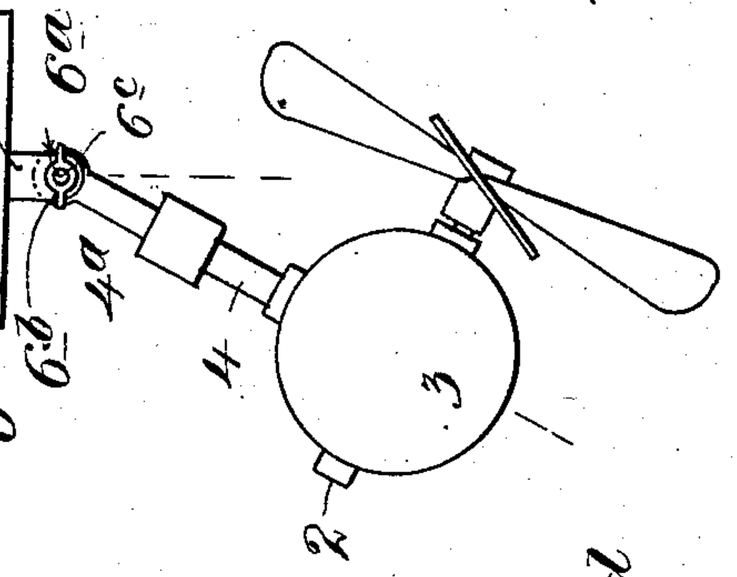


Fig. 14.

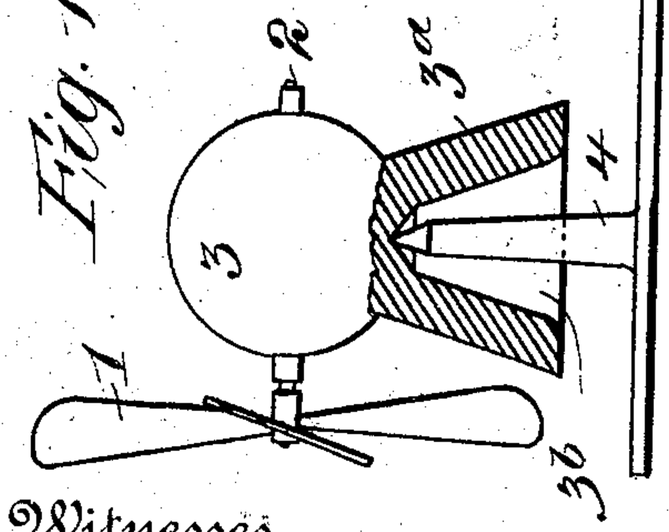


Fig. 18.

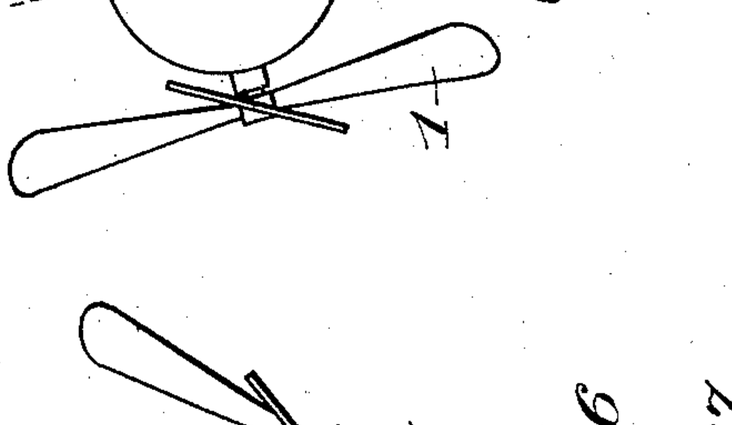
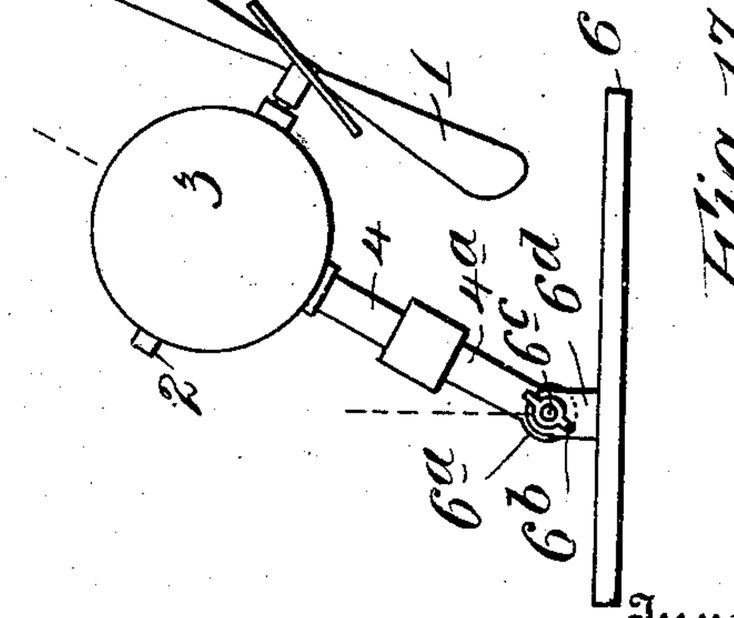


Fig. 17.



Witnesses

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UNITED STATES PATENT OFFICE.

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OSCILLATING ELECTRIC FAN.

No. 908,736. Specification of Letters Patent. Patented Jan. 5, 1909.

Application filed January 5, 1906. Serial No. 294,695.

To all whom it may concern:

Be it known that I, HERBERT S. BROWN, a citizen of the United States, residing in New York city, borough of Manhattan, New York, have invented certain new and useful Improvements in Oscillating Electric Fans, of which the following is a specification.

My invention relates to improvements in oscillating electric fans, and it has for its object to produce a structure wherein the fan is capable of oscillating automatically, in substantially any plane, without requiring the use of gears or of vanes or their equivalents, employing a single pivot only, and operative irrespective of an angle by which its supporting base may vary from the level or horizontal plane, being capable of support from beneath, from a side wall, or from the ceiling or other pendent position.

The said objects of my invention may be attained by means of the novel details of improvement and combination of forces inherent in the structures that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings forming part hereof, wherein,

Figure 1, is an elevation of a fan structure embodying my improvements, Fig. 2, is a detail view, looking from the left in Fig. 1, of the support for the fan and its motor, Figs. 3, 4, 5 are sections, respectively on the lines 3, 3; 4, 4, and 5, 5 of Fig. 2, Fig. 6, is a side elevation of a fan structure showing a modification in details, Fig. 7, is a side view, looking from the left in Fig. 6, of the support for the fan and its motor, Figs. 8, 9, and 10 are sections, respectively, on the lines, 8, 8; 9, 9, and 10, 10 in Fig. 7, Fig. 11, is a plan view, on a reduced scale, of Fig. 6, illustrating a circuit for the motor, Fig. 12, is a side elevation of a fan adapted for the utilization of gravity, and showing modified means for controlling the circuit of the motor, Fig. 13, is a rear view thereof, Figs. 14, 15 and 16 are diagrammatic views showing different forms of pivotal supports for the fan and its motor, Figs. 17, 18, and 19, are diagrammatic views illustrating some of the different positions in which my improvements may be operatively supported. Fig. 20 is a detail view illustrating an off-center support for the fan motor.

The various force and combinations of forces utilized in my invention are: (1) leverage action of the fan blades upon the air, produced when the plane of the blades is set at an angle to the axis of the pivot of oscillation, causing one blade always to be at a greater distance or leverage from the pivotal axis than the blade opposite, as is familiar in the art as, for instance, as shown in the patent to Wood, No. 697,697, of April 15, 1902, which shows a revolving fan structure. (2) back pressure of the column of air propelled by the fan, operative whenever the axis of the fan shaft is "off center" or to one side of the pivot of oscillation, as familiar in the recent development of the art. (3) gyroscopic action of the rotating parts of the fan structure, present whenever said parts are placed at an angle to the horizontal, as more fully described in my Patent No. 809,356, dated Jan. 9, 1906. In addition to these three primary forces three resultant or secondary forces, developed by the action of the primary forces, may be utilized: (*a*) the torsional reaction of a twisted cord or strands of elastic material, tending to return a structure affixed to one end of said material to a central point of equilibrium of the elastic or torsional material, whenever the structure is rotated to one side or the other of this center, as described fully in my above mentioned patent. (*b*) the reaction of one or more coiled, spiral, or other springs to movement of the fan structure to either side of a central point of equilibrium, substantially equivalent to the torsional reaction described above, and as described in my pending application for Letters Patent filed August 10, 1905, Serial No. 273,550. (*c*) the action of gravity upon an unbalanced pivoted structure, tending always to move the center of gravity of the system to the lowest possible point, as described in my pending application for Letters Patent filed June 26, 1902, Serial Number 113,216, and in aforesaid application, Serial No. 273,550.

Experiment appears to show that any one of the three primary forces above mentioned, substantially unaided, may cause oscillation of a fan, provided automatic means are used whereby said force is made to act alternately in opposite directions, such means, as I am familiar with the art, consisting mostly of structures whereby surplus energy of the actuating force may be stored up and at suitable points be discharged against a fixed or elastic stop with sufficient impetus to shift

with respect to the pivot of oscillation the part or parts against which the force acts. I have also found it possible to produce oscillation by using any two (or more) of these primary forces, acting to oppose each other; and in this case the essential feature of the operative combination is a means for automatically varying the point at which the opposing forces are in equilibrium. My present invention, however, is of the type in which a primary force (or combination of forces) is combined with a secondary force (or combination of forces) to produce oscillation without necessary reversal in direction of the primary force, the essential feature here again being a means whereby the point of rest of the opposing forces is automatically varied.

The suspending device shown in my said patent operates by means of intermittent variations in the current supplied to the motor, which variations, affecting the back pressure of the column of propelled air, vary the angle of inclination of the fan structure with respect to the horizontal and to the supporting cord or pivot, thus varying the intensity of both the leverage and the gyroscopic action. These latter then directly act to disturb the point of equilibrium between themselves and the torsional reaction of the supporting structure, and thus maintain oscillation.

In the preferred form of my present invention the dependence upon back pressure is omitted, it having been found that variation in any single one of the three primary forces, due to variations in the current supplied to the motor, is sufficient to maintain oscillation if the forces utilized are properly proportioned

In the preferred form of my structure (Figs. 1 to 11) I have used a combination of leverage action and gyroscopic action, opposed by the reaction of one or more springs. I have found that this combination affords the nearest approach to universal applicability, with a minimum of adjustment for operation in different planes.

Proceeding now to describe the structures and the operation of my present improvements, I refer to the drawings, Figs. 1 to 20 inclusive, in which the numeral 1 indicates a fan, shown of the propeller type, carried by a shaft 2 of the electric motor 3, which parts may be of any well known or suitable construction. The casing of motor 3 is connected with a pivotal support whereby said casing and fan may oscillate. In the example illustrated I have shown the support 4 generally in the form of a post secured to the casing of the motor and having a pivot, indicated generally at 5, which may be in the form of well-known ball-bearings (indicated in Fig. 2) to reduce friction, the part 4^a of the support being shown carried by a suitable base 6.

Referring now to Figs. 1 to 5, I have illustrated means for normally holding the fan and its motor in a position of rest while permitting oscillation thereof, arranged as follows:—In order to secure a leverage action of the fan blades, the axis of the fan shaft 2 is inclined slightly from the perpendicular to the axis of the supporting pivot 5; and the fan 1 and motor 3 are then symmetrically balanced with respect to the pivot 5. A flat spiral spring 7 freely surrounds post 4 and is attached, as at 7^a, to said post and at its other end said spring is connected with a stationary part, as to a projection 8 connected with post 4^a, in the example illustrated said projection being carried by a sleeve 9 mounted upon post 4^a and frictionally held thereon, but so that said sleeve may be adjusted angularly by hand. The spring 7 is in circuit with a line wire *a*, and with a terminal of the motor 3, as by wire *c*. The other terminal of the motor is connected by a wire *d* with the line wire *e* and in the example illustrated, I provide a spring 11 connected with wire *d* and loosely surrounding post 4 and connected at one end with said post, as at 11^a, the wire *d* being connected with spring 11, and at the other end said spring is connected with a projection 12 that is connected with the part 4^a as with the sleeve 9. The projection 12 is so situated that spring 7 may freely uncoil. I have shown the spring 7 as provided with a contact finger 7^b that engages a circular contact 10 carried by sleeve 9 and less than a complete circle, whereby the circuit of line wire *a* will be maintained closed during part of the oscillatory movements of the fan and its motor, and whereby the direct circuit through wire *a* will be broken at or near one or both terminations of the desired oscillatory arc of the motor. For the purpose of reducing the strength or flow of the current passing through the motor at or near a termination of each oscillating movement thereof while still maintaining a flow of current. I provide a suitable resistance *x* connected with line *a* and with spring 7, as by a wire *b*, so that when the circuit through *a* is broken by finger 7^b breaking circuit with contact 10, at or near a termination of the oscillatory movements of the motor, the circuit will be continued through the resistance *x* thereby reducing momentarily the flow of current through the motor and causing a momentary reduction of speed of rotation of the fan. It will be understood, however, that if the resistance *x* were not used and the finger 7^b were permitted to break circuit completely with the line wires at or near a termination of the oscillating movements of the motor the power of the motor would be reduced in much the same manner. I prefer, however, to use the resistance *x* as above stated so as not to completely break the circuit through the motor during operation. By adjusting or bending the contact 10 the point or points at

which contact is broken may be shifted at will, thus regulating the extent of the oscillatory movements.

The springs 7 and 11 wind in opposite directions and are of such relative tension that the fan and its motor will normally rest in a certain position of equilibrium, the two springs for the purpose of reaction acting substantially as one spring. When now the current is started through the motor and the fan blades commence to revolve, the pivoted fan structure will start to swing to one side or the other on the pivot 5 because of the gyroscopic and leverage forces gathering momentum as it proceeds.

In order to secure the normal momentum such as the fan would have in passing the center of oscillation when in full operation, it may be desirable to give the structure a slight additional push with the hand during the first movement, though this is not necessary when the fan is working in the particular plane for which it has been adjusted. The springs 7 and 11 now react, opposing movement upon pivot 5, and would stop and reverse said movement quickly were it not for momentum which acting against the springs serves to overcome their force and lengthen out the arc of oscillation. Momentum, however, dies out as the increasing tension of the springs causes the oscillatory movement to slow up, and at some point the force of the springs overcomes and reverses the other operative factors, and the structure begins to return toward a point at which all the forces are balanced or in equilibrium. But by reason of momentum, which increases as the structure travels back toward the point of equilibrium, this point is passed and the structure moves to the other side of the arc of oscillation, momentum now opposing the combined forces of leverage and gyroscopic actions and the springs until these forces overbalance it and coöperating return the structure to and again past the point of normal equilibrium, the fan thus oscillating back and forth, in arcs tending to decrease until finally the structure would come to rest at the point of normal equilibrium. But by reason of variations in the current supplied to the motor, or to parts of it, as existing in all commercial circuits, or as caused by irregular commutation in the fan motor or automatically produced in connection with the oscillatory movements of the fan structure, the leverage and gyroscopic forces utilized in oscillating the fan are intermittently varied, thus disturbing the point of equilibrium of the operative forces and causing it to shift from time to time. I find that these variations and consequent shiftings of the point of normal equilibrium are sufficient, even without being automatically augmented in connection with the oscillatory movements of the fan, to overcome friction and maintain oscillation of the fan structure.

In this explanation for clearness I have purposely omitted reference to the function of the resistance *x*, Fig. 1, and explained the operation as though this resistance were exactly equal to that through the main circuit *a*, or as though there were no automatic cutout in the circuit, as in Fig. 12. This cutout of the main circuit as shown in Figs. 1 to 11 is utilized in the present modifications of the broad features of my invention merely as a brake or check to prevent excessive oscillation or racing of the structure about the pivot 5 when by chance excessive variations in the current supplied to the motor shift the normal center of equilibrium more than is required to offset friction and tend to build up longer and more rapid oscillations than are desired. For this purpose I have the main circuit broken preferably on the side toward which the primary forces impel the structure, the break on the opposite side being adjusted at a point rarely reached. By slight modifications in this circuit interrupting device I find it possible to use this device to assist in the intermittent variations of current upon which I depend to maintain oscillation, but as such variations are sufficient for the desired purpose without automatic assistance, I have not shown such modifications in the present structure, the present function of the cut out or interrupter being merely coöperative with and regulative of the main actuating forces as described above.

When it is desired to shift the direction of the air currents flowing from the fan the sleeve 9 may be turned around the part 4^a, which will cause the springs 7 and 11 to shift with respect to base 6, to thereby alter the position of the axis of the fan, instead of shifting the base 6, though it will be understood that the base 6 may be shifted for the same purpose if desired.

While in Figs. 1 to 5 I have shown the springs 7 and 11 as in convolute form, substantially the same results may be accomplished by utilizing a cord or strands of elastic material as illustrated in my aforesaid Letters Patent No. 809,356, or by utilizing spiral springs 7^b, 11^b, as in Figs. 6 to 11, the spring 7^b being connected with wires *a* and *b*, while the spring 11^b is connected with wire *e*. To this end, and to provide for including the resistance *x* in the circuit at or near the limit of oscillation of the fan structure in one direction or both, I provide in this modification the following arrangement:—The wire *a* connects with a contact *a'* and the spring 7^b is connected with a wire or spring 13 that is secured at its other end to the sleeve 9, as by a screw 14, the contact 13 being normally in engagement with contact *a'*. The contact 13 is connected with wire *b*, as by wire *b'* con-

nected with screw 14 and with a screw 15 on sleeve 9 to which wire *b* is also connected.

When the fan structure rotates, as to the left in Fig. 11, and arrives near the limit of its movement in that direction, the tension of spring 7^b will lift contact 13 out of engagement with contact *a'* and thus break the direct circuit through line wire *a* and thereby include the resistance *x* in the circuit, thereby reducing the potential of the current through the motor to cause a momentary reduction in speed of rotation of fan 1. In order to regulate or adjust the time at which contact 13 will disconnect from contact *a'* the contact 13 may be put under more or less tension, and this may be done by attaching the wire 13 rigidly to screw 14, as by passing the wire 13 through a hole 14^a in said screw (Fig. 10), and then by turning said screw to the right or left; thus the spring 7^b when the fan oscillates will move said wire out of engagement with contact *a'* sooner or later. Aside from the form of the springs and circuit interrupter used, the modification of my invention shown in Figs. 6 to 11 is substantially identical with, and operates in the same manner as, the structure shown in Figs. 1 to 5.

In the form of my invention illustrated in Figs. 12 and 13 I have shown how gravity may be utilized as a reacting force instead of a spring or springs shown in Figs. 1 to 12. In order to conduct the current supplying the motor past the junction of the fixed and moving parts of the structure, I have shown contact fingers 7^c, 11^c, connected with support 4^a, as by the sleeve 9 thereon, which fingers engage annular contacts 15, 16 carried by post 4, the fingers 7^c, 11^c sliding on the contacts 15, 16 during oscillation of the fan structure. In this form of the invention, as in the forms shown in Figs. 1 to 11, leverage and gyroscopic actions are utilized as the primary forces in the oscillation of the fan, the plane of the fan blades being inclined to the axis of the support 4, and the axis of the support 4 being inclined with respect to the horizontal.

In order to regulate and control the extent of gravitational reaction at will, the pivoted structure is made adjustable transversely with respect to the axis of support 4, and to this end I have shown a screw 17 meshing in a threaded hole in support 4 and extending transversely thereof and connected with the casing of fan 3, by a yoke or frame 18 attached to said casing, and in which yoke or frame the screw 17 is journaled. Guides 18^a on said frame, bearing against support 4, or entering recesses therein, serve to balance and center the fan structure upon the support. By this means the fan structure can be adjusted more or less to one side of the axis of support 4, to thereby induce a more or less forcible gravitational reaction of the fan structure during oscillation. The base 6 may be adjusted to a desired angle with respect to the horizontal to thereby deflect the fan blades or to affect the gravitational reaction as by means of screws 19 connected with said base.

Figs. 14, 15 and 16 illustrate diagrammatically different ways of supporting the fan structure for the purpose of utilizing the forces before mentioned or combinations of forces. In each of the said structures the operation is substantially identical with that described in my Patent No. 809,356, referred to above. In Fig. 14 the fan casing is mounted upon the pivot 4 and has a depending weight portion 3^a, in the socket 3^b of which the support 4 passes, the tendency of which is to always return the fan structure to a position of equilibrium, the depending weight 3^a thus acting against and varying the forces employed in operating the fan structure for causing oscillation of the latter. In Fig. 15 the fan casing is supported from above by means of a curved spring 3^b carried by the pivotal support 4, said spring permitting the fan structure to swing bodily rearwardly under the varying pressure of the column of air flowing from the fan blades, thus varying the movement of the fan structure about the supporting device as a pivot. In Fig. 16 the fan structure is supported in the manner of a universal joint by means of a yoke 20 carried by pivot 5 and having a horizontally disposed shaft 21 pivoted to the yoke above the motor casing, to which shaft said casing is attached. In this case the back pressure of the air upon the rotating fan blades causes the fan structure to swing rearwardly on the axis of shaft 21, thereby changing the leverage action of the blades upon the surrounding air and causing the fan structure to oscillate more or less rapidly according to such leverage action.

Figs. 17, 18, and 19 illustrate diagrammatically means for supporting the fan structure in such a manner that adjustment can be made to direct the air current flowing from the fan at different angles to the horizontal. In this modification the sustaining post 4 for the motor is shown connected with a base 6 by a clamp joint 6^a, which may be in the form of a screw 6^c provided with a nut 6^b connecting the part 4^a with base 6 by a lug 6^d. By this means when the base is held substantially horizontally as in Fig. 17 the fan structure may be moved to one side of the vertical and held in position by the screw and nut; if the base 6 be attached to a wall, as in Fig. 18, the fan structure may also be inclined to the vertical as desired and held in such position by the screw and nut; and if the base be attached to a ceiling or over-head support, as in Fig. 19, the fan

may here also be inclined at an angle to the vertical and held in such position. In either case the fan structure may be adjusted so that the axis of oscillation of the fan structure will be vertical if desired.

The balancing of the pivoted structure symmetrically with respect to the pivot of oscillation, as shown in Figs. 1 to 11 and 17 to 20, makes the device substantially independent of gravity and capable of operation equally well in any plane; except that the gyroscopic action increases in proportion as the axis of the rotating parts approaches an angle of 45° from either the vertical or the horizontal, and to some extent acts as a disturbing force on devices not specially adjusted for operation at excessive angles from the horizontal. I find that an inclination of the fan axis of ten to fifteen degrees from the horizontal in either direction does not materially disturb the action of a fan adjusted to work near the horizontal, with a very slight gyroscopic component.

In Fig. 20, instead of sustaining the fan structure in such manner as to utilize leverage of the fan blades upon the surrounding air, I have shown an arrangement whereby the fan structure is pivotally supported off-center wherein the connection of the support 4 with the motor casing is at one side of a plane passing vertically through the axis of the fan blades or in other words the line *s* passing through the axis of support 4 is at one side of the axis of the fan shaft 2. At *t* is a counterweight on the casing of the motor to balance the structure with respect to the weight thereof on the opposite side of the axis *s*.

In Figs. 17, 18, 19 and 20 the structures are assumed to be substantially similar to those shown in Figs. 1 to 11 and operate substantially the same way.

Having now described my invention what I claim is:

1. The combination, with an electric motor-driven fan having its axis placed at an angle to the vertical and arranged to deliver a stream of air in the general direction of said axis, of a pivotal supporting device beneath the fan and connected therewith having means for producing reaction to the movement of the fan about the supporting device as a pivot, whereby variations in the current supplied to the motor serve to maintain oscillation of the fan.

2. The combination in a pivotal fan structure of means whereby air pressure acts to rotate the fan in one direction, mechanical means connected with said structure and simultaneously reacting to rotate it in the opposite direction, and automatic means connected with the fan structure for causing the air pressure alternately to exceed and to be exceeded by the reaction caused by said mechanical means, all arranged so that variations in the flow of current through the fan motor during its operation cause the fan to oscillate.

3. The combination in a pivotal fan structure of means whereby gyroscopic action acts to rotate the fan in one direction, mechanical means connected with said structure and simultaneously reacting to rotate it in the opposite direction, and automatic means connected with the fan structure for causing the gyroscopic action alternately to exceed and to be exceeded by the reaction caused by said mechanical means, all arranged so that variations in the flow of current through the fan motor during its operation cause the fan to oscillate.

4. The combination of an electric motor-driven fan, means for pivotally sustaining said fan, and means for producing an oscillatory movement of the fan with automatic means connected with the fan and controlled by its oscillatory movement for varying the flow of current through the fan motor during its operation.

5. The combination of an oscillating electric fan, with an automatic interrupter for the current supplied to the fan motor controlled by the oscillatory movement of the fan.

6. The combination of an electric motor-driven fan having its axis placed at an angle to the vertical and arranged to deliver a stream of air in the general direction of said axis, means for pivotally sustaining said fan, and means for producing an oscillatory movement of the fan with automatic means connected with the fan and controlled by the oscillations of the fan for varying the flow of current through the fan motor during its operation.

7. The combination of an oscillating electric motor-driven fan, and means for pivotally sustaining said fan, with means controlled by the fan for altering the flow of current through the fan motor at or near a termination of the oscillatory movement of the fan.

8. The combination of an oscillating electric motor-driven fan and means for pivotally sustaining said fan, means for altering the flow of current through the motor during its operation, and means controlled by the fan for reducing the potential of the current flowing through the fan motor at or near a termination of its oscillatory movement.

9. The combination of an electric motor-driven fan, means for pivotally sustaining said fan, and means for producing an oscillatory movement of said fan, with means for connecting the fan motor with line wires, said means comprising contacts normally connecting the motor and a line wire, and automatic means connected with the fan and

controlled by its oscillatory movements for cutting out the direct circuit from the line to the motor and cutting in a resistance during the pivotal movement of the fan structure for varying the flow of current through the fan motor during its operation.

10. The combination with an electric motor-driven fan of means for pivotally sustaining said fan and motor, means effective through the motive power whereby the fan is turned upon its pivotal support, means for producing reaction to the movement of the fan about its sustaining device, and means associated with the fan and controlled by the oscillatory movement of the fan structure and located in the motor circuit for causing variation in the flow of current to the motor during its operation.

11. The combination with an electric motor-driven fan, of means for pivotally sustaining said fan and motor, means effective through the motive power whereby the fan is turned upon its pivotal support, means for producing reaction to the movement of the fan about its sustaining device, and means operated with the fan and operatively located at or near a termination of the oscillatory movement of the fan and located in the motor circuit and controlled by such movement of the fan for causing variations in the flow of current to the motor during its operation.

12. The combination with an electric motor-driven fan, of means for pivotally sustaining said fan and motor, means effective through the motive power whereby the fan is turned upon its pivotal support, means for producing reaction to the movement of the said fan about its sustaining device, means for connecting the motor with line wires, a resistance for the motor circuit, and means operated with the fan for throwing the resistance into direct circuit with the motor at or near a termination of the oscillatory movement of the motor for varying the flow of current through the motor during its operation.

13. The combination with an electric motor-driven fan, of means for pivotally sustaining said fan and motor, means effective through the motive power whereby the fan is turned upon its pivotal support, means for producing reaction to the movement of the fan about its sustaining device, means for connecting the motor with line wires, a resistance connected with one line wire, and means included in the motor circuit operated by and with the fan for breaking the normal circuit of the motor through the line wires and including said resistance in the circuit of the motor at or near a termination of the oscillatory movement of the fan for varying the flow of current through the motor during its operation.

14. The combination of a fan and its motor, means for pivotally sustaining the same, and means effective through the motive power whereby the fan is turned upon its pivotal support, with a spring connecting the motor with a stationary part for producing reaction to the oscillatory movement of the fan, and means operating with and controlled by the fan and included in the motor circuit for causing variation in the flow of current through the motor during oscillation of the fan.

15. The combination of a fan, its motor and means for pivotally sustaining the same, and means effective through the motive power whereby the fan is turned upon its pivotal support, with a spring connecting the motor with a stationary part for producing reaction to the oscillatory movement of the fan, a contact for connection with a line wire, a contact connected with a terminal of the motor and arranged to oscillate with the fan and in engagement with the first named contact and adapted to break engagement therewith during oscillatory movement of the fan, and means for connecting the other terminal of the motor with a line wire whereby the flow of current through the motor may be varied.

16. The combination of a fan and its motor, means for pivotally sustaining the same, and means effective through the motive power whereby the fan is turned upon its pivotal support, with a plurality of springs connecting the motor with a stationary part for producing reaction to the oscillatory movement of the fan, a contact connected with a line wire, and a contact connected with one of said springs to make and break circuit with the first named contact whereby the flow of current through the motor may be varied.

17. The combination of a fan and its motor, means for pivotally sustaining the same, and means effective through the motive power whereby the fan is turned upon its pivotal support, with a plurality of springs connecting the motor with a stationary part for producing reaction to the oscillatory movement of the fan, a contact connected with a line wire, a contact connected with one of said springs to make and break circuit with the first named contact, and a resistance connected with the other of said springs and with a line wire, whereby when the circuit through said contacts is broken the resistance will be included in the circuit of the motor whereby the flow of current through the motor may be varied.

18. The combination of a fan, its motor and means for pivotally sustaining the same, and means effective through the motive power whereby the fan is turned upon its pivotal support, with a spring connecting the motor with a stationary part for producing reaction to the oscillatory movement of the fan, a contact located concentrically with

respect to the axis of oscillation of the fan structure, a contact connected with the fan structure and in engagement with the first named contact, and means to cause said contacts to break engagement during the oscillatory movement of the fan structure for varying the flow of current through the motor.

19. The combination of a fan and its motor, means for pivotally sustaining the same, and means effective through the motive power whereby the fan is turned upon its pivotal support, with a spring connecting the motor with a stationary part for producing reaction to the oscillatory movement of the fan, a contact located concentrically with respect to the axis of oscillation of the fan structure, a contact connected with the fan structure and in engagement with the first named contact, means to cause said contacts to break engagement during the oscillatory movement of the fan structure, and a resistance connected with a line wire controlled by said contacts, whereby when circuit is broken through said contacts current will flow through the resistance to the motor and whereby the flow of current through the motor will be varied.

20. The combination of a fan and its motor, with a pivoted post connected with the motor, a member independent of the fan structure disposed concentrically with respect to the pivotal axis of said structure and adjustable about said axis, a spring connecting said adjustable member with the motor, and means adapted to coöperate with said spring in any position of the adjustable member to produce an oscillatory movement of the fan structure about its pivotal axis, the general direction of the column of air flowing from the fan being altered by moving the adjustable member around the pivotal axis of the structure.

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Witnesses:
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