S. A. MOSS.

CENTRIFUGAL AIR COMPRESSOR.

APPLICATION FILED AUG. 17, 1910.

1,119,713. Patented Dec. 1, 1914.

Fig. 1.

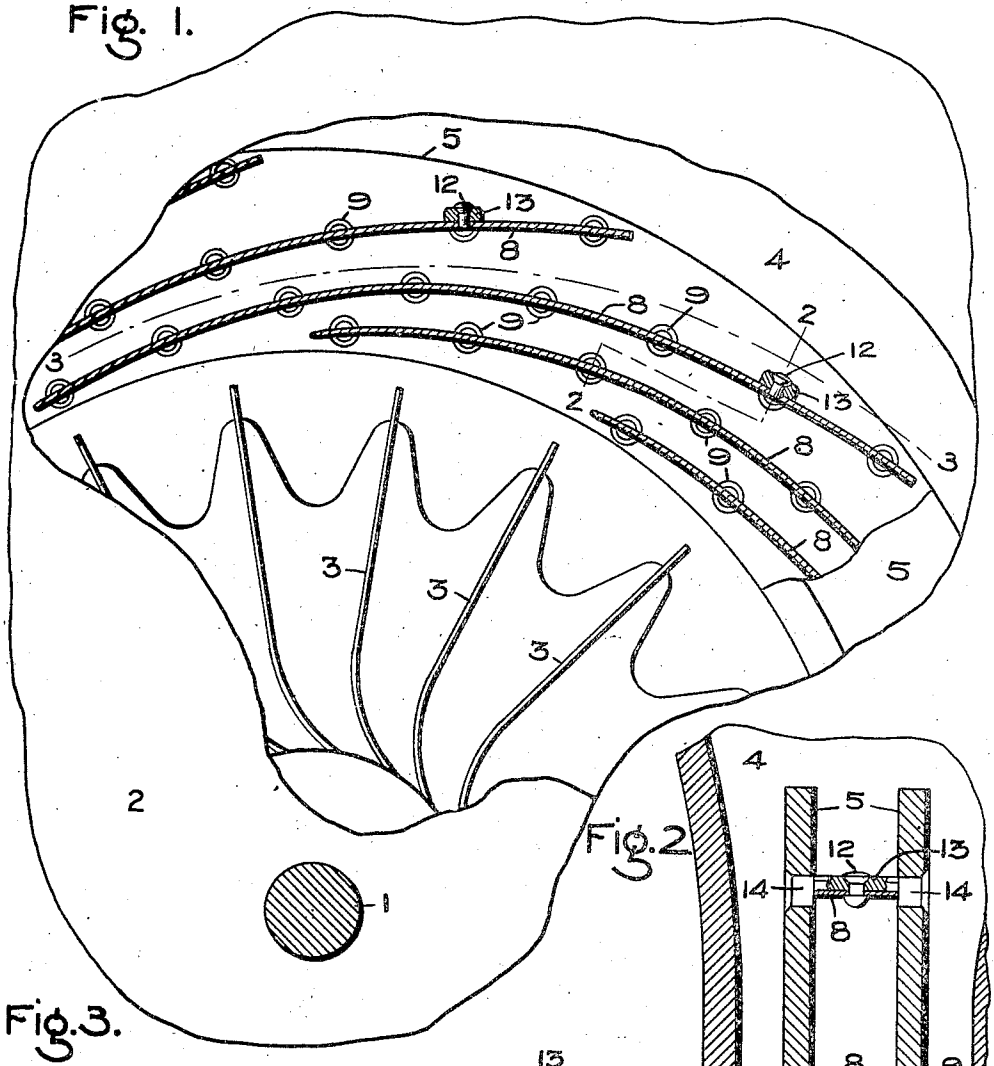


Fig. 2.

Fig. 3.

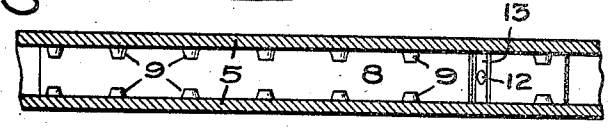


Fig. 4.

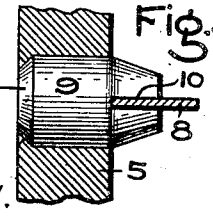
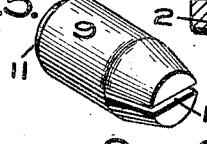


Fig. 5.



Witnesses:

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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL AIR-COMPRESSOR.

1,119,713. Specification of Letters Patent. Patented Dec. 1, 1914.

Application filed August 17, 1910. Serial No. 577,627.

To all whom it may concern:

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

This invention relates to air compressors wherein the air discharged by a rapidly rotating impeller is received by an annular device that in turn discharges the air into the scroll pipe or other part of the compressor casing. As the air leaves the impeller it has some pressure due to centrifugal force and also a relatively high velocity. The function of the annular discharging device is to convert the velocity of the air into pressure which is added to that due to centrifugal force. To facilitate this action the said device is provided with a plurality of vanes or partitions between which are passages that diverge from their receiving to their discharge ends. The amount of this divergence as well as the shape has a direct and important bearing on the conversion of velocity into pressure and hence on the output and efficiency of the machine. The passages must be great enough in cross-section to handle the fluid without choking, and must also diverge or enlarge by such an amount that the fluid, on reaching the point of discharge, will have lost substantially all its velocity. This requires accurate work both in designing and in the structure itself if the best results are to be attained. The problem presented then, is to provide an annular discharging device for a compressor that is capable of being accurately made by ordinary machine shop methods, and by workmen of ordinary skill. Further, the cost of the device must be reasonable as regards the balance of the apparatus. It is unsatisfactory to cast said device with cored passages since the latter must be of exact shape and have quite smooth surfaces in order to avoid losses from friction and eddies in the air currents. Such a device is also very costly to machine owing to its peculiar shape. It is also a slow and uncertain job to endeavor to secure sheet metal vanes by cast-jointing them with the side walls of the device. Moreover, the above mentioned arrangements have the disadvantage that if one vane is loose or injured the whole device is generally ruined. To make the entire device out of sheet metal involves the risk of failing to obtain sufficient rigidity. By reason of my invention as set forth more fully hereinafter, I utilize the smooth and easily made sheet metal vanes and rigid cast metal walls, the whole being secured by simple mechanical fastenings which can be quickly assembled, and which permit of the substitution of one or more vanes in case of injury without disturbing the others.

In the accompanying drawing that illustrates one of the embodiments of my invention, Figure 1 is an elevation of a portion of a centrifugal air compressor, partly in section; Fig. 2 is a cross-section taken on line 2—2 of Fig. 1; Fig. 3 is a section taken on line 3—3 of Fig. 1; Fig. 4 is a section showing a fastening plug on a large scale, and Fig. 5 is a perspective view of a fastening plug.

The impeller is mounted on a shaft 1 and revolves in a casing 2. It has blades 3 of any desired form which impart velocity to the air and a certain amount of pressure due to centrifugal force. The air discharged by the impeller is received by a stationary and annular discharging device from which it passes to the outer collecting chamber 4 for delivery through a suitable conduit.

The annular discharging device comprises two rings or walls 5, preferably, but not necessarily parallel and extending perpendicular to the shaft. These rings are seated on shoulders 6 formed in the casing or in some other stationary part and secured if desired by the screws 7. Between the adjacent faces of the rings or walls are located sheet metal vanes that are slightly curved from end to end and are arranged to overlap, thereby forming a series of outwardly extending approximately tangential passageways whose cross-section gradually enlarges from their inlet to their discharge ends. It is to be noted that the edges of these vanes are preferably smooth, *i. e.* free from all projections for securing the same to a support. As a result of this the sheet metal stock of which the vanes are composed can be cut to good advantage and the waste will be small. In order to secure these vanes accurately in place, I drill a row of holes through the rings or walls 5 and insert in each hole a plug 9 having its inner end preferably tapered and provided with a trans-

verse slot 10 adapted to receive the edge of a vane 8. The plugs are preferably cylindrical so that they can be rotated or adjusted in their holes to bring the slots in line with the vanes as said plugs are pushed in. When in place the plugs are secured preferably by riveting down the adjacent material of the wall 5; the outer end of the plug being preferably chamfered at 11 to give a better hold. These plugs hold the vanes against movement transverse to their normal plane and to a limited extent against longitudinal movement depending largely upon the tightness of the fit between the walls of the slot and the vane itself.

The vanes can be slid through the slotted ends of the plugs to adjust them to the proper position, and when accurately located they can be secured or anchored by a rivet 12 passing through the vane and through a cross-bar 13 secured in the rings or walls 5, preferably by having cylindrical ends 14 located in holes in the opposite walls and riveted down to hold said bar in place. The rivets 12 are located near the ends of the vanes so that they are accessible. The cross-bars 13 are located at a point where they have little if any effect on the air currents leaving said discharging device. If located at the inner ends of the vanes they would be relatively inaccessible and would interfere to a greater or less extent, depending upon their exact position, with the free passage of air and the function of said vanes. The rivet 12 and the cross-bar 13 in addition to forming an anchor to prevent longitudinal displacement of the vane, serve to accurately locate the inner or air receiving end of each vane.

As will be seen the structure is simple, the parts being easily made and assembled. The smooth sheet metal vanes can be accurately shaped in dies and are held rigidly in place, affording air passages of suitable area and of proper cross-section and shape throughout. The inner ends of the plugs owing to their shape and size offer practically no obstruction to the air currents. The rings or walls have smooth flat surfaces and can readily be machined, as on a boring mill for example.

The inlet ends of the passages between the vanes should be of sufficient cross-sectional area to receive the fluid from the impeller without choking and should enlarge sufficiently toward their discharge ends to gradually reduce the velocity of the fluid to a negligible amount.

I have referred to air as the fluid to be compressed but obviously the compressor can be employed for other fluids.

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 apparatus 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. A fluid discharging device comprising a pair of parallel annular stationary walls with tangential overlapping sheet metal vanes located between them, the passages between said vanes gradually increasing in cross-sectional area from end to end, and means extending through and anchored in the walls that engage the edges of said vanes.

2. A fluid discharging device comprising a pair of annular stationary walls provided with rows of holes, overlapping sheet metal vanes located between the walls, and plugs that are located in the holes and engage the edges of the vanes.

3. A fluid discharging device for a centrifugal air compressor, consisting of parallel rigid metal walls provided with rows of holes, plugs in said holes having slotted inner ends, and sheet metal partitions having their edges engaged in said slots.

4. A fluid discharging device for a centrifugal air pump consisting of parallel rigid metal walls provided with rows of holes, plugs rotatable in said holes and each having a tapering inner end containing a transverse slot, and sheet metal partitions having their edges engaged in said slots.

5. A fluid discharging device for a centrifugal air pump consisting of parallel rigid metal walls provided with rows of holes, plugs rotatable in said holes and each having a tapering inner end containing a transverse slot, and sheet metal partitions having their edges engaged in said slots, the metal of said walls being riveted down over the outer ends of said plugs.

6. A fluid discharging device for a centrifugal air compressor, consisting of parallel rigid metal walls provided with rows of holes, plugs in said holes having slotted inner ends, sheet metal partitions having their edges engaged in said slots, and cross bars secured to said walls and to said partitions.

7. A fluid discharging device comprising a pair of rings, a casing having shoulders that engage and support the ring at its bore, curved overlapping sheet metal vanes located between the rings whose edges are in contact therewith and form passages, a plurality of devices located on each side of each vane which receive and hold said vane by its edges, and means for anchoring the vanes against longitudinal movement.

8. A fluid discharging device comprising a pair of annular stationary walls, rows of members carried by and projecting inwardly

from the walls, each member having a slot therein, and overlapping sheet metal vanes located between the walls with their edges engaging in said slots.

9. A fluid discharging device comprising a pair of annular stationary walls, tangential overlapping sheet metal vanes located between them, rows of members carried by and projecting inwardly from the walls which engage the opposite edges of the vanes to hold the same against transverse movement but which permit of longitudinal movement, and means at one point only for anchoring the vanes against longitudinal movement.

10. A fluid discharging device comprising a pair of annular stationary walls, rows of members carried by and projecting inwardly from the walls, each member having a slot therein, overlapping sheet metal vanes located between the walls with their edges engaging in said slots, and means at one point only for anchoring the vanes against longitudinal movement.

In witness whereof, I have hereunto set my hand this fifteenth day of August, 1910.

SANFORD A. MOSS.

Witnesses:

FRANK G. HATTIE,

CHARLES A. BARNARD.