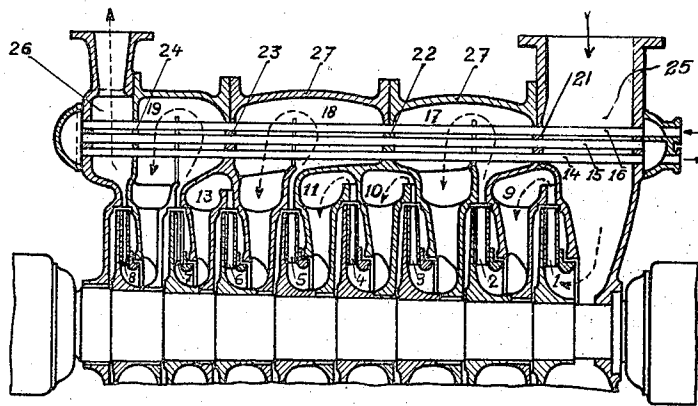


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COOLING DEVICE IN MULTISTAGE CENTRIFUGAL COMPRESSORS.
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1,425,855.

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Inventor:
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UNITED STATES PATENT OFFICE.

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COOLING DEVICE IN MULTISTAGE CENTRIFUGAL COMPRESSORS.

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Specification of Letters Patent. Patented Aug. 15, 1922.

Application filed December 1, 1920. Serial No. 427,564.

To all whom it may concern:

Be it known that I, BENJAMIN GRAEMIGER, a citizen of the Republic of Switzerland, residing at Zurich, Hardturmstrasse 19, Switzerland, have invented certain new and useful Improvements in Cooling Devices in Multistage Centrifugal Compressors; and I do hereby declare the following to be a clear, full, 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.

This invention relates to a cooling device in multistage centrifugal compressors having cooling channels parallel to the axis of the compressor shaft.

Cooling devices of this type form the subject matter of my Patent No. 1265650 dated May 7, 1918. The object of the present invention is a further improvement on the cooling devices described and claimed in said patent.

According to the invention some of the stages are arranged within the range of the cooling channels which are parallel to the axis of the compressor shaft and only the remaining stages alternating with the first mentioned stages are passed by the cooling channels.

One mode of carrying the invention into effect is shown by way of example in the accompanying drawing. This drawing illustrates part of a longitudinal section through an air-compressor having eight stages. The path of the air on its way through the compressor is indicated by arrows shown in dotted lines. The rotor wheels 1, 3, 4 and 6 deliver the air into diffusers which open toward the circulation chambers 9, 10, 11 and 13 respectively. The latter are arranged within the range of the cooling tubes 14, 15, and 16. The rotor wheel 2 delivers the air compressed by the latter into a circulation space 17, the rotor wheel 5 delivers the air through an interposed diffuser into the circulation chamber 18 and the rotor wheel 7 through a diffuser into the circulation space 19. Said circulation chambers 17, 18 and 19 extend in the radial direction so far that they inclose the cooling tubes 14, 15 and 16. In these circulation chambers and further in the inlet space 25 and in the pressure space

26 the air is sufficiently cooled. This arrangement presents the advantage that the cooling tubes 14, 15, 16 have only to pass through four cast partition walls 21, 22, 23 and 24, i. e. in the number of partition walls separating the pressure stages through which the tubes have to pass, is equal to only half the number of the stages of a compressor. Thereby, whilst maintaining the total effective area of the cooling surface, the construction of a compressor is rendered much simpler, lighter and cheaper than if all the partition walls separating the single stages were to be extended up to the outer wall 27 of the compressor casing and if every cooling channel had to pass through all these many partition walls.

Further, the construction according to the invention is particularly advantageous in case a compressor has to be designed to be driven by a prime mover that runs at a comparatively low speed. Owing to the small circumferential speeds, a large number of stages has to be provided and it is not necessary to cool each stage. This may even prove disadvantageous, owing to the drop of pressure caused by cooling each stage. If the medium is compressed in two or more successive stages without being cooled and the cooling is then applied in a subsequent stage the temperature difference between the compressed medium and the cooling means is greater than if the cooling were effected in each stage. By this measure the specific exchange of heat per unit of area is increased.

I claim:

1. In a multistage centrifugal compressor, a cooling device comprising cooling channels arranged substantially parallel to the axis of the compressor and passing through some of the pressure-stages of the compressor, and the remaining pressure-stages so arranged that they are not intersected by said cooling channels.

2. In a multistage centrifugal compressor, a cooling device comprising cooling channels arranged substantially parallel to the axis of the compressor, and half of the number of partition walls separating the single stages extending to the outer wall of the compressor casing and being passed by said cooling channels.

3. In a multistage centrifugal compressor, a cooling device comprising cooling channels

arranged substantially parallel to the axis of the compressor, some of the partition walls separating the single stages extending to the outer wall of the compressor casing and being passed by said cooling channels, and the remaining partition walls ending within the inner radial ends of said cooling device.

4. A multistage centrifugal compressor, comprising some successive stages connected by circulating chambers, and other circulating chambers also connecting other successive stages extending radially beyond the

former chambers and cooling means for said other chambers.

5. A multistage centrifugal compressor, comprising some of the successive stages connected by circulating chambers, and other circulating chambers connecting other successive stages, said other chambers extending radially beyond the former chambers and laterally thereover, and cooling means for said other chambers.

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

BENJAMIN GRAEMIGER.