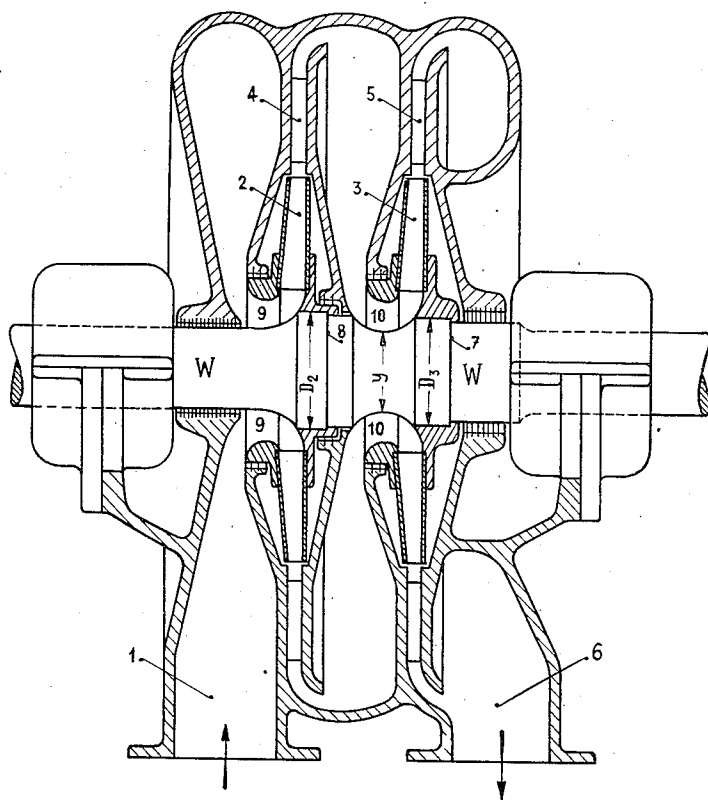


APPLICATION FILED NOV. 26, 1918.

Patented Dec. 9, 1919.



Inventor
Benjamin Graemiger.
By Alvin Orth atty.

UNITED STATES PATENT OFFICE.

BENJAMIN GRAEMIGER, OF ZURICH, SWITZERLAND, ASSIGNOR TO THE FIRM OF
AKTIENGESSELLSCHAFT DER MASCHINENFABRIKEN ESCHER WYSS & CO., OF
ZURICH, SWITZERLAND.

SHAFT FOR ROTARY COMPRESSORS AND PUMPS.

1,324,664.

Specification of Letters Patent.

Patented Dec. 9, 1919.

Application filed November 26, 1918. Serial No. 264,222.

To all whom it may concern:

Be it known that I, BENJAMIN GRAEMIGER, a citizen of the Republic of Switzerland, residing at Zurich, Switzerland, have invented certain new and useful Improvements in Shafts for Rotary Compressors and Pumps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to letters or figures of reference marked thereon, which form a part of this specification.

15 This invention relates to a shaft for rotary multistage compressors and pumps. According to this invention the portion of the shaft between each two succeeding seats of impellers of the compressor or pump is thinner than each of the two adjoining seats, and the surface of each of said thinner portions of the shaft forms a part of the inner surface of the inlet channel for the impeller mounted on the second one of the two adjoining impeller seats.

25 An exemplification of the invention is shown in the annexed drawing illustrating a vertical longitudinal section through a two stage air compressor. The air enters into the compressor through the branch 1, is compressed successively by the impellers 2 and 3, passes through the diffusers 4 and 5 and is exhausted through the outlet 6. The boss of the impeller 3 has a bore in the seat having the diameter D_3 . The impeller 3 is pressed from the right toward the shoulder 7. The boss of the impeller 2 has a bore in the seat having the diameter D_2 , and this impeller is pressed against the shoulder 8. Its smallest bore is slightly larger than the diameter of the seat of the impeller 3. The air flows through the compressor from left to right. Before the inlet of the impeller 3 the shaft has the diameter y , whereby y is less than D_3 and y is less than D_2 . The transitions to the diameter y and from this to the diameter D_3 are shown in meridian section by curves, with a relatively large radius of curvature and particularly with relatively large arcs of circle, and in these parts the surface of the shaft W forms a portion of the inner surface of the inlet channel 10. An advantage of this construction is that said inlet channel can be made of the small-

est possible diameter. Should the shaft have a constant diameter y for its entire length, it would be too weak, and then too much. Its speed would eventually be under or at least near the critical speed, a circumstance which would cause the compressor to run in an unstable and even dangerous manner. In order to make the shaft, nevertheless, as strong as possible and avoid an excessive bending of same, it has been constructed of considerably larger diameter in those parts where it can be made thicker, viz. inside the bosses of the impellers 2 and 3, or in other words, in the seats of these impellers.

A machine embodying the present invention is suitable for dealing with a relatively large output when running at a very high speed. Its design permits of the use of impellers having a relatively small outer diameter, which avoids greater impeller friction and excessive losses due to leakage. The advantages described are particularly emphasized in the multiple stage compressors. I claim.

1. In a rotary multistage compressor or pump, a shaft having a plurality of impeller seats, the portions of the shaft between each two succeeding seats of impellers being of less diameter than each of the two adjoining seats and the surface of each of said portions of less diameter forming a part of the inner surface of the inlet channel for the impeller mounted on the second one of the two adjoining impeller seats.

2. In a rotary multistage compressor or pump, a shaft having a plurality of impeller seats, said shaft having in front of each seat a portion of less diameter than the seat itself and the portions of the shaft between each two succeeding seats of impellers also being of less diameter than the diameter of each of the two adjoining seats and the surface of each of said portions forming a part of the inner surface of the inlet channel for the impeller mounted on the second one of the two adjoining impeller seats.

3. In a rotary multistage compressor or pump, a shaft having a plurality of impeller seats, said shaft having before each seat a portion which is of less diameter than the seat itself, and the shaft portion before the thinner shaft portion immediately preceding the first seat having the same diameter as

said thinner portion and the diameter of the shaft decreasing behind each seat of an impeller succeeded by a further seat down to the diameter of the thinnest portion of the shaft. 5

4. In a rotary multistage compressor, a shaft, separate impeller elements mounted on said shaft, seat portions formed on said

shaft for each of the impeller elements, said shaft having reduced portions between each two succeeding seat portions gradually diminishing from said seat portions. 10

In testimony that I claim the foregoing as my invention, I have signed my name.

BENJAMIN GRAEMIGER.