C. H. J. DILG.

FAN.

APPLICATION FILED SEPT. 14, 1908.

1,094,540. Patented Apr. 28, 1914.

5 SHEETS—SHEET 1.

Fig. 1

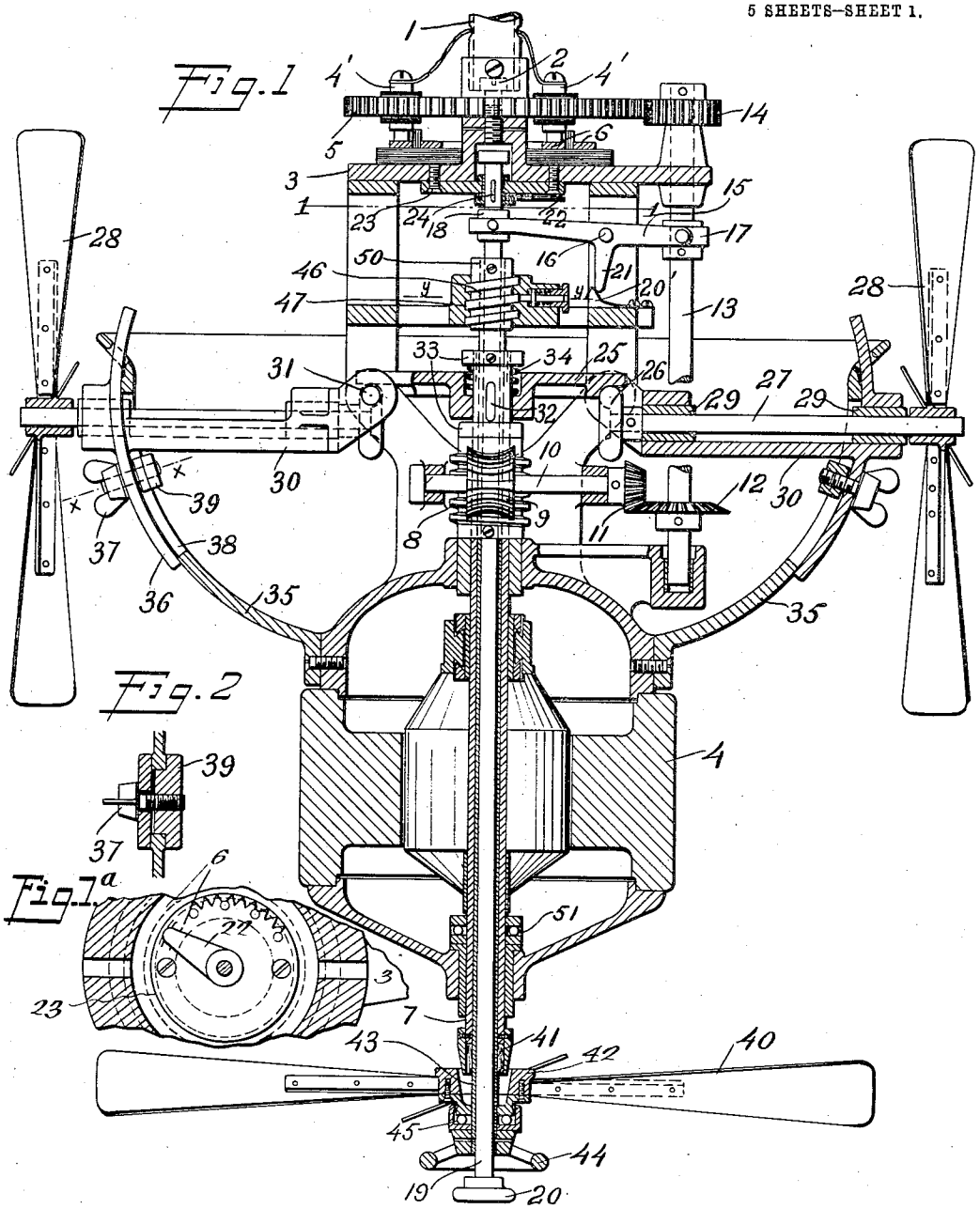
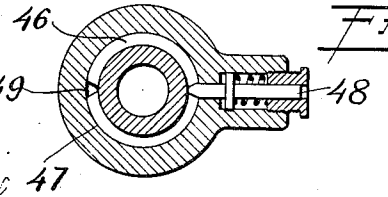


Fig. 2

Fig. 1a

Fig. 3



WITNESSES

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5 SHEETS—SHEET 2.

Fig. 4

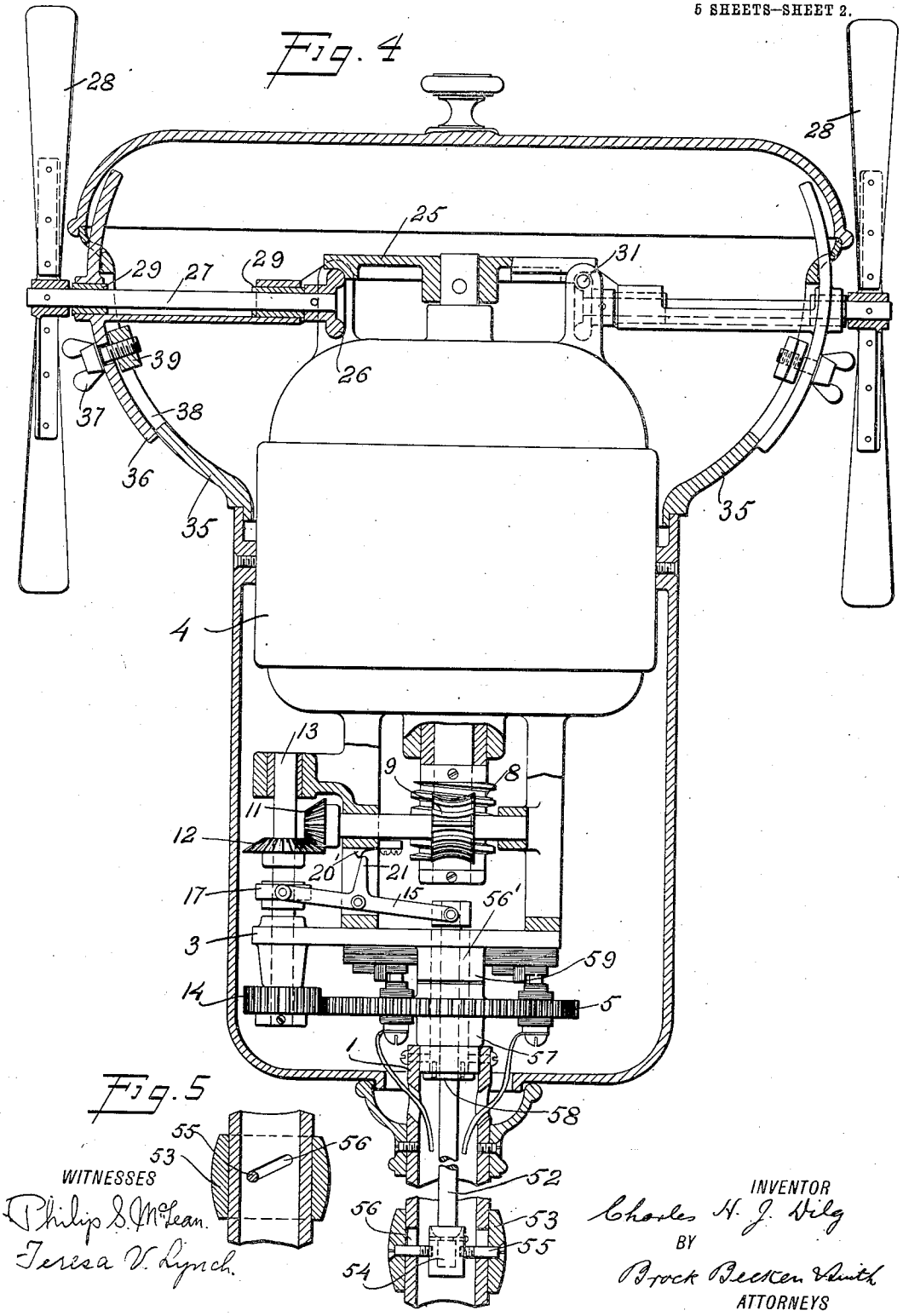

Fig. 5

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5 SHEETS—SHEET 3.

Fig. 8

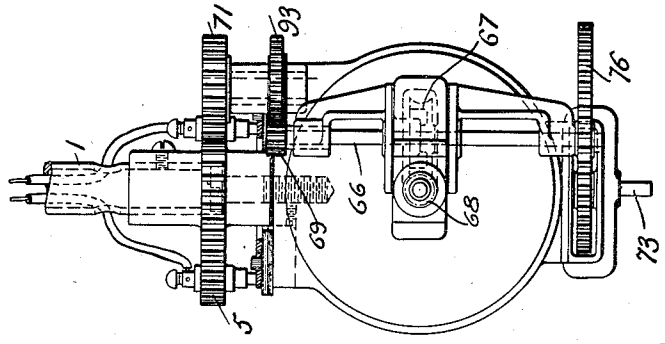


Fig. 7

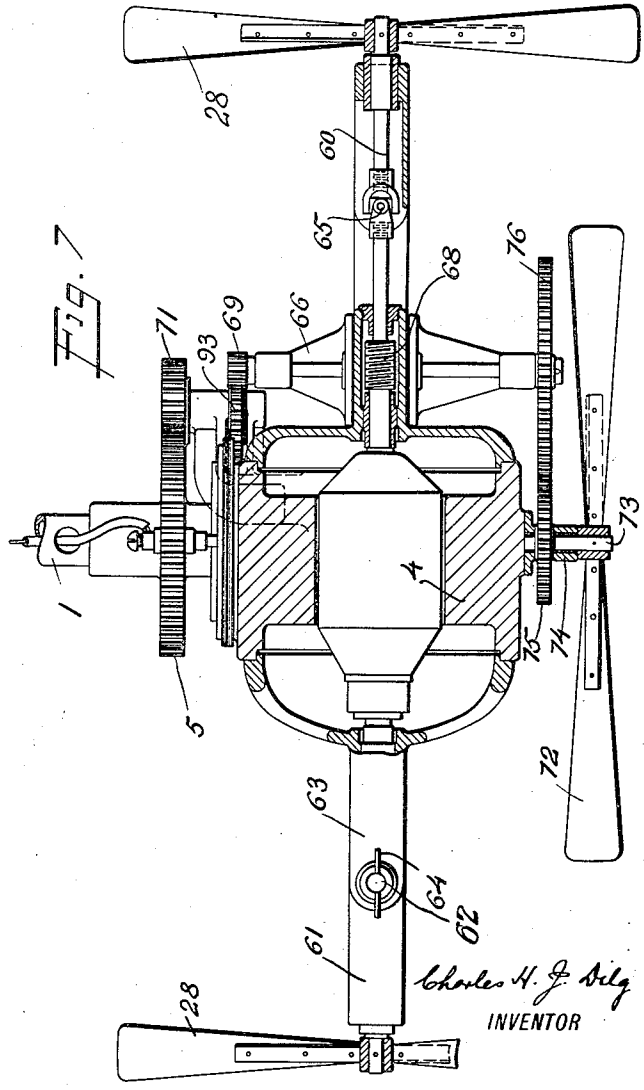
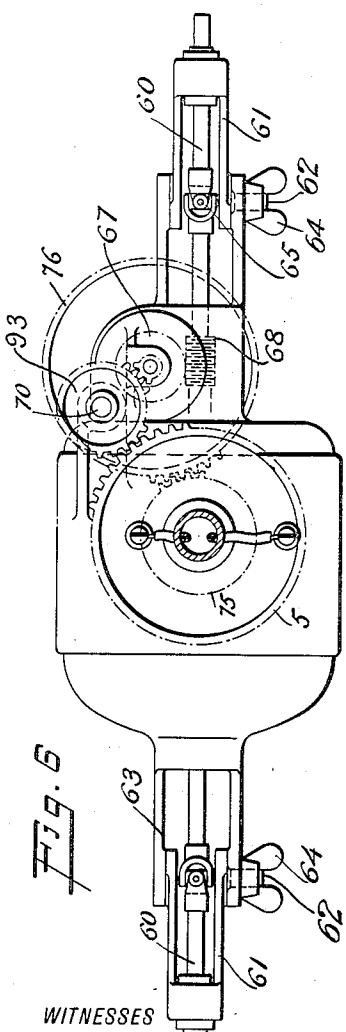


Fig. 6



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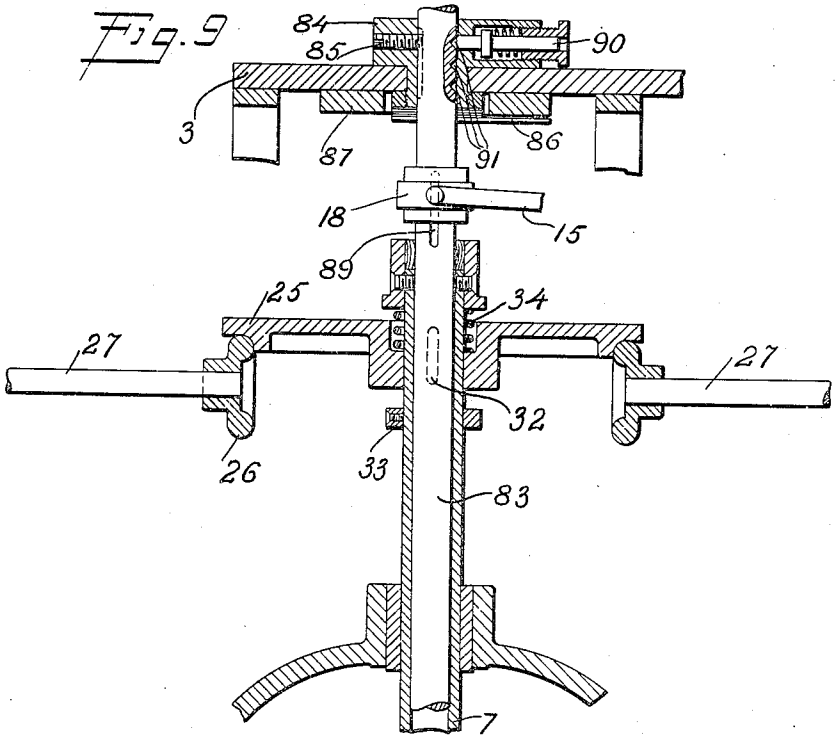
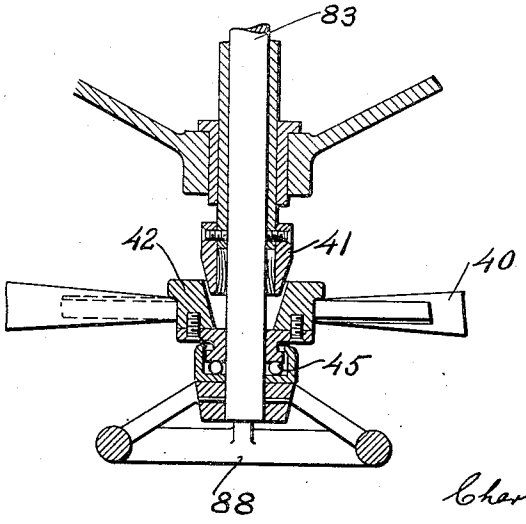
5 SHEETS—SHEET 4.

Fig. 9





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5 SHEETS—SHEET 5.

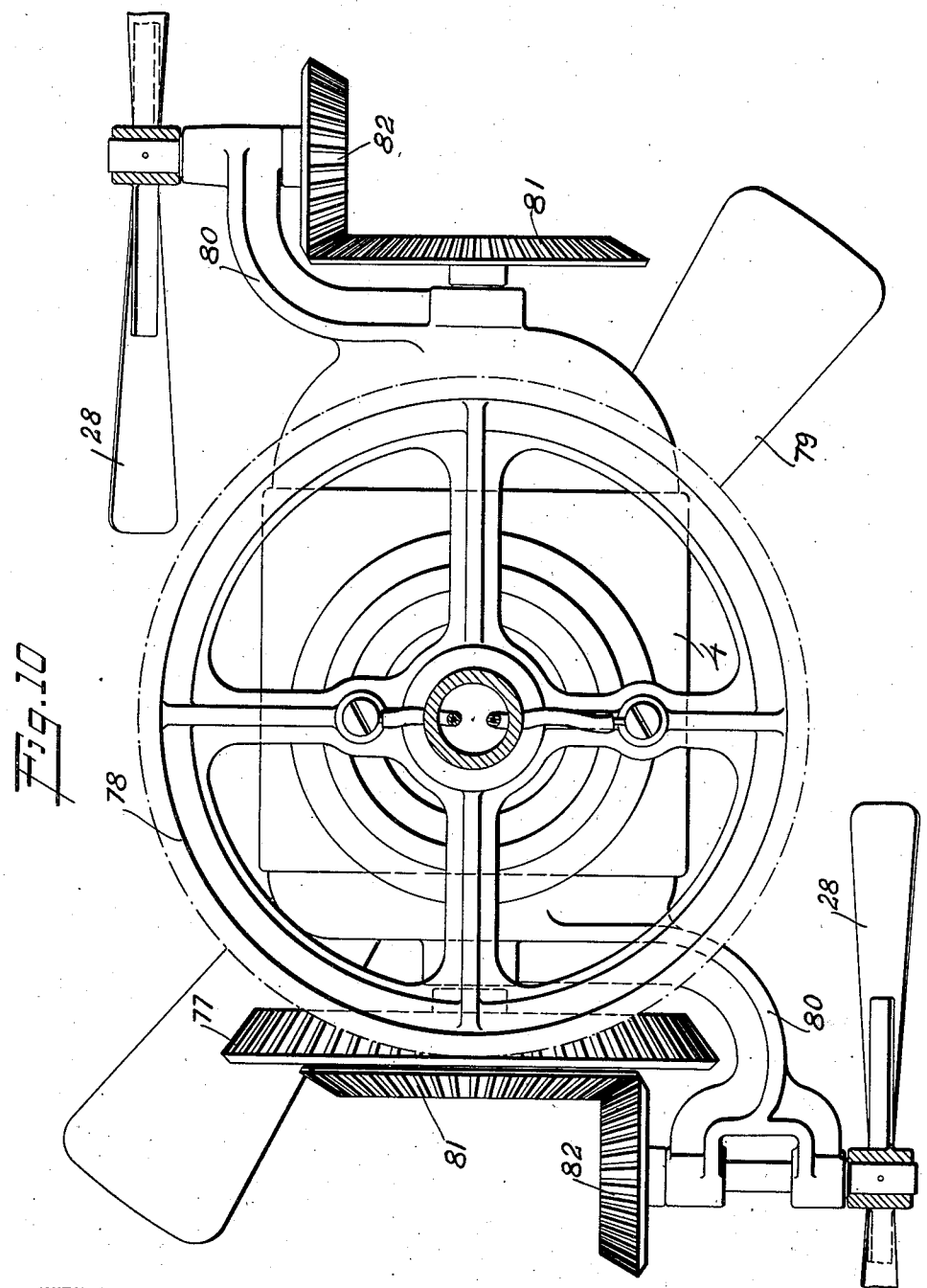

Fig. 10

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UNITED STATES PATENT OFFICE.

CHARLES H. J. DILG, OF NEW YORK, N. Y., ASSIGNOR TO ECK DYNAMO AND MOTOR COMPANY, A CORPORATION OF NEW JERSEY.

FAN.

1,094,540. Specification of Letters Patent. Patented Apr. 28, 1914.

Application filed September 14, 1908. Serial No. 452,814.

To all whom it may concern:

Be it known that I, CHARLES H. J. DILG, citizen of the United States, and resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Fans, of which the following is a specification.

The present invention relates generally to fans, and to means for driving and controlling the same, and has more especially reference to an electric motor and gearing particularly adapted to be used in connection with fans, and to the arrangement of the fans, and controlling means, to be driven thereby.

The main object of the invention is the production of a fan capable of diffusing and distributing the air over a wide area and in many directions, universally adjustable and controllable, and simple in construction.

One feature of the invention resides in imparting a revolving motion to a fan in a substantially horizontal plane, and additionally imparting thereto an individual rotation substantially at right angles to the revolution of the fan, together with means for adjusting the fan at an angle to the plane of its revolution.

The main difference between the construction used in this application and in that of my copending application Serial No. 542,815, filed Sept. 14, 1908, lies in the following: In my copending application the fan is given an oscillating bodily movement with the casing in addition to its rotation around its own axis; whereas, in this application the bodily movement of the fan and casing is one of revolution as mentioned above.

Instead of using one fan, any number of fans may be utilized all possessing the same movement and adjustment. When several fans are so used they may be adjustable independently one of the other.

In connection with the foregoing, there may be employed a second fan substantially at right angles to the first fan and rotating in a substantially horizontal plane. This second fan may or may not partake of the revolving motion of the first fan.

Any suitable means may be utilized to impart the several motions, but in the more preferred form an electric motor is preferably utilized both to produce the revolving motion and the individual rotation of the fans. In the preferred form the revolving member is the motor casing itself, and this motor casing as well as the fan or fans are all driven positively by connections from the armature shaft of the motor.

Another feature of the invention resides in positively driving two fans, placed substantially at right angles to each other on a motor, from the armature shaft of the motor. In connection with this feature means are provided for adjusting the angular relation between the fans.

Whenever an electric motor is utilized as the prime mover, it may be arranged so that its armature shaft extends in a substantially horizontal plane. In the preferred form, however, the motor is so arranged that its armature shaft extends in a substantially vertical direction.

Obviously the fan and motor, if used, may be either suspended from the ceiling, placed on a column or otherwise mounted as may be desired.

The invention further consists of a motor whose casing is revolved concentrically around its armature shaft by connections driven from the said armature shaft.

An additional feature of this invention resides in a construction involving the use of several fans having a common actuating means, together with devices for permitting either of said fans to be rotated independently of the other, or both in unison at will. These fans are preferably disposed at an angle to each other, and will preferably both be driven by connections from the armature shaft of a motor.

In connection with the above, or independently thereof, a further improvement consists in a revolving member having a fan which latter is given an independent rotation, and devices permitting the fan to be rotated independently of or in unison with the revolution of the revoluble member. As before, the revolving member may take many forms, but will preferably consist of an electric motor which carries the fan; the revolving motion of the motor casing and the rotation of the fan both being obtained from the rotating armature shaft.

With this construction there may be utilized several fans, preferably disposed at an angle to each other, and one of said fans may be carried by the revolving motor casing or other member, while the other is carried independently thereof, say by the arma-

ture shaft. When this form is used it is preferable to so arrange the parts that when the rotation of the fan carried by the motor casing ceases, the latter will stop revolving.

A further feature of the invention resides in having two fans preferably disposed at an angle to each other, both of which are independently rotatable and one or both of which follow the revolving motion of a revolving motor casing. Preferably all the motions are obtained by driving connections from the armature shaft. Devices may further be utilized to throw either of the fans out of operation.

While any suitable means may be employed for effecting the adjustment of the fan shafts, one of the forms shown involves in itself new and valuable features of construction. In the preferred form the fan shafts are provided with friction pulleys adapted to engage a friction disk mounted on a driving shaft. This driving shaft may be, and generally is, the armature shaft of an electric motor. A pivotal support for the fan shaft is provided whose axis coincides with the cross sectional axis of the engaging rim of the friction pulley whereby the friction pulley will be in engagement with the friction disk whatever its adjusted position. Suitable means are provided for adjusting the outer end of the fan shaft, capable of assuming many forms. In the precise embodiment shown these means take the form of two sectors, one of which is stationary and the other movable with the fan shaft, said sectors extending in an arc drawn from the center of the pivotal support of the fan shaft.

When the revolving member is in the form of a revolving motor casing it is convenient to support the brushes for the collector rings on a stationary gear forming a part of the transmission mechanism. This is a feature in itself.

A further improvement resides in the particular train of gears used in causing the motor casing to revolve, and further broadly in revolving the motor casing by means of connections driven from the armature shaft, together with means for disengaging the train of connections so that the motor casing will not revolve. It may be remarked here that wherever "gear" is mentioned it should be held to include any transmission mechanism, such as friction pulleys and disks.

The motor may be mounted in many ways to suit surrounding conditions, but preferably the motor is so arranged that its armature shaft is vertically disposed, and said armature shaft preferably will be wholly or partly supported by transmission mechanism driven from the armature shaft. This feature is of great advantage since it tends to simplify the structure and constitutes a very convenient mode of suspending a vertical shaft.

In addition to the foregoing feature, means are provided for supporting the armature shaft from another point when the driven members are disengaged from the driving connections on the armature shaft.

The means for controlling the several fans and the revolving member, or the gearing for same, so as to render the same operative or inoperative at will, may take many forms. Preferably, however, means are utilized which extend up through the armature shaft, or in certain cases the armature shaft itself is moved up or down. The several members can be controlled by a single device which serves to operate different means by turninig it or by raising and lowering it. Or separate rods or other means may be employed for the several fans and other members. If desired, the switch and rheostat can be conjointly or separately controlled in the same manner.

Where several fans are utilized one of said fans may be a normally idle fan, and the same means which are employed to place this fan in operation may be utilized by a progressive movement to disconnect the normally rotating fan, and, if desired, to stop the revolving member as well. The same or other means may be employed to bodily lift the armature shaft for the purpose of controlling the parts, when a longitudinally movable armature shaft is employed. Preferably the armature shaft is moved longitudinally by means of a controlling member extending through the armature shaft having a worm or threaded member which by its engagement with a stationary part effects the proper movement of the said armature shaft. If desired the normally idle fan may be supported by the controlling member, and this controlling member may also carry a bearing which supports the armature shaft, when the transmission mechanism for other fan shafts is disengaged. Suitable means for locking the parts into their variously adjusted positions are also employed.

Minor features of construction will appear as this specification proceeds.

In the accompanying drawings is illustrated the preferred embodiment of the invention, but various changes in the construction and arrangement of the parts may be made without departing from the spirit and scope of the invention.

In the said drawings: Figure 1, is a vertical sectional view of a ceiling fan constructed in accordance with and embodying the features of my invention, certain of the parts being shown in elevation. Fig. 1[a] is a sectional view taken along the line 1—1 of Fig. 1, and shows the construction of the controlling rheostat. Fig. 2, is a broken sec-

tional view taken on the line *x*—*x* of Fig. 1, to show the construction of the sector clamp for holding the upper fans at the proper angle. Fig. 3, is a sectional view taken on the line *y*—*y* of Fig. 1, illustrating the worm or elevating device for the fan controlling member. Fig. 4, is a part sectional view illustrating the invention modified to constitute a column fan. Fig. 5, is a detail sectional view of a slightly modified form of collar or sleeve for controlling the rotation of the column fan depicted in Fig. 4. Fig. 6, is a top plan view of one adaption of the invention as a ceiling fan, the motor shaft being arranged horizontally in this case instead of vertically as in the first figures. Fig. 7, is a sectional view partly in elevation of the form illustrated in Fig. 6. Fig. 8, is an end view of the same with the fans removed. Fig. 9, is a broken sectional view of one form of the fan, showing a modified form of controlling means. Fig. 10, is a top plan view of a modification in which the fan shafts are placed angularly with respect to the armature shaft and driven therefrom by bevel gearing.

In the different views, the same reference characters, designate like parts.

I prefer to employ an electric motor as the driving power for my improved fan and this motor may be mounted in several different ways. Preferably, however, the motor is mounted to rotate and the armature shaft of the motor is preferably vertically disposed as illustrated in Figs. 1 and 4.

When arranged as a ceiling fan, as best illustrated in Fig. 1, the device is dependent from a ceiling column or support 1, there being provided a swivel connection between the fan and the column such as the headed screw or stud 2. In this construction, the swivel stud is secured in the dependent frame 3, which carries the motor 4, and the head of the stud makes rotatable engagement with the column, but I do not wish to limit myself to this precise construction as other means of pivotal connection between the two parts might be devised. When the motor is thus mounted to rotate, sliding connections must be provided for conducting the electric current thereto. This is preferably done by means of brushes 4′, carried by a stationary part on the end of the column and for the purpose of imparting rotation to the motor, this stationary part would preferably be in the form of a gear 5, these brushes engaging the collector or slip rings 6, on the dependent frame, from whence suitable connections lead to the motor, these connections not being shown.

The devices for controlling the different fans and the motor, preferably extend up through the armature shaft and for this reason the armature shaft would be tubular in the form of a hollow sleeve 7. For the purpose of imparting a revoluble movement to the fan as a whole, a worm 8, would preferably be mounted on the armature shaft to engage the worm wheel 9, on the angularly disposed auxiliary shaft 10, the latter shaft carrying a bevel pinion 11, adapted to mesh with the bevel gear 12, on the intermediate shaft 13, and this shaft carrying at its upper end the spur pinion 14, meshing with the stationary gear 5. This construction might be modified if desired. For various reasons it might be desirable to stop the bodily rotation of the fan and to do this, the driving connections must be interrupted at some point. A simple way of doing this is by disengaging the bevel gears on the intermediate and auxiliary shafts, by means of a shifting lever 15, fulcrumed at the point 16, one end of the lever having sliding engagement with the shifting collar 17, on the intermediate shaft and the opposite end of the lever slidably engaging a shifting collar 18, on the controller rod 19, the controller rod extending downward through the armature shaft and provided with a knob or handle 20, on its lower end. It will be evident that the longitudinal shifting of this controller rod will engage or disengage the bevel gears at will and the gears may be held in either position by means of a retaining spring 20′, engaging an angular locking projection 21, on the shifting lever. The controller rod will preferably also serve as a motor control, in which case it may carry a switch arm 22, at its upper end to engage the contact or contacts of a starting switch 23, it being apparent from this, that rotation of the rod would control the speed or operation of the motor. The switch arm may be secured to the rod by a feather 24, or other slip connection so that the longitudinal shifting of the rod would not affect the operation of the switch or controller.

For the purpose of driving a plurality of fans, the armature shaft carries a driving member which is preferably in form a friction disk 25, adapted to engage the friction pulleys 26 on the substantially horizontal fan shafts 27, which shafts carry the fans 28 on their outer ends, the said fans rotating in a substantially vertical plane. The fan shafts rotate in bushings 29, in the bracket arms 30, and these bracket arms are pivoted at the point 31. The axis of the pivotal support for the fan shaft corresponds to the cross sectional axis of the engaging rim of the pulley so that the angular relation of the pivotal support may be altered without changing the driving relation of the friction disk and pulley. It will be understood that more or less than two fans may thus be driven from the armature shaft and while for various reasons a friction gearing is desirable in this connection, I do not restrict myself to the use of friction gearing for this

purpose. The driving member is held by a feather 32, or otherwise fixed on the armature shaft so as to be capable of a slight sliding movement and this movement is limited by the confining collars 33, the spring 34, normally holding the driving member in engagement with the driven members.

Means for sustaining the pivotal supports of the fan shafts in their adjusted positions must be provided, and for this purpose I preferably employ supports in the shape of sectors 35, with which engage the sector extensions 36, on the outer end of the pivotal supports, the relatively fixed and movable sectors being drawn on an arc having as its center, the axes of the pivotal supports. The sectors are held in adjusted relation by means of clamping screws 37 working through the slots 38, in the sector-like supports, the screws being engaged in the blocks 39, which make clamping engagement with the inner side of the support. I have illustrated the arcuate support as a bowl shaped member supported on the motor casing, but this member might be made in a number of different parts and in fact the supporting means for the pivoted or swinging shaft supports might be varied in a number of different ways. I prefer also to use in combination with these vertically-rotating fans, a horizontally rotatable fan 40, which may be driven direct from the armature shaft. In order that this horizontal fan may be controlled independent of the other fans, corresponding clutch members 41, and 42 on the armature shaft and horizontal fan respectively, are provided, as well as means for bringing these clutch parts into active engagement. When so arranged, the lower fan is normally inactive, but if desired, the lower fan might have positive or fixed connection with the armature shaft.

The means for controlling the lower or normally idle fan would preferably be utilized for controlling the upper fans as well and for this purpose, I prefer to use a tubular rod 43, provided with a wheel or handle 44 and also extending up through the armature shaft. This fan controlling member and the normally idle fan have co-acting parts constituting a ball bearing 45, for the support of the fan when inactive, and this bearing under certain conditions acts as a thrust bearing for the support of the armature shaft.

In order to bring the clutch members into engagement for causing operation of the normally idle fan, it is necessary to give the fan-controlling member a certain lifting movement, and then if desired to render the upper fans inactive, a further lift of the controlling member could be utilized for lifting the driving gear on the armature shaft from engagement with the driven gears on the fan shafts. This so-called "lift" of the controlling member could be effected in a number of different ways, but for this purpose I prefer to employ a worm member or screw 46, on the upper portion of the controlling member which engages a corresponding thread or relatively stationary seat 47. It will be obvious that a turning movement of the fan controlling member, by reason of this screw member, will impart a lifting movement to the controlling member, bringing the clutch members into engagement and causing operation of the normally idle fan, and that a further turning movement will finally lift the driving gear from engagement with the gears on the fan shafts and render the upper fan shafts inoperative. In this last position the armature shaft would be supported by the ball bearing 45. As the driving gear on the armature shaft is capable of a sliding movement between the confining collars 33, and as the spring 34, tends to hold said gear in engagement with the driven gears on the fan shaft, in order to disengage the said gears, the armature shaft has to be lifted until the lower confining collar engages the driving gear and the parts are so related and proportioned that the driving gear is not disengaged until the clutch members of the normally idle fan are in mesh, so that in this way any or all of the fans may be operated, as desired. In order to hold the fan controlling member in any of these positions, a locking device is employed, which is preferably in the shape of a spring-pressed plunger 48, adapted to engage properly positioned locking notches or seats 49, in the elevating worm. The fans are thus controllable at will, the controlling member preferably acts sequentially to control the different fans, and the parts when set in any desired relation, are locked that way. The locking pin or plunger and the locking notches in the elevating worm are shaped or formed so that the locking plunger will not offer too much resistance to the turning movement of the controlling member.

When only the lower or horizontal fan is in operation, the continued bodily revolution of the device is useless so it is desirable to provide means for automatically disengaging the gears which revolve the fan when the upper fans have been rendered inactive. As the preferred means for accomplishing this result, I prolong the elevating worm into an abutment 50, which when the controlling member has been elevated to its last position, to disengage the driving gear on the armature shaft from the driven gears on the fan shafts, engages the collar 18 on the motor controller rod lifts the said controller rod, actuates the shifting fork and disengages the bevel gears on the intermediate and auxiliary shafts in the same way as if the controller rod had been individually operated in the manner before described.

When running under normal conditions, with the lower fan inactive, as illustrated in Fig. 1, the armature shaft is preferably entirely or almost entirely supported by the transmission mechanism between the armature shaft and fan shafts, so that the necessary amount of friction is obtained between the driving and driven gears, and by this means of suspension the friction of the armature bearings is reduced to a minimum. A thrust bearing 51, may or may not be used to aid in the support of the armature shaft.

The adaptation of the invention to a column fan, as illustrated in Fig. 4, is similar in most respects to the construction just described, but in the case of a column fan, the use of a horizontally rotatable fan is generally unnecessary when the adjustable side fans are used, as these fans can be adjusted by the means already described to direct the draft in any desired direction. As with the column fan there is preferably only one set of fans driven from the armature shaft, there is therefore no necessity for providing means for rendering the said fans inoperative, other than the motor control, which may be in the shape of a rheostat or other controlling device which may be mounted in any suitable position and which it is not necessary to here illustrate. Means are however, preferably provided for controlling the bodily revolution of the fan and this means would preferably take the form of the shifting lever for disengaging the bevel gears on the auxiliary and intermediate shafts, all of which parts have been previously described. In this case however, the controlling means would not pass through the armature shaft, but could be in the form of a rod 52, connected with the inner end of the shifting lever and pasing downward through the column. This controller rod would preferably be operated by means of a shifting sleeve 53, slidably mounted on the post or column and making connection with a coupling device 54, on the lower end of the controller rod by means of screws 55, or other suitable fastenings. These connecting screws would work through the slots 56, in the column and the slots could be arranged vertically as in Fig. 4, or on a slant as in the fragmentary view Fig. 5. In the first case, the sleeve would be given a straight upward thrust for the purpose of disengaging the fan-revolving gears and in the latter case, a twisting movement of the sleeve would accomplish the same result. In the case of the column fan adaption, the pivotal support for the fan preferably consists of a tubular spindle 56', which passes down through the hub 57 of the stationary gear and a retaining washer 58 secured to the lower end of the spindle prevents the fan from working off the column. The motor frame also preferably carries a hub part 59, which abuts against the hub portion of the stationary gear.

In the form of the invention illustrated in Figs. 6, 7 and 8, the motor is mounted for rotation as before, but in this case the motor shaft is disposed horizontally instead of vertically and for the purpose of adjusting the upper or approximately vertically rotating fans, flexible shafting, or shafts provided with universal joints, are employed. In this case the armature shaft is extended at both ends and the fan shafts 60, form continuations of the armature shaft. The pivotal supports 61, for the fan shafts are pivoted to the extension 63 of the motor frame at the point 62 and are held in adjusted relation preferably by means of clamping screws 64. In order to permit the angular adjustment of the fan shafts with relation to the armature shaft, flexible connections are interposed between the ends of the armature shaft and the fan shafts and for this purpose I prefer to use the universal joints 65, but if found desirable, portions of flexible shafting could be used, or the entire fan shafts could be made flexible.

As the means for accomplishing the bodily revolution of the fan, I prefer to use an auxiliary shaft 66, disposed at an angle to the armature shaft, and having a worm gear 67, driven by a worm 68, on the armature shaft, the auxiliary shaft carrying at its upper end a pinion 69, meshing with the reduction gear 93 on the intermediate shaft 70, the latter shaft carrying at its upper end the pinion 71, in mesh with the stationary gear. The lower horizontally rotatable fan 72, is carried by the stub shaft 73, journaled in the bearing 74, the said shaft having a spur pinion 75, in mesh with the spur gear 76, on the lower end of the intermediate shaft.

In the form of the invention shown in Fig. 10, the motor is mounted to revolve as before, and the armature shaft is arranged in a horizontal plane. The bodily revolution of the fan is preferably accomplished by means of a bevel pinion 77, on the armature shaft which meshes with the stationary bevel gear 78. The lower or horizontal fan 79, preferably rotates with the motor but if desired, it may be geared from the armature shaft to rotate at a faster speed than the motor. The fan shafts are journaled in the brackets 80, on the motor and are preferably driven by means of the intermeshing bevel gears and pinions 81 and 82, on the armature shaft and fan shafts respectively. The motor is controlled by a rheostat, switch, or like device.

A simpler form of controlling means for the fan than that shown in Fig. 1, is illustrated in Fig. 9, only as much of the device being shown in this figure as is neces-

sary to illustrate the application of this form of controlling means. Here the controlling means consists of a single member, a rod 83, which passes up through the tubular armature shaft and is keyed or otherwise slidably secured to a bushing 84, at its upper end, by means of a suitable pin 85, or like fastening. This bushing carries the switch arm 86, adapted to engage the rheostat 87, so that by rotating the controlling member by means of the handle 88, on its lower end, the motor is controlled at will. The lifting of this controlling member in a step-by-step movement, first meshes the clutch members, causing the normally idle lower fan to become active, (the upper fans being already in operation), the next movement causes disengagement of the driving gear from the driven gears on the fan shafts, and the final movement operates the shifting lever 15, to stop the bodily rotation of the fan. In this case, the collar 18, is slidably keyed or otherwise fastened to the controlling member as indicated at 89, so as to be unaffected by the first two movements of the controlling member. The controlling member is locked to hold the parts in these three positions preferably by means of a spring-pressed locking pin 90, preferably carried in the bushing 84, which engages the notches 91, in the controlling member. The parts shown as broken away in this figure would be substantially the same as the corresponding parts fully illustrated in Fig. 1.

While in the forms illustrated, the motor is shown as constituting the revoluble member, it will be understood that this is not necessarily the case, as by the use of suitable gearing, the motor could be mounted stationary and a suitable revoluble member could be driven from the motor, the fans in this case being carried by a revoluble member other than the motor.

What is claimed, is:

1. The combination with the casing and armature shaft of a motor, of means for causing the casing to revolve concentrically around the armature shaft by connections driven from the latter, a fan mounted on the motor casing and carried bodily therewith during the revolution of the same, and driving connections from the armature shaft to said fan.

2. The combination with the casing and armature shaft of a motor, of bearings for supporting the casing and shaft so that the latter extends vertically, means driven from the armature shaft for causing the casing to revolve concentrically around the armature shaft, a fan mounted on the motor casing and carried bodily therewith during the revolution of the same, and driving connections from the armature shaft to said fan.

3. The combination of a revoluble member, fan shafts carried thereby extending in opposite directions, means for rotating said fan shafts substantially at right angles to the plane of the revolution of the revoluble member, and means for adjusting said fan shafts independently of each other at an angle to the plane of revolution of the revoluble member.

4. The combination of two fans disposed at an angle to each other, a common actuating means for rotating both fans, and controlling devices for causing either of said fans to be rotated separately or in unison at will.

5. The combination of a revolving member, a fan carried thereby, a second fan disposed at an angle to the first fan, a common actuating means for rotating both fans, and devices permitting either of said fans to be rotated independently of the other or both in unison at will, independently of, or in unison with, the revolution of the revolving member.

6. The combination of two fans disposed at an angle to each other, an electric motor, means for rotating both of said fans from the armature shaft of the motor, and devices permitting either one of said fans to be rotated independently of the other or both in unison at will.

7. The combination of a motor, a fan carried thereby, means for revolving said motor driven by connections from the armature shaft, a second fan disposed at an angle to the first fan, driving connections from the armature shaft for rotating each fan, and devices for permitting either of said fans to be rotated independently of the other or both in unison at will.

8. The combination of a motor, a fan carried thereby, a second fan disposed at an angle to the first fan driving connections from the armature shaft for causing the motor to revolve and the fans to be driven, and devices permitting either of said fans to be rotated independently of the other or both in unison at will, independently of or in unison with the revolution of the motor.

9. The combination of two fans, a common actuating means for rotating both fans, and devices for permitting either of said fans to be rotated independently of the other, or both in unison at will.

10. The combination of a revolving member, a fan carried thereby, a second fan, a common actuating means for rotating the two fans, controlling means adapted to allow either fan to be rotated independently of the other or both in unison at will, and means whereby the revolving member is stopped when the fan carried thereby is thrown out of operation.

11. The combination of a motor whose casing is revoluble, a fan carried by the casing, a second fan disposed at an angle to the first fan, driving connections from the

armature shaft for causing the casing to revolve and the fans to be rotated controlling means to allow either fan to be rotated independently of the other or both in unison at will, and means whereby the revolution of the casing ceases when the fan carried thereby is thrown out of operation.

12. The combination of a motor whose casing is revoluble, a fan carried by the casing, a second fan disposed at an angle to the first fan and carried independently of the casing, driving connections from the armature shaft for causing the casing to be revolved and the fans to be rotated.

13. The combination of a motor whose casing is revoluble, a fan carried by the casing, a second fan disposed at an angle to the first fan, and carried independently of the casing, driving connections from the armature shaft for causing the casing to be revolved and the fans to be rotated, and devices permitting either of said fans to be rotated independently of the other or both in unison at will.

14. The combination of a motor whose casing is revoluble, a fan carried by the casing, a second fan disposed at an angle to the first fan and carried independently of the casing, driving connections from the armature shaft for causing the casing to be revolved and the fans to be rotated, and devices permitting either of said fans to be rotated independently of the other or both in unison at will, independently of or in unison with the revolving motor casing.

15. The combination with a motor having a revoluble casing, of two fans one of which follows the revolution of the casing and is independently rotatable as well, and the other of which rotates independently of the revolution of the casing, and driving connections from the armature shaft of the motor for causing the revolution of the casing and the rotation of the fans.

16. The combination with a motor having a revoluble casing, of two fans one of which follows the revolution of the casing and is independently rotatable as well, and the other of which rotates independently of the revolution of the casing, and driving connections from the armature shaft of the motor for causing the revolution of the casing and the rotation of the fans, and means for throwing either of said fans out of operation.

17. The combination with a motor having a revoluble casing, of two fans, disposed at an angle to each other, one of which follows the revolution of the casing and each of which has a rotation around its own axis, driving connections from the armature shaft of the motor for causing the revolution of the casing and the rotation of the fans, and means for throwing either of said fans out of operation.

18. The combination of a motor, a horizontally disposed fan supported in line with the armature shaft and driven from the latter, a second substantially vertically arranged fan disposed substantially at a right angle with respect to the armature shaft, means for driving the second fan from the armature shaft, and means for adjusting the angular relation of the second fan with respect to the first fan.

19. The combination of a motor, a fan supported in line with the armature shaft of the motor, and driven therefrom, a second fan at substantially a right angle with the armature shaft, means for driving the second fan from the armature shaft, and means for adjusting the angular relation of the second fan with respect to the first fan, and means driven by connections from the armature shaft for revolving the motor as a whole.

20. The combination of a motor, a fan supported at right angles to the armature shaft and driven from the latter, means for adjusting the angular relation between the fan and the armature shaft, a second fan substantially at right angles to the first fan and in line with the armature shaft and adapted to be driven from said armature shaft, and means driven by connections from the armature shaft for revolving the motor as a whole and means for independently controlling the operation of the respective fans.

21. In combination with an electric motor having a vertically disposed armature shaft, a driving gear on the armature shaft, fan carrying shafts, driven gears on said fan carrying shafts operated from the driving gear, the driven and driving gears adapted to sustain the weight of the armature shaft, and means for disengaging the said gears and supporting the armature shaft from another point.

22. In an electric fan, a motor having a vertically disposed armature shaft, a driving gear on the armature shaft, fan shafts and driven gears on said fan shafts meshing with the driving gear on the armature shaft, fans on said fan shafts, a normally idle fan, means for bringing said normally idle fan into driving engagement with the armature shaft and for individually controlling the fans at will.

23. An electric fan comprising a motor having a vertically disposed armature shaft, fan-carrying shafts and transmission mechanism between the armature shaft and fan-carrying shafts serving to support the armature shaft, and means for rendering the transmission mechanism inactive so as to interrupt the operation of the fans and for supporting the armature shaft from another point.

24. An electric motor having a vertical

armature shaft, a driving gear on the armature shaft, fan-carrying shafts, driven gears on the fan-carrying shafts to be engaged by the driving gear, a normally idle fan, controlling means for bringing the normally idle fan into operative engagement with the armature shaft and for lifting the armature shaft to disengage the driving and driven gears, and means for controlling the motor, all of said controlling means extending through the armature shaft.

25. In combination with an electric motor, having a vertical armature shaft, a driving member on the armature shaft, fan-carrying shafts, driven members on the fan-carrying shafts operated by said driving member, a normally idle fan, a member extending through the armature shaft, for bringing the normally idle fan into active engagement with the armature shaft and also to lift the armature shaft to disengage the driving and driven gears, a switch for the motor, and a second member also extending through the armature shaft to operate the switch.

26. In an electric fan, a motor having a vertically disposed armature shaft, fan shafts, driven gears on said shafts, a driving gear on the armature shaft to engage the said driven gears, a member extending through the armature shaft, a worm on the upper end of said member engaging a corresponding grooveway, the member when turned, adapted by reason of the worm to lift the armature shaft to disengage the driving and driven gears, and means for locking the worm to hold the parts in adjusted relation.

27. In a fan, an electric motor having a vertically arranged armature shaft, a friction disk on the armature shaft, fan-shafts and friction elements on said fan-shafts to be engaged by the said friction disk, a controlling member extending through the armature shaft, a worm on said member and a stationary seat to be engaged by said worm, a normally idle fan supported by the controlling member, the rotation of the controlling member, by reason of the worm adapted to bring the normally idle fan into active engagement with the armature shaft and also to disengage the friction disk from the friction elements.

28. In a fan, an electric motor having a vertically arranged armature shaft, a friction disk on the armature shaft, fan-shafts and friction elements on said fan-shafts to be engaged by the said friction disk, a controlling member extending through the armature shaft, a worm on said member and a stationary seat to be engaged by said worm, a normally idle fan supported by the controlling member, the rotation of the controlling member, by reason of the worm, adapted to bring the normally idle fan into active engagement with the armature shaft and also to disengage the friction disk from the friction elements, means for locking the worm to hold the controlling member in adjusted position, and means for controlling the motor also passing through the armature shaft.

29. In a fan, an electric motor having a vertically disposed armature shaft, a driving member on said shaft, fan-carrying shafts, driven members on said fan-carrying shafts, the armature shaft being normally supported by said driven and driving members, a sleeve extending through the armature shaft, a worm on said sleeve and a corresponding relatively stationary seat for the worm, a normally inactive fan supported by the said sleeve, the sleeve adapted when turned, by reason of the worm, to cause active engagement of the normally inactive fan and the armature shaft and also to disengage the driving member from the driven member, and a bearing carried by the sleeve to support the armature shaft when the driving and driven members are disengaged.

30. In a fan, an electric motor having a vertically disposed armature shaft, a driving member on said shaft, fan-carrying shafts, driven members on said fan-carrying shafts, the armature shaft being normally supported by said driven and driving members, a sleeve extending through the armature shaft, a worm on said sleeve and a corresponding relatively stationary seat for the worm, a normally inactive fan supported by the said sleeve, the sleeve adapted when turned, by reason of the worm, to cause active engagement of the normally inactive fan and the armature shaft and also to disengage the driving member from the driven members, and a bearing carried by the sleeve to support the armature shaft when the driving and driven members are disengaged, and a controller rod also passing through the armature shaft for controlling the motor.

31. In combination with an electric motor having a vertically disposed armature shaft, a driving gear on the shaft, fan-shafts, driven gears on the fan-shafts to be engaged by the driving gear, the driven and driving gears serving to normally support the armature shaft, a controlling member, a normally idle fan supported by said controlling member, coöperating clutch members on the armature shaft and normally idle fan, the controlling member adapted to bring the clutch members on the armature shaft and normally idle fan into active engagement and also to disengage the driving from the driven gears, and a bearing on the controlling member to support the armature shaft when the gears are disengaged.

32. In combination with an electric motor having a vertically disposed armature shaft, a driving gear on the shaft, fan-shafts,

driven gears on the fan-shafts to be engaged by the driving gear, the driven and driving gears serving to normally support the armature shaft, a controlling member, a normally idle fan supported by said controlling member, clutch members on the armature shaft and normally idle fan, the controlling member adapted to bring the clutch members on the armature shaft and normally idle fan into active engagement and also to disengage the driving from the driven gears, a bearing on the controlling member to support the armature shaft when the gears are disengaged, and means operated from the motor to rotate bodily the motor and the fans driven thereby.

33. In combination with an electric motor having a vertically disposed armature shaft, a driving gear on the shaft, fan-shafts, driven gears on the fan-shafts to be engaged by the driving gear, the driven and driving gears serving to normally support the armature shaft, a controlling member, a normally idle fan supported by said controlling member, clutch members on the armature shaft and normally idle fan, the controlling member adapted to bring the clutch members on the armature shaft and normally idle fan into active engagement and also to disengage the driving from the driven gears, and a bearing on the controlling member to support the armature shaft when the gears are disengaged, and means for controlling the motor, all of said means passing through the armature shaft.

34. The combination with an electric motor having a vertically disposed armature shaft, a driving gear on said armature shaft, fan-shafts, driven gears on said fan shafts to be engaged by the driving gear on the armature shaft, the driving and driven gears serving to normally support the armature shaft, a worm on the controlling member and a relatively stationary seat for said worm, a normally inactive fan, and related clutch members on the armature shaft and said normally inactive fan, means for turning the controlling member to first bring the clutch members of the normally inactive fan and armature shaft into active engagement, and to then lift the driving gear from engagement with the driven gears, means for locking the worm on the controlling member to hold the parts in adjusted relation, and a bearing on the controlling member to support the armature shaft when the driving and driven gears are disengaged.

35. The combination with an electric motor having a vertically disposed armature shaft, a driving gear on said armature shaft, a controlling member passing through the armature shaft, a worm on the controlling member and a relatively stationary seat for said worm, a normally inactive fan, and related clutch members on the armature shaft and said normally inactive fan, means for turning the controlling member to first bring the clutch members of the normally inactive fan and armature shaft into active engagement, and to then lift the driving gear from engagement with the driven gears, means for locking the worm on the controlling member to hold the parts in adjusted relation, and a bearing on the controlling member to support the armature shaft when the driving and driven gears are disengaged, a speed controller for the motor and a member also extending through the armature shaft for operating the controller of the motor.

36. In combination with an electric motor having a vertically disposed armature shaft, a driving gear on the said armature shaft, fan shafts, driven gears on the fan-shafts to be engaged by the driving gear, a clutch member on the armature shaft, a normally idle fan and a corresponding clutch member carried thereby, a controlling member extending through the armature shaft and adapted to control the speed of the motor, said controlling member adapted to be positioned to bring the clutch members on the armature and normally idle fan into active engagement, also to disengage the driving and driven gears, a bearing for the armature shaft carried by the controlling member, and means for locking the controlling member in its different positions.

37. In a fan, an electric motor mounted for rotation, fans driven from the motor, means for individually controlling the fans, a switch carried by and rotating with the motor, means for operating said switch to control the motor, all of said controlling means being carried by the motor.

38. The combination of a fan rotating in a substantially vertical plane, a second fan arranged at right angles to the first fan and rotating in a substantially horizontal plane, an electric motor, means for rotating both fans from the armature shaft of the motor, and means for imparting a revolving motion to the first fan in a substantially horizontal plane.

39. The combination of a fan rotating in a substantially vertical plane, a second fan arranged at right angles to the first fan and rotating in a substantially horizontal plane, an electric motor, the casing of the motor being mounted for rotation, means for rotating both fans from the armature shaft of the motor, and means for rotating the motor casing to impart a revolving motion to the first fan in a substantially horizontal plane.

40. In combination with an electric motor having an armature shaft, a driving gear on the shaft, fan shafts, driven gears on the fan shafts to be engaged by the driving gear, a controlling member, a normally idle fan, the said controlling member adapted to

bring the normally idle fan into operative engagement with the armature shaft and also to disengage the driving from the driven gears.

41. In a fan, an electric motor having an armature shaft, a driving member on said shaft, fan-carrying shafts, driven members on said fan-carrying shafts, a sleeve extending through the armature shaft, a worm on said sleeve, and a corresponding relatively stationary seat for the worm, the sleeve, when turned, adapted by reason of the worm to disengage the driving member from the driven members.

42. In a fan, an electric motor having an armature shaft, a driving member on said shaft, fan-carrying shafts, driven members on said fan-carrying shaft, a sleeve extending through the armature shaft, a worm on said sleeve, a corresponding relatively stationary seat for the worm, the sleeve, when turned, adapted by reason of the worm to disengage the driving member from the driven members, and a controller rod also passing through the armature shaft for controlling the motor.

43. In combination, an electric motor having an armature shaft, a driving gear on the armature shaft, fan-carrying shafts, driven gears on the fan-carrying shafts, to be engaged by the driving gear, a normally idle fan, controlling means for bringing the normally idle fan into operative engagement with the armature shaft and for moving the armature shaft to disengage the driving and driven gears, and means for controlling the motor.

44. In combination with an electric motor having an armature shaft, a driving gear on the armature shaft, fan shafts, driven gears on the fan shafts to be engaged by the driving gear, and a controlling member adapted to shift the armature shaft longitudinally to disengage the driving and driven gears.

Signed at New York in the county of New York and State of New York this eighth day of Sept. A. D. 1908.

CHARLES H. J. DILG.

Witnesses:
AXEL V. BEEKER,
PHILIP S. MCLEAN.