

July 19, 1932.

J. O. HEINZE

1,868,143

TURBINE

Filed Aug. 24, 1928

2 Sheets-Sheet 1

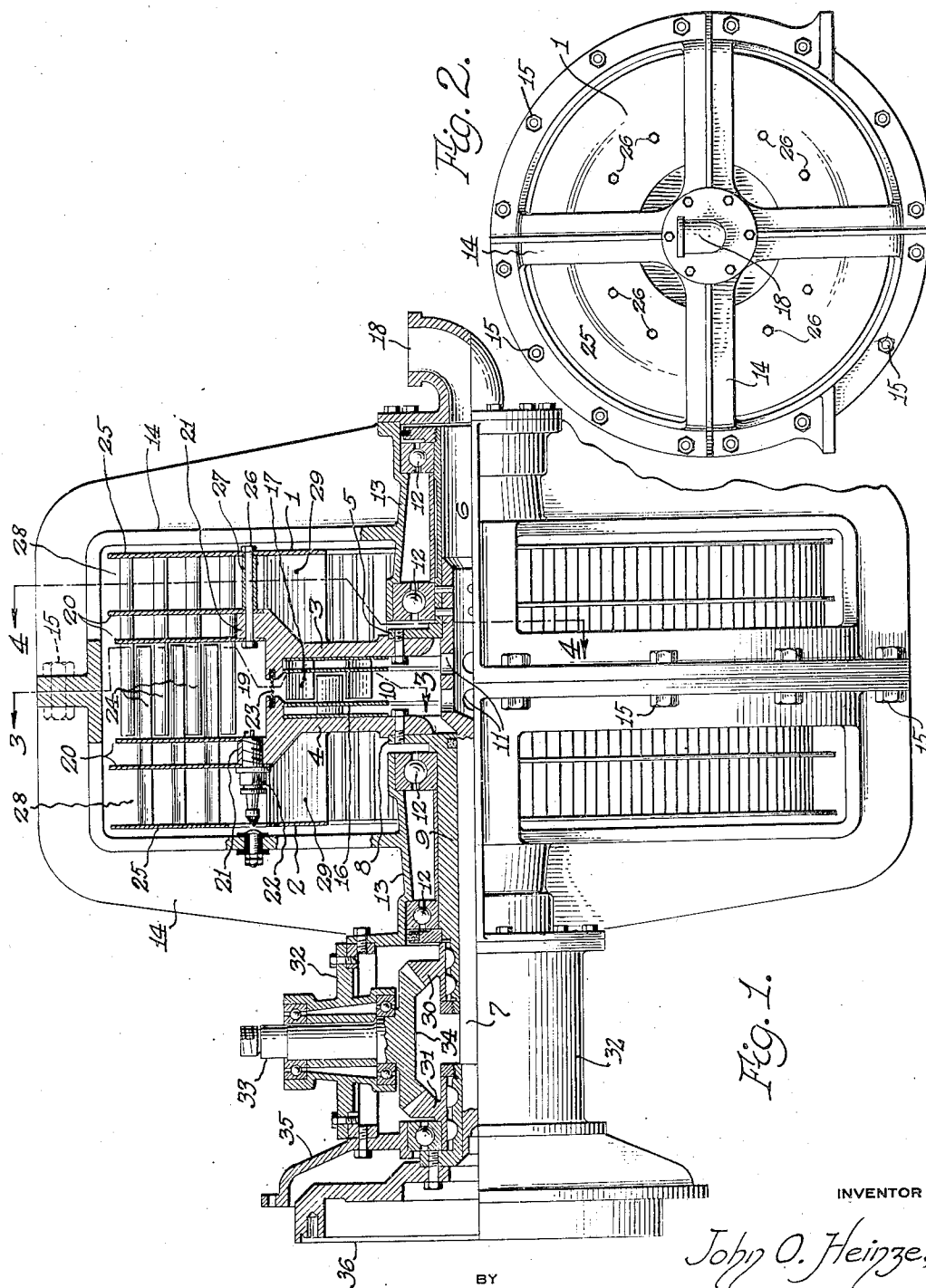


Fig. 1.

Fig. 2.

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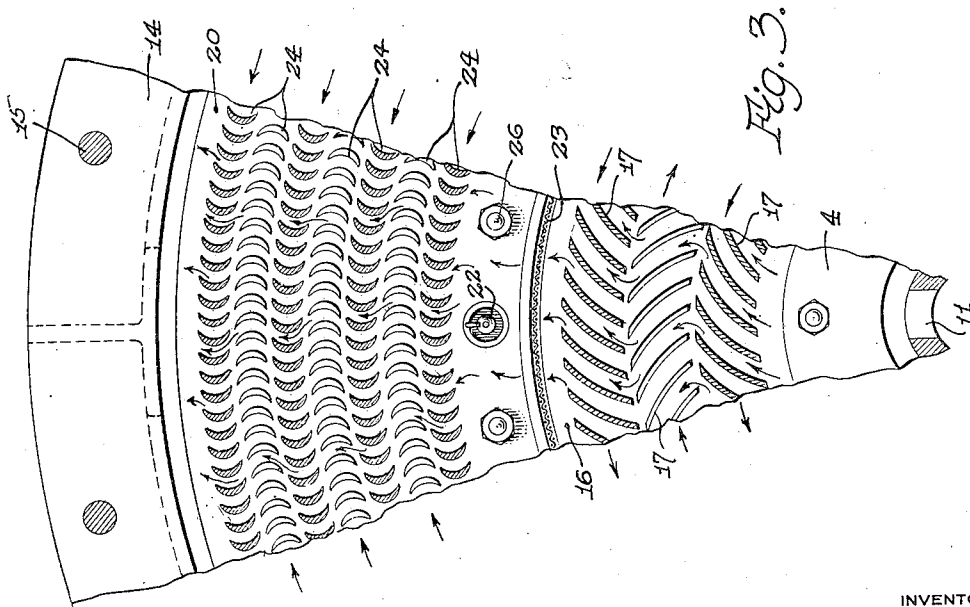
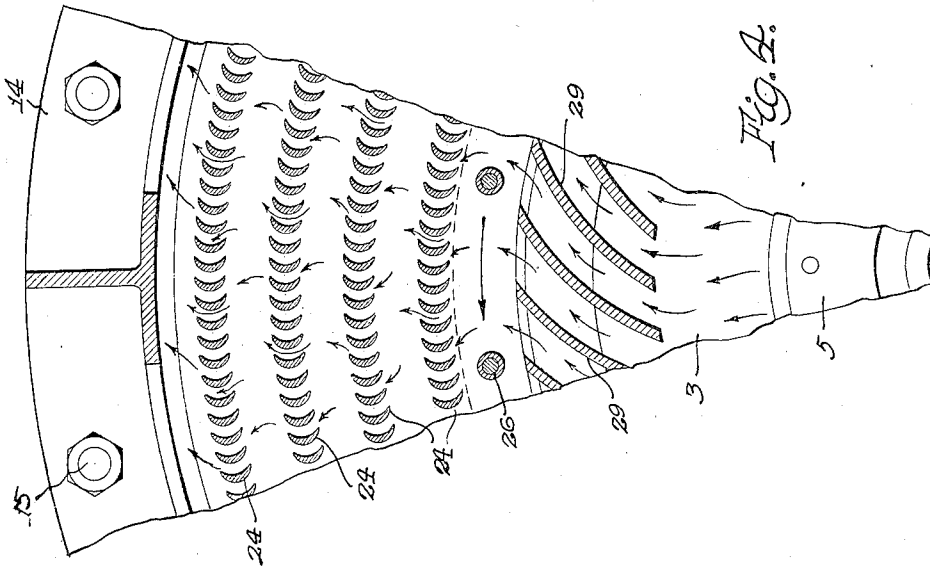
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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

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## TURBINE

Application filed August 24, 1928. Serial No. 301,779.

This invention relates to turbines of the type shown in my prior Patent No. 1,388,707, dated August 23, 1921.

In this type of turbine, the combustion chamber is practically filled with a great number of comparatively thin propeller blades which are therefore, subjected to the high heat generated in this chamber and are liable, in time, to become distorted or partially disintegrated thereby.

An object of the present invention is to effectually cool these propeller blades by directing air over portions of the blades to carry away the heat imparted thereto in the combustion chamber. A further object is to provide a mounting for the blades so constructed as to facilitate installation, reduce the cost of manufacture, provide ample bearing for each blade upon the mounting to insure efficient rigid support, and obviate all danger of the blades becoming loose in their support or displaced during engine operation.

With the above and other ends in view, the invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims, reference being had to the accompanying drawings in which

Figure 1 is a longitudinal, vertical section through a structure illustrative of an embodiment of the present invention;

Figure 2 is an end elevation of the same drawn to a reduced scale;

Figure 3 is an enlarged sectional detail substantially on the line 3—3 of Fig. 1, and

Figure 4 is a similar sectional detail substantially upon the line 4—4 of Fig. 1.

The operation of the turbine shown in the accompanying drawings is substantially the same as that of the turbine shown in my patent above referred to, but the construction has been modified to provide for an efficient cooling of the propeller blades and to adapt the engine for installation in a motor vehicle construction.

As shown in the accompanying drawings, the turbine comprises two separate and oppositely rotating rotors, indicated as a whole by the numerals 1 and 2, said rotors including annular plates or disks 3 and 4 respectively,

with the disk 3 secured adjacent its inner edge to a radial flange 5 on the tubular end portion 6 of an inner shaft 7, and the disk 4 bolted to a like flange 8 on a sleeve 9 through which the solid portion 7 of the inner shaft extends. The plates or disks 3 and 4 are spaced apart, providing a suction and compression chamber 10 therebetween which is in free communication with the interior of the tubular end portion 6 of the inner shaft or shaft of the rotor 1, through a series of holes 11.

The shafts 6 and 9 are mounted for free independent rotation in opposite directions, within bearings 12 of the anti-friction type, which bearings are mounted within tubular hub portions 13 of a non-rotatable rigid frame comprising a spider 14 made in two halves extending over and meeting in the mid-transverse plane of the rotors, said spider parts being flanged and securely bolted together by the bolts 15, forming a rigid supporting frame within which the rotors are mounted and free to rotate.

Within the suction and compression chamber 10 are two pairs of radially extending annular plates 16, the plates of each pair being spaced apart with one pair rigidly secured in any suitable manner to each disk 3 and 4, and the plates of each pair are formed with alined openings of a size and shape to conform to the cross-sectional shape of blades 17 which are forced endwise through these alined openings with the inner ends of the blades projecting across the chamber 10 and with the rows of blades carried by one rotor, alternating with the rows of blades on the other rotor and all of the blades curved in the direction of their width to form suction and compression blades arranged and formed substantially as in the well known "Sirocco" pressure fan or blower, their cross-sectional curvature and the angle of the setting of the blades on one rotor relative to those on the other rotor, being such that they will act to draw into the chamber 10, gaseous fluid through the openings 11 from the hollow shaft 6 to which said combustible fluid mixture is supplied

through a pipe connection 18 secured to the frame 14 over the open end of said shaft.

Radially outward from said suction and compression chamber 10, an annular chamber 19 is formed by securing a pair of parallel spaced apart annular plates 20 to opposite sides of a peripheral flange 21 on each of the disks 3 and 4, the pairs of plates forming the side walls of the chamber 19 and which walls are spaced apart a sufficient distance to provide a chamber of substantially three times the cubical capacity of the chamber 10 which chamber is in communication with the inner end of chamber 19 through a narrow space between the outer edge of the disks 3 and 4. A spark plug 22 is connected in the usual manner by wiring (not shown) to any suitable source (not shown) of electric current and is carried by the flange 21 on one of the disks and projects into the chamber 19 to ignite the combustible fluid forced into the chamber from the chamber 10 through a fire screen 23 secured to one of the disks and extending across the space forming the inlet for the chamber 19 so that the combustible mixture in chamber 10 will not be ignited by the flame in the outer chamber.

Chamber 19 therefore forms a combustion and expansion chamber and extending across the chamber and carried by the side walls thereof are interactive pressure receiving or pressure imparting elements in the form of propeller turbine blades 24 which in the particular form illustrated, are similar to blades employed in the well known Parsons turbine. Each rotor is provided with several concentric series or steps of these blades and the respective blades on the two rotors are curved oppositely to accord with the direction of rotation of the particular rotor on which they are mounted. These blades also overlap with the blades of the respective steps or rows projecting alternately from the side walls of the chamber and across the chamber to the opposite side wall.

These blades 24 are rigidly supported and securely held in proper relative position, by forming the two disks 20 comprising each pair, with aligned openings of proper size and shape to receive the blades which are forced endwise therethrough, each pair of disks thus providing spaced apart supports for each blade with the outer end portions of the blades projecting a considerable distance beyond the outer disks 20 with their outer ends fitting within openings in a third or outer disk 25 which disks 25 are rigidly secured in spaced relation to the outer disk of each pair 20 by bolts 26 and spacer sleeves 27 on these bolts. The several blades of each rotor are therefore further supported by the disks 25 and an annular air passage 28 is formed between each disk 25 and the adjacent disk 20 with the outer ends of the

blades 24 extending across these passages. Cast integral with or otherwise rigidly secured to each of the disks 3 and 4 is a series of laterally extending blades 29 which are curved in the direction of their width and set with the tangents to their curves at an angle and inclined according to the direction of rotation of the rotor by which they are carried, so that air will be forced thereby outward through the passages 28 over the outer ends of the blades which project across said passages, each disk 25 being of a width to extend across the full width of the blades 29 against the outer free end edges thereof and enclose said blades within the inner open ends of the passages, the outer ends of the passages being also open for the free escape of the air forced radially outward therethrough by the blades.

As the two rotors are driven in opposite directions by the action and reaction on the blades 24 of the expanding gases in the combustion chamber 19, the shafts to which these rotors are secured, also rotate in opposite directions, and to take off power from both of these shafts in such a manner that such power is available for the purpose of propelling a motor vehicle, and to also provide a construction and arrangement which is particularly adapted for such use, the sleeve 9 forming the shaft of the rotor 2 is provided with a bevel pinion 30 at its outer end through which end the shaft 7 of the rotor 1 extends, and a like bevel pinion 31 is secured upon the projecting end of the shaft 7. Mounted at right angles to the shaft 7 in suitable bearings in a casing 32 forming a housing for these gears and rigidly bolted to the end of the hub 13 of the fixed frame 14, is an idler shaft 33 with its end projecting from the casing and on this stub or idler shaft is an idler pinion 34 in mesh with both of the pinions 30 and 31 so that power will be transmitted from one to the other of said pinions to turn the pinion 31 in a reverse direction to that of the pinion 30 but in the same direction as the shaft 7. A bell housing 35 is bolted to the end of the casing 32, and arranged to be bolted at its periphery to a fly wheel housing (not shown) and secured to the end of the shaft 7 within this bell housing is a circular member 36 adapted to be bolted directly to the usual clutch assembly (not shown). This construction and arrangement of motor is therefore particularly adapted for installation upon motor vehicles.

In operation the engine is initially started by applying power to the projecting end of the stub shaft 33 in any suitable manner. The rotors are thus initially rotated in opposite directions to cause combustible fluid to be drawn into the chamber 10 by the operation of the blades 17, compressed therein and forced into the combustion chamber 19. A

spark is then produced at the spark plug terminals in the usual manner of firing charges in an internal combustion engine and the gaseous mixture fired, producing rapid expansion in the chamber 19 which will act and react upon the blades 24 to drive the rotors. After the initial starting, combustion in the chamber 19 is maintained by the continuous flame produced and as the outer or peripheral end of this chamber 19 is open to the atmosphere, the products of combustion escape freely.

The mounting of all of the blades 17 and 24 in spaced apart thin metal walls having alined openings shaped to conform to the cross-sectional shape of the blades, provides a very strong rigid support for these blades and also securely holds the same in their proper relative positions, at the same time affording a construction which is cheap to manufacture, and by extending the blades 24 and providing a third disk or wall forming an air passage across which the extended ends of the blades extend, effective cooling of these blades is secured as the heat imparted to the blades within the combustion chamber will quickly pass by conduction to their outer ends and be carried away by the air forced through the air passages by the blades 29.

Having thus fully described my invention, what I claim is:—

1. A turbine including opposed rotors forming between them a chamber, pairs of parallel spaced apart plates secured adjacent their inner edges to said rotors and forming the walls of said chamber, means forming air passages at the outer side of each wall, and blades extending from each wall across the chamber to adjacent the opposite wall, said plates of each pair and said means being formed with aligned openings within which the outer end portions of said blades are fixed with said outer end portions extending across said air passages.

2. A turbine including opposed rotors forming between them a chamber having side walls, a plate carried by each of said rotors and spaced from each of said side walls to form air passages outside of said walls parallel with said chamber, and propeller blades carried by said chamber side walls and extending across said chamber with their outer end portions extending across said air passages at each side of said chamber.

3. A turbine including opposed rotors forming between them an inner suction and compression chamber and an outer combustion chamber in communication with said inner chamber, a plurality of spaced apart plates carried by each rotor and forming the side walls of said combustion chamber, an outer plate spaced from the outer plate of each pair to form air passages at the outer side of each pair of plates forming said side walls of said combustion chamber, said pairs

of said plates being formed with aligned openings and said outer plates being formed with openings, and a plurality of blades carried by each rotor and supported within said openings in said pairs of plates and said openings in said outer plates with their inner end portions extending across said combustion chamber to adjacent the opposite wall thereof and with said inner end portions of the blades carried by one rotor in overlapping relation to those carried by the other rotor, and with the outer ends of said blades extending across said air passages, and blades carried by said rotors for forcing air outwardly through said air passages.

4. A turbine including a supporting frame, opposed rotors supported in said frame for free rotative movement, said rotors forming between them an inner annular suction and compression chamber and an outer annular combustion chamber in communication with said inner chamber, said combustion chamber side walls being each formed by spaced apart plates, suction and compression blades in said inner chamber, propeller blades mounted in openings in said spaced apart plates forming the side walls of the combustion chamber with their inner ends extending across said chamber, a plate carried by each rotor and spaced from said plates forming the side walls of said combustion chamber to form air passages, said propeller blades extending through and beyond said walls into openings in said plates forming said air passages and across said passages, and blades on each rotor for forcing air across the outer projecting ends of said propeller blades through said air passages.

In testimony whereof I affix my signature.

JOHN O. HEINZE.