M. A. O'CONNOR.

BLOWER.

APPLICATION FILED MAR. 18, 1907.

951,197.

Patented Mar. 8, 1910.

2 SHEETS—SHEET 1.

Fig. 1

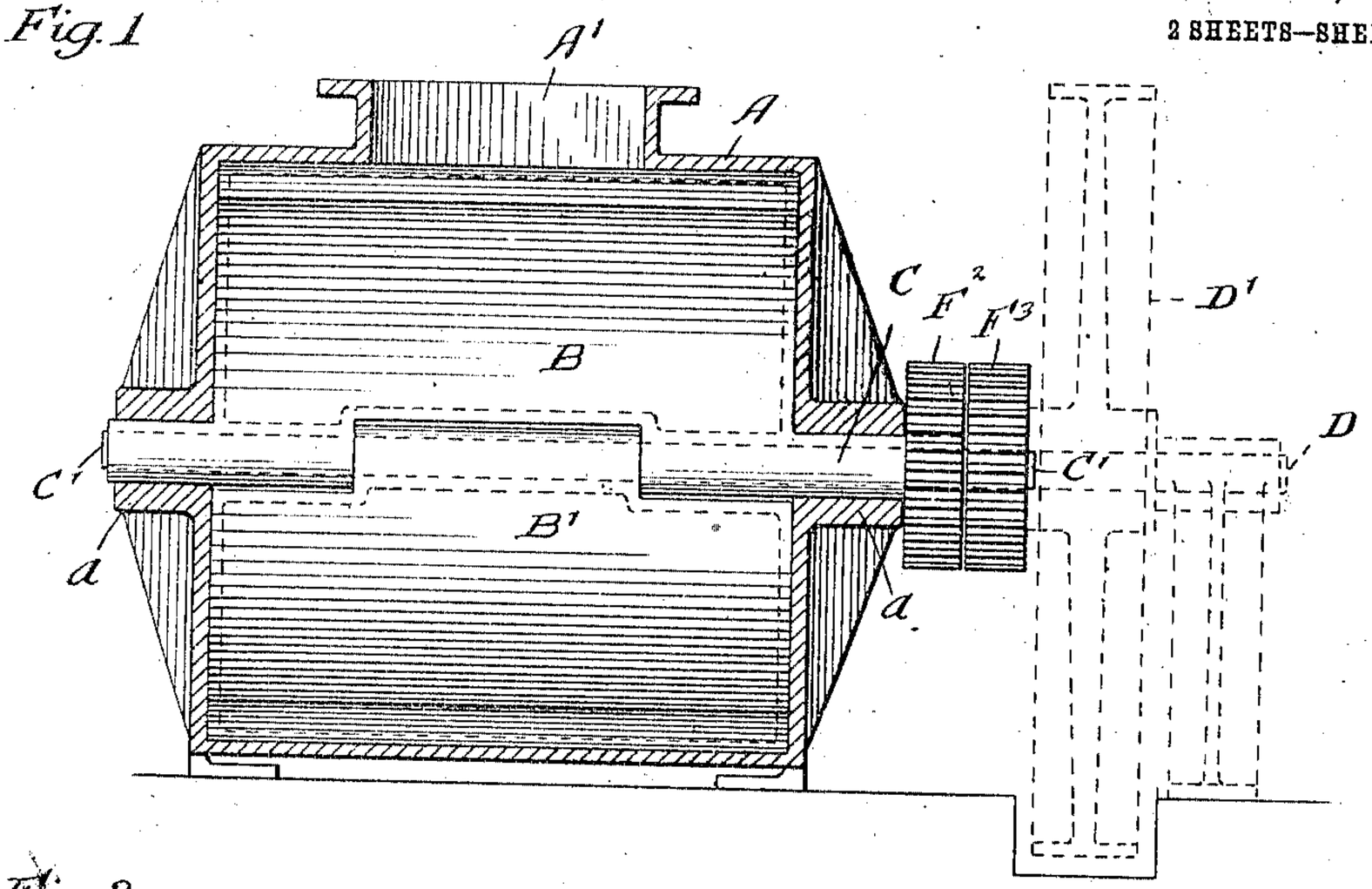
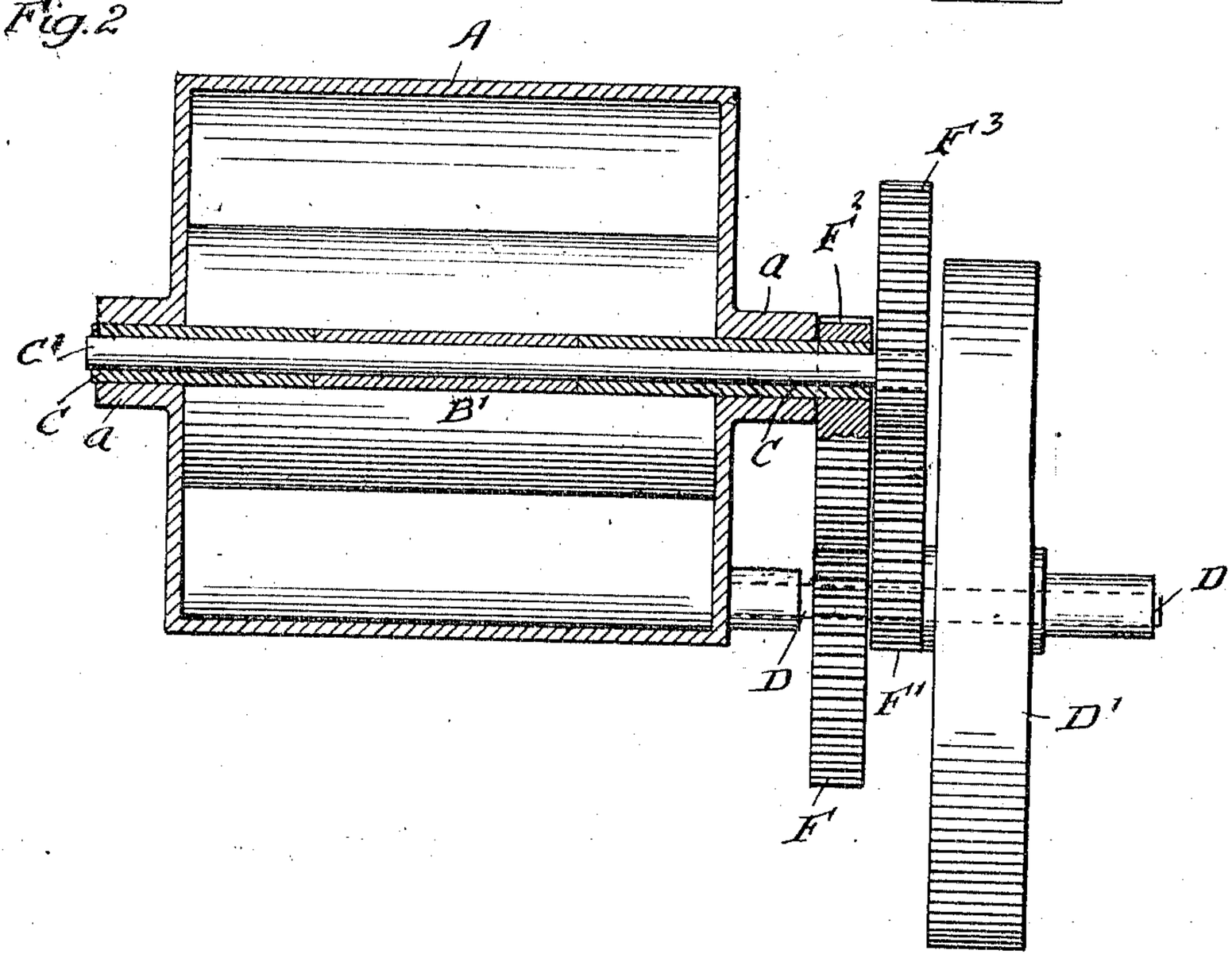


Fig. 2



Witnesses:

Wm. Geiger

A. W. Mundy

Inventor:

Martin A. O'Connor

By Munday, Evarts, Adcock & Clarke

Attorneys

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Fig. 3

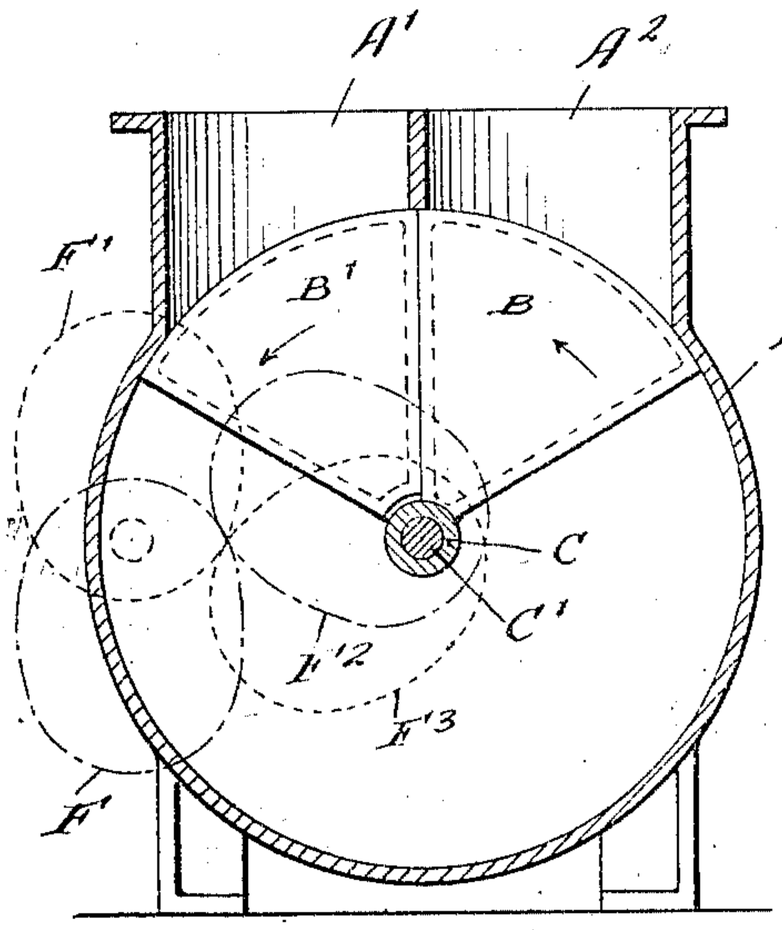


Fig. 4

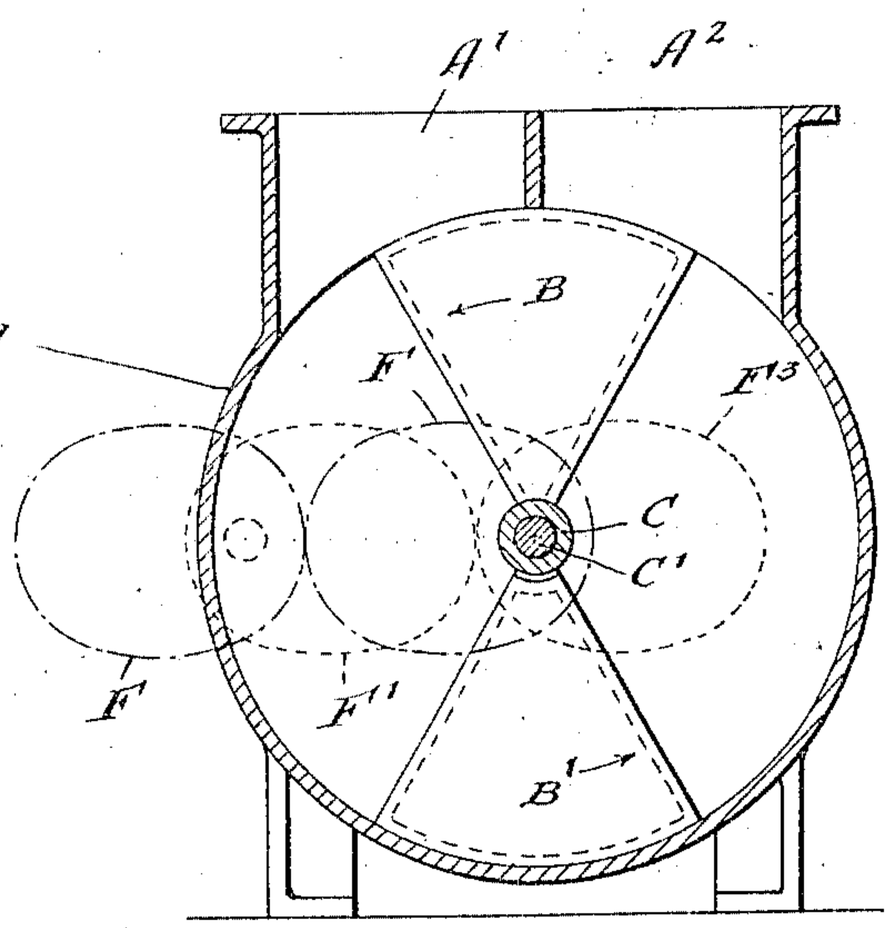


Fig. 5

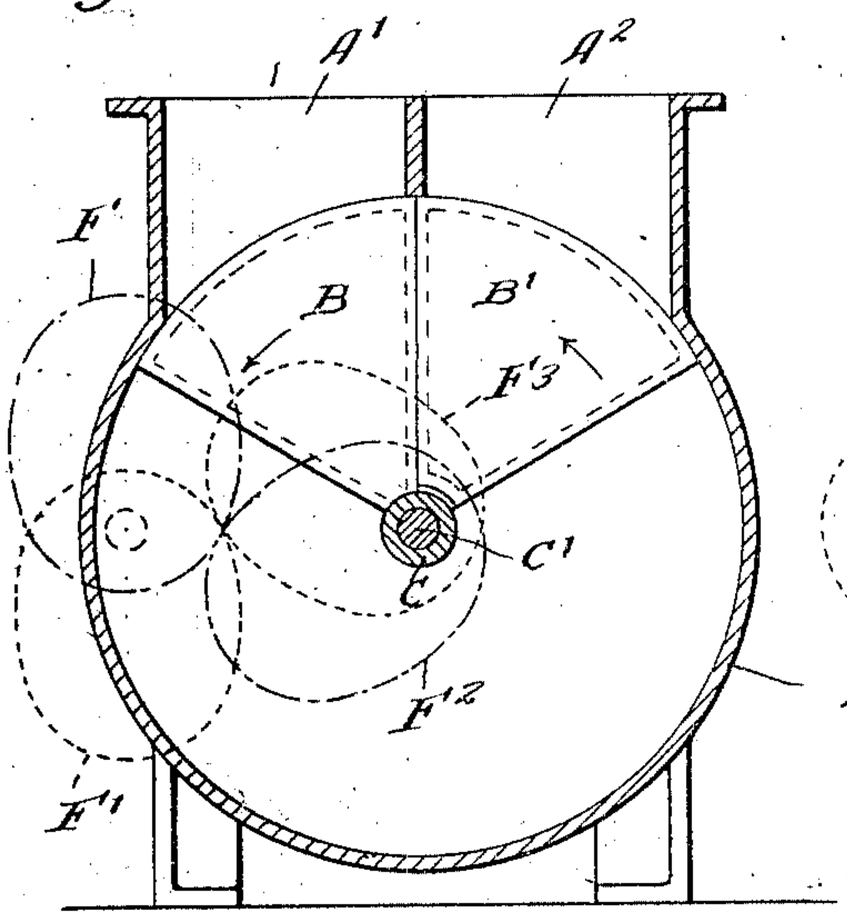
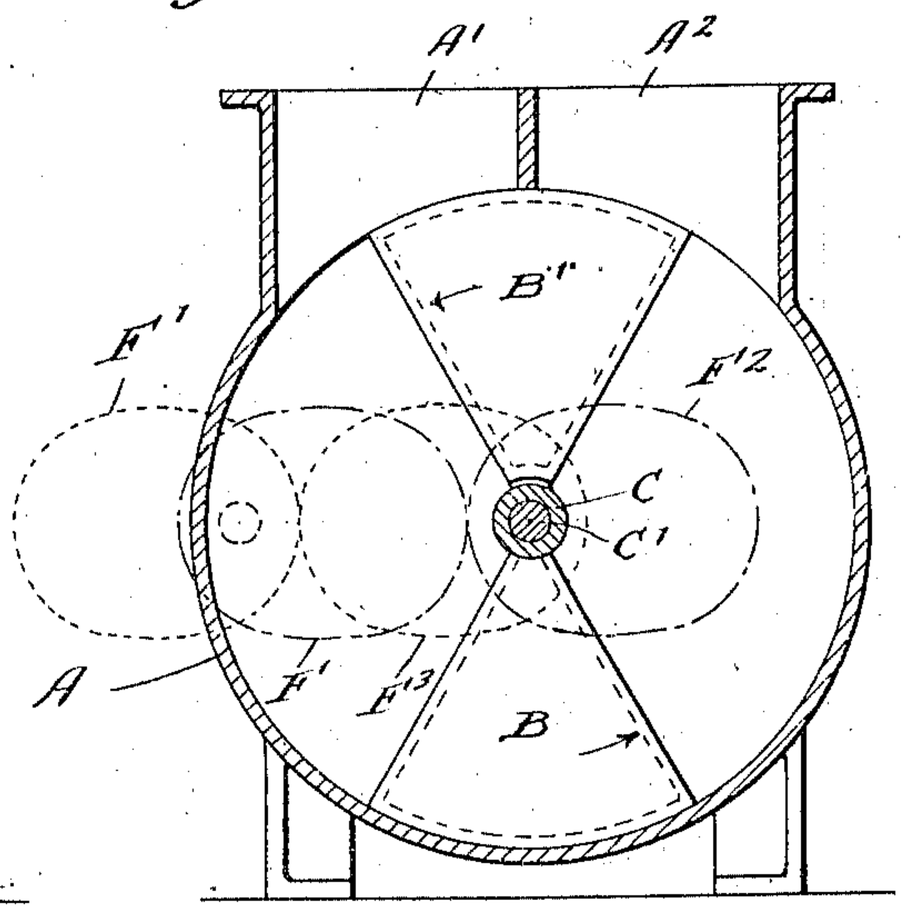


Fig. 6



Witnesses:

Wm. Geiger.

H. M. Munday

Inventor:

Martin A. O'Connor

By Munday, Evarts, Adcock & Clark.

Attorneys.

UNITED STATES PATENT OFFICE.

MARTIN A. O'CONNOR, OF CHICAGO, ILLINOIS.

BLOWER.

951,197. Specification of Letters Patent. Patented Mar. 8, 1910.

Application filed March 18, 1907. Serial No. 362,918.

To all whom it may concern:

Be it known that I, MARTIN A. O'CONNOR, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Blowers, of which the following is a specification.

My invention relates to improvements in blowers for converters, blast furnaces and other purposes.

The object of my invention is to provide a positive pressure blower for supplying compressed air to Bessemer converters, blast furnaces, &c., which will be of a simple, efficient and durable construction and composed of few parts, and by means of which compressed air may be supplied with regularity and uniformity in respect to volume and pressure, as required.

My invention consists in the means I employ to practically accomplish this object or result, as herein shown and described, the same comprising essentially a cylinder or shell furnished with inlet and outlet ports for the air, and a plurality of variable speed air compressor blades or impellers rotating within the shell and preferably about a common axis, the impellers or blades alternately approaching or overtaking each other to compress the air between them and expel the compressed air through the outlet port as the speed of the one accelerates over that of the other and alternately receding or separating from each other to admit fresh air between them through an inlet port, as the speed of the other blade in turn accelerates and that of the first mentioned blade is retarded; and means for driving or rotating the blades at variable or alternately accelerated and retarded speeds, such driving means preferably comprising two pairs of intermeshing eccentric or non-circular gears, preferably oblong or elliptical gears, in opposite phase, two of said gears being fast on the main driving shaft and the other two being one on each of the blade shafts.

It further consists in two impellers or compressor blades rotating about the same axis in a cylinder or shell, said impeller or blades alternately approaching and receding one from the other.

It further consists in combination with the cylinder or shell provided with inlet and outlet ports, of impellers or compressor blades rotating in said shell about a common axis and alternately approaching and receding from each other to vary the volume between them and compress and expel the air, the inlet and outlet ports of the cylinder or shell and the impellers or compressor blades being so constructed and combined as to enable the impellers or blades themselves to open and close the inlet and outlet ports at proper intervals, as said impellers or blades rotate and they alternately approach and recede from each other.

The principle of my invention or blower is further to compress and displace the air or other gas by varying the volume between the continuously rotating impellers or blades and the cylinder wall in such manner that such volume will be a maximum just as the admission port closes, and a minimum just as the discharge port closes, the ports in the wall of the cylinder being so situated or combined in relation to the variable speed mechanism as to fulfil these conditions, the inlet and outlet ports being opened and closed by the impellers or blades as they leave or approach them in rotation.

My invention further consists in the novel construction of parts and devices and in the novel combination of parts and devices herein shown and described.

In the accompanying drawing, forming a part of this specification, Figure 1 is a central vertical longitudinal section, partly in elevation, of a blower embodying my invention. Fig. 2 is a central horizontal section, and Figs. 3, 4, 5 and 6 are vertical sections of the shell or cylinder showing the air compressor blades in different positions, and the diagrams of the elliptic gears in different positions. Fig. 3 shows the position of the impellers just as the volume of air or gas has been discharged and the discharge port closed by one impeller, while the other is inclosing another volume and closing the admission port. Fig. 4 shows the impellers after a quarter of a cycle and the volume of air or gas has been compressed and partially displaced or discharged. Fig. 5 shows the impellers after half a cycle and in a similar but reverse position to Fig. 3, and Fig. 6 shows the impellers after three fourths of a cycle in a similar but a reverse position to that shown in Fig. 4.

In the drawing A represents the cylinder or shell having an air inlet A^1 and outlet A^2.

B B^1 are variable speed rotating air com-

pressor blades, each preferably of sector-shape, the arc of each sector being preferably about 60°.

C C¹ are rotating shafts to which the blades B B¹ are secured respectively, the shaft C being hollow, and the shaft C¹ fitting within it, so that the blades rotate about a common axis. The shell or cylinder A is furnished with bearings *a* to receive the outer or hollow shaft C.

D is the driving shaft having a driving pulley D¹, and F, F¹, F², F³, are non-circular gears, preferably oblong or elliptical gears, for rotating the air compressor blades at variable speeds, the speed of each blade being alternately accelerated and retarded so that the blades alternately approach each other and recede or separate from each other as they both rotate continuously around their common axis. Two of the gears F F¹, are secured to the driving shaft in diametrically opposite positions, so that the one will be acting as a gear of large diameter while the other is acting as a gear of small diameter. The elliptical or oblong gears F² F³ are secured one to the blade shaft C and the other to the blade shaft C¹, and mesh respectively with the gears F F¹ on the driving shaft. As illustrated in the drawing the gears are arranged to turn one of the blades through five-sixths of a revolution while the other moves through one-sixth of a revolution. By increasing or diminishing the eccentricity or ellipticity or oblong character of the gears the relative acceleration and retardation of the air compressor blades may be increased or diminished as required.

In operation, as indicated in Figs. 3, 4, 5 and 6, which represent the position of the blades and gears in four different successive positions, a quadrant apart, in a complete revolution, Fig. 3 shows the sector-shaped blades B B¹ in juxtaposition the one closing the air inlet and the other the air outlet port. Fig. 4 shows the sector-shaped blades B B¹ diametrically opposite after the driving shaft has made one-fourth of a complete revolution, at which time the blade B has advanced five-twelfths of a revolution and the blade B¹ one twelfth. Fig. 5 shows the position of the parts after the driving shaft has made a half revolution, at which time the blade B¹ has advanced one-sixth of a revolution and the blade B five-sixths of a revolution, the air between the blades being in the meanwhile compressed and expelled through the outlet port A², and Fig. 6 shows the parts after the driving shaft has made three-fourths of a revolution, at which time the blade B has advanced eleven-twelfths of a revolution and the blade B¹ seven-twelfths of a revolution. During the next or final quarter revolution of the driving shaft the blade B¹ advances one-twelfth of a revolution and the blade B five twelfths of a revolution, and the parts again assume their original position, as shown in Fig. 3, at which time both blades have made a complete revolution. The Figs. 3, 4, 5 and 6, taken together, serve to indicate how the rotative speed of the two blades B and B¹ is alternately accelerated and retarded, and how the blades B B¹, alternately approach and recede from each other.

As compared with the Root type of blower for lower pressures, my invention or blower offers the following advantages: The cylinder and impellers are simple in form, being made of cylindrical and plane surfaces, and can be readily made with much greater accuracy than the cycloidal surfaces of the old or Root type; second, larger displacement per revolution for a given volume of cylinder (as shown in the drawings the displacement is approximately, four thirds the volume of the cylinder per revolution); third, shorter leakage line and smaller clearance spaces, as all surfaces are plane or circular and can be made very accurately.

For higher pressures, which are usually obtained by the piston compressor or blowing engines, my invention or blower has the following advantages in its favor—first there are no valves, cross head, connecting rod, etc. required; second, much less mass to be accelerated and retarded; third, greatly reduced friction losses, as there is less mechanism; and fourth, no packing as in the piston type as the clearance can be very small and the velocity great enough to make the leakage negligible.

In my invention the inlet and outlet ports A¹ A² are located closely adjacent to each other in the periphery of the cylinder or shell A and together occupy or extend over but a minor segment of the cylinder, preferably not much exceeding a quadrant thereof, so that the major segment of the cylinder is closed or without openings and thus made available for compressing the air between the sector shaped blades or impellers B B¹, each of which is preferably a sector of about sixty degrees or one sixth of the circumference. This very greatly increases the compressive capacity of the blower for each complete revolution of the blades or impellers.

I claim:

1. The combination with a cylinder or shell having inlet and outlet ports both in a minor segment of its periphery and the major segment of its periphery being closed, of variable speed sector-shaped blades rotating continuously within the shell about a common axis, concentric shafts, one for each of said blades and intermeshing non-circular gears rotating the blades at alternately accelerated and retarded speeds, substantially as specified.

2. The combination with a cylinder having an inlet and outlet both in a minor segment

of its periphery and the major segment of its periphery being closed, of variable speed blades rotating continuously within said cylinder, a driving shaft, a pair of oppositely arranged oblong gears on the driving shaft, said blades having concentric shafts and the shaft of each of the blades having an oblong gear meshing with one of the oblong gears on the driving shaft, substantially as specified.

3. In a compressor or blower, the combination with a shell having adjacent inlet and outlet ports in a minor segment of its periphery and the major segment of its periphery being closed, of concentric shafts impellers rotating within the shell one secured to each of said shafts, the one alternately approaching and receding from the other to vary the volume between them, and mechanism for rotating the blades continuously, and causing one blade to approach into approximate contact and recede from the other as they rotate, substantially as specified.

MARTIN A. O'CONNOR.

Witnesses:
WILLIAM A. GEIGER,
H. M. MUNDY.