

(No Model.)

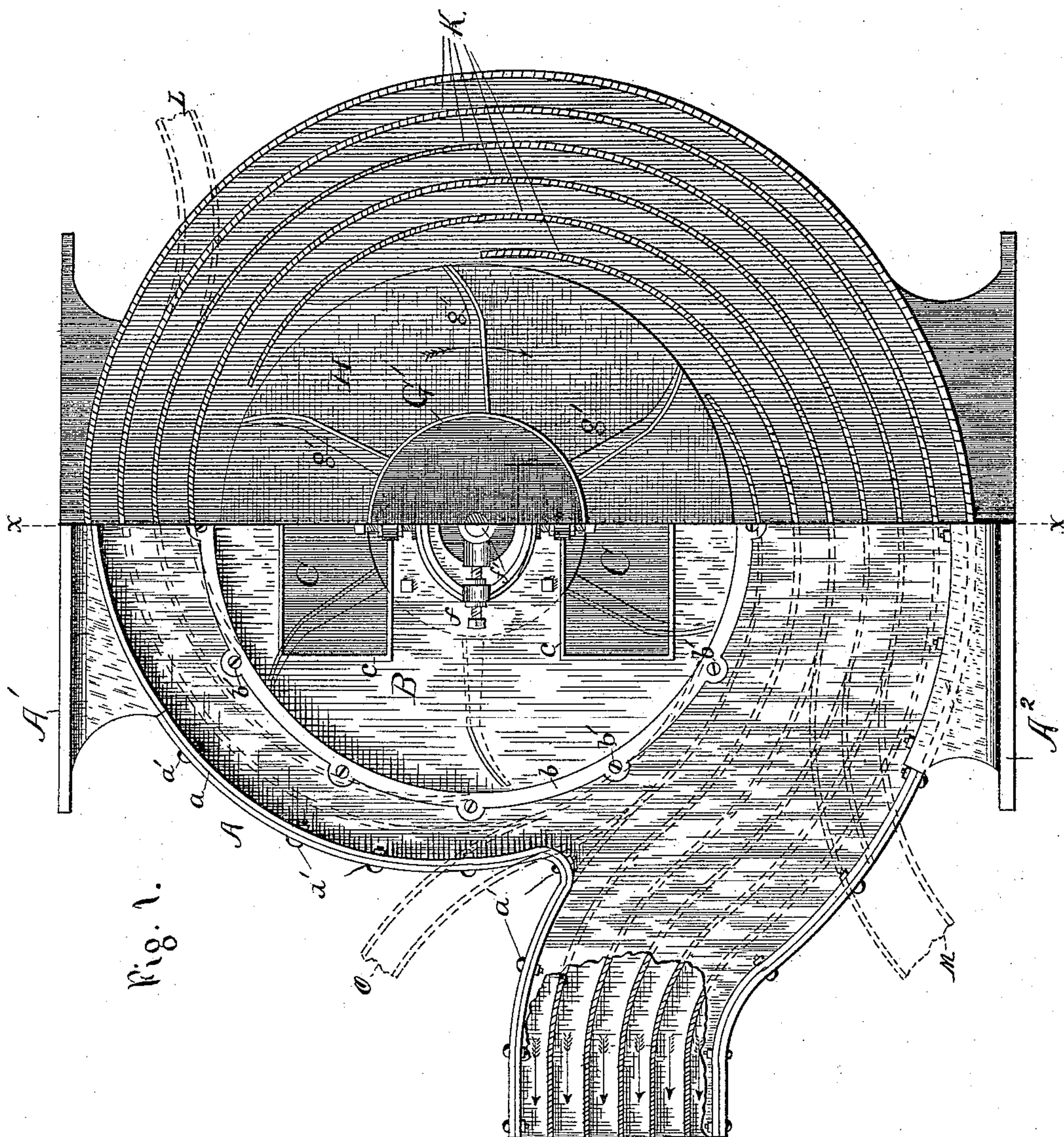
2 Sheets—Sheet 1.

J. E. STUDLEY.

FAN BLOWER.

No. 297,310.

Patented Apr. 22, 1884.



Witnesses:-

N. C. Studley
Henry Frankfurter.

Inventor:-
James E. Studley
per D. H. Fletcher
his Attorney.

(No Model.)

2 Sheets—Sheet 2.

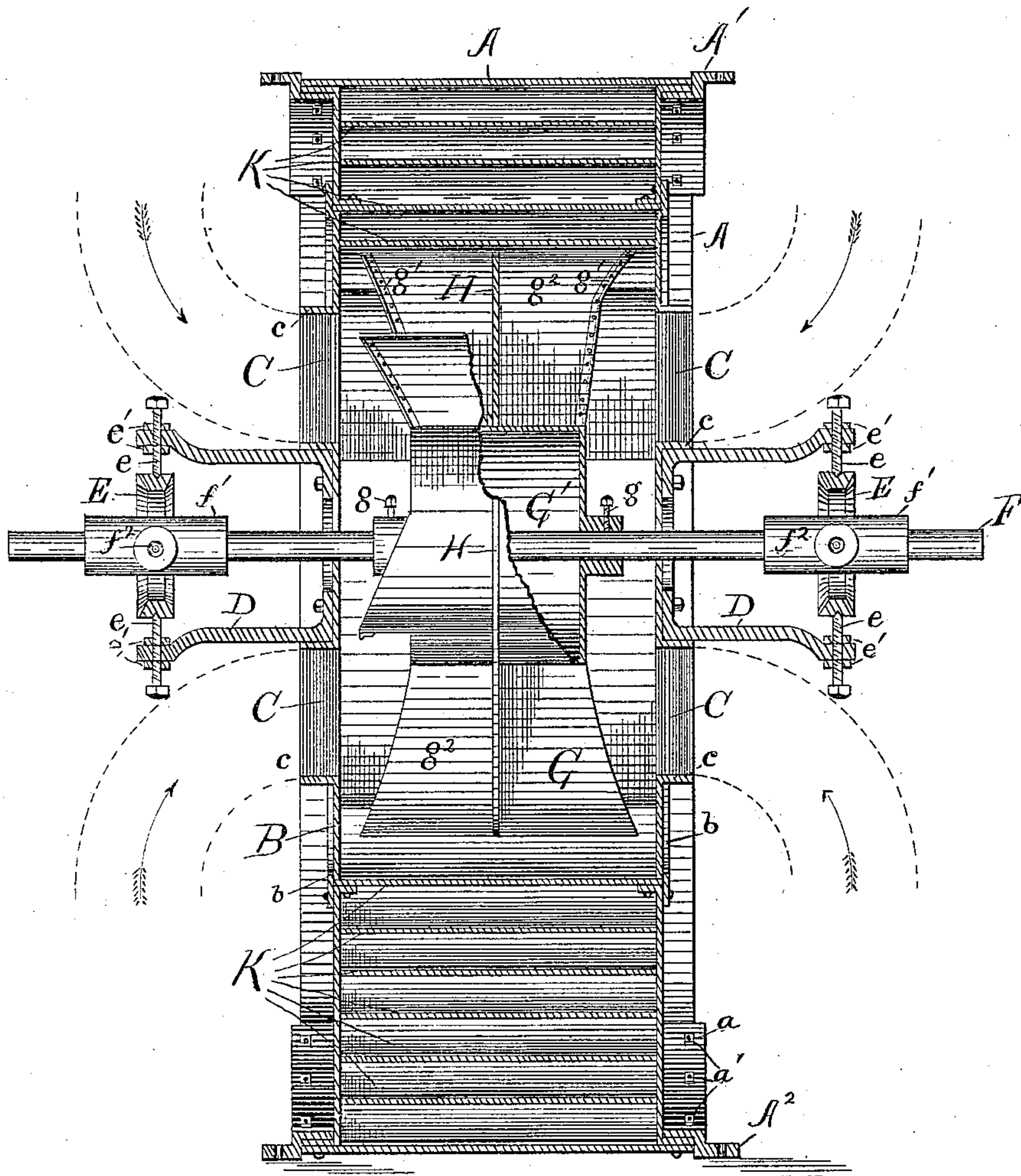
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Fig. 2.



Witnesses:-

N. C. Studley
Henry Fauschman

Inventor:

James E. Studley
per D. H. Fletcher
his Attorney.

UNITED STATES PATENT OFFICE.

JAMES E. STUDLEY, OF OSHKOSH, WISCONSIN.

FAN-BLOWER.

SPECIFICATION forming part of Letters Patent No. 297,310, dated April 22, 1884.

Application filed May 5, 1883. (No model.)

To all whom it may concern:

Be it known that I, JAMES E. STUDLEY, of Oshkosh, in the county of Winnebago and State of Wisconsin, have invented a new and
5 useful Improvement in Fan-Blowers, of which the following is a description, reference being had to the accompanying drawings, in which—

Figure 1 is a side view, partly in section and partly in elevation. Fig. 2 is a transverse
10 sectional view of the shell or case cut through the line *x x*, Fig. 1, showing the fan therein, partly in section and partly in elevation.

Like letters of reference indicate like parts in both figures.

15 It is a fact well known to all familiar with the use of blowers, however and for whatever purpose the same may be used, that the power required to propel the same is very great, and apparently in marked disproportion to the ef-
20 ficiency of the blower. From various pneumatic experiments and long experience in the use of exhaust and pressure blowers, I am convinced that this fact is the result of two primary causes—viz., first, the eddies produced
25 in the air-currents under the usual mode of forcing the same from the induction to the eduction pipes, and a consequent damming up of said currents at or near their point of exit; and, second, that the fan itself by reason there-
30 of is necessarily unbalanced when in labor, and is therefore unsteady in its motion. Another objection is that more or less noise is produced by the ordinary fan, arising from similar or kindred causes.

35 The object of my invention is to overcome these difficulties and to produce a fan that may run smoothly and evenly without noise and at a minimum expenditure of power.

I accomplish said object in the following
40 manner: The tendency of a current of air, when forced into or against other air, either at rest or in motion, is to disperse, forming eddies varying in proportion with the condition and direction of movement, if any, of the air into
45 which it is forced. It is therefore highly essential that in order to prevent too great an impingement of the air-currents with the atmosphere into which they are thrown, and the consequent friction arising therefrom, said cur-
50 rents should be separated by some positive

means until a point is reached at which they may be brought together and caused to proceed therefrom in as nearly as possible parallel lines.

It is obvious that the tendency of an air- 55 current must always be in a straight line, except as it is varied by surrounding causes, and the meeting of another current at an angle thereto must tend greatly to break its force; hence it follows that less power would be re- 60 quired to produce a given force at a given point of two commingled currents of air, if allowed to mingle in parallel lines, than if brought together obliquely.

With these principles in view my invention 65 consists, preferably, in providing as many openings in the shell of the blower as there are blades upon the fan, the number varying according to the size and purpose for which the blower is used, and having said openings 70 so arranged as that each blade may discharge its air simultaneously with the others. Leading from said openings I provide a series of fixed curved guides or partitions arranged, respectively, in a volute form in the shell of the 75 blower, and having their commencement at the periphery of the fan, each advancing forward and outward until a point is reached, when all are located substantially at equal distances apart, from whence the curve of each is 80 reversed and said partitions are continued in parallel lines, said continuation terminating in the eduction-pipe, the peripheral chamber or shell, partitioned as described, being enlarged in a regularly-increasing proportion 85 until said eduction-pipe is reached; or, if preferred, pipes from one or more of said openings may be carried directly from the shell in the manner hereinafter shown, and used as separate discharge-pipes. When not less than 90 six blades are used upon the fan, three openings at equal distances from each other, and more in proportion as the number of blades are increased, may be used, provided they are so disposed with reference to the blades of the 95 fan as to balance said fan while in labor, without essentially varying the principle of my invention; but I prefer having an equal number of blades on the fan and corresponding openings in the shell. I also prefer taking 100

the air from both sides of the case or shell and through two or more induction-pipes on each of said sides. To prevent impingement of these opposite currents, and the consequent friction formed thereby, I place a circular disk in the center of said fan, which serves to separate said currents until they emerge from the respective openings. I also inclose the central part of the fan in a circular case or cylinder so formed as to prevent the entry of air. This causes the air-currents to be carried near the periphery of the fan, where the same has a great and more uniform velocity, which serves to prevent the formation of a vortex in the center and the noise resulting therefrom.

My invention is more particularly described as follows:

In the drawings, A represents the outer shell or case of my improved blower, constructed in the usual manner of cast or wrought iron plates provided with flanges *a* and bolts *a'*, for fastening the same to each other. Seats *A'* *A''*, (better shown in Fig. 1,) for securing the same in position when in use and reversing it as desired, are bolted to said case in the manner clearly shown in the drawings.

On each side of the case are circular plates B B, provided with flanges *b b*, by which they are secured by suitable bolts, *b'*, to said shell A. The plates B B are pierced by suitable openings, C C C C, provided with flanges *c c c c*, to which may be secured induction-pipes, as indicated in the dotted lines proceeding therefrom.

Suitable brackets or arms, D D, preferably made in the manner shown, are bolted to the plates B B, in which are supported, by means of the trunnions *e e*, secured by jam-nuts *e' e'*, the rings E E. At opposite points through the rings E E, and at right angles to the trunnions *e e*, I insert like trunnions, *f f*, one of which is shown in Fig. 1, which serve to support the journal-bearings *f' f'*, the points of contact on one side being more clearly shown at *f'' f''*, Fig. 2. The shaft F, on which may be placed one or more driving-pulleys, as desired, at one or both ends, turns in the bearings *f' f'*, and, passing through openings in the center of the plates B B, supports the fan G, which is preferably secured thereto by set-screws *g g*, passing through flanges projecting at either end from a cylinder, G', which I prefer to make considerably shorter than the case, to allow a freer flow of air to the fan.

Extending radially from the cylinder G', to which the same are secured in any convenient manner, are arms *g'*, formed from angle-iron, to which the curved blades *g''* are secured. I prefer to make said blades, which are formed from thin sheet-steel or other metal, of a width at the bottom to correspond with the length of the cylinder G', the same being gradually widened at their outer extremities, as clearly shown in Fig. 2, until they nearly attain the width of the case A.

Surrounding the cylinder G', and dividing the fan G through its center, and in a plane at right angles to its axis, I place an annular disk, H, to which the blades of said fan G are riveted or otherwise secured, and which may be provided with a suitable flange for riveting the same to the cylinder G'. To secure the best results, said disk should be of the full diameter of the fan.

Around the fan G, I place partitions K, constructed in a volute form, (more clearly shown in Fig. 1,) which are secured to the plates of the case A by means of flanges and rivets or bolts, each partition having its commencement as close as practicable to the periphery of said fan, and extending outward therefrom in the form of a volute, the commencement of each being the same distance from that of its successor as the distance between the vanes of the fan G. As shown, this arrangement of the partition forms a series of openings, at equal distances apart, from the fan-chamber into separate and distinct receiving chambers or channels, arranged as shown in the case.

It is obvious that one or all of the partitions K may be carried directly and separately from the fan-chamber through the shell, to connect with a separate eduction-pipe, as indicated in the dotted lines shown at L L L, Fig. 1; or two or more may be combined in a separate eduction-pipe, as shown in dotted lines at M in said figure, the remainder of said outlets communicating directly with the horizontal eduction-pipe N, as commonly used; but in case only a part of said openings connect with separate eduction-pipes, and the remainder are continued, as shown, to emerge in the main discharge-pipe, it is obvious that the first should commence at such a point as will enable the eduction-pipe to be carried out at the beginning of the peripheral chamber of the shell A, as at O, Fig. 1, and consecutively thereafter until as many as desired are carried out.

It is obvious that by means of the construction shown I succeed in completely separating all of the air-currents from the time they leave the fan until they emerge in parallel lines into said main eduction-pipe.

In the operation of my improved blower the air enters to the fan G through the induction-pipes C C C C, and the currents from the opposite sides being separated by the disk H until their uniform direction is insured, and impingement thereby prevented, they are carried forward by the curved floats or vanes of the fan entering the conduits between the partitions K, and continuing therein until they emerge in parallel lines.

It is evident that the journal-bearings *f'*, being supported by means of double trunnions, as described, must always accommodate themselves to the variations of the shaft F, while the fan G, receiving air from opposite sides of said shaft and discharging the same uniformly and at consecutive points equally distant from

each other, and conforming, respectively, with the blades upon said fan, must serve to preserve a uniformity of movement and a perfect balance of said fan while the same is in labor.

5 This, by preserving a regular and unvarying flow of air through the eduction-pipes, prevents the formation of eddies therein, thus reducing the friction and lessening the power required to operate said fan, while the cylinder G', by preventing the formation of a vortex, enables the fan to run without noise.

I do not confine myself to the form of partitions so fully extended, as shown, for the reason that shorter partitions extending outward from the periphery of the fan, the end of one preferably passing the beginning of the next, may give good results, provided the points of beginning of the several partitions are concentric with the axis of the fan, equally distant from each other, and correspond in number or bear a fixed proportion to the blades of the fan, said partitions serving, as thus arranged, to balance the blades of the fan while in motion, and to initiate the direction of the air-currents.

25 It is obvious that this device may operate equally well as an exhaust or pressure blower.

Should the fan require repairs, the same may be readily taken out of the shell by removing one of the plates B B.

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

1. A fan-blower provided with a series of partitions within the shell, arranged, respectively, in volute form, the beginning of said partitions being at equal distances from each other and from the axis of the fan, respectively, and corresponding in number to the blades of the fan, substantially as and for the purposes set forth.

2. A fan-blower provided with a series of partitions within the shell, arranged in a volute form and terminating in the eduction-pipe in parallel lines, substantially as described.

3. A fan-blower provided with a series of partitions within the shell, arranged, respectively, in volute form, the beginning of said partitions being at equal distances from each other and from the axis of the fan, respectively, and corresponding in number or bearing a fixed proportion to the blades of the fan, whereby the latter may be balanced while in labor, substantially as described.

4. A fan-blower in which the air is received from side induction-pipes provided with a cylinder surrounding the axis of the fan, and to which cylinder the blades of said fan are secured, substantially as and for the purposes set forth.

5. A fan-blower provided with a seat upon the bottom and top, respectively, whereby the position of said blower may be reversed and the same adapted for use as an exhaust or pressure blower, substantially as described.

6. A fan-blower provided with a series of partitions within the shell between the fan and peripheral chamber, the beginning of said partitions being at equal distances from each other and concentric with the axis of the fan, and corresponding in number or bearing a fixed proportion to the blades of the fan, whereby said fan may be balanced while in labor, said partitions being carried outward, so that the end of one may pass the beginning of the next, substantially as and for the purposes set forth.

7. A fan-blower in which the air is received from opposite sides, provided with a series of partitions within the shell, arranged in volute form, and terminating in parallel lines in the eduction-pipe, in combination with the fan G, having the central annular disk, H, substantially as and for the purposes set forth.

JAMES E. STUDLEY.

Witnesses:

GEORGE B. MCC. HILTON,
DAVID LAWSON.