UNITED STATES PATENT OFFICE.

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TURBINE-WHEEL AND CASING THEREFOR.

1,130,444.


To all whom it may concern:

Be it known that I, MICHAEL H. SULLIVAN, a citizen of the United States, residing at Poughkeepsie, in the county of Dutchess and State of New York, have invented certain new and useful Improvements in Turbine-Wheels and Casings Therefor; and I do declare the following to be 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.

This invention relates to improvements in turbine wheels and casings therefor.

The principal object of the invention is to improve the construction and arrangement of the turbine wheel and its casing shown in United States Patent No. 1,006,416, granted to me October 17, 1911, whereby the heat of the exhaust gases of the engine will be confined to the periphery of the wheel and prevented from heating the bearings and shaft of the engine. In my former invention covered by the above patent the exhaust gases were permitted to circulate over the entire surface of the turbine wheel and this resulted in an excessive heating of that part of the engine including the shaft and its bearing. I have found in practice that when the casing of the wheel is constructed as hereinafter set forth and claimed a much greater efficiency in the running of the engine is obtained.

Another object of the invention is to provide a turbine wheel casing made in separable sections so that they may be readily disconnected and removed from the wheel and shaft and turbine wheel without removing the latter from the engine shaft or otherwise interfering with the engine or its connections.

Another object is to provide a turbine wheel of the character shown having means for creating and directing a blast of air on the radiator of the engine.

With these and other objects in view, the invention consists of certain novel features of construction, combination and arrangement of parts as will be more fully described and claimed.

In the accompanying drawings; Figure 1 is a side view of an internal combustion engine showing the application of the invention parts being broken away and in section; Fig. 2 is a top plan view partly in horizontal section; Fig. 3 is an outer end view of the turbine wheel and its casing; Fig. 4 is a vertical cross section taken on the line 4—4 of Fig. 1; Fig. 5 is a detail sectional view of a portion of the turbine wheel taken on line 5—5 of Fig. 4 and showing more particularly the shape of the operating blades of the wheel; Fig. 6 is a similar view taken on line 6—6 of Fig. 4, showing more particularly the arrangement of the fan blades.

Referring more particularly to the drawings 1 denotes the engine to which the invention is applied. The engine 1 is here shown as having cylinders 2 and 3 the pistons of which are operatively connected with a drive shaft 4 in the usual manner. The engine is provided with suitable means for controlling the admission of fuel to the cylinders and with other necessary elements which are not shown as they form no part of the present invention. Arranged on one side of the cylinders 2 and 3 are exhaust valve casings 5 in which are arranged suitably operated exhaust valves (not shown).

Connected with the valve casings 5 are exhaust pipes 6 which join at a suitable point as shown. The outer or free end of the joined exhaust pipes 6 has a close fitting engagement with an accumulator 7 which is connected at a suitable point with the casing 8 of my improved turbine wheel 9 hereinafter described. The accumulator 7 comprises a substantially spherical expansion chamber 10 on one side of which is a coupling socket 11 into which the end of the fluid conducting pipe 6 is snugly but detachably fitted. On the opposite side of the chamber 10 is a flanged extension 12 adapted to be bolted to the adjacent side of the casing 8 of the turbine wheel as shown.

The casing 8 of the turbine wheel comprises a circular plate 13 in the center of which is formed a laterally projecting tapered chamber 14 in which may be arranged timing gears or other mechanisms (not shown). On the outer end of the chamber 14 is an annular flange 15 adapted to be bolted or otherwise secured to the end of the engine 1 around the drive shaft 4 thereof, said shaft being arranged concentrically in and projecting through the chamber 14 as shown but out of contact with the walls thereof. In the sides of the chamber 14 is an annular series of air inlet openings 16 the purpose of which will be hereinafter described. The inner member or plate 13 and
chamber 14 of the casing 8 are formed in two semi-circular sections the engaging edges of which are provided with suitable flanges for receiving clamping bolts whereby the sections of the casing may be placed around the shaft of the engine and bolted together without removing the turbine wheel 9.

The outer member of the turbine wheel casing comprises a circular plate 17 which forms the other side of the casing and has therein a central concentrically formed opening 18 the purpose of which will be hereinafter described. Formed integral with the outer edges of the front plate 17 of the outer member of the casing is an annular inwardly projecting right angularly disposed flange 19 which forms the peripheral wall of the casing. On the inner edge of the peripheral flange 19 is a radially projecting flange 20 which engages the outer side of the plate 13 of the inner member of the casing and through which and through said plate are fastening bolts whereby the outer member of the casing is detachably secured to the inner member. The inner and outer members of the casing are provided with annular packing rings or ribs 21 which are here shown and are preferably cast integral with the inner sides of said members, the ring 21 of the inner member of the casing being arranged beyond or around the annular series of openings 16 while the ring of the outer member is arranged around the central opening 18 in said outer member as shown. The accumulator 7 is connected with the inner member of the casing 8 in position to communicate with the annular chamber formed between the packing rings 21 and the flange 19 of the outer member of the casing whereby the exhaust gas from the engine is discharged into this chamber or space of the casing. In the outer member of the casing is arranged a discharge opening 22 which may be located at any convenient point so that the final exhaust takes place unobstructedly to the atmosphere.

On the outer end of the drive shaft 4 is fixedly mounted my improved turbine wheel 9 said wheel being adapted to revolve in the casing 8 as shown. The wheel 9 comprises a centrally disposed hub 24 around which is a concentric web 25. Around the web 25 and formed integral therewith is an annular series of fan blades 26 which are disposed at suitable angles or inclinations for creating a draft through the casing when the wheel is revolved. The blades 26 are formed integral at their inner ends with a concentric ring 27 forming part of the web 25 and at their outer ends said blades 26 are formed integral with an intermediate ring 28. Arranged around and spaced from the intermediate ring 28 is an outer concentric ring 29 between which and the ring 28 is an annular series of turbine blades 30 said blades being mounted in any suitable manner. The blades 30 are preferably slightly curved and are arranged at slight angles across or between the rings so that the spaces between the blades decrease from the inner or inlet side of the wheel toward the discharge or outer side thereof as clearly shown in Fig. 5 of the drawings. This arrangement of the blades 30 has been found to facilitate the action of the exhaust gases on the turbine wheel and to thus increase the power of the latter. In the opposite sides of the intermediate ring 28 of the wheel are annular packing ring grooves 31 with which the packing rings 21 are engaged to form a fluid tight connection between the wheel and the inner and outer members of the casing. This engagement of the packing rings with the grooves forms the annular chamber in the outer portion of the casing hereinafter referred to. It will be noted that the wheel is of slightly less width than the width of the casing thus forming an annular exhaust space 32 between the outer side of the outer portion of the wheel and the adjacent side of the casing. By thus arranging the turbine blades 30 it will be seen that the exhaust gases from the accumulator will act upon the blades thereby driving the turbine wheel and utilizing the exhaust gases for assisting in the operation of the engine.

Arranged in front of the opening 18 of the casing 8 and spaced a suitable distance therefrom is the radiator 33 of the engine said radiator when thus arranged being adapted to receive a blast of air which is drawn through the openings 16 in the inner member of the casing and discharged through the opening 18 by the fan blades 26 of the turbine wheel said wheel thus serving the twofold purpose of an auxiliary driving mechanism for utilizing the exhaust gases of the engine and as a means for directing a cooling blast of air onto the radiator of the engine.

By constructing the casing and arranging it as set forth it will be noted that the hot exhaust gases will be confined entirely to the periphery of the wheel and this is the only part which will become highly heated by such gases. The open central portion of the casing with the fan arranged therein effectively prevents heat from the gases from being communicated to the engine shaft or its bearings. This construction also provides a wheel and its casing which are out of contact at all points except where the ribs 21 and the groove 31 interlockingly engage, thereby greatly reducing the friction which would otherwise occur were the wheel and casing disposed in contact at the sides and periphery thereof.

Having thus described my invention, what I claim is:
1. The combination with an engine hav-
ing its shaft projecting beyond one end thereof, and a turbine wheel fixed on said projecting shaft end, of a casing inclosing said wheel and having a fluid tight engagement with said wheel, said casing having central openings in its end walls encircling said shaft, the walls of said openings being disposed out of contact with said shaft and one of them having means for attaching the casing to the engine.

2. The combination with an engine having its shaft projecting beyond one end thereof, of a casing inclosing an outer annular chamber and a central chamber, a turbine wheel fixed to said shaft and mounted to revolve in said casing and having a fluid tight engagement with the casing separating the outer annular chamber from the central chamber, a series of blades mounted on said turbine wheel within the outer annular chamber, the central chamber being open to the atmosphere and the end walls thereof having openings at their center around said shaft, the walls of the openings being spaced from the shaft and one of them having means for attaching the casing to the engine, and means for discharging an actuating fluid into said outer annular chamber.

3. The combination of a casing having an annular chamber, a turbine wheel provided with a hub mounted in said casing and having an annular chamber extending into said annular casing chamber, a plurality of blades mounted in said turbine wheel chamber, said casing and wheel having a fluid tight engagement at the inner walls of said annular chambers, said casing having enlarged openings in the end walls thereof opposite the hub of the turbine wheel, said openings being larger than said wheel hub and one of them having means for attaching the casing to the engine, and means for discharging an actuating fluid into the annular chambers of said wall and casing.

4. The combination of a turbine wheel casing having a hollow extension on one end wall thereof for securing it to an engine, said casing having an annular outer chamber and a central chamber, the end walls of which have large central openings surrounding said shaft, one of which is formed by said hollow extension, a turbine wheel revolubly mounted in said casing and having a fluid tight connection at its opposite sides with the opposite side walls of said casing at the inner side of the annular chamber thereof, the blades arranged in said wheel and disposed in the open central chamber of said casing, blades arranged in said wheel beyond its fluid tight connection with the casing, and means for discharging exhaust gases into said annular chamber and onto the blades therein.

5. In an internal combustion engine, a turbine wheel casing comprising an inner section secured to the engine and having therein a series of air inlet openings and an outer section comprising a plate having therein a centrally disposed air discharge opening, an annular flange on the outer edge of said plate to form the sides of the casing, said flange having a detachable engagement with the inner section of the casing, annular packing rings on the inner sides of said sections of the casing; an accumulator connected with one side of the outer portion of the casing, an exhaust pipe connected with the opposite side thereof, an exhaust gas conducting pipe engaged with said accumulator; a turbine wheel revolubly mounted in said casing and having a fixed engagement with the drive shaft of the engine, said wheel having therein annular packing ring grooves adapted to receive the packing rings on the sections of the casing, a series of turbine blades arranged in the outer portion of the wheel and having an operative engagement with the casing between the packing rings and the outer sides thereof, and an annular series of fan blades arranged within the inner part of said turbine wheel and adapted to force a draft of air through the air inlet and discharge openings of the casing.

6. The combination with an engine having its shaft projecting beyond one end wall thereof, and a turbine wheel fixed on said projecting shaft end, of a casing inclosing a portion of said wheel adjacent its periphery and having a fluid tight connection therewith, one end wall of said casing having a tubular extension, means for securing the free end of said extension to the end wall of the engine through which said shaft projects, and means for discharging the exhaust gases into the peripheral portion of said wheel inclosed by said casing.

7. The combination of an explosive engine, a radiator for the engine arranged in line with its shaft, a turbine wheel on the engine shaft adjacent the radiator and adapted to be driven by the exhaust gases from the engine, a casing surrounding the periphery of the wheel and having an open central portion, and fan blades carried by the intermediate part of the turbine wheel for directing air against the radiator.

8. The combination of an engine having its shaft projecting beyond one end thereof, a turbine wheel fixed on said projecting shaft end, a casing secured to said engine and inclosing said wheel, said casing having openings in its end walls encircling said shaft, the walls of said openings being disposed out of contact with said shaft, and said wheel and casing having contacting means on their opposite sides and being out of contact at all other points.

9. The combination of an engine having
its shaft projecting beyond one end thereof, a turbine wheel fixed on said projecting shaft end, a casing secured to said engine and inclosing said wheel, said casing having in its end walls encircling said shaft, the walls of said openings being disposed out of contact with said shaft, and said wheel and casing having on opposite sides thereof interlocking annular engaging means and being out of contact at all other points.

10. The combination of an engine having its shaft projecting beyond one end thereof, a turbine wheel fixed on said projecting shaft end, a casing secured to said engine and inclosing said wheel, said casing having openings in its end walls encircling said shaft, the walls of said openings being disposed out of contact with said shaft, said wheel and casing being provided on their adjacent side faces one with annular grooves and the other with annular ribs disposed in interlocking engagement, said casing and wheel being out of contact at all other points.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

MICHAEL H. SULLIVAN.

Witnesses:
C. H. Griesbauer,
V. Kessler.