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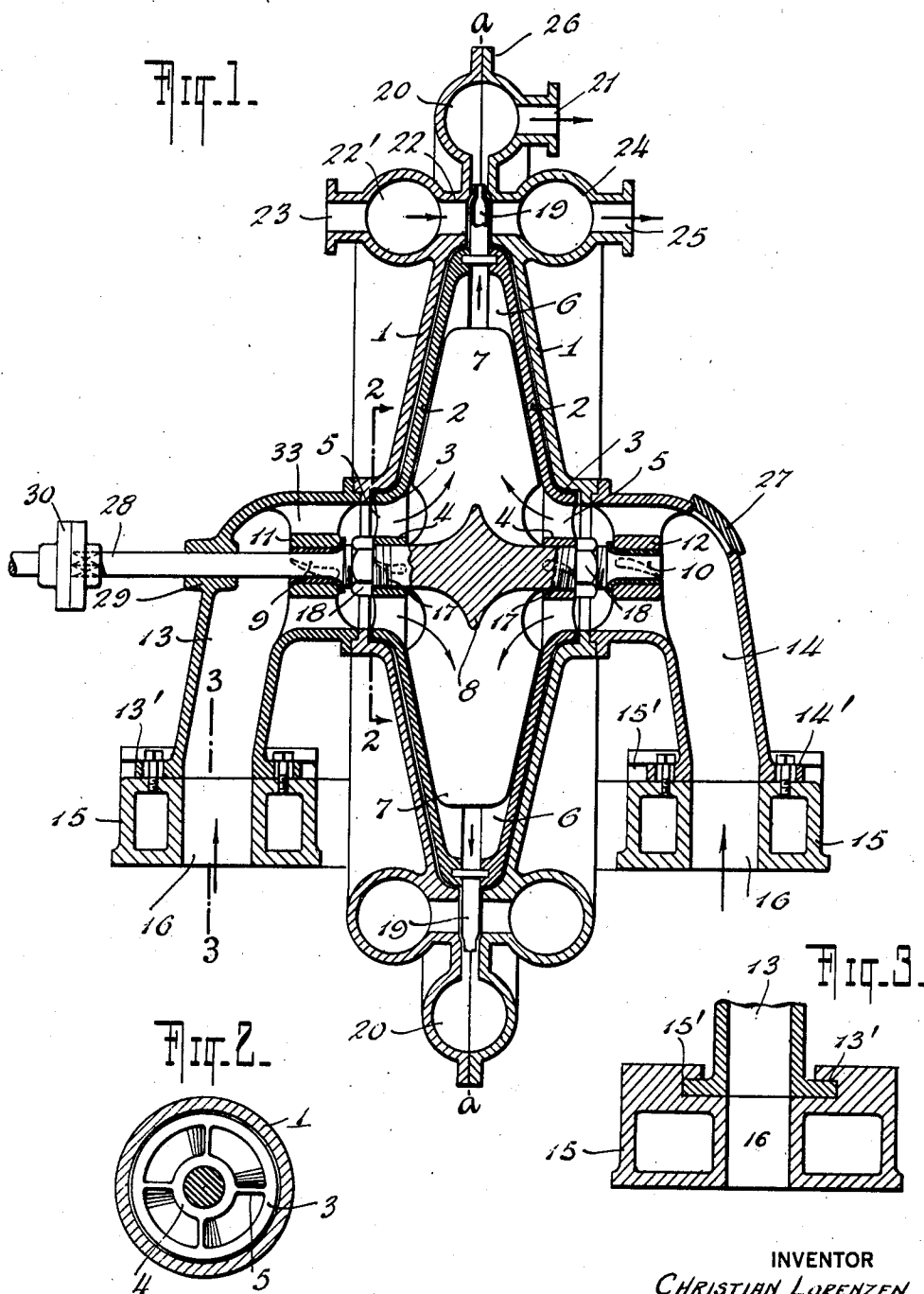
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TURBINE AND ROTARY COMPRESSOR

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2 Sheets-Sheet 1.



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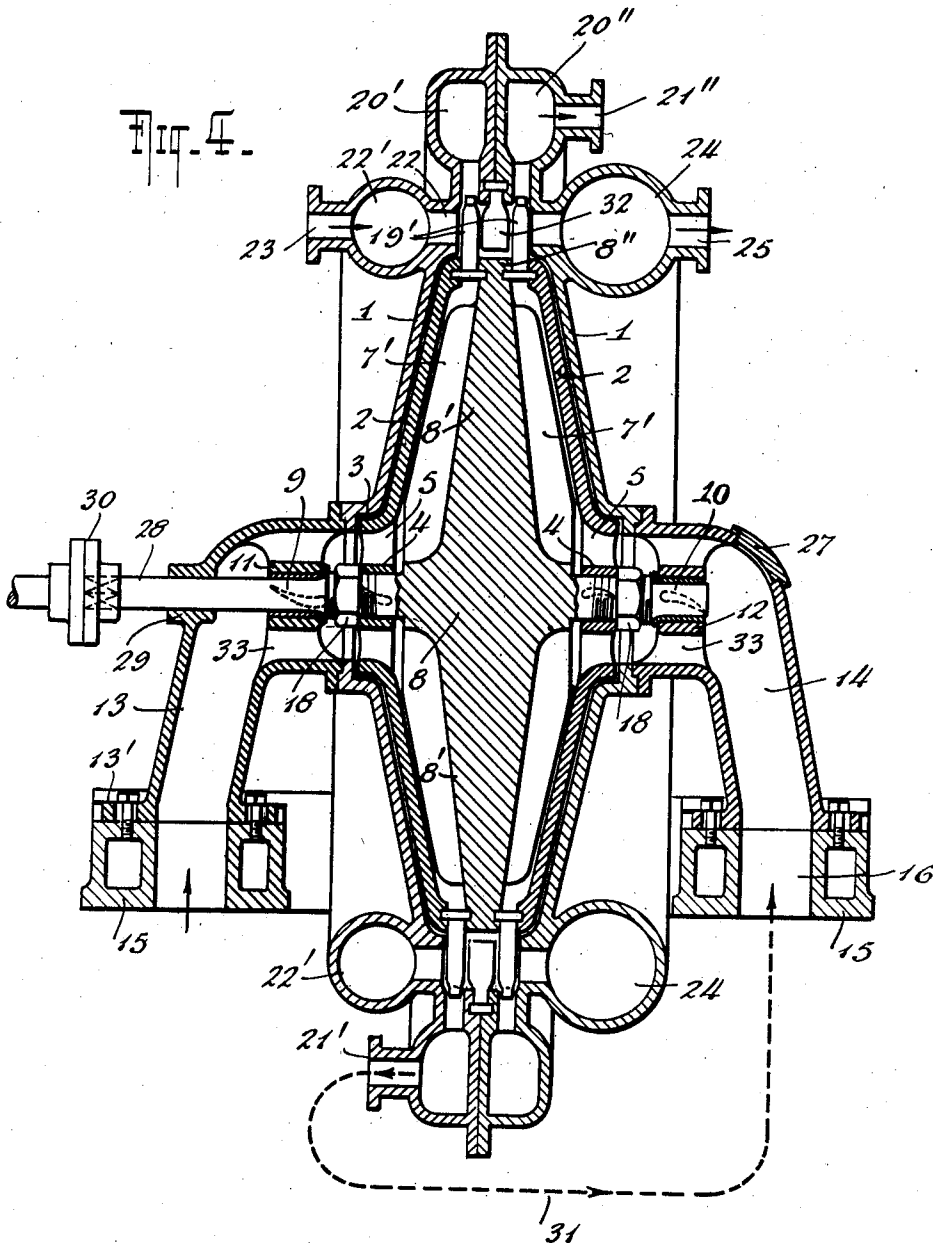
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UNITED STATES PATENT OFFICE.

CHRISTIAN LORENZEN, OF BERLIN, GERMANY, ASSIGNOR TO LORENZEN-TURBINEN AKTIENGESellschaft, OF BERNE, SWITZERLAND, A CORPORATION OF SWITZERLAND.

TURBINE AND ROTARY COMPRESSOR.

Application filed January 11, 1926, Serial No. 80,424, and in Germany January 27, 1925.

My present invention relates to turbines and rotary compressors, and in its preferred embodiment combines a turbine with a rotary air compressor. The objects of my invention include improved means for conducting the air or other medium to be compressed, to the central or axial portion of the rotor, for increasing the suction effect by which such medium is drawn into the rotor, for efficiently accomplishing a gradual change in the stream of such medium from an axial to a substantially radial direction, for simplifying the construction, particularly as regards easy assembly and rigid connection of the stator parts, and for increasing the compactness and general efficiency of the entire machine.

Two typical and satisfactory embodiments of my invention will now be described in detail with reference to the accompanying drawings, in which Fig. 1 is an axial section of a turbo-compressor constructed according to my present invention; Figs. 2 and 3 are partial sections on line 2-2 and 3-3 respectively of Fig. 1; and Fig. 4 is an axial section showing another form of turbo-compressor embodying my improvements.

In the construction illustrated by Figs. 1, 2 and 3, the stator is shown as comprising two similar sections or halves joined at the plane *a-a*, each of said sections including a disk-like portion 1 of more or less conical shape, the two portions 1 converging toward the periphery. Within the chamber formed between said portions 1, I arrange the body of the rotor, said body consisting of two disk-like portions 2 of a shape similar to the stator portions 1 and arranged to revolve adjacent thereto. The central portions of the rotor body disks are extended outwardly in an axial direction to form annular substantially cylindrical flanges 3 within which are arranged concentrically sleeves 4 connected with the outer flanges 3 by ribs or vanes 5 to which I prefer to give a screw shape of such nature that rotation of the rotor in the normal direction will cause the screw vanes to feed or suck air inwardly as indicated by the arrows. The parts 3, 4, 5 constitute hub portions for the

rotor body. Within the chamber 6 which is formed between the two halves or sections of the rotor body, I arrange the radial compressor blades 7 which are rigid and preferably integral with a central core portion 8 which forms part of the rotor shaft and has its ends fitted into the sleeves 4. The shaft has journal portions 9, 10 supported in bearings 11, 12 respectively which are located within the air inlet pipes 13, 14 respectively which at the same time constitute standards for supporting the stator by fitting into recesses at the central portions of the disks 1. The pipes 13, 14 are shown as converging upwardly, thus giving greater stability to the frame or housing of the machine, and the lower ends of said pipes are shown flanged at 13', 14' for convenient bolting to a suitable base 15, which of course will have channels 16 registering with the pipes 13, 14 and open to the surrounding air. The rotor shaft has threaded portions 17 between the bearings 11, 12 and the core 8, and on these portions are screwed nuts 18 which bear against the outer ends of the sleeves 4 and thus press the rotor disks 2 toward each other, to clamp in position the turbine blades 19 which are thus held rigidly between the disks 2 to rotate in unison with them. The flanged inner ends or bases of these blades are fitted into annular grooves of the disk-like portions 2.

The blades 19 are hollow, the inner ends of their radial passages communicate with the chamber 6 while their outer ends discharge into an annular collector channel 20 from which the compressed air is conveyed to the place of use through an outlet pipe 21 or otherwise. The outer surfaces of the blades are of proper shape to produce rotation of the rotor as such surfaces are struck by the propelling medium (for instance, combustion gases under pressure) issuing from nozzles 22 to which it is supplied from an annular chamber 22' having an inlet 23 for such gases. After impelling the rotor, the power gases pass into a chamber 24 having an outlet 25. These chambers 22', 24 as well as the collector 20 are shown as formed in portions of the stator body

integral with the disks 1, and the two halves of the stator as bolted together at the abutting flanges 26 located along the outer edges of the collector channel 20.

5 The air is drawn in through the pipes 13, 14 by the suction due to the action of the compressor blades 7 and of the screw vanes 5. In order to effect a gradual change in the course of the air from the axial direction in which it streams around the bearings 11, 12 and sleeves 4 to the radial direction in which it flows in the outer portion of the chamber 6, the core 8 is made of enlarged diameter in the plane of rotation of the rotor blades 19, and its surface given a concave shape to direct the air in the desired manner.

At 27 I have indicated a door giving access to the bearing 12. A portion 28 of the rotor shaft is extended through the housing as indicated at 29, so that power may be taken from the shaft as through a clutch 30 to drive other machinery; but if the power of the turbine is to be used exclusively for driving the air compressor, the left hand end of the rotor shaft would be constructed exactly as shown for the right hand end thereof in Fig. 1. The flanges 13', 14' of the pipes 13, 14 are preferably mounted to slide in straight aligning guides 15' of dovetail or other suitable formation provided in the base 15, to facilitate assembly of the machine.

In the form of my invention illustrated by Fig. 4, the central enlargement of the core 8 is formed as a web 8' extending outwardly as far as the disk-like portions 2 of the rotor body and made with an annular flange or head 8'' to form grooves which, in connection with similar grooves in the disks 2, receive the inner portions or base flanges of the rotor blades 19', of which there are two annular sets in this form of my invention. Radial compressor blades 7' are provided on each side of the web 8', integral therewith. As in the form of my invention first described, the air current passes to the rotor in a substantially axial direction and is then gradually changed to a radial direction. In Fig. 4, the two streams of air on opposite sides of the web 8' are entirely separate, and therefore this form of my invention may be used as a two-stage compressor, if desired. For instance, air from the surrounding atmosphere might enter through the pipe 13, be compressed on the left-hand side of the machine, delivered to the collector 20' and pass out through the outlet 21' and a suitable pipe 31 to the base channel 16 connected with the right-hand pipe 14. The air would then be compressed further on the right hand side of the machine and delivered to the collector 20'' provided with an outlet 21''. Between the two sets of rotor blades 19'

I have shown a stationary set of blades 32 which serve to deflect and in a certain sense reverse the flow of the combustion gases or other power gases which operate the rotor. The other parts of the machine may be of the same construction as in the form of my machine first described, as will be evident from the reference numerals employed.

Various modifications may be made without departing from the nature of my invention as defined in the appended claims.

The bearings 11, 12 are preferably connected with the adjacent portions of the pipes 13, 14 respectively by ribs 33 which may be given an oblique or helical formation so that the air will be given a twist or initial rotary motion (in the same direction as by the vanes 5) even before such air enters the rotor. The air, by flowing around the said bearings, keeps them cool.

I claim:

1. In a rotary compressor, a rotor having a substantially axial inlet for the fluid to be compressed and a peripheral outlet for the compressed fluid, a normally stationary pipe communicating with said inlet and provided with a bearing for said rotor, and a base provided with a guide, parallel to the rotor axis, along which said pipe may be adjusted.

2. In a rotary compressor, a rotor having a substantially axial inlet for the fluid to be compressed and a peripheral outlet for the compressed fluid, a normally stationary pipe communicating with said inlet and provided with a bearing for said rotor, and a base provided with a guide, parallel to the rotor axis, along which said pipe may be adjusted, said base having an admission channel in registry with said pipe.

3. In a rotary compressor, a rotor having an axial inlet for the medium to be compressed, and a peripheral outlet for the compressed medium, a stator having an intake passage communicating with the rotor inlet, a shaft for said rotor, a bearing for said shaft positioned in said passage and spaced from the walls thereof, and bearing supports extending from the walls of said passage to said bearing.

4. In a rotary compressor, a rotor having an axial inlet for the fluid to be compressed, a stator having an intake passage communicating with the rotor inlet, a shaft for said rotor, a bearing for said shaft positioned in said passage to be cooled by said fluid, and spiral ribs extending from the walls of said passage to said bearing to maintain the bearing in position and to impart an initial rotary motion to the fluid before its admission to the rotor.

5. In a rotary compressor, a rotor having an axial inlet for the fluid to be compressed, a stator having an internal passage communicating with the rotor inlet, a shaft for said

rotor, a bearing for said shaft positioned in said passage to be cooled by said fluid, spiral ribs extending from the walls of said passage to said bearing to maintain the bearing in position and to impart an initial rotary motion to the fluid before its admission to the rotor, the walls of said passage being provided with an opening, and a door normally closing said opening through which access may be had to said bearing. 10

In testimony whereof I have hereunto set my hand.

CHRISTIAN LORENZEN.