Sept. 17, 1946. J. A. FISHER 2,407,824

TURBINE ENGINE

Filed Nov. 22, 1943 3 Sheets-Sheet 1

Fig. 1.

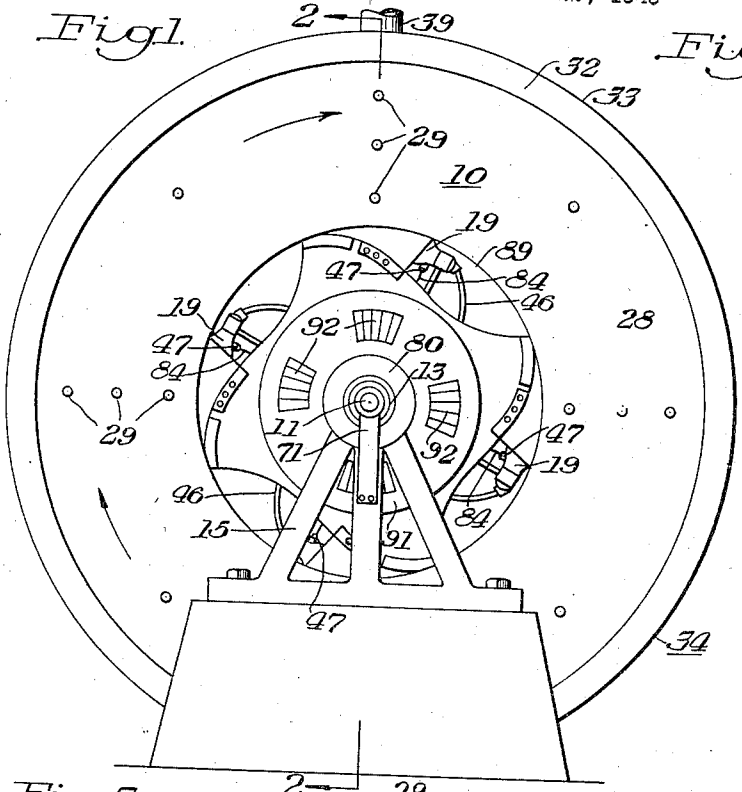


Fig. 4.

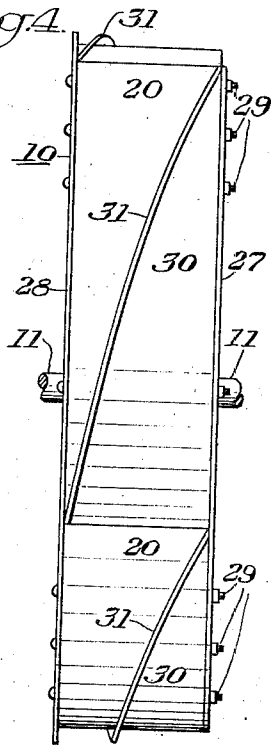
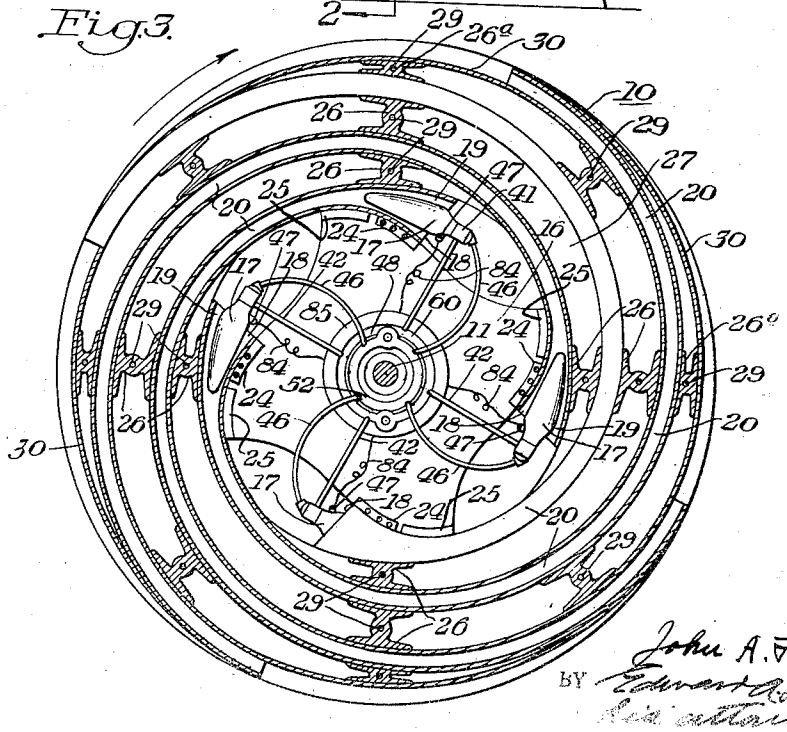


Fig. 3.



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TURBINE ENGINE

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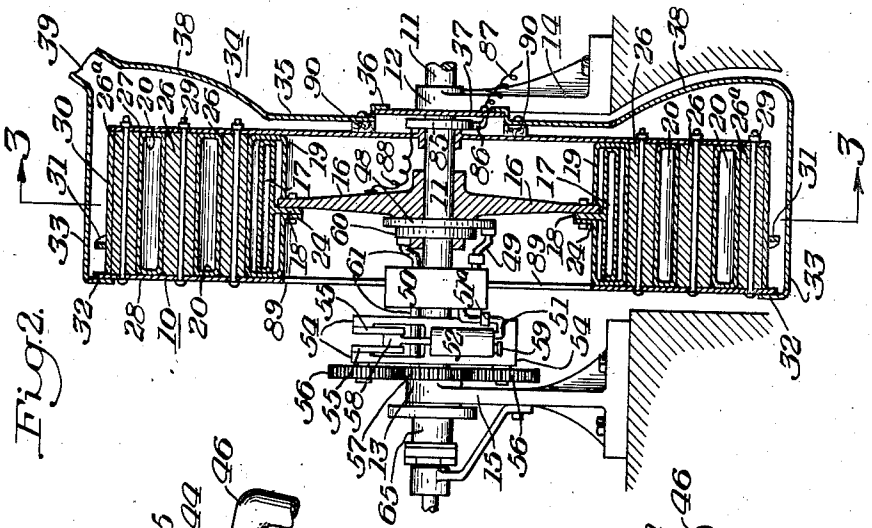


Fig. 2.

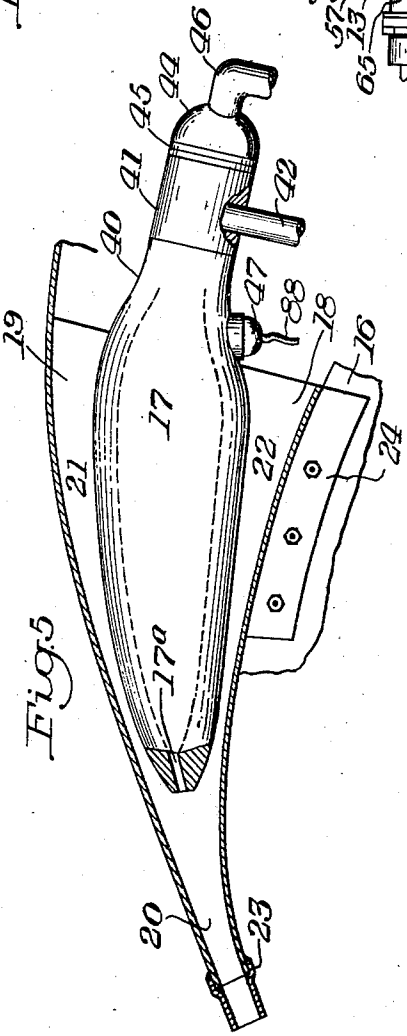


Fig. 5

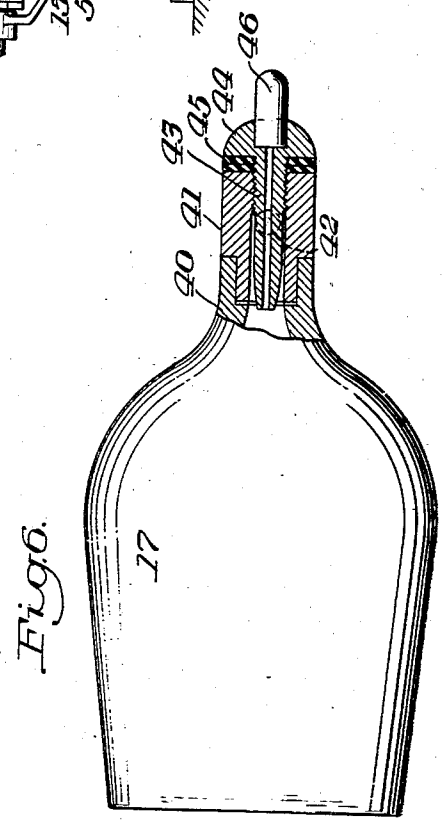


Fig. 6.

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TURBINE ENGINE

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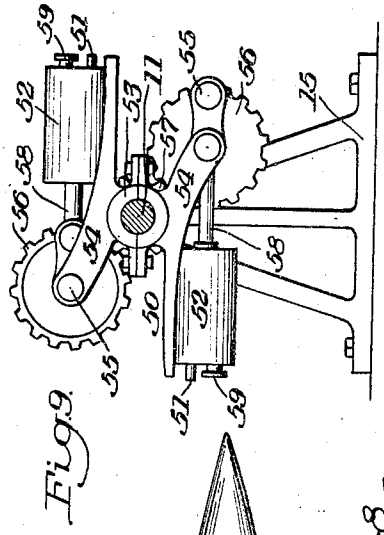


Fig. 9.

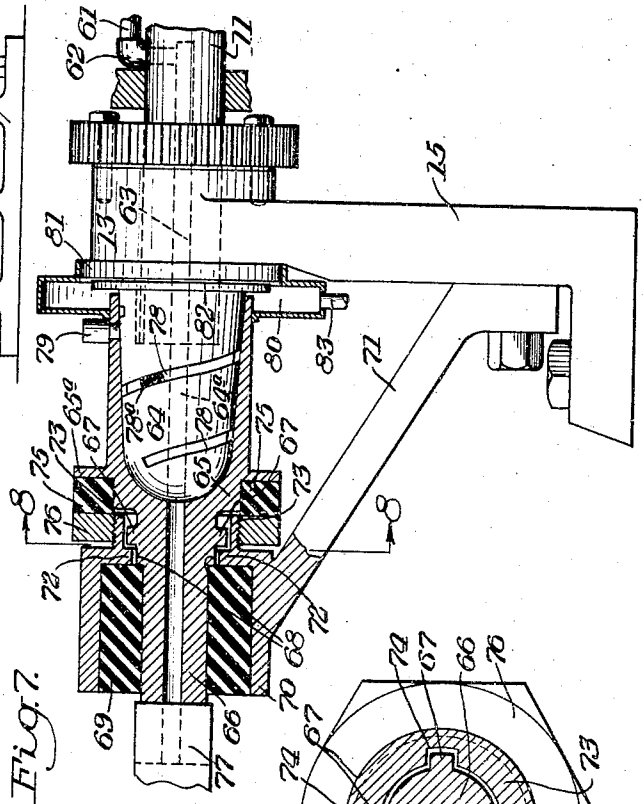


Fig. 7.

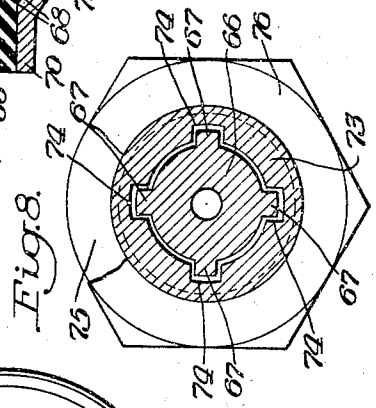


Fig. 8.

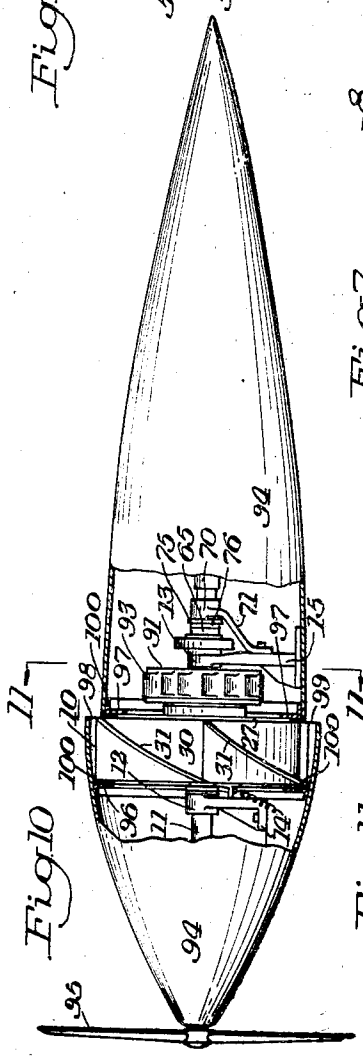


Fig. 10.

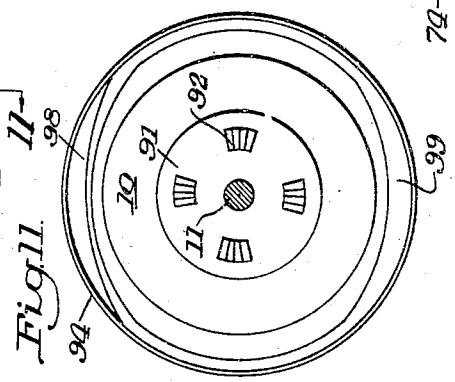


Fig. 11.

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Patented Sept. 17, 1946

2,407,824

UNITED STATES PATENT OFFICE

2,407,824

TURBINE ENGINE

John A. Fisher, Tarpon Springs, Fla.

Application November 22, 1943, Serial No. 511,287

15 Claims. (Cl. 60—41)

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My invention consists in a new and improved internal combustion engine of the turbine type.

Among the novel features of construction and arrangement of parts which characterize the same are the following:

A turbine engine comprising a rotor in which are mounted a plurality of symmetrically arranged tubes substantially of spiraloid form into the inner ends of which tubes the products of combustion are introduced and the reaction forces generated by the travel of the products cause the rotor to rotate on its axis;

A turbine engine of such character wherein the tubes are substantially disposed in a plane rectangular to the axis of rotation of the rotor;

A turbine engine comprising a rotor in which are mounted a series of symmetrically arranged tubes of substantially spiraloid form into the inner ends of which the products of combustion are introduced from combustion chambers wherein are ignited explosive mixtures of fuel and air;

A turbine engine comprising a rotor carrying a series of symmetrically arranged tubes having combustion chambers communicating with the inner ends of the tubes, and means for introducing the fuel and air into said chambers from the axis of the turbine;

A turbine of the character last described in which the elements of the fuel mixture are supplied to the combustion chambers from the axial portion of the rotor;

A turbine of the character described in which compressed air for the combustion chambers is supplied by compressor means operated by the rotation of the rotor;

A turbine of the character described in which the rotor is provided with a stationary housing and with means for discharging the products of combustion emitted from the rotor to without the housing;

A turbine of the character described in which the fuel is introduced through the axial shaft of the rotor;

A turbine of the character described in which a novel leakproof connection for the passage of fuel is provided between the axial shaft of the rotor and the fuel supply conduit.

Other novel features of construction and arrangement of parts will appear from the following description:

In the accompanying drawings, wherein is illustrated a practical embodiment of the principles of the present invention:

Fig. 1 is a side elevation of a turbine internal combustion engine shown mounted on a stationary foundation;

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Fig. 2 is a vertical cross section of the same taken along the line 2—2 in Fig. 1, certain parts and connections being omitted for the sake of clearness, the compressor cover being omitted;

Fig. 3 is a sectional view of the rotor removed from the housing, taken along the line 3—3 in Fig. 2, but, for the sake of clearness, with one of the four spiraloid tubes shown in elevation;

Fig. 4 is an elevation of the rotor looking from the right in Fig. 3;

Fig. 5 is a side elevation on enlarged scale of one of the combustion chambers with the scoop end of the corresponding tube shown in section;

Fig. 6 is a plan view of one of the combustion chambers with the burner mechanism shown in section;

Fig. 7 is a view on enlarged scale of a portion of the tubular axial shaft of the rotor and the fuel connections therefor, the same being partially in section for the sake of illustration;

Fig. 8 is a sectional view along the line 8—8 in Fig. 7;

Fig. 9 is a view looking from the left in Fig. 2 and showing the mounting of the twin air compressors on the axial shaft, associated elements being omitted for the sake of clearness;

Fig. 10 is a side view of an airplane nacelle, partially broken away, showing a suitable method of mounting the turbine in an airplane;

Fig. 11 is a cross sectional view along the line 11—11 in Fig. 10, the turbine being omitted.

Referring to the drawings:

10 indicates generally the rotor, of the turbine, which is fixed on the rotatable axial shaft 11, the shaft being journaled in bearings 12 and 13 in spaced apart stands 14 and 15, respectively, which stands are supported on suitable foundations.

16 is a disk rigid on the shaft and supporting on its perimetral edge a plurality, four in the illustration, of equally spaced apart combustion chambers 17, which chambers are preferably of wide, flattened cross sectional shape and are provided on their under surface with fins 18 which mate in surface contact with the side surface of the disk. The approximate contour of the combustion chamber 17 is illustrated in Figs. 2, 5 and 6. The discharge openings of the combustion chambers are slotted as shown at 17a. As shown in Fig. 5, and also in Fig. 2, the combustion chambers are inserted in the vertically flared air-scoops 19 which form the inlet ends of the spiraloid tubes 20, air inlet passages 21

and 22 being provided between the upper and lower walls of the combustion chambers and the adjacent upper and lower walls of the scoops. The scoops 19 may be integral with the tubes 20, as shown in Fig. 2, or they may be separate elements attached to the inlet ends of the tubes as indicated at 23 in Fig. 5.

The scoops 19 are provided in their bottom walls with slots to provide clearance for the disk and also fins 24 which fit against the fins 18 so that bolts may be used to attach the scoops and the combustion chambers to the disk.

25 indicates ledges or broadened perimetral surfaces for the disk 16 upon which the scoops may be given additional support by the disk.

The tubes 20 are arcuately disposed and may, if desired, be closely convoluted together, but I prefer them to be spiral or spiraloid, and spaced apart somewhat so that all the tubes may have the same convolution curvature. Again such spacing permits the support of the elements in proper relation by bolsters 26 extending between the side plates 27 and 28.

These side plates, best shown in Fig. 2, are circular in shape and are held in position by means of the stay bolts 29 extending through holes in the interposed bolsters 26.

The tubes 20 are of the flattened character substantially as indicated by their cross sections in Fig. 2, and they may increase somewhat in vertical capacity toward their outer or discharge ends which extend to the perimeter of the rotor, as shown in Fig. 3.

The discharge ends of the tubes are provided with extension plates 30 which extend from the floor of the tube to the roof of the extremity of the next succeeding tube. 31 indicates baffle plates which have their inner edges secured, as by welding, to the outer surface of the plates 30 and which are biased from one side of the mouth of each tube to the other side of the rotor, thus directing the exhaust fumes toward one side of the rotor, the right side in Figs. 2 and 4. The outer edges of the baffles 31 are concentric with the axis of the rotor, and have a slight clearance from the housing. These extension plates 30 may be supported by additional bolsters 26*a*.

One of the side plates, 28, the left one in Fig. 2, is extended outwardly radially so as to be overlapped outwardly, preferably in sliding contact, by the inturned edge flange 32 of the cylindrical portion 33 of the housing 34. The side wall 35 of the housing 34 is provided with a central opening having an edge formed as an angle flange 36 which fits on the perimetral edge of and is secured to the face of a disk 37 fixedly mounted on the stand 14, which disk is provided with a central opening to provide clearance for the shaft 11.

The outer portion of the side wall 35 of the housing 34 is dished outwardly, away from the rotor 10 to form an annular chamber 38 into which the exhaust gases of combustion, discharged from the tubes 20, are directed by the biased vanes 31. These gases are carried off through the exhaust duct 39.

The baffles 31 are vertical continuations of the forward walls of the tubes 20 and as the baffles sweep against the forcible stream of discharging gases a substantial propulsion effect on the vehicle, upon which the turbine is mounted, is obtained, and upon the rotor itself.

Referring now to Figs. 5 and 6, the ends of the combustion chamber 17, which protrude from the air scoops 19 are tapered to a neck 40 in which is inserted the reduced end of the air cup 41, compressed air being admitted to the interior of the cup through an air conduit 42 which may enter the cup laterally as shown in the drawings. 43 indicates a tubular burner nipple, the cylindrical body portion of which has an external diameter sufficiently less than that of the bore of the air cup to provide an annular air passage, but the outer portion of which is somewhat enlarged and threaded to be screwed into the threaded outer portion of the bore of the cup 41. The outer end of the nipple 43 is provided with an enlarged head 44 having an annular flat surface which compresses a gasket or gaskets 45 against the end of the cup to prevent leakage of fuel. The outer end of the bore of the nipple is connected to a fuel conduit 46.

47 indicates an electric firing plug extending into the combustion chamber adjacent the inner end of the air cup and fuel nipple to ignite the gaseous mixture of air and fuel.

The compressed air conduits 42 extend inwardly toward the axis of the rotor and connect with an annular header 48 which surrounds the shaft 11 and is secured to the face of the disk 16. Compressed air is supplied to the header 48 through a pipe 49 leading from the annular compressed air tank 50 which is mounted on the shaft 11 and rotates therewith.

The air tank 50 is connected by the pipes 51 with the outer ends of the cylinders 52 of the air compressors, which are illustrated in Fig. 9 as two in number and oppositely disposed. The pipes 51 are provided with check valves 51*a* to prevent backflow of air from the tank 50.

The cylinders are mounted on a support which comprises a central collar 53 which is mounted on the shaft 11 and rotates therewith, and two oppositely disposed tangential frames 54 which on one of their end portions support the pump cylinders 52, as best shown in Fig. 9.

The other end portions of the frames 54 are bifurcated, as best shown in Fig. 2, and have journaled between their twin arms the crank shafts 55. One end portion of each of said shafts extends through the adjacent arm of the frame and has fixed on its extremity the gear 56. The gears 56 are in mesh with a stationary pinion 57 mounted on a collar integral with the bearings 13 and concentric with the shaft 11. The speed of the gears 56 and consequently that of the operation of the compressor pumps is thus greatly reduced from the speed of rotation of the shaft 10 when the rotor is rotating.

As the air compressors rotate with the shaft 11 the gears 56 travel around their orbits and are rotated by their engagement with the fixed pinion 57 and thus cause the piston rods 58 of the air compressors, which are connected to the cranks of the crank shafts 55, to reciprocate in the cylinders 52, thus compressing the air and supplying it to the tank 50 which dampens the impulses of the reciprocating pistons of the air compressors and provides a flow of air to the air cups 41 at substantially constant pressure.

59 indicates the air inlet valves for the cylinders 52.

Referring now to the fuel supply means for the fuel pipes 46, 60 (Fig. 2) indicates an annular fuel manifold surrounding and rotating with the shaft 11. The fuel pipes 46 extend inwardly from the fuel nipples 43 and connect with the manifold 60.

Fuel is admitted to the manifold 60 through a pipe 61 which extends longitudinally of the

shaft 11 and connects with a nipple 62 connected to a radial port in the shaft 11, which port communicates with a longitudinal bore 63 extending to the adjacent extremity of the shaft (Fig. 7).

The fuel pipes 46 and the air conduits 42 are curved from their inner extremities toward the combustion chambers in a direction the reverse to that of the rotor's motion, which latter is shown by the arrows in Fig. 3. This arrangement of these pipes and conduits assists in the flow of fluid and augments the Venturi action of the air at the fuel nipple. Thus the need of a fuel pump may be avoided.

In Fig. 7 the extremity of the shaft 11 is shown as having fixedly secured thereto a cylindrical head 64 having formed therethrough a central bore 64a forming a continuation of the bore 63 of the shaft. The outer end of the head 64 is preferably rounded, as shown.

65 indicates a stationary cavitated or socket member, in which head 64 fits and rotates with the shaft 11. The socket member may be made of metal or other suitable material, but preferably not the same metal as that of the head 64 to avoid undue friction or tendency to seize.

The socket member 65 is provided with a tubular neck 66 provided with a plurality, shown as four in Fig. 8, of regularly spaced apart radial lugs 67 and spaced outwardly from the lugs an annular shoulder 68. 69 indicates a cylindrical encasement or cushion of rubber or other resilient material encasing the neck 66 and bearing inwardly against the shoulder 68. The cushion 69 is mounted in a collar 70 formed on the end of a bracket 71 extending upwardly from the stand 15.

The collar 70 is provided at its inner end with an inturned annular wall 72 which is radially aligned with the shoulder 68 but spaced therefrom. The cushion 69 bears against said wall.

Beyond the wall 72 the collar 70 extends axially in the form of a hollow boss 73 which is exteriorly cylindrical and threaded, while the bore of the boss is provided with radial seats 74 which receive the lugs 67, thus preventing the socket 65 from rotating with the head 64.

75 indicates an annular rubber or other resilient means on the member 65 which bears inwardly against an annular shoulder 65a formed on the exterior of the member, and 76 indicates a nut screwed on the threaded exterior of the boss 73 and tightened against the washer 75 to maintain the head and socket member in proper engagement, the washer providing sufficient resiliency to accommodate any play on the part of the shaft.

77 indicates a flexible fuel pipe attached to the protruding end of the tubular neck 66, and through which liquid fuel is admitted under suitable pressure head.

78 indicates a groove or grooves cut in the perimetral surface of the head 64 and supplied with grease or other lubricant. Preferably the grooves are generated as a spiral as to be supplied, while the head is rotating, with lubricant from the cup, or other source 79 mounted on the socket member 65. 78a indicates a packing ring, which may be of rubber, which preferably is placed in the groove to aid in distributing the lubricant and to block the escape of fuel between the mating surfaces of head 64 and socket member 65.

80 indicates a stationary annular dust box which is mounted on the annular shoulder 81 of the bearing 13, surrounding the annular base

flange 82 which is formed on the inner end of the head 64.

The box acts not only to prevent the entrance of foreign material between the head 64 and the cylinder 65 but functions as a collector of any fuel that may leak out between the head and the cylinder, such leakage being led away through the drain pipe 83.

Referring now to the electric current supplied to the firing plugs 47, 84 indicates electric conductors connected to each of the firing plugs, which conductors extend inwardly radially of the rotor, and 85 is a collector ring which encircles the shaft 11 outside the side plate 27 and inside and spaced from the bearing 12. The ring 85 is insulated from the shaft 11 and other portion of the mechanism but rotates therewith.

86 indicates a fixed finger supported by but insulated from the disk 37 of the bearing 12 and in contact with the rotating collector ring 85. Electric current is supplied to the fixed finger 86 by means of a conductor 87 extending through an aperture in disk 37 from a battery, magneto or other source of electric current, not shown.

The conductors 84 are connected at their inner ends to the lead conductor 88 which is connected to the collector ring.

It will be noted from Figs. 1 and 3 that the side plate 28 of the rotor 10 is provided with a large central opening 89, while the other side plate 27 (Fig. 2) has a flanged central opening which fits the shaft 11 snugly to prevent the entrance of waste gases from the housing into the interior of the rotor. As an additional caution against such gases, a compression annular gasket 90 is secured to the inner surface of the wall 35 of the housing 34 concentrically with the shaft 10. This gasket contacts the side wall 27 of the rotor 10 while the latter rotates and thus obstructs the travel of gases from the annular chamber 38.

The opening 89 in the side wall 28 is furnished to provide the free passage of air for the ventilation and cooling of the interior of the rotor 10.

Referring now to Figs. 1 and 10, 91 indicates a two part metal cover, omitted for the sake of clearness from Figs. 2 and 7, which may be used to inclose the air compressor mechanism to protect the same and also for the purpose of streamlining the unit and to cool the air compressors.

The cover is formed in the shape of a circular box with a central opening, the box being halved diametrically and provided for connecting the sections together when in place. The central opening fits the shaft 11 snugly and is clamped thereto when assembled in position.

The internal diameter of the cover is such as to enclose the compressor mechanism and it may readily be removed or installed in place.

The side walls of the cover 91 and the perimetral wall of the same are provided with louver openings 92 and 93, respectively, the same being so disposed that, as the cover rotates air is drawn in through the openings 92 and discharged through the openings 93, thus cooling the air compressor mechanism. The forcible entry of air through the openings 92 also provides an initial air pressure for the inlet valves of the compressor cylinders.

Referring now particularly to Figs. 10 and 11, wherein the turbine engine is shown installed in the nacelle 94; in Fig. 10 the housing 34 shown in other of the views is omitted as the wall of the nacelle may function as a substitute for the hous-

ing preferably employed in stationary installations of the engine.

As shown, the rear extremity of the shaft 11 is supported by the bearing 13 on the stand 15 secured to the floor of the nacelle, while at the other side or front of the engine is shown the stand 14 and bearing 12 through which the shaft 11 extends forwardly to and through the nose of the nacelle to carry the propeller 95. Between the bearing 12 and the rotor 10, the nacelle is shown provided with a vertical stiffening ring 96 and a similar ring 97 is provided in the rear of the rotor, which latter is slightly elliptical.

As shown in Figs. 10 and 11 the wall of the nacelle at the top and bottom is slit transversely for a suitable space adjacent the elliptical ring 97 and the upper and lower walls of the nacelle are bent inwardly to provide the upper and lower escape ports 98 and 99 for the waste gases discharged by the tubes of the rotor and directed rearwardly by the baffles 31. These gases are sucked out and carried off in the slipstream of the airplane.

Each of the rings 96 and 97 may be provided with an annular ring or facing of asbestos 100 which is in light contact with the side walls of the rotor to prevent the entrance of waste gases into the interior of the nacelle.

The operation of the turbine engine hereinbefore described is as follows:

Liquid fuel, preferably volatile, is introduced through the pipe 77 into the bore of the neck 66 of the cylinder 65 and thence through the bore of the head 64 and that of the shaft 11, when it passes through the nipple 62 and pipe 61 to the fuel manifold 60 whence it is distributed through the individual fuel conduits to the several firing nipples 43, and compressed air is supplied to the corresponding air cups 41 through the individual conduits 42. The fuel mixture of fuel and air is discharged into the rear ends of the combustion chambers.

Preferably the relation between the perimetral wall of the firing nipples and the inner wall of the air cups is such as to provide a Venturi action, and thus the flow of the air under pressure tends to suck the fuel through the burner nipples and forces the mixture of fuel and air into the interior of the combustion chambers where it is ignited.

The pressure of the air supplied to the air cups 41 should be sufficient to support combustion and overcome back pressure of the products of combustion.

A continuous stream of the products of combustion is forcibly ejected through the slotted outlets 17a of the chambers 17, and as the rotor attains speed in rotation, atmospheric air is gathered up by the scoops 18 and passes through the passages 21 and 22 to be mingled with the burning gases, thus absorbing a portion of the heat and thus protecting the coils if made of thin metal. This atmospheric air is energized by the heat and kinetic properties of the blast of burning gases and augments the values of the same, inasmuch as the blast of burning gases when mixed with the atmospheric air constitute heavier and more copious streams that are sped through the tubes 20 impinging against the inner surface of the perimetral walls of the latter for their full length. It is evident that the greater the pressure of the air supplied to the combustion chambers, to be mingled with the fuel supplied thereto in adequate quantity, the more intense will be the combustion of the fuel mixture and the more effective will be the continuous blasts delivered to the tubes 20.

The introduction of these continuous blasts of the hot gases of combustion into the curved, preferably spiraloid tubes 20 and their impingement against the walls thereof generates rotary motion in the rotor 10, which in turn rotates the axial shaft 11. The vanes 31 serve to sweep the products of combustion emitted from the tubes, toward and into the annular exhaust chamber 38 whence they escape through the outlet 39.

The continuous blast effective in the bores of the tubes 20 impinges on the interior walls of the same, and insomuch as the tubes are convoluted and preferably increase in inside diameter toward their discharge ends, and as the tubes continuously become more distant from the center of rotation, constant reactive forces are effective on the rotor by the blasts in the tubes and prior to the discharge of the gases against the vanes.

A method of initiating rotary movement is to permit fuel to flow into the combustion chambers either under forced pressure or gravitational head to more or less saturate the atmospheric air in the chambers 17, forming a mixture readily ignited by the firing plugs. This starts the rotation of the rotor, and as the same picks up speed the fuel and air supplied to the combustion chamber will be progressively increased in quantity, and thus the energizing forces will be multiplied and the speed of rotation built up to that desired, the same being controlled by regulating the quantity of fuel admitted through the pipe 77.

Again, when the fuel supply is cut off, the rotor will rapidly lose speed and come to a stop, because of the braking effect of the air compressors which continue to compress air until rotation ceases. This braking action is not effective in starting rotation of the rotor because the pressures in the pump cylinders and in the air tank do not become significant until the rotor has attained a high rate of rotative speed.

The method shown for introducing fuel from without the rotor through an axial bore in the shaft 11 is such that sufficient flexibility is provided to permit such angularity and misalignment as may occur in the case of the shaft 11 without producing leakage or disconnection.

The method shown for producing and supplying compressed air through compressor mechanism operated by the shaft of the rotor provides a suitable head of air to support combustion without admitting the air to the combustion chambers from an outside source or a source apart from the turbine.

Although, for the sake of clearness I have described in detail the specific embodiment of the principles of my invention disclosed for the purpose of illustration in the accompanying drawings, it is apparent that various modifications may be made in the construction of the turbine, and in the manner of operation of the same, without departing from the scope of the novel principles of my invention, and therefore I wish to claim broadly:

1. In an internal combustion turbine, the combination of a rotor, a plurality of substantially spiral tubes symmetrically arranged on the rotor, and having their inner ends progressively enlarged to form air-scoops and their outer ends open for discharge, said tubes being disposed in a plane normal to the axis of the rotor and in convolute relation to one another, an individual combustion chamber extending into the inner end of each of the tubes for the introduction of burn-

ing gases of combustion into the latter to be emitted through the same, passages being provided between the walls of the combustion chambers and the walls of the scoops for the forcible introduction of secondary air into the tubes while the rotor is in motion, and means for introducing a fuel mixture into said chambers and igniting the same.

2. In an internal combustion turbine, the combination of a rotor, a plurality of substantially spiral tubes symmetrically arranged on the rotor, and having their outer ends open for discharge, said tubes being disposed in a plane normal to the axis of the rotor and in convolute relation to one another, an individual combustion chamber located adjacent the inner end of each of said tubes and arranged to discharge the burning gases of combustion into the latter to be emitted through the same, means operated by the rotation of the rotor to supply secondary air under pressure to the combustion chambers, means to supply fuel to the combustion chambers, and means to ignite the fuel mixture in the combustion chambers.

3. In an internal combustion turbine, the combination of a rotor, a plurality of substantially spiral tubes symmetrically arranged on the rotor, and having their outer ends open for discharge, said tubes being disposed in a plane normal to the axis of the rotor and in convolute relation to one another, an individual combustion chamber arranged to discharge the burning gases of combustion into the inner end of each of the tubes to be emitted through the same, passages extending outwardly from the axis of the rotor to supply air and fuel to the combustion chambers, and means to ignite the fuel mixture in the combustion chambers.

4. In an internal combustion turbine of the character described, the combination of a rotor, a plurality of substantially spiral tubes symmetrically arranged on the rotor, and having their outer ends open for discharge and the inner ends of the tubes being shaped to form flattened scoops for the introduction of secondary air into the tubes as the rotor moves, said tubes being disposed in a plane normal to the axis of the rotor and in convolute relation to one another, an individual combustion chamber extending into the inner end of each of the tubes, said chambers having extended slotted emission openings for the discharge of the burning gases of combustion in the form of a flat sheet into the tubes, and means for supplying a fuel mixture to the chambers and igniting the same.

5. In an internal combustion turbine, the combination of a rotor, an axial shaft upon which the rotor is mounted and which moves with the latter, means carried by the rotor and actuated by the burning gases of combustion to rotate the same, the shaft being provided with an axial bore for conducting fuel to said means, a conduit, a rounded head on the end of the shaft and having a bore communicating with the bore of the shaft, a socket in which the head is received for rotation, the socket and the head being provided with curvilinear mating surfaces, and a conduit connected to the outer end of the socket for the supply of fuel to the latter.

6. In an internal combustion turbine, the combination of a support, a rotor journaled in said support and arranged for rotation, a plurality of substantially spiral tubes carried by the rotor, said tubes being disposed in a plane normal to the axis of the rotor and in convolute relation to each other, the inner ends of said tubes being open for the introduction thereinto of the burning gases of a fuel mixture and their outer ends open for the discharge of said gases, an equal number of combustion chambers mounted on the rotor, one of said chambers being arranged to discharge burning gases of a fuel mixture into each of said tubes, means for supplying a gaseous fuel mixture to said combustion chambers, means for igniting the fuel mixture in said combustion chambers, and means for forcibly introducing secondary air into the inner ends of the tubes to be intermingled with the burning gases.

7. In an internal combustion turbine, the combination of a support, a rotor journaled in said support and arranged for rotation, a plurality of substantially spiral tubes carried by the rotor, said tubes being disposed in a plane normal to the axis of the rotor and in convolute relation to each other, the inner ends of said tubes being open for the introduction thereinto of the burning gases of a fuel mixture and their outer ends open for the discharge of said gases, an equal number of combustion chambers mounted on the rotor, one of said chambers being arranged to discharge burning gases of a fuel mixture into each of said tubes, means for supplying a gaseous fuel mixture to said combustion chambers, means for igniting the fuel mixture in said combustion chambers, and the inner ends of the tubes being enlarged to form scoops into which the combustion chambers extend leaving passages about the chambers for the forcible introduction of secondary air into the inner ends of the tubes to be intermingled with the burning gases, while the rotor rotates.

8. In an internal combustion turbine, the combination of a support, a rotor journaled in said support and arranged for rotation, a plurality of substantially spiral tubes carried by the rotor, said tubes being disposed in a plane normal to the axis of the rotor and in convolute relation to each other, the inner ends of said tubes being open for the introduction thereinto of the burning gases of a fuel mixture and their outer ends open for the discharge of said gases, an equal number of combustion chambers mounted on the rotor, one of said chambers being arranged to discharge burning gases of a fuel mixture into each of said tubes, means for supplying a gaseous fuel mixture to said combustion chambers, an electric igniter for igniting the fuel mixture in each of the combustion chambers, a fixed disk concentric with the rotor, means for supplying electric current to the disk, a collector ring carried by the rotor and concentric with the disk, said ring being in electric connection with the igniters, and brush means carried by the ring and moving in contact with the disk as the rotor rotates.

9. In an internal combustion turbine, the combination of a support, a rotor journaled in the support and arranged for rotation, a plurality of substantially spiral tubes carried by the rotor, said tubes being disposed in a plane normal to the axis of the rotor and in convolute relation to each other, the inner ends of the tubes being expanded and flattened to form scoops for the forcible introduction of secondary air into the tubes as the rotor rotates, an equal number of combustion chambers mounted on the rotor and having their ends partially inserted into said scoops, said chambers being flattened to leave passages between their walls and the walls of the scoops and said chambers having narrow and

elongated emission openings, so that the burning gases of combustion and the secondary air will enter the tubes in parallel sheets to be intermingled, means for supplying a gaseous fuel mixture to the combustion chambers, and means for igniting the fuel mixture in said combustion chambers.

10. In an internal combustion turbine, the combination of a support, a rotor journaled in the support and arranged for rotation, a plurality of substantially spiral tubes carried by the rotor, said tubes being disposed in a plane normal to the axis of the rotor and in convolute relation to each other, the outer ends of the tubes being open for discharge, means for introducing the burning gases of combustion of a fuel mixture into the inner ends of the tubes to be discharged from the outer ends of the latter, a housing surrounding the perimeter of the rotor, and biased baffles carried by the rotor and associated with the outer ends of the tubes to deflect the discharged products laterally.

11. In an internal combustion turbine, the combination of a support, a rotor journaled in the support and arranged for rotation, a plurality of substantially spiral tubes carried by the rotor, said tubes being disposed in a plane normal to the axis of the rotor and disposed in convolute relation to each other, the outer ends of the tubes being open for discharge, means for introducing the burning gases of combustion of a fuel mixture into the inner ends of the tubes, a fixed housing inclosing the perimeter and one side of the rotor, means for the escape of gases through the side wall of the housing, and biased baffles carried by the rotor against which the gases are discharged from the tubes and which direct the discharged gases toward the side wall of the housing.

12. The structure of claim 11 characterized by the mounting of the baffles on the perimeter of the rotor adjacent the discharge ends of the tubes.

13. In an internal combustion turbine, the combination of a support, a shaft journaled in said support, a rotor mounted on and rotating with the shaft, a series of substantially spiral tubes carried by the rotor, said tubes being disposed in a plane normal to the shaft and in convolute relation to each other, means for introducing the burning gases of combustion of a mixture of gaseous fuel and compressed air into the inner ends of the tubes to be discharged at the outer ends of the latter, a compressed air header rotating with the rotor to supply air for the fuel mixture, a piston and cylinder air compressor mounted on a shaft and rotating as a unit therewith, said compressor connected with the header to supply compressed air thereto, and operative means for reciprocating the piston of the compressor in the cylinder thereof while the shaft rotates.

14. The structure of claim 13 characterized by said operative means consisting of a gear mounted on the crank shaft of the piston and in mesh with a fixed gear concentric with the shaft.

15. In an internal combustion turbine, the combination of a support, a stationary housing mounted on said support, a shaft journaled in said support and extending through the stationary housing, a rotor mounted on the shaft within the stationary housing and rotating with the shaft, a plurality of substantially spiral reaction tubes carried by the rotor having their outer ends open for discharge, means for introducing the burning gases of a mixture of gaseous fuel and compressed air into the inner ends of the tubes to travel through the same and cause the rotor and the shaft to rotate, a compressor mounted on the shaft to rotate therewith for the supply of compressed air for the fuel mixture, said compressor operated by the rotation of the shaft, a second housing mounted on the shaft to rotate therewith and enclosing the compressor, said second housing communicating with the stationary housing by means of an opening surrounding the shaft, and means carried by the second housing for drawing in atmospheric air into the stationary housing to supply secondary air to the inner ends of the tubes.

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