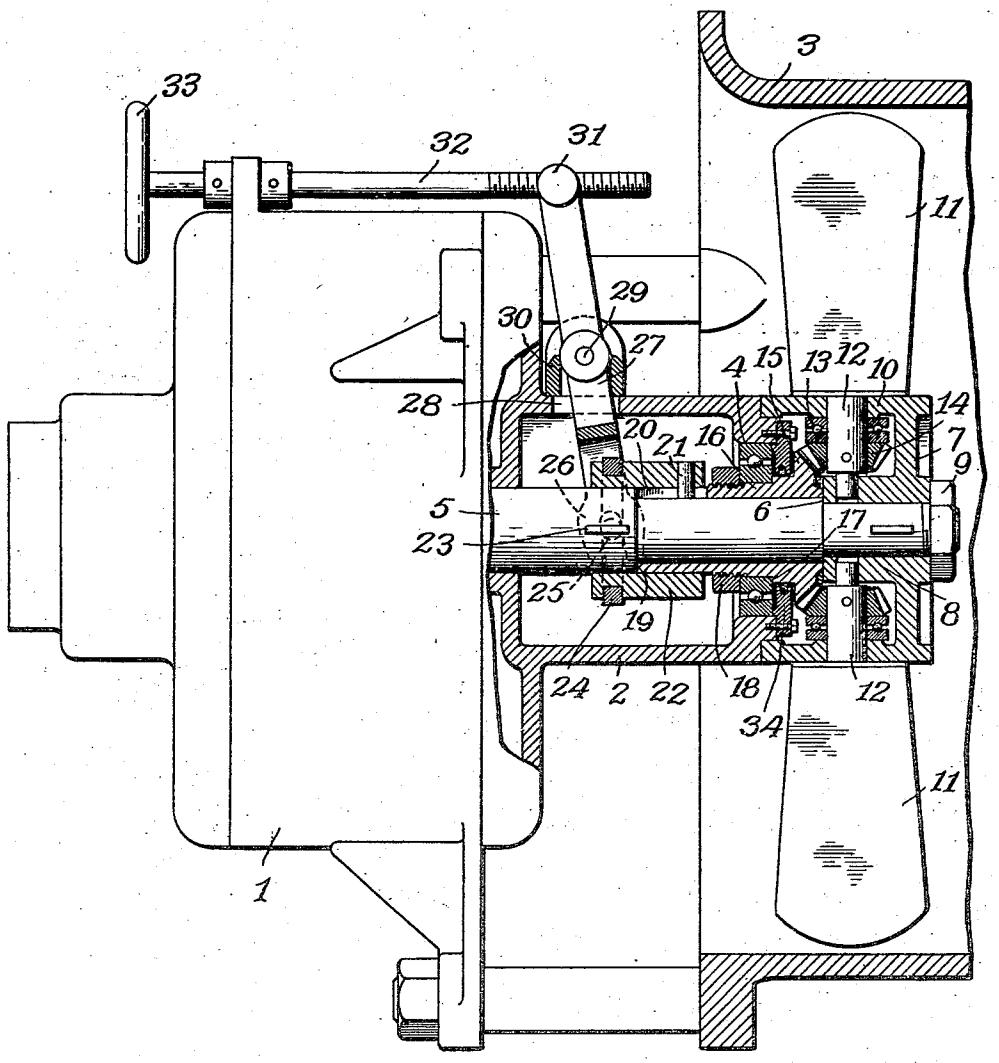
F. H. C. COPPUS.

BLOWER.

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1,377,400. **Patented May 10, 1921.**



Witnesses.

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BLOWER.

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To all whom it may concern:

Be it known that I, FRANS H. C. COPPUS, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in Blowers, of which the following, together with the accompanying drawings, is a specification.

The present invention relates to blowers, of the type ordinarily used for creating an artificial draft in the ash pit of a boiler or the like, or for ventilating purposes. The invention is chiefly concerned with an improved means for varying the quantity of air or other gas handled by the blower, without resorting to a regulation of the speed of the blower, or to the use of a damper in the casing or conduit through which the air or gas is forced.

In instances where a blower of the type above set forth is driven by an electric motor, changes in the speed of the blower, which must, in order to be effective, cover a wide range, require the use of a very expensive motor, and involve regulation of the same by a rheostat: the latter of course, consumes a large amount of power. In case the blower is of the pulley or gear driven type, its speed cannot be changed without the use of a change speed gearing, which is always clumsy and expensive. If the blower is turbine driven, any appreciable variation in the speed of the turbine results in a serious loss in efficiency, since a turbine must run at a certain definite speed in order to obtain the full benefit from the power consumed. The use of a damper in the casing or conduit of the blower is equally wasteful of power, since the partial closure of the outlet from said casing requires a large expenditure of power to force the air therethrough.

My invention aims to overcome the difficulties above enumerated, by the provision of means whereby the varying demands made upon a blower for a greater or less supply of air can be regulated without changing its speed or without changing the area of the blower casing or conduit; I have illustrated the same in the accompanying drawings in which the single figure is a sectional view of a blower constructed in accordance with my invention.

Like reference characters and figures refer to similar parts in the different views.

In the drawings I have illustrated a motor 1 as the driving means for the blower; it is apparent however that any other prime mover for driving the blower may be employed. The casing 2 of the motor 1 is extended forwardly into the mouth of the blower casing or conduit 3, and at its forward end supports a ball bearing 4, surrounding the shaft 5 of the motor, which also serves as the shaft of the blower. The shaft 5 is reduced in section at its outer end, to provide a shoulder 6, a flange 7 carried by a hub 8 being keyed upon said reduced outer end of the shaft, with its hub 8 held against the shoulder 6 by means of a nut 9 threaded upon the extreme outer end of the shaft. The flange 7 is provided with a polygonal rim 10 spaced from and surrounding the hub 8 thereof, and in the present instance having six symmetrical sides, to correspond to the number of blades in the fan. It is apparent that when a fan having a greater or less number of blades is employed, the shape of the rim 10 is made to correspond therewith.

Each blade 11 of the fan has at its base a journal 12 which passes centrally through the corresponding side of the rim 10 and is reduced at its end to enter a concentric hole in the hub 8. A ball bearing 13 is provided for each journal 12 between the inner surface of the corresponding side of rim 10, and a bevel pinion 14 keyed or pinned to the journal near its end. These ball bearings 13 take up the load which is put upon the blades by the centrifugal force produced by the rotation of the blower structure.

The shaft 5 has loosely journaled thereon a bevel gear 15 which meshes with each of the bevel pinions 14 carried by the journals 12 of the blades 11. The hub 16 of said gear 15 is elongated in the direction of the motor 1 and carries the inner raceway member of the ball bearing 4 which is held against a shoulder 17 thereon, by a nut 18. In the construction shown, the bevel gear 15 and its hub 16 is received upon the shaft 5 between the inner end of hub 8, and a shoulder 19, the diameter of the shaft 5, inwardly of said shoulder, being such that the periphery of the same is flush with the periphery of hub 16.

A helical cam slot 20 formed at the inner end of hub 16 receives a pin 21, projecting inwardly from a sliding sleeve 22, having a spline connection 23 with the enlarged section of the shaft 5 and projecting over the flush surface of the hub 16.

The sleeve 22 has an annular groove, in which a ring 24 rides loosely, said ring having diametrically opposite trunnions 25 over each of which fits the bifurcated end 26 of the side of a forked lever 27. The lever 27 extends through a slot 28 in the casing 2, and is pivoted at 29 upon a housing 30 which extends over and closes the slot 28. The other end of lever 27 in the construction shown carries a swiveled member 31, in threaded engagement with an adjusting screw 32. By turning the hand wheel 33 of said screw, the pin 21 is moved backward and forward, to rotate the bevel gear 15 upon the shaft 5 and thereby change the pitch of the blades 11 of the fan. An annular plate 34 may be bolted or otherwise secured upon the end of casing 2, thereby inclosing a chamber adapted to contain a supply of lubricant for the ball bearing 4, the pin and slot connection 20, 21, and the ring 24.

When a blower is used to produce a forced or induced draft in the ash-pit of a boiler, it is called upon to adapt itself to varying conditions of the fire. When the fire is low, for instance, the pressure required in the ash pit to develop a predetermined rate of fuel combustion does not need to be as high, as when the fire bed is thicker. Furthermore the quantity of air handled by the blower should bear a fixed relation to the rate of combustion required to keep the steam pressure within the boiler constant, for the varying demands made upon the same. Under these circumstances it is desirable to control the action of the blower in response to the fluctuations in the steam pressure, as for instance, by making the sleeve 22 responsive in its movement to variations of pressure in such a blower.

It will thus be seen that I have provided a blower adapted to be controlled either by hand or by an automatic regulator; when a greater quantity of air is required, the movement of the sleeve 22 to the right by either of the instrumentalities above described, causes the blades 11 to have a greater pitch according to the distance through which the sleeve is moved. This produces the desired result without increasing the speed of rotation of the fan. Obviously, movement of the sleeve in the other direction causes the blades to handle a smaller quantity of air.

Although I have described the blower constituting my invention in connection with the forced draft system of a furnace, it is obvious that the advantages to be derived therefrom are not limited to its employment in this connection alone. It will be clear that a blower of the type described is peculiarly adaptable for use in ventilating systems, wherein it is oftentimes highly desirable to vary the quantity of air handled by the blower. In such instances it is usually impracticable and inconvenient to vary the speed of the motor or other prime mover to drive the blower; the adjustment of the pitch of the blades of the blower, either automatically or by hand, affords a ventilating system in which all possible variations in the amount of air handled are obtainable.

I claim,

1. In an apparatus of the character set forth, a revoluble fan, a driving shaft for said fan, a sleeve attached to the end of said shaft, a radial flange carried by said sleeve, a rim carried by said flange concentric with said sleeve, and alined journal bearings for the blades of said fan in said sleeve and in said concentric rim respectively.

2. In an apparatus of the character set forth, a driving shaft, a sleeve attached to the end of said shaft, a radial flange carried by said sleeve, a rim carried by said flange concentric with said sleeve, a rotatable fan having its blades journaled in bearings in said sleeve and said rim, bevel gears carried by said blades, and ball bearings between said bevel gears and said rim to secure the radial thrust on said blades.

3. In an apparatus of the character set forth, a casing, a driving shaft journaled in said casing and projecting beyond the casing, a sleeve attached to the projecting end of said shaft, a fan carried by said sleeve, bevel gears carried by the blades of said fan, a sleeve rotatable on said shaft, a bevel gear carried by said rotatable sleeve, and an annular plate attached to said casing and holding the bevel gear on said rotatable sleeve in mesh with the bevel gears on said fan blades.

Dated this thirteenth day of April, 1915.

FRANS H. C. COPPUS.

Witnesses:

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