(Model.)

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F. M. ROOTS.

ROTARY BLOWER.

No. 247,691. Patented Sept. 27, 1881.

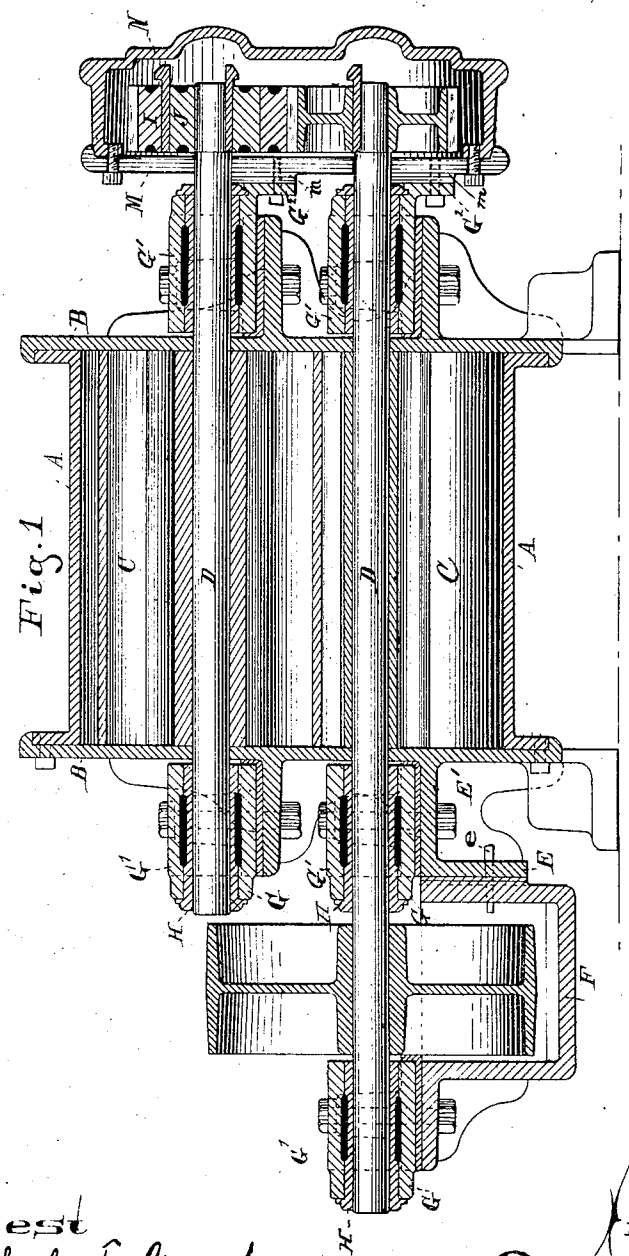


Fig. 1.

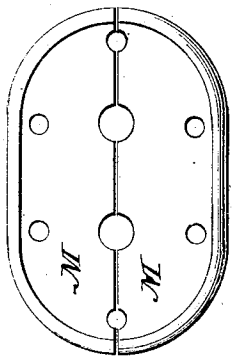


Fig. 2.

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ROTARY BLOWER.

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Fig. 2

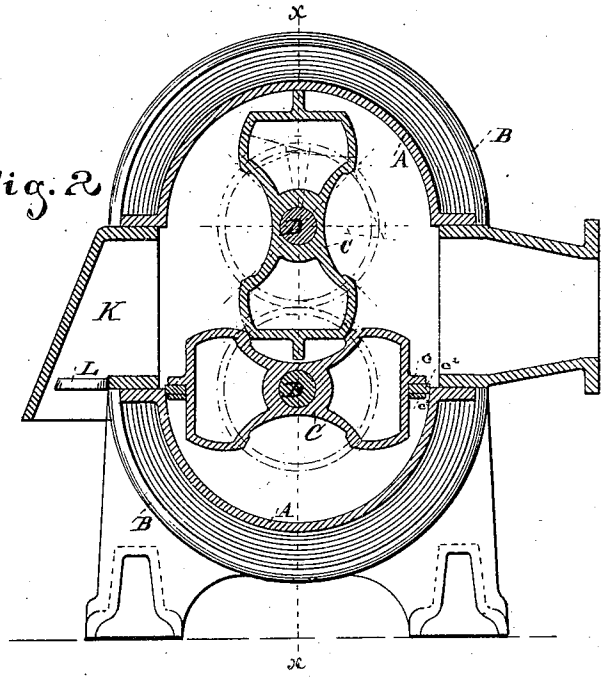


Fig. 3

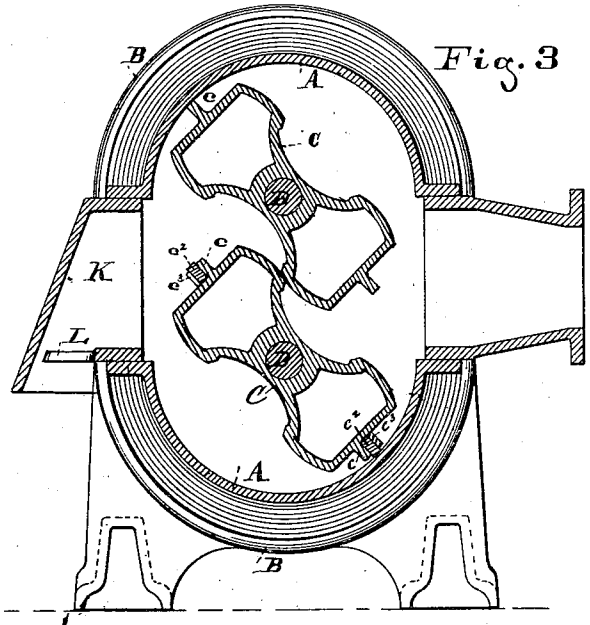
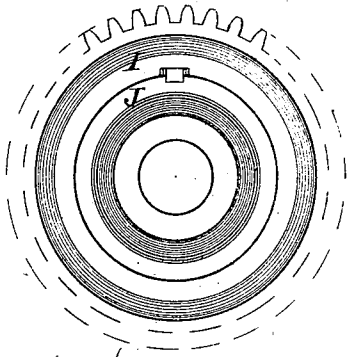


Fig. 5



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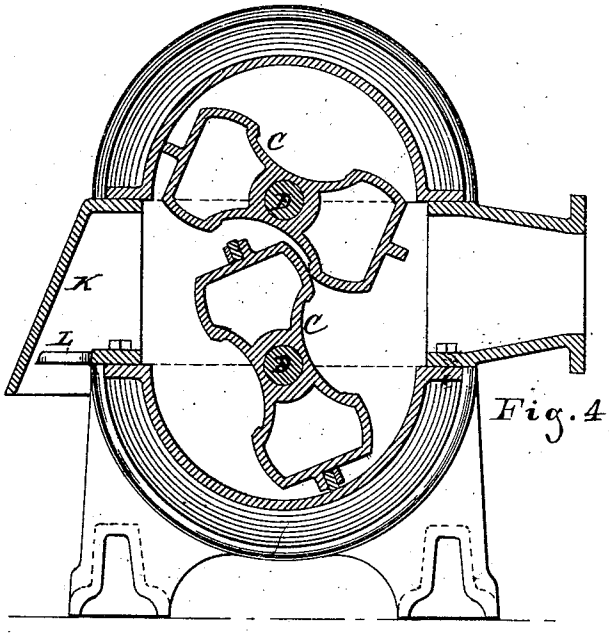


Fig. 4

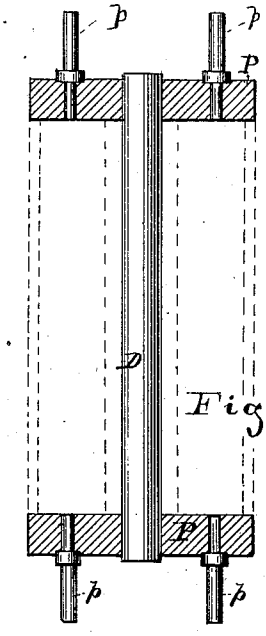
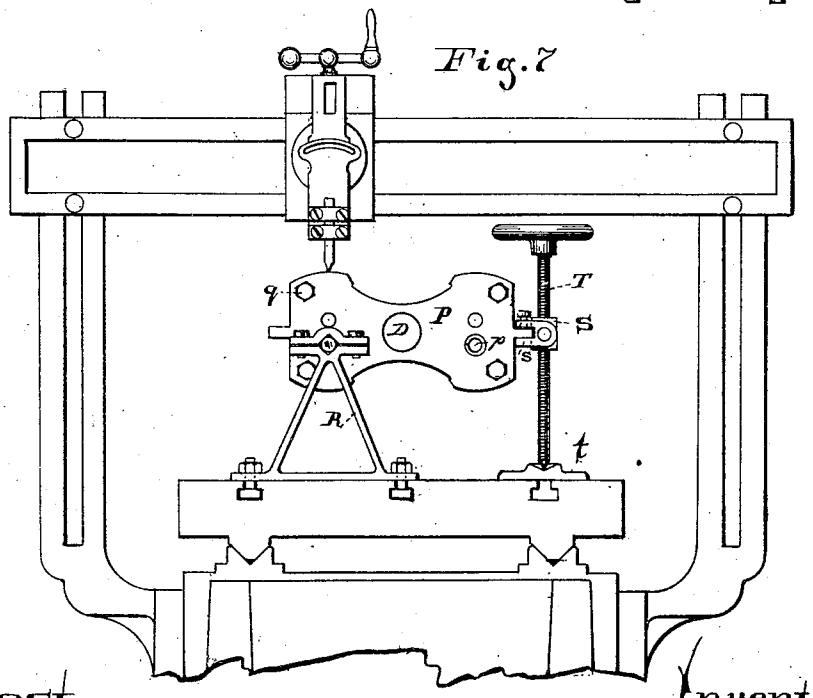


Fig. 6

Fig. 7



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No. 247,691 Patented Sept. 27, 1881.

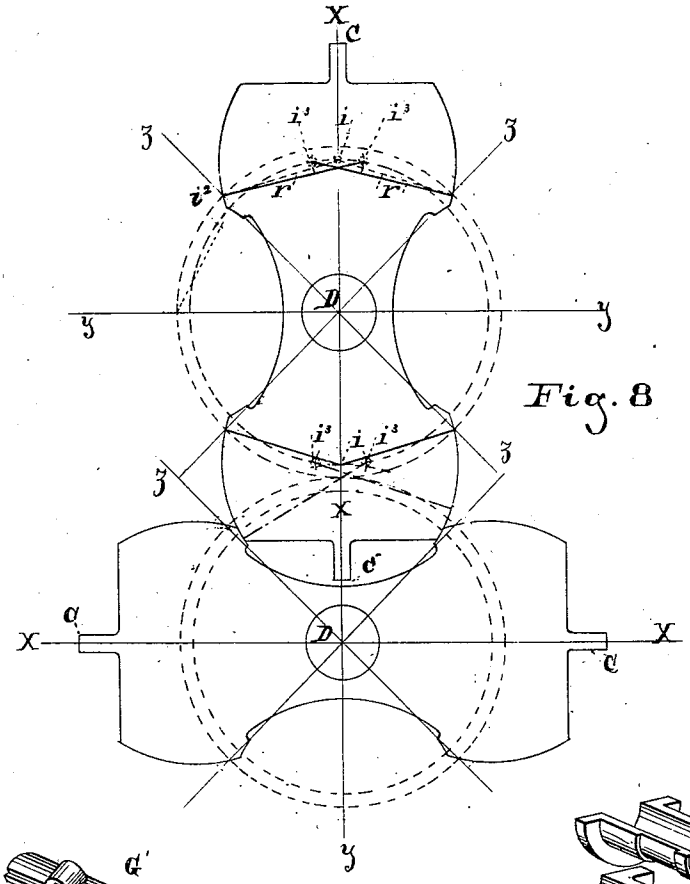


Fig. 8

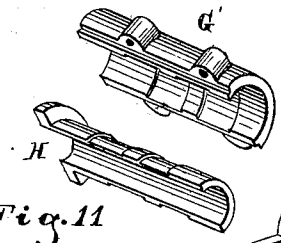


Fig. 11

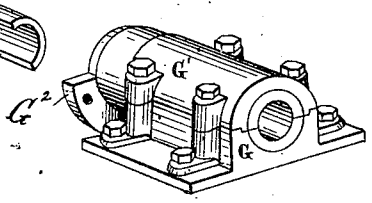


Fig. 9

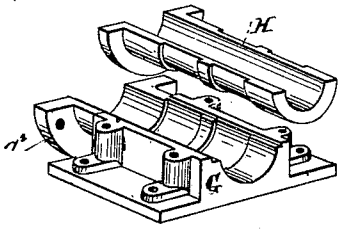


Fig. 10

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UNITED STATES PATENT OFFICE.

FRANCIS M. ROOTS, OF CONNERSVILLE, INDIANA.

ROTARY BLOWER.

SPECIFICATION forming part of Letters Patent No. 247,691, dated September 27, 1881.

Application filed March 9, 1880. (Model.)

To all whom it may concern:

Be it known that I, FRANCIS M. ROOTS, of Connersville, Fayette county, State of Indiana, have invented certain new and useful Improvements in Rotary Blowers, of which the following is a specification.

My invention relates to rotary blowing-engines in which two or more rotating abutments coact together and with the shell in which they are incased to force a current of air or other fluid in one direction without permitting backward escape of the same under pressure.

The objects of my improvements are, first, to insure perfect contact of the abutments with each other during their entire revolution, so that there can be no backward escape of the air or other fluid acted upon; second, to reduce the friction between the necessary points of contact, avoid concussion in use, lessen the surface necessary to be finished, and save material; third, to provide a means to pack the ends or tips of the pistons, so as to secure perfect contact between them and the shell when the machine is to be used under heavy pressure, or as a pump or hydraulic engine; fourth, to facilitate the readjustment of the abutments and replacement of the journal-linings to bring the pistons to their proper relative position; fifth, to protect the abutments and inside of the shell against injury by extraneous substances entering the induction-port; sixth, to facilitate the removal of the gear-wheels and the housing in which they are incased. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of a machine embodying my improvements, taken through the line *x* of Fig. 2, which is a central vertical transverse section of the machine. Figs. 3 and 4 are similar sections, showing the abutments in different positions. Fig. 5 is an end elevation of my improved cog-wheel. Fig. 6 is an axial section of one of the abutments fitted with the templets preparatory to dressing the convex arcs and concave points of contact. Fig. 7 is an end elevation of the mechanism for dressing the abutments. Fig. 8 is a diagram illustrating my system for obtaining the centers from which the convex arcs and concave points of contact are described. Fig. 9 is a perspective view of my improved journal-bearing. Fig. 10 is a detail view, in perspective, of the lower box and its lining; and Fig. 11, a similar view of the cup and lining. Fig. 12 is a front elevation of the inner plate of the gear-wheel housing.

Similar letters refer to the same parts throughout the several views.

The case or shell of the blower consists of two semi-cylindrical flanged shells, A, secured between end plates, B. C C are the coacting rotating abutments, mounted one above the other within the case A.

The method of constructing my improved abutments is as follows: The abutment-shafts D D are placed the requisite distance apart, depending upon the size of the machine to be constructed. Two equal circles are described from the shaft-centers by a radius equal to half the distance between said centers. These are the pitch-line circles. These circles are divided into eight equal parts by radial lines, one of the dividing-lines *x x* passing through the centers of both shafts. Within each of these circles, and described from the same centers, are two smaller circles, usually about one-twelfth less in diameter than the pitch-circles, although the size of the inscribed circles may be varied without materially affecting the result. Thus far the steps taken are the same as in the patent No. 58,745, granted to P. H. Roots October 9, 1866, but the convex arcs and concave surfaces in that case were respectively described from points in the central dividing-line, *x x*, and the radial line *y y*, at right angles to it.

I have discovered that in order to insure perfect contact during the entire revolution the radius by which the convex surfaces and concave points of contact are described must extend across the central dividing-line, *x*, to a point within the pitch-circle.

The points from and the radius by which the convex surfaces and the concave points of contact in my improved abutting pistons are described I obtain as follows, (referring now particularly to the diagram, Fig. 8:) From the point *i*, where line *x* cuts the inscribed circle, I draw a line to a point, i^2, where line *z* intersects the pitch-circle. Then, by a radius equal to one-fifth of the line just obtained, and with one point of the compass on point *i*, (in line *x*

and the inscribed circle,) I obtain two points, i^3, in the inscribed circle equidistant from line x. From these points i^3 as centers the opposite arcs of the pistons are described by a radius, r, extending from point i^3 across line x to point i^2, where line z cuts the pitch-circle. With this radius r all the convex surfaces, as well as all the concave points of contact, are described from centers i^3, as when the abutments are in the position shown in the diagram (their respective dividing-lines x x at right angles to each other) the convex arcs of one abutment are in perfect contact with the concave contact-points in the other.

I do not limit myself to the exact location described for point i^3, as this point may be somewhat varied without departing from the principle of my invention.

The extreme ends of tips c of the pistons are described from the shaft-centers. Coacting abutments thus constructed will maintain perfect contact with each other during the entire revolution, as appears clearly from Figs. 2, 3, and 4. The ends of the pistons upon each side of the central contact-point, c, are cut away, and the concaves between the concave abutting-points are cut back, thus leaving only the requisite surface to keep the contact during the revolution of the abutments. I thus reduce the surface which requires finishing more than three-fourths, effecting a great saving of labor and material, giving more clearance to the parts, and greatly reducing the friction, and when the machine is used as a pump for water or denser fluids it will operate without concussion. When used for this purpose or as a water-meter or hydraulic engine it is desirable that the contact between the pistons and the case should be perfect. In Figs. 2, 3, and 4 is shown a means by which this end is accomplished. A packing-strip, c^2, of leather, rubber, or other suitable material, is clamped between a metal retaining-strip, c^3, and the tip of the piston by screw-bolts. The strip may also serve without other packing to keep up contact with the case should the ends of the pistons become worn. When used for this purpose the bolts should pass through transverse slots in the metal strip to admit of its radial adjustment.

To attain the best results, great accuracy is required in fitting the parts together, in order that the abutment-shafts may be given and maintain the proper relative position to each other. Any change in the relative position of the shafts to each other or the case, either as to parallelism or circumferentially, will impair the effectiveness of the machine. Heretofore the labor of adjusting the pistons in the first place and readjusting them when the bearings became worn from use has been difficult and tedious, requiring great skill and care. By my present improvements these difficulties are in a great degree obviated.

I have provided means to prevent the driving-shaft from being drawn out of line by the tension of the driving-belt, by providing a rigid bearing for the end of the driving-shaft outside of the driven pulley.

Depending from the table which supports the journal-boxes is a plate, E, cast with the end plate of the blower-case, and rigidly supported by brackets E′, also cast with the end of the case. The plate E is planed off parallel with the inside of the end plate.

F is an iron frame, having upon its outer end a table to support journal-box. The shape of the frame in vertical cross-section is semi-cylindrical. It has openings of sufficient size to permit free play of the belt from the countershaft. The inner end of the frame F is planed to accurately fit the plate E, to which it is securely bolted. After it has been properly adjusted and secured in place on the end of the case, tapering holes are bored through the plate E and the end of frame F, to receive tapering steady-pins e. By means of these pins as guides the frame F may be removed when desired and readily replaced in its original position. This frame gives a rigid support to the shaft outside of the pulley.

I have also made provision to quickly readjust the shafts D in like should their journal-bearings become unevenly worn. This I accomplish by the devices illustrated in Figs. 9, 10, and 11.

The journal-boxes G G′ are bored out exactly concentric with the axes of revolution.

The linings H are turned off upon the outside to fit the boxes, and on the inside bored to fit the journals, thus leaving the shell-linings of uniform thickness in cross-section. So constructed, the linings may be turned around in their boxings and be evenly worn all around, and when so much worn as to require replacing, the cap G′ is removed, the old lining slipped around the shaft, and a new lining made to follow it while being removed, thus restoring the original position of the abutments. A set-screw may be passed through the top G′ of the box to prevent the linings from slipping.

It is evident that by continued use or from negligence (not keeping the parts properly lubricated) the teeth of the gear-wheels will become worn and permit the abutment to "lag."

In Fig. 5 is shown an arrangement to compensate for the wear of the teeth and facilitate the adjustment of the abutments when fitting up the machine. By this means the abutment may be advanced or retracted in its path of travel around its shaft. This object I accomplish by means of a cog-wheel consisting of an outer rim, I, and an inner hub, J, accurately fitted together. The keyway in the hub is cut just wide enough to fit the key, while the keyway in the rim I is cut about one-sixteenth or one-eighth of an inch larger. The spaces between the key and the sides of the keyway in the rim are filled with thin strips of rolled iron or steel from one sixty-fourth to one-hundredth of an inch in thickness. The rim can

may be circumferentially adjusted upon its hub by changing one or more of these strips from one side to the other of the key.

In use the pistons and interior of the shell are liable to be injured by extraneous substances being drawn into the induction-port. Attempts have been made to overcome this difficulty by covering the port with a wire-gauze screen; but it is found that substances too large to pass through the meshes would be held by suction against the screen, and thus obstruct the free flow of air to the machine. I overcome this difficulty by the hooded port K, the outer end of which is inclined, so that anything dropping in front of the hood or falling upon it is, or will be, carried out of the line of draft. The port is also guarded by a grate, L, located within the hood. Should any substance get within the hood its passage to the machine will be obstructed.

My improved housing for protecting the gear-wheels is constructed as follows: Flanges G^2 are cast upon the outer end of the journal-boxes G. (See Figs. 1, 9, and 10.) These are turned off parallel with the inside of the end plate. The inner plate, M, of the housing is divided vertically in the plane of the axes of the two shafts D D. It has cast upon it projections *m*, corresponding to the flanges G^2. These projections are planed off true to fit the flanges, and the plate is secured in the position shown in Fig. 1 by screws passing through the flanges G^2 into the projections *m*. The shell N of the housing is secured to plate M by screws passing through the plate and into the inwardly-projecting flange upon the rim of shell N. The purpose of this arrangement is to facilitate the removal of the cog-wheels or of the housing without disturbing the cogs. This is accomplished by removing the shell N, taking out the screws in flange G^2, and removing the divided back plate, M. The keys are now easily accessible from the back, and the cogs may be readily taken off or the rim of the adjustable cog-wheel set around upon its hub.

I will now describe the method by which my improved abutments are accurately dressed.

For each size of abutment I construct two templets, P P, according to the formula given for constructing any abutments. These templets are dressed to the exact size and shape of a cross-section of the abutment. The four centers in each templet from which the peripheries are described are bored out and accurately fitted with journal-pins *p*. The pins when in position form the axes of the piston. A hole is bored in the center of the templets to accurately fit the shaft of the abutments. Two or more holes are bored in each templet opposite each other, when the templets are in position. Through these clamping-bolts *q* are passed. The shafts and the ends of the abutments being turned down true, the templets are slipped over the shafts upon each end of the abutment, and the clamping-bolts passed through the templets and the hollow abutments. The templets are adjusted exactly opposite each other and out of "wind," and the abutment tightly clamped between them. The abutment is then mounted in standards R on the bed of the planer, (see Fig. 7,) the journal-pins *p* of the templets resting in V-shaped bearings and held in place by caps. The opposite tip of the piston is clamped in the end of a yoke, *s*, which is jointed to a traveling nut, S, upon a screw, T. The lower conical end of the screw rests in a step, *t*, on the bed-plate of the machine. By this screw and its nut the abutment is turned upon the pin *p*, and the convex surface of the piston fed to the cutting-tool and dressed down to the templets. The concave contact-points, being only about one-fourth to one-half inch in width, are dressed down to the templets by a tool of proper shape, while the abutment remains stationary in standards R. When one of the convex arcs and one of the concave points are dressed the abutment is removed from the standards R, the pins *p* changed to other holes in the templets, and the abutment replaced in the standards preparatory to dressing another side in the same way. The operation is repeated until all the convex arcs and concave contact-points are dressed down to the templets.

I have described my method of dressing my improved piston abutments upon an iron planer; but they may also be dressed upon a milling-machine or other dressing-tool in substantially the same way, as the principal feature in my method is the centering of abutments upon the points i^2, from which the arcs are described, or making the edge of the cutting-tool describe an arc from said centers, or around them, as an axis.

It is also evident that, instead of the pins *p*, a shaft may be passed through the pin-holes, or center bearings may be made in the templets at said points i^2, to receive centering-points secured in the standards R.

My improved abutments are cored out hollow, and are cast with the shafts in position.

By my improvements I am enabled to construct a blower entirely of metal as cheaply as those having wood-covered abutments; and as my improved blower will not be affected by different conditions of atmosphere, ordinary variations of temperature, dust, or other abrading substances that would injure wood-covered abutments, less clearance is required between the surfaces of contact, and hence a more accurate fit may be made and maintained between the parts, and a more durable and effective machine is produced.

The method of finishing the pistons above described, and illustrated in Figs. 6 and 7, is not claimed herein, as I intend to make the method of finishing the subject of a separate application.

I claim—

1. Abutments for rotary pressure-blowers, constructed substantially as described—that is, having the convex arcs of the pistons and

the concave points of its recesses described from a point, as i^3, within the pitch-circle by a radius extending from said point i^3 across the central dividing-line x to a point, i^2, in the pitch-circle.

2. Abutments for rotary blowers having their convex arcs and concave points of contact described substantially as hereinbefore set forth, and having the ends of the pistons upon each side of the central point, c, and their concave surfaces between the concave points of contact cut away, to lessen the friction, avoid concussion, and reduce the surface of the abutments necessary to be finished.

3. The abutments of a rotary blower, such as described, having its ends cut away upon each side of the central point, c, in combination with a packing-strip, c^2, secured to one side of said central tip, c, to make an air-tight fit between the case and piston, substantially as described.

4. In a rotary pressure-blower, the combination, substantially as specified, of the coacting abutments and their shafts with journal-boxes G G′ and the two-part linings H H, the bearings in the boxes and the interior and exterior of the linings being concentric with the axes of the shafts, so that in case of uneven wear the said abutments may be in contact by turning said linings, and the linings removed and replaced without disturbing the position of the abutments.

5. The rotary pressure-blower having coacting rotary abutments incased and operating within the shell A B, in combination with the hooded port K and grating L, for the purpose set forth.

6. In a housing for rotary blowers, the combination, substantially as specified, of the flanged journal-box, the divided inner plate, M, adapted to be readily secured to or removed from said flange G^2 independent of the gear-wheels, and the shell N, secured to plate M, for the purpose of protecting the gear-wheels and readily removing them when desired.

FRANCIS M. ROOTS.

Witnesses:
CHARLES M. COVERT,
THOMAS M. LITTLE.