(No Model.) 2 Sheets—Sheet 1.

F. H. BEERS.

CEILING FAN.

No. 492,523. Patented Feb. 28, 1893.

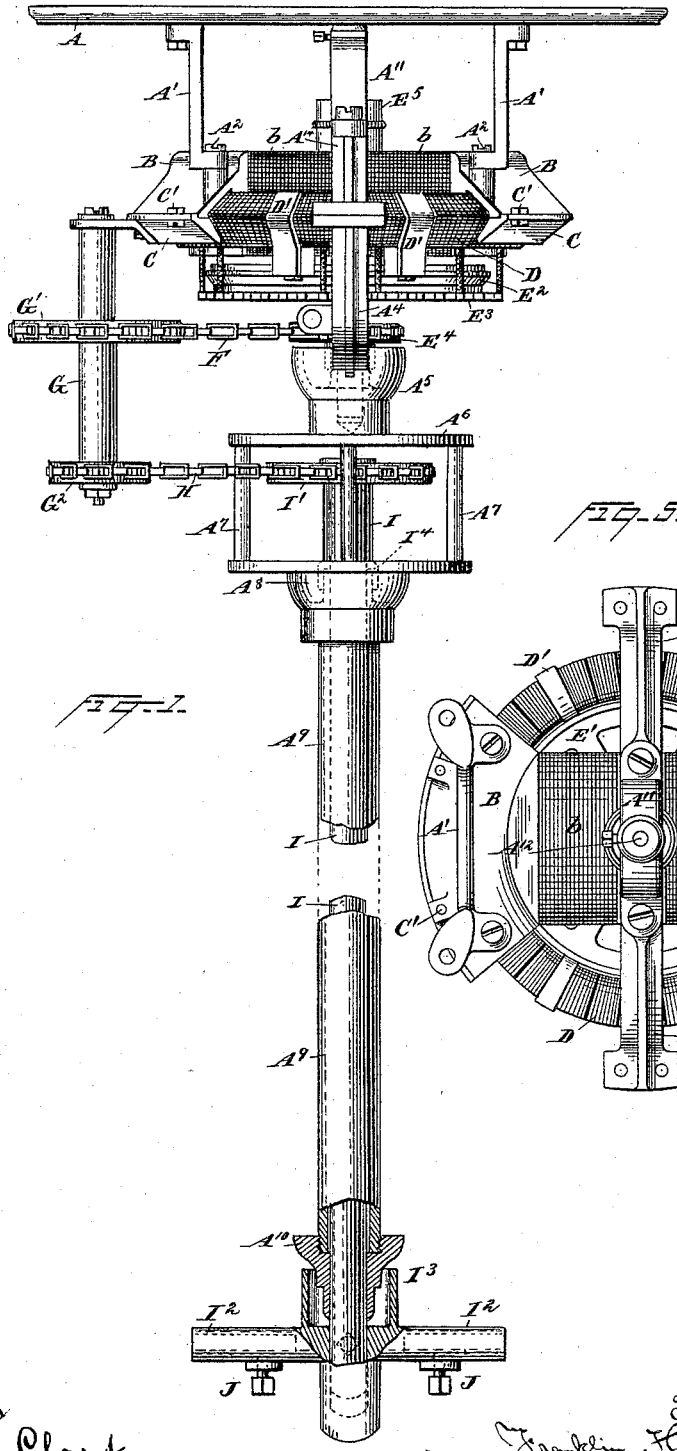


Fig. 1.

Fig. 5.

Witnesses
Norris S. Clark
Charles R. Searle.

Inventor
Franklin H. Beers
By his Attorney
Thomas Spencer Sutton

(No Model.) 2 Sheets—Sheet 2.

F. H. BEERS.

CEILING FAN.

No. 492,523. Patented Feb. 28, 1893.

Fig. 2.

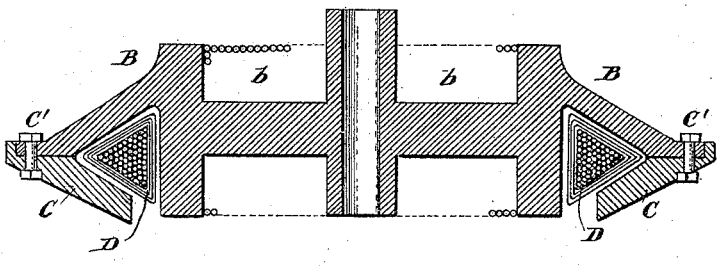


Fig. 3.

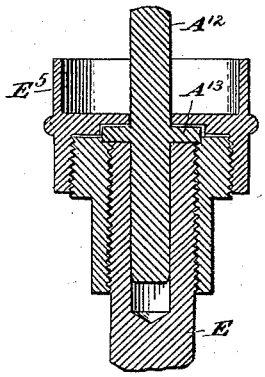
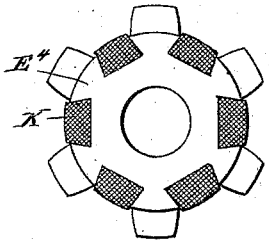


Fig. 4.



Witnesses
Norris S. Clark.
Charles R. Searle.

Inventor
Franklin H. Beers
By his Attorney
Thomas Dyer Stetson

UNITED STATES PATENT OFFICE.

FRANKLIN H. BEERS, OF NEWARK, NEW JERSEY.

CEILING-FAN.

SPECIFICATION forming part of Letters Patent No. 492,523, dated February 28, 1893.

Application filed October 24, 1891. Serial No. 409,675. (No model.)

To all whom it may concern:

Be it known that I, FRANKLIN H. BEERS, a citizen of the United States, residing at Newark, Essex county, in the State of New Jersey, have invented a certain new and useful Improvement in Ceiling-Fans, of which the following is a specification.

The invention is adapted to serve in offices, workshops, dwellings, restaurants and generally in any situations where it is desired to agitate the air. I operate horizontally revolving fans each by an independent electric motor. The motor revolves rapidly in a horizontal plane on a shaft distinct from the fan shaft, and connected thereto by mechanism which increases the force, reducing, of course, the velocity. I attain an unusually efficient fan-driving mechanism which may be located in any position, independent of any other fan, and be changed in position at will by correspondingly changing the position of the connecting wires. It also allows great facility for slowing or stopping the fan, or varying the velocity of each fan independently of that of any other fan or fans. I attain the required connection between the motor and the fan by means of pitch-chains running silently on sprocket wheels having the proper relations of size, and peculiarly faced with leather. I carry the weight of the fan-shaft by a bearing at the upper end, and support it laterally by a bearing at the bottom, both having provisions for efficient lubrication. The armature is of triangular section, giving marked advantages in the construction. It works within a closely matched casting serving as the field magnet, which nearly incloses it and has an annular opening extending around below, through which arms carried on a spider-frame below reach up and support the armature. The under face of the spider frame carries radially arranged commutator-plates acting against brushes which are supported on fixed lugs. The commutators and the brush, as also the field magnet and the armature coils are properly connected to a dynamo or other source of strong electric current in any ordinary or suitable manner.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a side elevation, a portion being broken away to reduce the length. The remaining figures show details on a larger scale. Fig. 2 is a central vertical section through the field magnet. Fig. 3 is a central vertical section through the bearing at the top of the motor which supports its weight and keeps it in position. Fig. 4 is on a smaller scale. It represents one of the sprocket wheels. Fig. 5 is a plan view with the top plate removed.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

A is a horizontal plate bolted to the ceiling and forming in effect a part thereof.

A′ A′ are rigid arms extending downward from A, to which is firmly fixed by screws A^2, a casting B, which serves as a field magnet, to which in turn are secured by bolts and nuts C′ two partial rings C C.

The general form of section of the casting B and partial rings C is shown in Fig. 2. In rectangular channels around the body of the casting B, are wound the field magnet coils *b*. In an annular space of triangular cross-section within the field magnet casting B is mounted an armature D, of corresponding triangular section, but sufficiently smaller to allow it to revolve without contact. A series of arms D′ connect this armature to a ring E^2 at a slightly lower level, which latter is the periphery of a spider-frame E′ mounted on the central upright shaft E, peculiarly supported, as will presently appear. The electric current acting through ordinary connections or commutators E^3 carried under the spider and ring, induces a rapid rotation of the armature D, and consequently of the arms D′, rings E^2, spider E′ and shaft E. On this latter shaft is mounted a small sprocket-wheel E^4, which through a pitch-chain F communicates a slower rotatory motion to a larger sprocket-wheel G′ fixed on an upright sleeve G and carrying at a lower level a smaller sprocket wheel G^2, which by a second pitch-chain H communicates a further reduced rotatory motion to a large sprocket-wheel I′ on the upper end of a shaft I, which extends downward to arms I^2 provided with sockets for receiving fan-blades, not shown, which are set at the required degree of obliquity, and firmly held by pinching screws J. An oil cup

I^3 is formed on the upper side at the junction, as clearly shown in Fig. 1.

An arch A^{11} resting on the field magnet B, and extending across the center, supports a vertical pin A^{12} having a collar A^{13} which is inclosed within a cap serving as an oil cup E^5 in the top of the shaft E of the motor. The field magnet B also connects through intermediate castings A^{14} to a yoke A^4, which connects to a cup A^5, which is in practice kept filled with oil, and forms the bottom step for the upright shaft E. Rigidly connected to this cup, or cast in one therewith, is a horizontal plate A^6, larger than the sprocket wheel I'. This plate is connected by rigid uprights A^7 to a corresponding horizontal plate A^8 at a lower level, a swell A^8 in the center of which furnishes a cup-shaped bearing for a collar I^4 on the shaft I. A fixed tube A^9, larger than the shaft I, extends down loosely inclosing such shaft, and terminating by a close-fitting bearing A^{10}, which is represented as screwed to the tube A^9. This bearing dips into the oil in the cup I^3.

The shaft E carrying its several attachments including the armature D, is hung upon the fixed collar A^{13} through the medium of a cap screwed on the top of the shaft E, and in which cap the oil cup E^5 is formed.

I will use the letter and supernumeral E^5 to indicate both the cap and the oil cup formed in or by such cap.

The armature D is triangular in cross-section. The soft iron wires forming the core, are wound in layers, having in each layer one less turn than in the layer preceding, until they terminate in a single turn. The coils wound thereon are divided into sections, insulated and connected up in the usual manner. The arms D' are formed of separate pieces of metal firmly embracing the core between certain of the sections of coil, and extending downward as already described, connecting this armature stiffly to the spider frame E' below. There are the ordinary provisions by commutators and brushes, for closing and opening the circuit through the coils at the proper times to attain the rapid rotation of the armature and consequently of the shaft E. The upper pitch-chain F communicates this motion to the sleeve G reduced in velocity, and the lower pitch-chain H communicates motion again to the shaft I, further reduced in velocity but increased in force. This gives a proper speed and force for the fans which are attached adjustably to the arms I^2 as previously described.

I reduce the sound which would otherwise be produced by the rapid action of the metal pitch-chains upon the sprocket-wheels by coating the surfaces of the wheels between the spurs with leather, K, secured by dovetailing and cementing. Fig. 4 shows one of the wheels with the leathers in place.

I can provide one or more pulleys on the shaft I below the sprocket-wheel I' and connect by round belts or other suitable means from this shaft I to another, not shown, so as to drive two or more fans from the motor here shown, but I propose under all ordinary conditions to avoid such connection and work each fan independently by its own motor, with the advantage that it may be shifted into any position and may be connected and disconnected at any moment by simply switching the current on or off. The independent action of each also gives great facility for modifying the velocity of each according to the conditions required. Thus in a large hall or other room there may be a number of my fans, part of which are working with their full force, others standing idle and others working under various intermediate conditions.

When one fan is out of use it may stand still instead of annoying the eye by rotating idly. This is of special importance in hospitals where patients may be peculiarly sensitive to annoyance from such cause.

The lower bearing A^{10} not only supports the lower end of the shaft I laterally but also prevents any rise of the shaft which is likely to be impelled by a vigorous action of the inclined wings of the fan. The weight of the shaft when not thus sustained is supported by the upper bearing A^8. This bearing is lubricated by the cup being filled with oil. If any excess flows over it arrives in course of time at the lower bearing A^{10} and adds to the lubricating fluid therein. The construction at the junction of the branches I^2 with the shaft I, makes it possible to maintain an absolutely tight oil cup at this point. The shaft I is received in a solid hub. I have shown it as extending down a little distance, but this may be varied. There is no hole down through it either for a shaft or for any other purpose.

There may be a tight casing not shown, inclosing the motor and the counter shaft, and such may be made ornamental in appearance, and may serve usefully in defending the bearings and oil-cups against dust.

My provision in this independently operated fan and its motor for reducing the speed and increasing the force is important by allowing the fan to be worked at a proper effective velocity by a very moderate current. My experiments indicate that I can run thus independently any number of five-foot fans by the current required for a corresponding number of incandescent lamps.

I do not in this application claim the improvement in the motor, such being made the subject of a separate application for patent filed as a division of this.

I claim as my invention—

1. In a ceiling fan the supporting frame A' A^2, the electric motor, the upright rapidly revolving shaft E and sprocket wheel E^4, in combination with fan shaft I and sprocket wheel I' mounted below the motor shaft and with the separate shaft G and sprocket wheels G', G^2, and chains F and H, the several sprocket wheels being so proportioned relatively to each other as to reduce the velocity

and increase the force transmitted to the fan shaft, as herein specified.

2. In a ceiling fan having an electric-motor on an upright shaft allowed to rotate at a high velocity, a fan mounted on a shaft below and an intermediate shaft with pitch chains and sprocket wheels having dove-tail recesses, the elastic cushions K of dove-tail form fitted in the said recesses, all combined and arranged for joint operation substantially as herein specified.

3. In combination with a ceiling fan having a motor revolving at a high velocity on an upright axis, the fixed supporting pin A^{12} having a collar A^{13} and centered in the upper end of the upright shaft of the motor, and with a cap E^5, carried in the said motor shaft and matching over said collar, the cap E^5 being formed into a cup above the collar adapted to supply oil for lubrication, all substantially as herein specified.

4. In a ceiling fan the fixed inclosing tube A^9, the top bearing A^8 and bottom bearing A^{10} in combination with the shaft I arms I^2 and provisions for connecting suitable fan-blades thereto and with the oil-cup I^3 the latter performing the double function of catching the drip and lubricating the said bottom bearing, all substantially as herein specified.

5. The ceiling fan mechanism described, having the shaft I, oil cup I^3 arms I^2 top bearing A^5, fixed tube A^9 and bottom bearing A^{10}, in combination with the revolving armature D fixed on a separate shaft, and connecting mechanism and framing, arranged for joint operation as herein specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

FRANKLIN H. BEERS.

Witnesses:
THOMAS DREW STETSON,
M. F. BOYLE.