(No Model.) 3 Sheets—Sheet 1.

# H. B. COLLINS.

## ELECTRIC MOTOR.

No. 569,746. Patented Oct. 20, 1896.

Fig. 1.

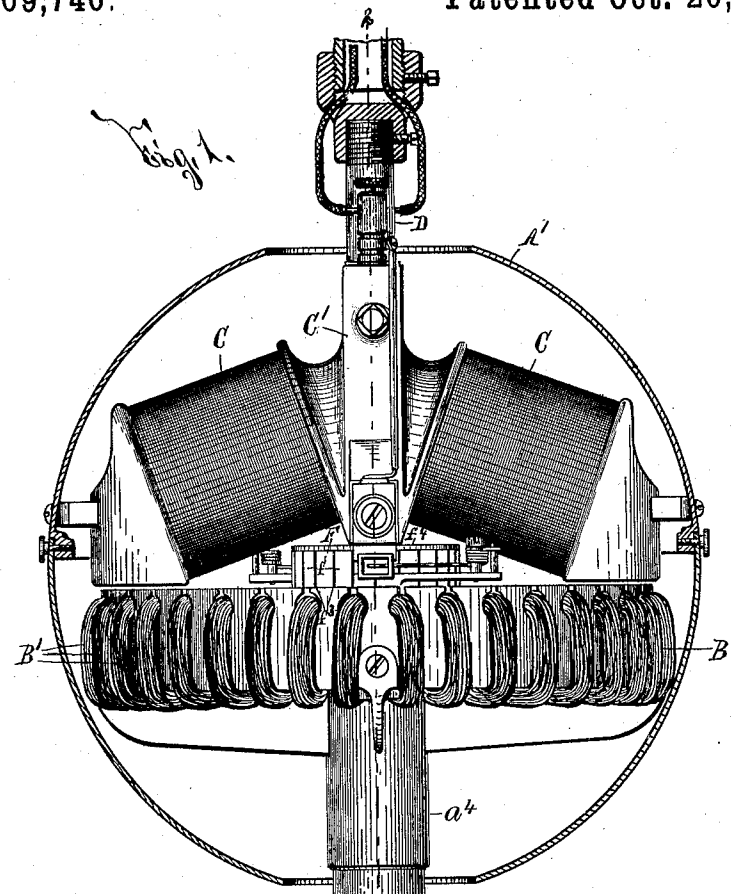
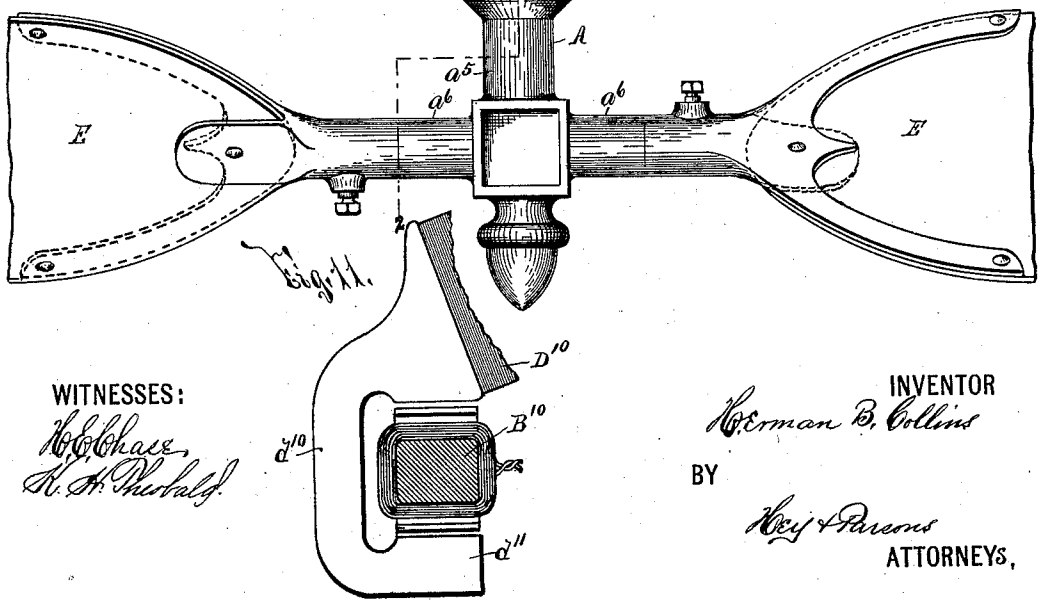



Fig. 11.

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(No Model.) 3 Sheets—Sheet 2.

# H. B. COLLINS.

## ELECTRIC MOTOR.

No. 569,746. Patented Oct. 20, 1896.

Fig. 2.

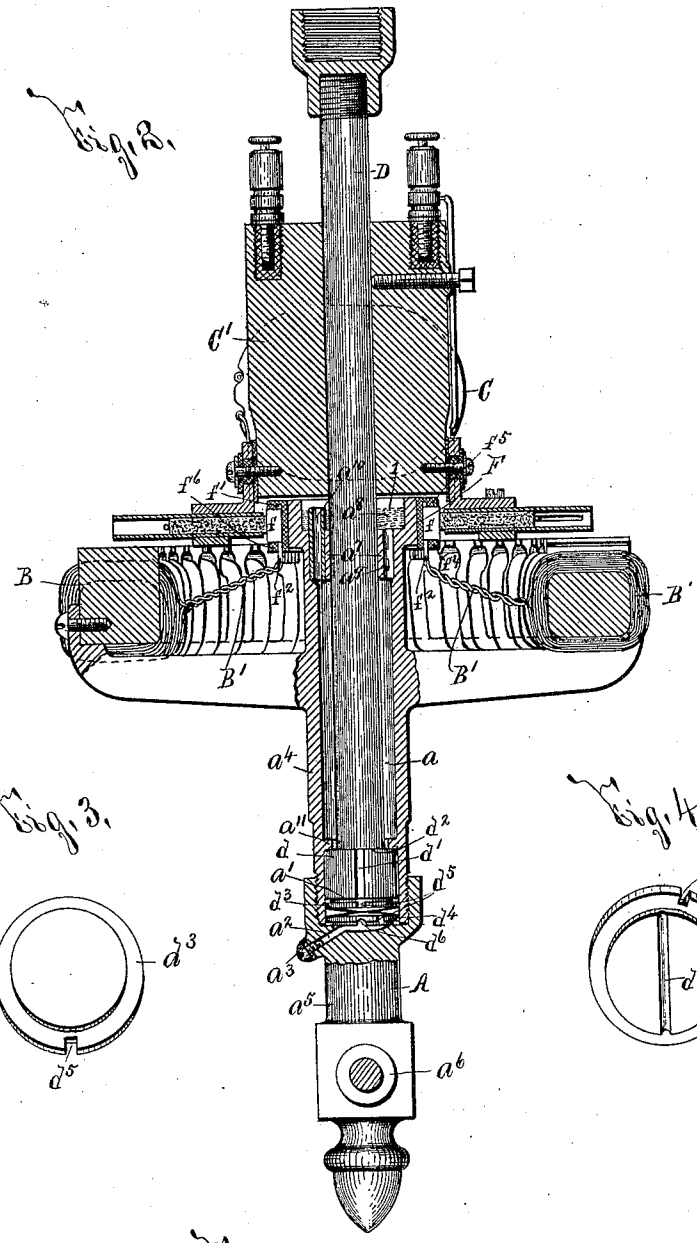


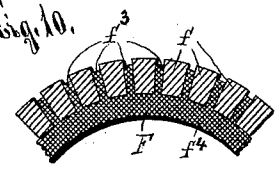

Fig. 3.




Fig. 4.




Fig. 10.

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(No Model.) 3 Sheets—Sheet 3.

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## ELECTRIC MOTOR.

No. 569,746. Patented Oct. 20, 1896.

Fig. 5.

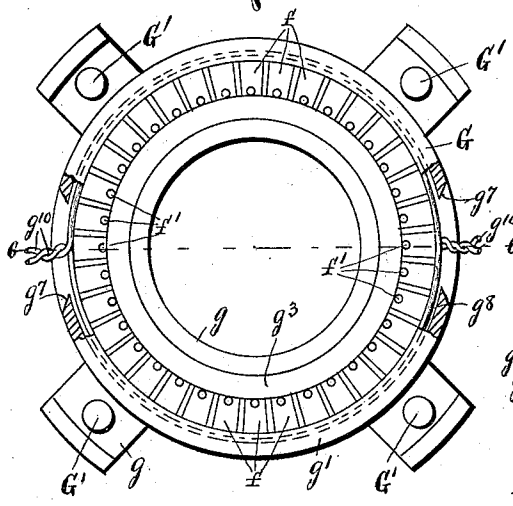



Fig. 6.

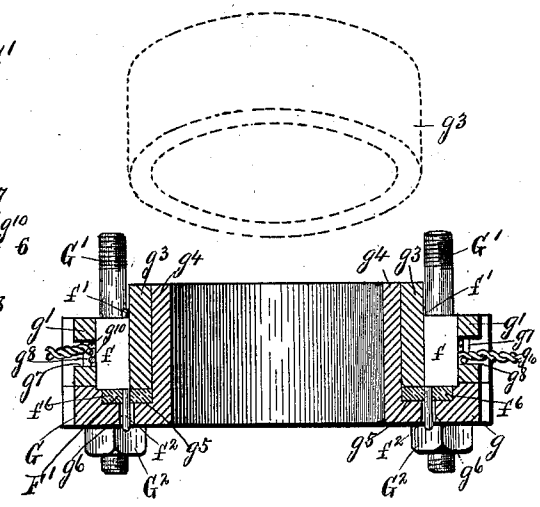



Fig. 7.

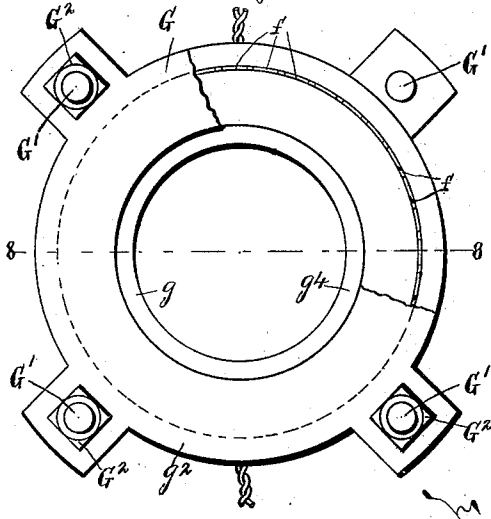



Fig. 8.

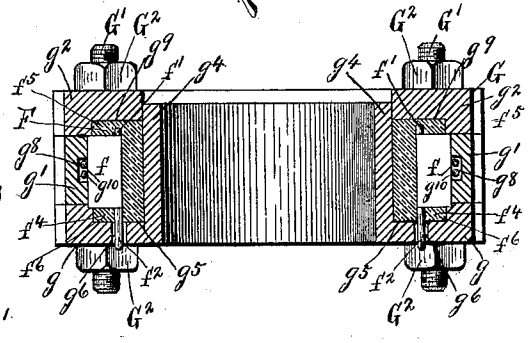
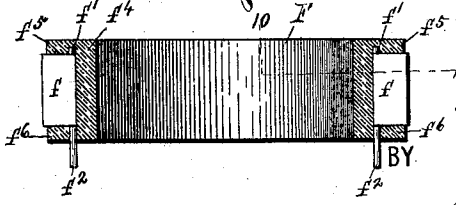



Fig. 9.

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# UNITED STATES PATENT OFFICE.

HERMAN B. COLLINS, OF FULTON, NEW YORK.

## ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 569,746, dated October 20, 1896.

Application filed November 20, 1895. Serial No. 569,489. (No model.)

*To all whom it may concern:*

Be it known that I, HERMAN B. COLLINS, of Fulton, in the county of Oswego, in the State of New York, have invented new and useful Improvements in Motors, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to improvements in motors particularly applicable for use in driving ventilating-fans and similar mechanisms, and has for its object the production of a device which is practical and effective and operates with a minimum degree of friction and noise; and to this end it consists, essentially, in a rotary head or part for driving the fan-blades or other devices connected thereto and an armature and a field-magnet for raising or suspending the head or part and revolving the same in an elevated plane.

The invention also consists in the detail construction and arrangement of the parts of the rotary head or part and the motor.

In describing this invention reference is had to the accompanying drawings, forming a part of this specification, in which like letters indicate corresponding parts in all the views.

Figure 1 is an elevation, partly in section, of my improved motor, shown as operatively connected to the inner ends of oppositely-arranged fan-blades. Fig. 2 is a vertical section taken on line 2 2, Fig. 1. Figs. 3 and 4 are isometric views of the detached bearing-pieces, one of which is shown as inverted. Fig. 5 is a top plan view, partly in section, of the flask for facilitating the construction of my improved commutator, its top section being removed and the commutator-segments being shown in position within the flask. Fig. 6 is a vertical section taken on line 6 6, Fig. 5, the annular ring of the flask being also shown by dotted lines in its elevated position. Fig. 7 is a top plan view, partly broken away, of my improved flask, the top section being shown in its normal position. Fig. 8 is a vertical section taken on line 8 8, Fig. 7. Fig. 9 is a vertical section of the detached commutator of my improved motor. Fig. 10 is a detail section taken on line 10 10, Fig. 9; and Fig. 11 is a detail section, partly in elevation, of a portion of an armature and a slightly-modified construction of pole-piece for my improved motor.

A represents the rotary head or part, B and C the armature and field-magnet of the motor for revolving the head, and A′ a case inclosing the upper end of the rotary head and the armature and field-magnet, and, as is obvious, said head or part, motor, and inclosing case may be of any suitable form, size, and construction. The head or part A is formed with a chamber $a$, extending downwardly from its upper face for receiving the lower end of the shaft D, which is preferably stationary. The lower end of the chamber $a$ is preferably closed and is provided with an end bearing-face $a'$, formed with a central socket or depression, and an outlet-conduit $a^2$ extends downwardly from said socket or depression through the outer face of the head or part A and is closed by suitable means, as a screw $a^3$. The head or part A is preferably composed of upper and lower sections $a^4$ $a^5$, usually united at the lower end of the chamber $a$, and the fan-blades, as E, or other articles driven by my invention may be suitably secured or connected to the lower section $a^5$, which is here shown as provided with opposite arms $a^6$.

The chamber $a$ is preferably formed of greater diameter than the shaft D and is provided at its upper end with a contracted portion forming a bearing $a^7$ for said shaft and a superimposed lubricant-reservoir $a^8$. A conduit $a^9$ extends downwardly from the reservoir $a^8$ into the underlying enlarged portion of the chamber $a$, and a conduit $a^{10}$ extends upwardly from said portion of the chamber and above the level indicated by line 1, Fig. 2, of the lubricant in the reservoir $a^8$ for permitting the escape of the air beneath the bearing $a^7$ when the oil is feeding through the conduit $a^9$. The lower end of the shaft D is provided with an enlargement $d$ of substantially the same diameter as the chamber $a$, and a groove $d'$ extends lengthwise of said enlargement for permitting the downward passage of the lubricant admitted to the chamber $a$ from the reservoir $a^8$ by the conduit $a^9$. The top face of said enlargement is provided with a stop-shoulder $d^2$, engaged by a suitable stop-face $a^{11}$ of the head or part A, here shown as the lower face of the an-

nular ring within the chamber $a$, formed of greater internal diameter than the shaft D for permitting the passage of the lubricant. The described arrangement of the lubricant, reservoir and the bearings for the shaft D is particularly practical and effective, as the bearings are submerged beneath the level of the lubricant and are effectively and constantly supplied with the lubricant.

Suitable bearing-pieces $d^3$ $d^4$, preferably formed of hardened steel, are interposed between the lower end of the shaft D and the face $a'$, and their opposite faces and peripheries are formed with grooves $d^5$ $d^6$ for permitting the passage of the lubricant. These bearing-pieces preferably consist of disks having their adjacent faces of such construction that their central portions only are engaged and their outer portions disengaged, thus reducing to a minimum the amount of friction and noise incidental to the rotation of the head or part A. It is obvious, however, that a ball may be substituted for one of the disks, that the adjacent or bearing faces of either of the disks may be flat instead of convex, and that both disks may be omitted and the face $a'$ then engaged by the lower end face of the shaft D, providing one or both of said faces are formed convex. Consequently the convex face of the disk $d^3$ is essentially removably provided upon the lower end of the shaft D and the adjacent face of the disk $d^4$ is formed at the lower end of the chamber $a$, since it is immaterial whether said faces are formed separable from or integral with said shaft and the bottom wall of said chamber.

The armature B encircles the shaft D and is suitably fixed to the upper end of the head or part A, which forms a hub for said armature. The field-magnet C for coöperating with the armature B is secured to the shaft D and its arms are inclined downwardly toward the adjacent or top face of the armature and are provided with pole-pieces arranged above and at substantially right angles with the top face of the armature.

If desired, the pole-pieces of the field-magnet may be provided with extensions having their ends arranged beneath the armature, and at Fig. 11 I have shown a portion of a field-magnet $D^{10}$ having its pole-pieces provided with extensions $d^{10}$, formed with laterally-extending ends $d^{11}$, arranged beneath the armature $B^{10}$. It will be understood, however, that in this construction of the field-magnet the portions of the pole-pieces arranged above the armature are capable of the stronger action. The armature and the head or part A are suspended or slightly elevated by the magnetism of the armature and field-magnet, and consequently said field-magnet is preferably so adjusted vertically that the elevation or upward tendency of the armature is just sufficient to engage the adjacent faces of the bearing-pieces $d^3$ $d^4$, and when the field-magnet and the armature B cease to attract each other the rotary head or part A and said armature descend slightly until the stop-faces $a^{11}$ $d^2$, previously described, are engaged. It is therefore obvious that the armature B and the rotary head or part A are revolved with a minimum degree of noise and strain and friction upon the bearings of said head.

F is the commutator of my motor, which is highly effective and is of special construction in order to greatly cheapen its cost and thus render an electric motor particularly applicable for driving ventilating-fans and similar devices. As best seen at Figs. 2, 5, and 9, the commutator consists of a series of segments $f$, having arms $f'$ $f^2$ usually of unequal length extending from their opposite ends, insulating-strips $f^3$ of mica or other suitable material interposed between the segments, and an insulating-support $f^4$, vulcanized to the segments and insulating-strips and fixed to the upper end of the rotary head or part A. The support $f^4$ is preferably provided with upper and lower flanges $f^5$ $f^6$, formed with sockets for receiving the arms $f'$ $f^2$, the lower flange $f^6$ being of less thickness than the length of the lower or longer arms $f^2$, which extend through said flange and are secured to the wiring B' of the armature B.

The commutator F is preferably formed by a flask G, consisting of lower, intermediate, and upper sections $g$ $g'$ $g^2$ and an annular ring $g^3$, the sections $g$ $g'$ $g^2$ being normally alined with each other by upper and lower arms G,' projecting from the opposite faces of the section $g'$, and perforations (not illustrated) formed in the sections $g$ $g^2$ for receiving the arms G'. The lower section $g$ is provided with an annular wall $g^4$, projecting upwardly from its inner edge, an annular groove $g^5$ in its top face, and a circular series of apertures $g^6$, extending downwardly from said groove through the lower face of the section. The annular ring $g^3$ closely encircles the wall $g^4$ and is formed of less diameter than the series of apertures $g^6$. The intermediate section $g'$ consists of a ring formed with perforations $g^7$, extending through its upright wall and having its inner peripheral face formed of considerably greater diameter than the outer face of the ring $g^3$ and provided with an annular groove $g^8$, and the upper section $g^2$ is provided with an annular groove $g^9$ in its lower face alined with the groove $g^5$.

In the manufacture of my improved commutator F the lower and intermediate sections $g$ $g'$ and the ring $g^3$ are arranged in operative position, and the segments $f$ are placed between the section $g'$ and the ring $g^3$ and are supported upon the section $g$ with the longer arms or projections $f^2$ arranged in the perforations $g^6$. The insulating-strips $f^3$ are then interposed between the segments $f$, and suitable clamps $g^{10}$, as flexible wires, are arranged in the perforations $g^7$ and grooves $g^8$ and clamped around said segments and insulating-strips for firmly holding the same together and temporarily securing them to

the section $g'$. After the clamps $g^{10}$ are in position the ring $g^3$ is withdrawn and the sections $g\ g'$ are separated, the segments $f$ and strips $f^3$ remaining secured to the section $g'$ by the clamps $g^{10}$. A ring of unvulcanized rubber is then arranged within the groove $g^5$, and the lower and intermediate sections $g\ g'$ are again assembled in operative positions and are suitably alined with each other by the arms G′ and the perforations (not illustrated) for receiving said arms, so that the longer arms or projections $f^3$ of the segments $f$ are passed through the rubber strip into the apertures $g^6$.

After the sections $g\ g'$ are assembled the space between the annular wall $g^4$ and the segments $f$ and insulating-strips $f^3$ is filled with unvulcanized rubber, a ring of unvulcanized rubber is placed upon the top faces of said segments and strips, so as to enter the groove $g^9$, and the upper section $g^2$ is arranged in operative position. The sections $g\ g'\ g^2$ are then firmly clamped together by nuts $G^2$, movable on the arms G′, and the rubber within the flask G is suitably vulcanized, and when the sections $g'\ g'\ g^2$ are separated the segments $f$, insulating-strips $f^3$, and insulating-support $f^4$ are firmly and practically secured together and said segments are positively and effectively insulated. The support $f^4$ is then secured to the head or part A in any suitable manner, and, if desired, a metallic ring similar to the ring $g^3$ may be vulcanized to the inner periphery of said support, providing the wall $g^4$ is of the requisite diameter.

The operation of my invention will be readily understood upon reference to the accompanying drawings and the foregoing decription, and it will be particularly noted that the suspension or elevation of the armature and the rotary head or part, when in motion, and the peculiar construction of the bearings for the shaft upon which said head or part revolves greatly reduce the noise, strain, and friction incidental to the revolution of said armature and head or part.

My invention is particularly applicable for use in driving ventilating-fans and similar devices. It is apparent, however, that the detail construction and arrangement of my improved motor and the head or part revolved thereby may be considerably changed without departing from the spirit of my invention, and consequently I do not herein specifically limit myself to such exact detail construction and arrangement.

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

1. In combination, a rotary pendent head or part, and a motor for revolving the head or part, said motor being provided with an armature and a field-magnet magnetically cooperating to effect an upward tendency of the revolving head or part during the operation of the motor, substantially as and for the purpose described.

2. In combination, a rotary armature, a field-magnet having its pole-pieces arranged above the armature for magnetically attracting the same upwardly and a rotary head or part arranged beneath the armature and revolved thereby, substantially as and for the purpose specified.

3. In combination, a rotary head or part, a motor for revolving the head or part, said motor being provided with an armature and a field-magnet magnetically coöperating to effect an upward tendency of the revolving head or part during the operation of the motor, and a fan-blade revolved by the head or part, substantially as and for the purpose described.

4. In combination, a stationary shaft formed with a convex engaging face, a rotary armature, a field-magnet for magnetically attracting the armature upwardly, and a rotary head or part arranged beneath the armature and revolved thereby, said head or part being provided with a bearing-face for engaging the convex face, substantially as and for the purpose set forth.

5. In combination, a stationary shaft formed with a pair of separated engaging faces, a rotary armature, a field-magnet arranged at one side of the armature for coöperating therewith, and a rotary head or part arranged at the opposite side of the armature and revolved thereby, and provided with separated bearing-faces for engaging the former separated faces, one of said bearing-faces being formed convex, substantially as and for the purpose specified.

6. In combination, a pendent stationary shaft formed with an engaging face, a rotary head or part provided with a convex face for engaging the former face, and a motor for raising the head or part and revolving the same in its elevated plane, substantially as and for the purpose described.

7. In combination, a pendent stationary shaft formed with a convex engaging face at its lower end, and a stop-face arranged above the convex face, a rotary head or part encircling the shaft and provided with a convex face and a stop-face for engaging the former faces, and a motor for raising the head or part and revolving the same in its elevated plane, substantially as and for the purpose set forth.

8. In combination, a pendent stationary shaft, a rotary head or part provided with an internal chamber for receiving the head or shaft having its lower end closed, a pair of bearing-pieces interposed between the shaft and the end face of the chamber, and a motor for revolving the head or part, substantially as and for the purpose specified.

9. In combination, a pendent stationary shaft formed with an engaging face at its lower end, a rotary head or part formed with an internal chamber for receiving the shaft

having its lower end closed, and formed with a bearing-face for engaging the former face, said chamber being provided with a bearing for the shaft and a superimposed lubricant-receptacle whereby said bearing and the engaging and bearing faces are submerged beneath the level of the lubricant, and a motor for revolving the head or part, substantially as and for the purpose described.

10. In combination, a pendent stationary shaft formed with a convex engaging face at its lower end, and a stop-shoulder arranged above the convex face, a rotary head or part provided with an internal chamber for receiving the shaft, having its lower end closed and formed with bearing and stop faces for engaging the former faces, said chamber being provided with a contracted portion above the bearing and stop faces for forming a bearing for the shaft, a lubricant-receptacle arranged above the bearing, a conduit extending downwardly from the receptacle into the internal chamber, and a second conduit extending from said chamber above the level of the lubricant in said receptacle, and a motor for revolving the head or part, substantially as and for the purpose set forth.

11. In combination, a pendent stationary shaft formed with a stop-face, a rotary armature encircling the shaft, a field-magnet arranged above the armature and coöperating therewith for suspending and revolving the armature, a rotary head or part arranged beneath the armature and provided with an internal chamber for receiving the shaft having its lower end closed, bearing-pieces interposed between the lower end of the shaft and formed with conduits for the passage of the lubricant, said bearing-pieces having the central portions of their adjacent faces engaged and the surrounding portions thereof disengaged, substantially as and for the purpose specified.

12. In combination, a rotary head or part, fan-blades connected to the head or part, an armature fixed to the head or part, a commutator comprising a series of segments, and an insulating-support for the segments fixed to the head or part and a field-magnet coöperating with the armature for suspending and revolving the same, substantially as and for the purpose specified.

13. The herein-described commutator, the same comprising a series of separated segments having arms or projections extending from their opposite ends, an insulating-support vulcanized to the segments, and provided with upper and lower flanges having sockets for receiving said arms or projections, substantially as and for the purpose described.

14. The herein-described flask for molding commutators, the same comprising a lower section having an annular wall projecting upwardly from its inner edge, an annular groove in its top face and a circular series of apertures extending downwardly from said groove through the section, a movable annular ring encircling the annular wall and formed of less diameter than the circular series of apertures, an intermediate section of greater diameter than the annular ring, provided with perforations extending through its upright wall and an annular groove in its inner peripheral face, and a top section formed with an annular groove in its lower face, substantially as and for the purpose specified.

In testimony whereof I have hereunto signed my name, in the presence of two attesting witnesses, at Syracuse, in the county of Onondaga, in the State of New York, this 30th day of August, 1895.

HERMAN B. COLLINS.

Witnesses:
E. A. WEISBURG,
K. H. THEOBALD.