

May 27, 1924.

1,495,222

O. E. CLARK

METHOD OF MANUFACTURING IMPELLERS

Filed Oct. 2, 1920

2 Sheets-Sheet 1

FIG. 2.

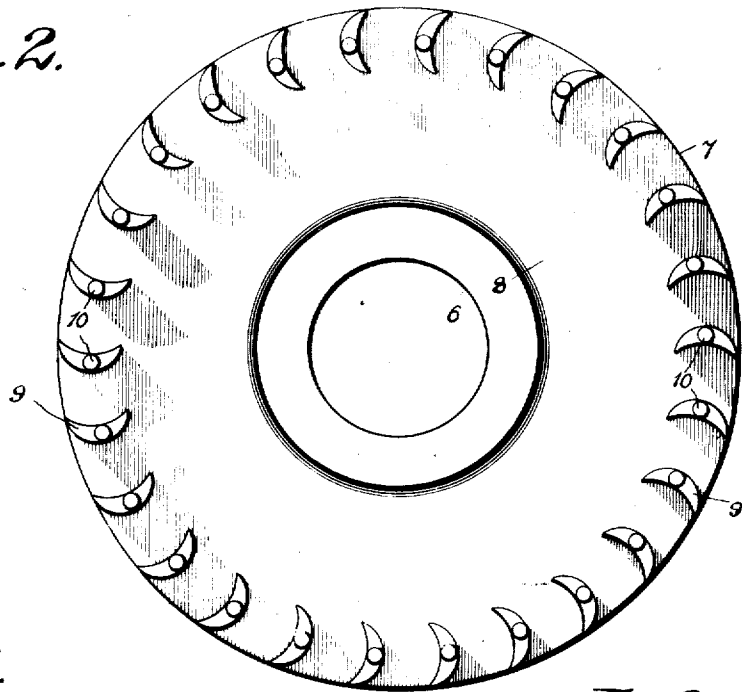


FIG. 1.

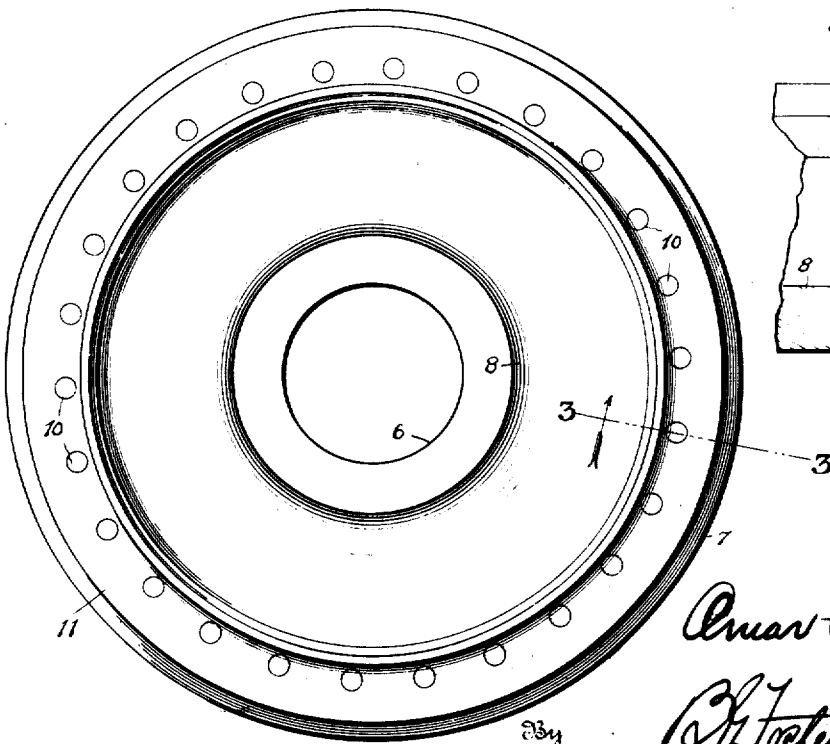
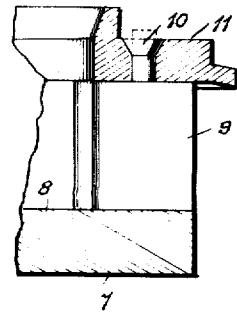


FIG. 3.



Inventor,
Omar E. Clark,
By
R. H. Foster.

Attorney,

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2 Sheets-Sheet 2

FIG. 5.

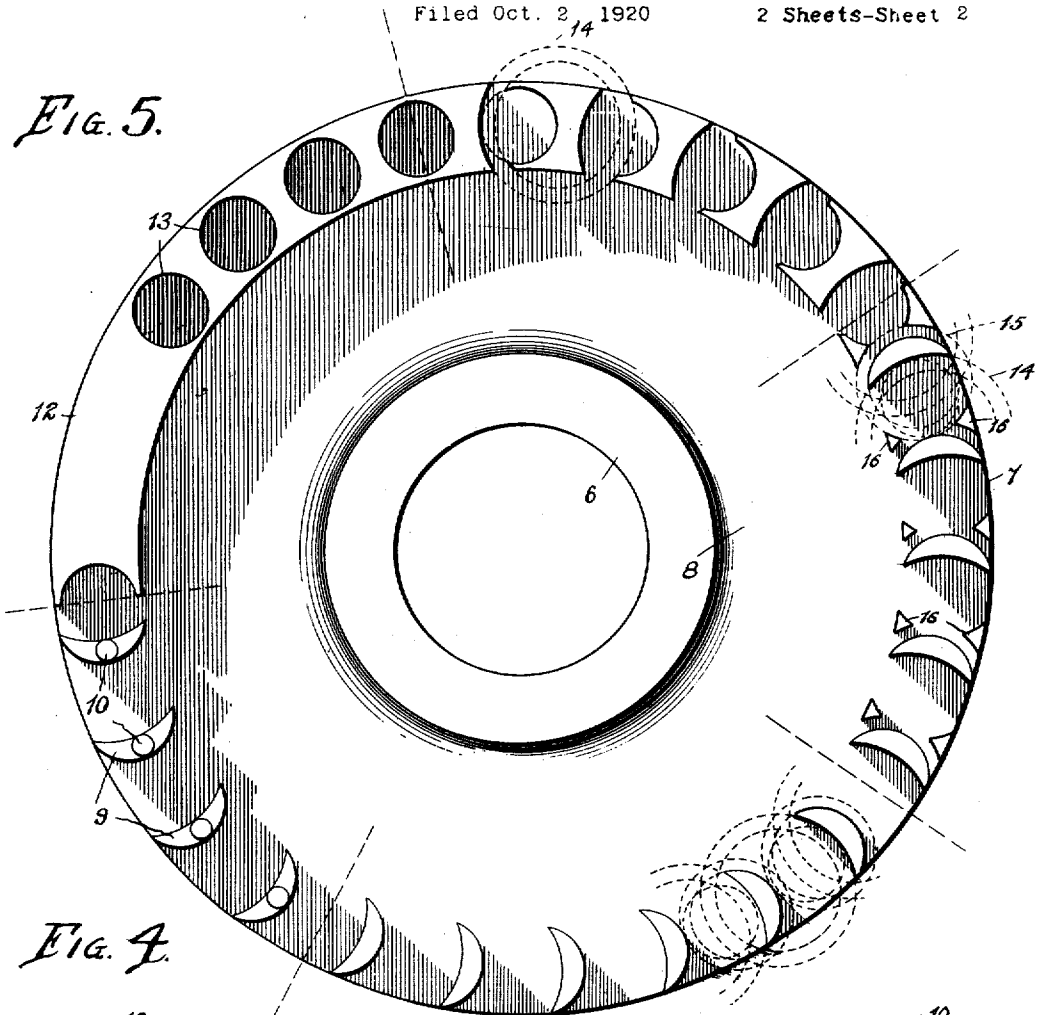
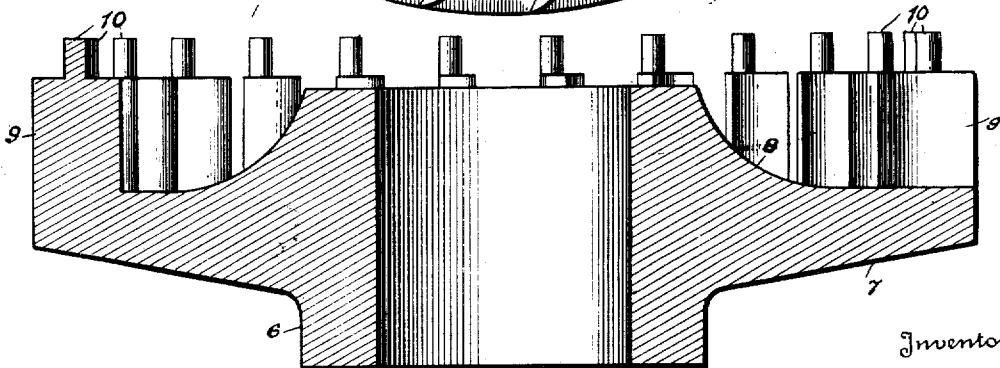


FIG. 4.



Inventor,

Omar E. Clark,

By

R. H. Foster

Attorney

UNITED STATES PATENT OFFICE.

OMAR E. CLARK, OF DENVER, COLORADO, ASSIGNOR TO THE DENVER ROCK DRILL MANUFACTURING COMPANY, OF DENVER, COLORADO, A CORPORATION OF DELAWARE.

METHOD OF MANUFACTURING IMPELLERS.

Application filed October 2, 1920. Serial No. 414,225.

To all whom it may concern:

Be it known that I, OMAR E. CLARK, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Methods of Manufacturing Impellers, of which the following is a specification.

In the construction of high speed rotary impellers, such as are used in air compressors and other apparatus of an analogous character, a very serious difficulty has always been experienced in securing the blades or buckets to the rotary body or support. It would appear that the most satisfactory method is to make the blades integral with the wheel, and it is the primary object of the present invention to produce a structure of this type in which the blades are not only integral, but are properly proportioned and formed for the work to be accomplished.

In the accompanying drawings:—

Figure 1 is a face view of an impeller unit, constructed in accordance with the present invention,

Figure 2 is a similar view, with the reinforcing ring removed,

Figure 3 is a detail sectional view on an enlarged scale and taken on the line 3—3 of Figure 1,

Figure 4 is a vertical sectional view through the unit, with the retaining ring removed, and

Figure 5 is a detail face view of a section of the body, illustrating the blades or buckets at different stages of their formation.

The device illustrated in the accompanying drawings is primarily intended as an impeller for a rotary compressor, but it will be obvious to those skilled in the art, that the invention is not limited to devices for this specific use, and may be successfully employed for any type of rotary member having buckets, being especially useful, as heretofore indicated, for those operated at high speed.

The member, as disclosed, consists of a hub 6 having an outstanding integral and outwardly tapered body 7, one face 8 of which is preferably curved, as illustrated. From the terminal portion of the curved face project laterally disposed buckets 9 arranged in the form of an annular series, and integral with the body 7. These buckets are provided with integral lugs or stems 10

that pass through openings in a retaining or reinforcing ring 11 abutted against their outer ends, the said stems or lugs being upset, as illustrated in Figure 3. By reference particularly to Figure 5, it will be noted that the inner faces of the blades or buckets are concave, and each is on the arc of a circle that embraces the adjacent bucket. The opposite faces of the bucket are convex, and each of said convex faces constitutes the arc of a circle that surrounds the bucket and extends between said bucket and the adjacent bucket.

The method of forming these buckets is disclosed more particularly in Figure 5. The body 7 is initially formed with a lateral continuous flange 12, into which are drilled spaced holes 13. A hollow milling cutter is then utilized, as indicated at 14 to cut the concave face of each blade, this milling cutter giving the proper form to the face, and surrounding the material of which said blade is formed, while operating between it and the material for the adjacent blade. The convex face of each blade is formed by a hollow milling cutter, indicated at 15 of less diameter than the milling cutter 14. The milling cutter 14 operates around or encloses the material of the adjacent blade. These two cutters leave the portions designated 16, which are then removed by suitable tools, and the stems 10 are then produced by the employment of a hollow milling cutter that cuts down the ends of the blade blanks. The blades or buckets are thus completed and are ready to receive the reinforcing ring that is placed in position, and the parts either welded or upset, as shown.

As a consequence, buckets or blades can be made integral with the body that carries them, and will more successfully retain their shape and position than those which are attached to the rotating carrier. Moreover tests and experience have demonstrated that the buckets constructed as above described, are properly shaped to successfully operate, and are sufficiently strong to withstand the various influences to which they are subjected in operation.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, without further description, and it will be under-

stood that various changes in the size, shape, proportion and minor details of construction, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is:—

1. The method of forming impeller blades integrally on a rotary body which consists in forming the body with a flange thereon, and forming out of said flange a series of blades having their opposite faces respectively concave and convex by cutting each blade with a pair of hollow milling cutters, one of which encircles the blade being cut and the other encircling the blade adjacent to that being cut.

2. The method of forming impeller blades integrally on a rotary body which consists in forming the body with a flange thereon, and forming out of said flange a series of

blades by cutting a convex face on one side of the blade with a hollow cutter that encircles said blade and passes between it and the adjacent blade and by cutting an opposite concave face with a hollow cutter that encircles the adjacent blade.

3. The method of forming integral buckets or blades on an impeller or like rotary member, which consists in forming a flange on the side of the member, drilling spaced holes into said flange, and cutting out of the material between said holes blades having opposite convex and concave faces, by employing milling cutters that respectively encircle the blade being cut and the next adjacent blade.

In testimony whereof I affix my signature in the presence of two witnesses.

OMAR E. CLARK.

Witnesses:

SULLINA W. JOHNSON,
ELIZABETH JOHNSON.