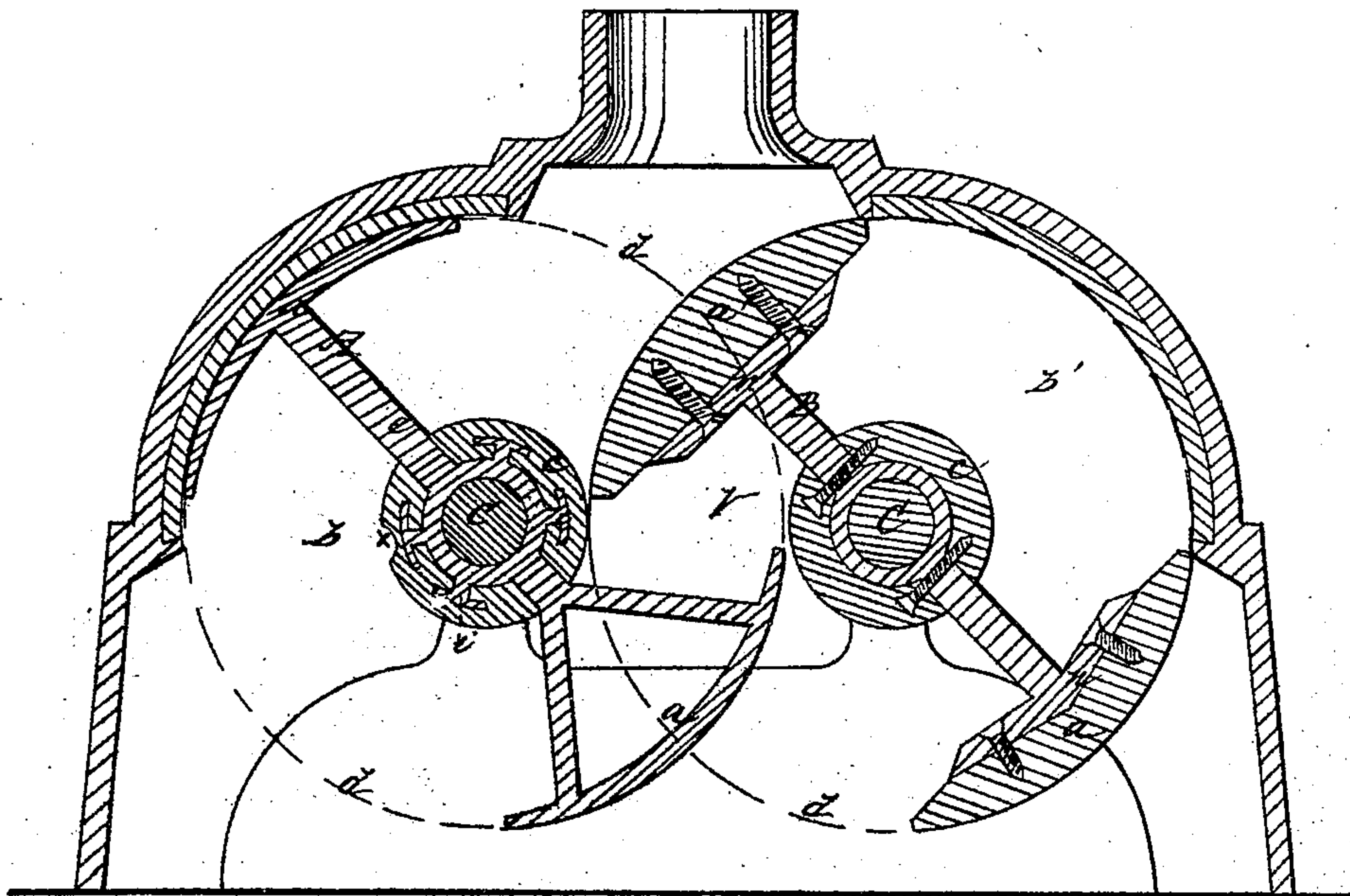


P. H. & F. M. ROOTS.  
ROTARY BLOWER.

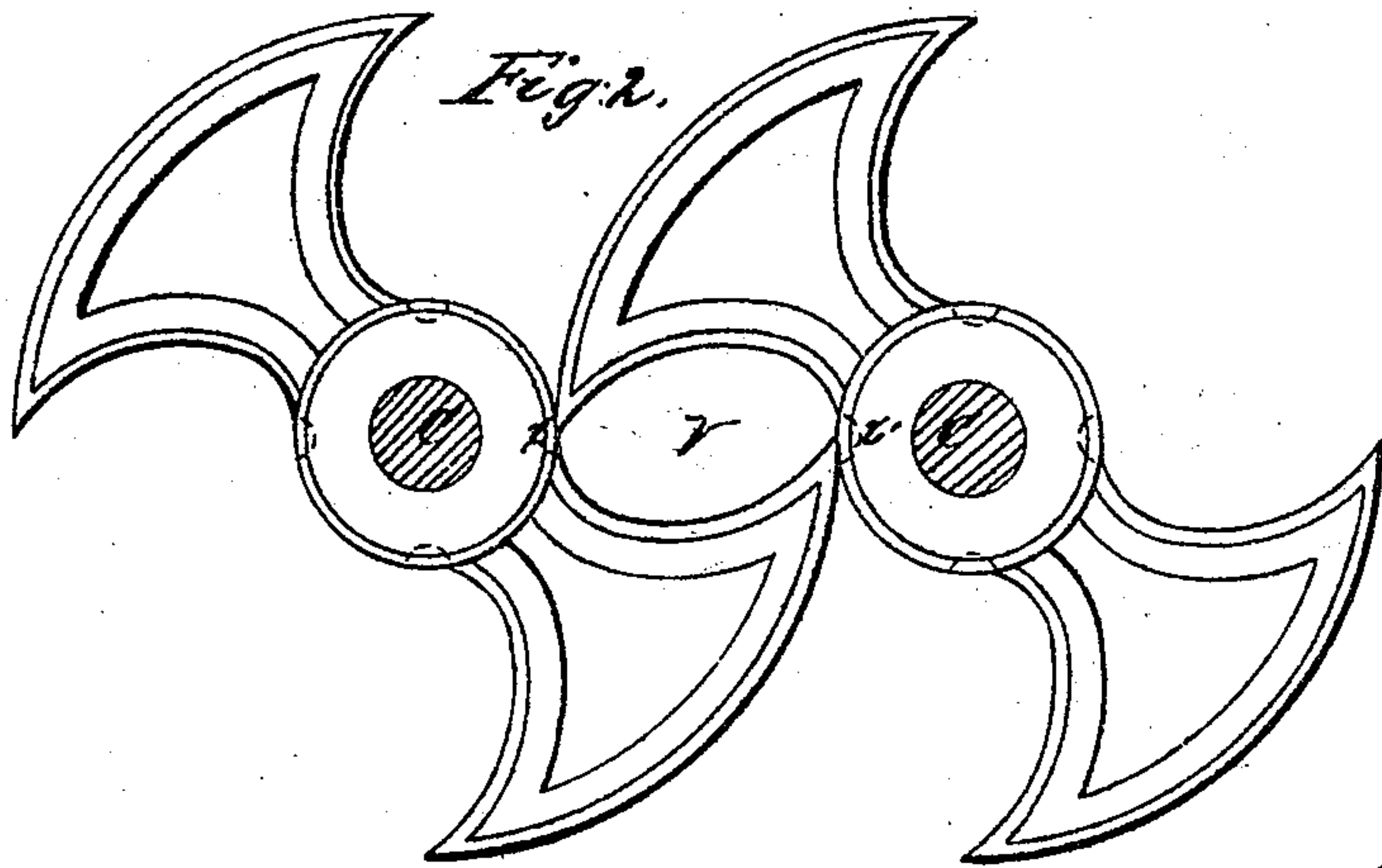
No. 81,009.

Patented Aug. 11, 1868.

*Fig. 1*



*Fig. 2*



*Witnesses.*

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*per*  
*Munroe & Atty.*

# United States Patent Office.

P. H. ROOTS AND F. M. ROOTS, OF CONNERSVILLE INDIANA.

*Letters Patent No. 81,009, dated August 11, 1868.*

## IMPROVEMENT IN ROTARY BLOWERS.

*The Schedule referred to in these Letters Patent and making part of the same.*

### TO ALL WHOM IT MAY CONCERN:

Be it known that we, P. H. ROOTS and F. M. ROOTS, of Connorsville, in the county of Fayette, and State of Indiana, have invented a new and improved Rotary Blower; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 represents a vertical transverse section of our rotary blower.

Figure 2 is a sectional view of two abutments, showing their relative positions as they have hitherto been made, and the source of the difficulty hitherto experienced.

Similar letters of reference indicate corresponding parts.

This invention relates to a new manner of constructing the abutments in that class of rotary blowers or engines in which two revolving abutments are used, whose circular portions or peripheries are formed of arcs of different diameters.

The invention relates also to constructing the abutments with shell-pistons, each having one or more arms or wings extending from the centre cylinder to the outer circular part of the piston, which is either cast on the arms or otherwise secured to them in the proper manner, whether made of metal or wood. These arms or wings extend the entire length of the cylinder, thus forming a sort of continuous cross-head.

This invention consists, further, in constructing the centre cylinder, of plaster of Paris or other material, in a plastic or molten state.

This invention consists, finally, in forming the pistons of such proportions, by suitably reducing their arcs and increasing correspondingly the recesses, as will overcome difficulties experienced in former methods of construction.

The object of this invention is to construct the abutments of rotary blowers, of sufficiently light weight to adapt them to run at such speed as is necessary to force any considerable volume of air, and at the same time so to dispose of the metal as to secure adequate strength, and also to construct them either partly of wood or entirely of metal.

And, finally, the object of this invention is so to proportion the pistons and recesses as to obviate difficulties which have rendered machines made as described in the Letters Patent granted to us, January 21, 1868, (No. 73,654,) almost useless.

A B are two coacting, rotating abutments, mounted on two shafts, C C. Each abutment consists of two pistons,  $a a'$ , and two intervening recesses,  $b b'$ , and a centre cylinder,  $c c'$ , as shown in fig. 1. The peripheries of the abutments are formed in the same manner as described in the Letters Patent above referred to, with exceptions that will be noted.

From two points, C C', which are the centres of the shafts, and taken at any desired distance apart according to the size of the machine to be constructed, are described two circles,  $c c'$ , of equal radii, each of which may be about one-fourth the distance the centres C C are apart. These circles may, however, be described with a radius greater or less than that here stated, and may also be made operative with unequal radii, if desired. The circles  $c c'$  constitute the centre cylinders of the abutments. The radius for forming the pistons is the distance from the centre of one of these circles  $c c'$  to the nearest point in the periphery of the other circle. Of the peripheries of each of the circles  $d d'$  thus formed, two arcs, of about eighty degrees, are taken on opposite sides of the circle, and the corresponding recess will consist of one hundred degrees, whereas in the former patent, both the piston and the recess consisted each of ninety degrees.

Abutments may also be advantageously made for various purposes, unlike each other. For instance, the pistons of one abutment may consist of arcs of fifty degrees, instead of sixty, and its recesses of one hundred and thirty degrees, instead of one hundred and twenty, and the corresponding abutment will require its pistons to be one hundred and ten degrees, instead of one hundred and twenty, and its recesses consist of seventy instead of sixty degrees.



The importance of the object gained by thus shortening the arcs of the pistons will be readily understood by reference to fig. 2, which represents the position of the abutments when the tips of two pistons are at the same time in contact with the centre cylinders. This position occurs four times to each revolution of the abutments together. As the pistons approach or reach this position, a violent concussion is produced by the sudden compression of the air caught in the elliptical recess *v*, shown in fig. 2, from which recess, for a brief portion of the revolution of the parts, there is no escape for the air. So violent is this concussion, that the noise produced by it with a blower running at a moderate speed, can be heard a quarter of a mile or more, thus rendering the machine intolerable and inadmissible in a work-shop or foundry, as conversation would be impossible near the machine. When more dense fluids, as water, are acted upon, the difficulty experienced is still greater.

A pump made with pistons and recesses of ninety degrees can, under any circumstances, move only with a jerking and irregular motion, causing great strain to the machine, and attended with great loss of power, and if made strictly accurate and tight, is not an operative machine. It has been by numerous and expensive experiments that the seat of the difficulty has been ascertained and the remedy devised. When the abutments, in the course of their revolution, come to occupy the relative position shown in fig. 2, a line drawn through the centre of any one piston to the centre of the opposite piston, forms an angle of forty-five degrees with a line drawn from the centre of one shaft, *c*, to the centre of the other shaft, *c'*. In this position the tips of the two pistons are at the same time in contact with the two centre cylinders, and form between them an elliptical recess, shown at *v*, fig. 2. As the pistons approach this position, the air is violently compressed, and on reaching this position, there is no escape for the compressed air, as the tips of the pistons are respectively in contact with the centre cylinders. In order to obviate this difficulty, it is found necessary to prevent this double contact. By removing a portion of the tips of the pistons, an opening or outlet is formed for the air, so that when the pistons come into the position stated above, the tips of both pistons are disconnected from their respective centre cylinders, until the described position is passed. As the air finds an escape through the openings thus formed, the concussion is thus avoided.

By reducing the arc of the piston about ten degrees, nearly all the noise and concussion of the air is obviated. This reduction can be varied according to the density of the fluids acted upon, and for dense fluids should be increased to fifteen or twenty degrees. It is evident, also, that by reversing the application of the principle, and removing a portion of the centre cylinder, as indicated by the red lines at *x x'*, an escape may be made for the air caught in the recess *v*. But as the motion of the surface of the centre cylinder is so much slower than that of the pistons, the opening thus formed would not be so instantly closed when no longer needed to be opened, yet the object is well accomplished by this arrangement.

The construction of the shell-pistons and centre cylinders is clearly shown in fig. 1. In the abutment A, one piston is constructed with one arm or wing, *e*, extending from the centre cylinder to the outer circle, *a*, of the piston with which it is cast. The other piston has two arms, to which the outer circular part of the piston *a'* is cast. The centre cylinder, *c*, is made of plaster of Paris, or other plastic or molten material, and is held in position by suitable projections, *i i*. We usually cast the plaster of Paris in a mould to its exact dimensions. Any cheap metal, as zinc, could be substituted and cast in like manner.

In the abutment B, each piston has one arm, with suitable projections or flanges, *n n'*, at their extremity, to which wood or suitable material is fastened by bolts or screws, to form the external circular parts of the pistons. The centre cylinder is formed of wood, fastened with screws or bolts.

We are thus enabled to construct the abutments of sufficiently light weight to adapt them for the purpose of blowers, and at the same time, with accuracy and all necessary strength. These abutments are made to co-operate together by two equal-sized cog-wheels.

In fig. 2, we show a cross-section of the abutments of a blower, substantially as they have been hitherto constructed.

The air confined in the elliptical space, and having no means of escape for a certain length of time, is the cause of the difficulty experienced, and which is inseparable from blowers or pumps constructed with pistons whose arcs are ninety degrees. It is true that we can in a measure overcome the difficulty, and give relief by cutting grooves the length of the interior cylinders, as shown in *x x'*, fig. 2, but we prefer to reduce the arc of the piston as described above.

Having described our invention, we claim as new, and desire to secure by Letters Patent—

1. The co-operating abutments A B, constructed with skeleton pistons, having their external circular peripheries connected by longitudinal arms to the centre cylinders, as and for the purpose specified.
2. The abutments A B, having their centre cylinders made of plaster of Paris, or other plastic or molten material, substantially as and for the purpose set forth.
3. The abutments A B, having the arcs of their pistons so constructed as to become simultaneously disconnected from their respective centre cylinders at certain portions of their revolutions, as herein described.

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F. M. ROOTS.

Witnesses:

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WM. F. McNAMARA.