

R. H. RICE.
 RUBBING STRIP FOR CENTRIFUGAL AIR COMPRESSORS.
 APPLICATION FILED AUG. 31, 1914.

1,159,095.

Patented Nov. 2, 1915.

Fig. 1.

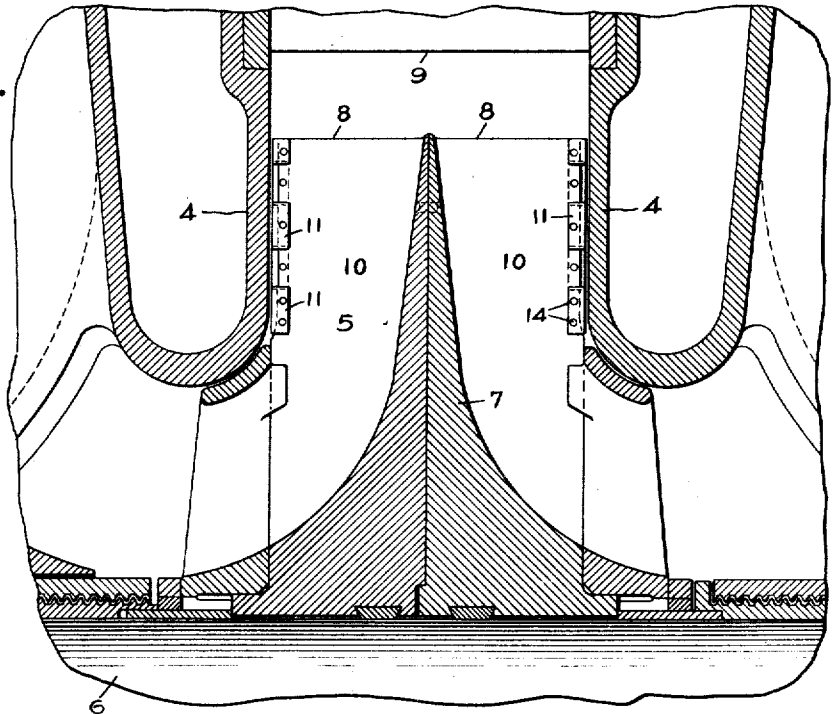


Fig 2.

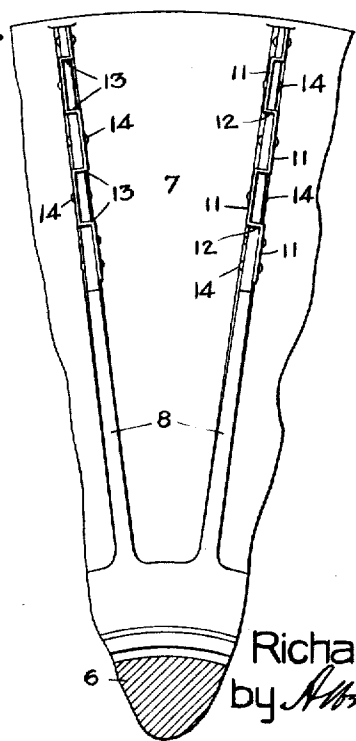


Fig 3

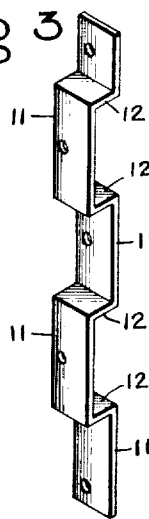
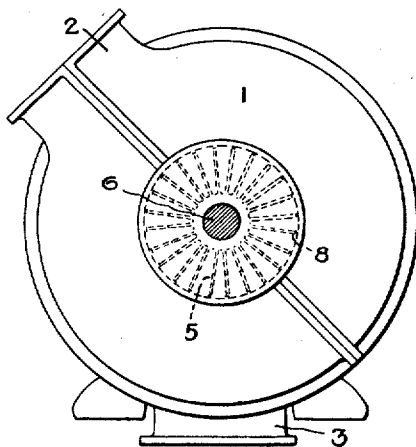


Fig. 4.



Witnesses:
 Marcus L. Byng
 J. Ellis Elm

Inventor,
 Richard H. Rice,
 by *Alfred G. Davis*
 Att'y.

UNITED STATES PATENT OFFICE.

RICHARD H. RICE, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

RUBBING-STRIP FOR CENTRIFUGAL AIR-COMPRESSORS.

1,159,095.

Specification of Letters Patent.

Patented Nov. 2, 1915.

Application filed August 31, 1914. Serial No. 859,330.

To all whom it may concern:

Be it known that I, RICHARD H. RICE, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Rubbing-Strips for Centrifugal Air-Compressors, of which the following is a specification.

This invention relates to centrifugal machines for compressing air, and its object is to provide renewable edges for the impeller vanes, permitting them to be replaced in case they become injured by contact with the walls of the casing in which the impeller rotates.

The running clearance between the impeller and the casing is usually made small in order to avoid losses by leakage. If, by reason of accidental misadjustment of the position of the impeller shaft, the edges of the vanes come in contact with the wall of the casing, the renewable edges which I provide, wear off readily without causing vibration of the shaft or damage to any part.

In a previous application, filed August 13th, 1912, Serial Number 715,709, I have disclosed a removable edge for impeller vanes, consisting of a strip of soft metal secured to the edge of the vane, which actual use has proved to be an efficient and valuable improvement.

My present invention has particular reference to a new mode of securing the rubbing or wear strip to the impeller vane, whereby a more substantial and secure fastening of these strips is effected. This is desirable not only on account of the rubbing action but also because of the centrifugal force exerted upon them. This new method does not depend entirely upon rivets for fastening the strips to the impeller blade, since the strip itself is interwoven or laced into the edge of the impeller blade. In order to avoid any sacrifice of strength and yet to afford a better resistance to the centrifugal and rubbing strains to which the strip is subjected, I make the strip in zigzag form and let it into slots cut in the edge of the vane, so that it lies alternately on opposite sides thereof.

In the accompanying drawing, Figure 1 is an axial section of a portion of a centrifugal air compressor showing an impeller provided with my improved rubbing strip. Fig. 2 is an edge view of two of the vanes

so equipped. Fig. 3 is a perspective view of one of the strips, and Fig. 4 is an end view of the entire compressor.

The casing 1 of the compressor has the usual intake 2 and outlet 3, with one or more hollow walled diaphragms 4 forming chambers in which the impellers 5 can rotate. A shaft 6 passing centrally through the casing carries the several impellers with which a multi-stage machine is provided. Each impeller has a central web 7 supporting vanes 8 on each side of it. The air enters the impeller at the center and is thrown off through stationary discharge vanes. The vanes are preferably radial, at least throughout their outer portions 10, and along each edge of this portion is secured the rubbing strip. This is a straight piece of thin soft metal, such as brass, babbitt or other suitable alloy, bent into a zigzag shape and preferably having longitudinal sections 11 lying alternately on opposite sides of a median plane and connected by short transverse sections 12, whose length is equal to the thickness of the vane. Slots 13 are sawed in the edge of the vane at the same distance apart as the transverse sections 12 of the strip and of a depth a little less than the width of the strip, so that the strip projects a little beyond the vane. After the strip has been slipped into the slots, a few rivets 14 are put in to keep it in place. But the centrifugal strains tending to throw the strip outwardly are entirely sustained by the edges of the slots engaging the transverse sections 12 of the strip, while the rubbing strains, if any, are sustained by the portions of the vanes underlying the longitudinal sections 11 on the front of the vane and against which said sections are held in close contact. The alternate sections 11 on the back of the vane transmit the rubbing strains to the vane through the transverse sections 12 and the rivets 14.

The invention therefore provides a strong yet simple mode of securing a rubbing strip to an impeller vane, which affords ample resistance both to centrifugal and rubbing strains.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the ap-

paratus shown is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. The combination in a centrifugal compressor having a casing and an open sided impeller with vanes designed to run with close clearances, of a wear strip fixed to and projecting over the edges of the vanes into close proximity to the casing wall, said wear strips each comprising a zig-zag strip lying alternately on opposite sides of said vanes.
2. The combination in a centrifugal compressor having a casing and an open sided impeller with vanes designed to run with close clearances, of a wear strip fixed to and projecting over the edges of the vanes into close proximity to the casing wall, said wear strips each comprising a zig-zag strip let into the edges of the vanes.
3. In a centrifugal compressor having a

casing and an open sided impeller having vanes designed to run with close clearances, the combination with the vanes having slots in their edges, of wear strips fixed to and projecting over the edges of the vanes with transverse portion received in said slots.

4. In a centrifugal compressor having a casing and an open sided impeller having vanes designed to run with close clearances, the combination with the vanes having slots in their edges, of wear strips which project over the edges of the vanes into close proximity to the casing wall and are woven back and forth in said slots so as to lie on alternate sides of the vanes.

In witness whereof, I have hereunto set my hand this 28th day of August, 1914.

RICHARD H. RICE.

Witnesses:

JOHN A. McMANUS, Jr.,
ROBERT SHAND.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

It is hereby certified that in Letters Patent No. 1,159,095, granted November 2, 1915, upon the application of Richard H. Rice, of Lynn, Massachusetts, for an improvement in "Rubbing-Strips for Centrifugal Air-Compressors," errors appear in the printed specification requiring correction as follows: Page 1, line 69, after the word "vanes" insert the reference-numeral 9; same page, line 70, after the word "vanes" insert the reference-numeral 8; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of December, A. D., 1915.

[SEAL.]

R. F. WHITEHEAD,
Acting Commissioner of Patents.

Cl. 230—11.