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FUEL ADMITTING MEANS FOR INTERNAL COMBUSTION ENGINES

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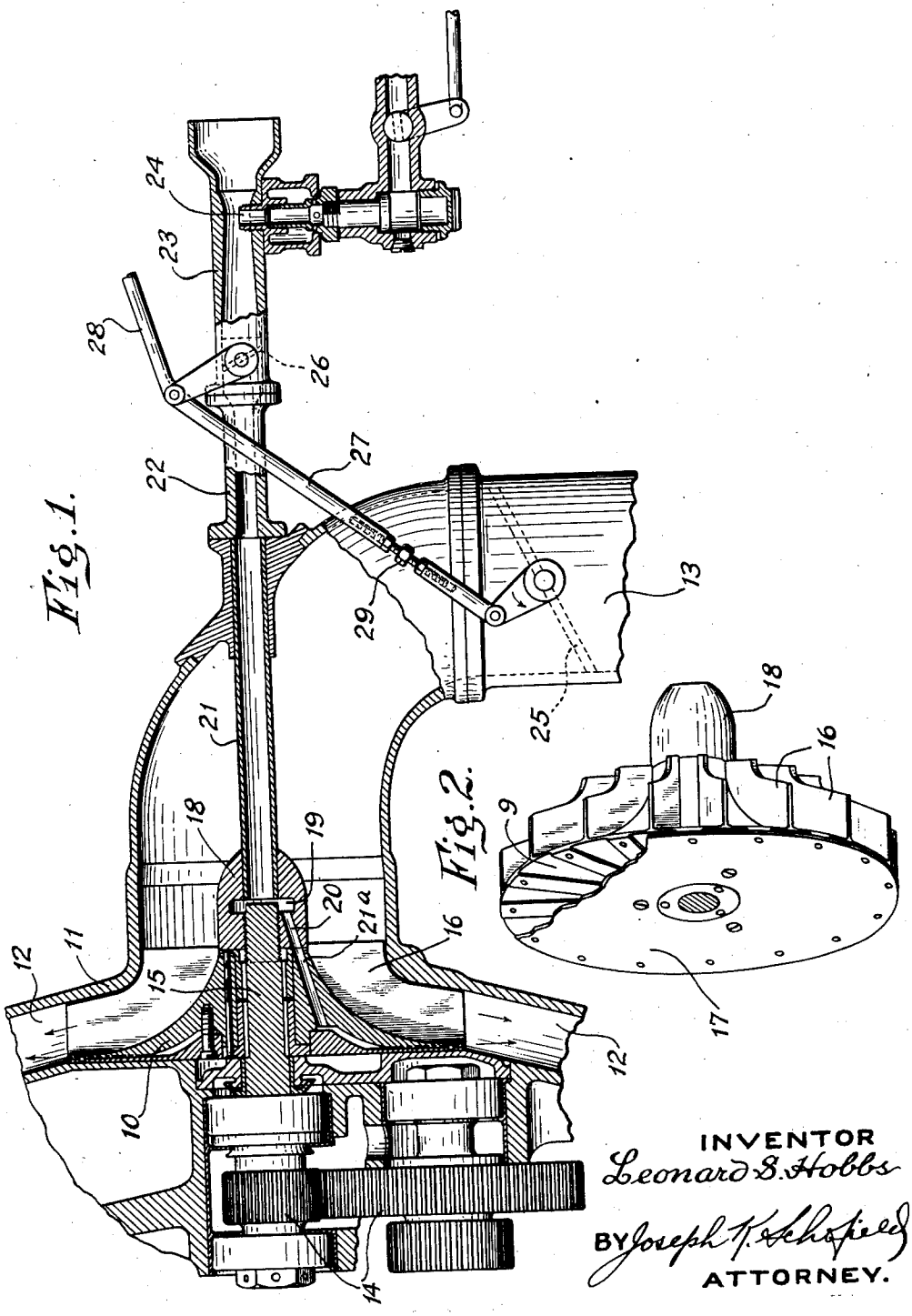

Fig. 1.

Fig. 2.

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FUEL ADMITTING MEANS FOR INTERNAL COMBUSTION ENGINES

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This invention relates to internal combustion engines and more particularly to improved means for admitting the fuel charge thereto in intimately mixed and uniformly distributed condition.

A principal object of the invention is to provide centrifugal means of forcing the explosive charge for an internal combustion engine in finely divided form in all directions within a plane into the intake passages of an engine, the charge being distributed without any tendency to settle due to the effects of gravitation.

It is another primary object of the invention to provide a supercharger of the rotary impeller type with passages or conduits through which all, or a part, of the explosive mixture may be admitted directly to the intake passages leading to the cylinders, the centrifugal effect of the supercharger upon the charge serving to aid in the atomization of the particles thereof and force them at high velocity uniformly throughout the air being admitted into the intake passages.

A feature of importance of the invention is that a rich mixture of air and a hydrocarbon, such as gasoline or other liquid fuel, may be admitted at the axis of an impeller independently of the air admitted through the intake passage, and, after being forced from the periphery of the impeller, will be admitted uniformly distributed in finely divided or atomized condition directly into the diffusion chamber surrounding the impeller wherein it will be intimately mixed with the air taken in through the intake.

Another feature of importance is that the supercharger will not require numerous additional or complicated parts to provide the necessary passages for the fuel but will be simple and not easily put out of operation.

Another most important object of the invention is to effect an extremely even distribution of a liquid fuel in air to form an explosive charge for an internal combustion engine, the charge being uniformly distributed among the different cylinders regardless of their position and the shape of the intake passages which may have sharp turns.

The present invention is designed primarily for application to an engine having a cylinder arrangement and form of diffuser space and intake passages similar to those shown and described in the application of G. J. Mead, Serial No. 142,332, filed October 18, 1926.

With these and other objects in view my invention includes the features of construction and operation set forth in the following specification and illustrated in the accompanying drawings.

In the accompanying drawings annexed hereto and forming a part of this specification, I have shown my invention embodied in a rotary impeller positively driven and centrally located relative to the intake conduit and diffuser chamber of an internal combustion engine designed for aircraft, but it will be understood that the invention can be otherwise embodied and that the drawing is not to be construed as defining or limiting the scope of the invention, the claims appended to this specification being relied upon for that purpose.

In the drawings:

Figure 1 is a central longitudinal sectional view of mechanism illustrating the invention; and

Fig. 2 is a perspective view of the impeller shown in Fig. 1 partly broken away to more clearly show its construction.

In the above mentioned drawings I have shown but one embodiment of the invention which is now deemed preferable but it is to be understood that changes and modifications may be made within the scope of the appended claims without departing from the spirit of the invention.

Briefly, and in its broadest aspect, my invention includes the following principal parts: first, an impeller rotatably mounted within a portion of the fuel intake passages leading to the cylinder or cylinders of an engine; second, a fuel supply conduit connected at one end to the impeller in a manner permitting rotation of the impeller about the conduit; third, means to admit fuel to the conduit, preferably mixed with air to form an extremely rich mixture; fourth, passages extending from within the impeller to

the periphery thereof so that the fuel or the mixture of fuel and air forming the explosive charge may be thrown substantially radially outward in a plane from the periphery of the impeller; fifth, air passages through which air unmixed with fuel may be admitted to the intake passage and past or through vanes of the impeller when the impeller also forms the supercharger; and sixth, controlling means for regulating the amounts of the fuel or fuel mixture forming the explosive charge being admitted to the impeller through the mixture and air passages.

Referring more in detail to the figures of the drawings, I provide a rotatably mounted centrifugal wheel or impeller 10 within an engine frame member 11, this member 11 having formed therein intake passages 12. The passages 12 lead to the different cylinders of an engine, the portions of the passages 12 shown in Fig. 1 also forming the diffuser section of the supercharger. The passages 12 shown are adapted particularly for a radial type internal combustion engine and may be provided with the usual diffusion vanes (not shown). A main intake passage 13 is provided through which air unmixed with fuel may be admitted to the central or axial portions of the impeller 10. The impeller 10 in the embodiment shown is adapted to be driven from the crank shaft of the engine (not shown) by means of gearing 14 connected to shaft 15 on which the impeller is mounted.

The impeller 10 is formed of two principal members shown most clearly in Fig. 2. As shown, the impeller is preferably of the single intake open type and when employed also as a supercharger, the vanes 16 are preferably formed integrally with the web or body portion of the impeller. By means of these vanes 16, when the impeller 10 is rotated rapidly the air or fuel mixture forming the explosive charge is admitted to the passages 12 in greater quantity and at a higher pressure than without the impeller vanes 16, the effect of the impeller vanes 16 being to greatly increase the velocity of the air or air and the finely divided liquid fuel through the diffuser space immediately surrounding the periphery of the impeller 10.

As will be seen from an inspection of Fig. 2, one face of the impeller body member is provided with shallow recesses or slots 9, radially disposed ridges being left on the body member between the slots 9. Preferably the slots 9 may be milled directly into the member 10, these being wider at the periphery of the impeller 10 than at its central portions. This face of the impeller 10 is provided with a cover plate 17 riveted or otherwise fastened at its periphery to the member 10 as shown. The slots 9 milled into this member 10 therefore provide extremely shallow but relatively wide passages extending radially so that air or gases within these passages will be thrown radially and tangentially outward in the plane of the slots in all directions by the centrifugal forces induced by the rapid rotation of the impeller or wheel 10.

On the intake side of the impeller 10 is provided a member 18 conveniently threaded upon the impeller shaft 15 to hold the impeller thereon, its inner portions being recessed as shown at 19 to form a chamber and provided with a plurality of passages 20 extending to the front face of the impeller 10. The extended end of the member 18 fits over one end of a tube 21 so that the impeller 10 and member 18 may rotate freely and without friction about this tube. The tube 21 passes through the wall of the main intake passage 13, a special cap being provided therein and at its outer end is attached to a tube 22. Into this tube 22 may be admitted fuel either in the form of a liquid unmixed with air or preferably, and as will be presently described, intimately mixed with air and in finely comminuted form.

The rear ends of the passages 20 within the member 18 join continuations thereof 20^a within the body member of the impeller 10. At the rearward ends of these passages 20^a, but one of which is shown in the drawings, the fuel in its liquid or mixed form enters the space between the body member of the impeller 10 and the plate 17. From this space it is thrown as described above through the slots 9 into the intake passages or diffuser space 12.

One preferred form of admitting fuel to the tube 22 is shown in Fig. 1. In this form a Venturi nozzle 23 is connected to the outer end of the tube 22 into the throat of which is introduced a connection or orifice 24 connected by any desired or preferred means to a fuel supply system. Due to the effect of the high speed of rotation of the impeller, air is drawn through the nozzle 23 at high velocity. Into this stream of entering air through the nozzle 23 fuel is admitted from the orifice or connection 24. The mixed air and fuel therefore enter the tubes 22 and 21 and from tube 21 enter the member 18 in its central recessed portion 19. From this recessed or chambered portion 19 the mixture enters the conduits 20 and 20^a within the member 18 and body member of the impeller 10. From the opposite ends of the conduits 20^a the mixture enters the central portion of the impeller as above described.

From an inspection of Fig. 1 it will be seen that the intake passages and diffuser space 12 are inclined or oblique relative to the axis of the impeller 10 so that the mixture, as soon as it leaves the periphery of the impeller 10, enters the stream of incoming air discharged by the impeller in a di-

rection oblique thereto and is forced by its velocity obliquely across the stream of air. The fuel in its finely divided form is therefore picked up by the stream of air throughout its entire width, thus more uniformly distributing it throughout the incoming air and dividing it equally among the different cylinders of the engine.

A valve 25 is interposed within the main intake passage 13 to provide means to regulate the quantity of air admitted to the passages 12 in the usual manner. Similarly a valve 26 may be provided within a portion of the Venturi nozzle 23 controlling the amount of mixture or fuel charge. For convenience these valves may be connected by a link 27 so that movement of one valve as by a reach rod 28 will also operate the other valve. As shown, the link 27 connecting the valves 25 and 26 is adjustable as to its length by means of a turn buckle 29 or other convenient means so that the proper relative positions of the valves 25 and 26 may be set for any desired or predetermined operating conditions.

What I claim is:

1. In an internal combustion engine in combination, an intake conduit, a rotary member therein, and means to supply fuel to said member, conduits within said member extending to the periphery thereof, said member when rotated forcing said fuel tangentially therefrom in all directions in a plane by centrifugal force.

2. In an internal combustion engine in combination, an intake conduit, a rotary impeller therein, conduits within said impeller extending radially and disposed in a plane normal to the axis of rotation of said impeller, and means to admit fuel to the central portion of said impeller.

3. In an internal combustion engine in combination, an intake conduit, an open type rotary supercharger impeller therein, radially disposed conduits within said impeller extending to the periphery thereof, and means to admit fuel to the central portion of said impeller, whereby upon rotation of said impeller at high speed said fuel will be thrown therefrom simultaneously with air acted on by said impeller.

4. A supercharger impeller for internal combustion engines comprising a body member having vanes provided thereon, means to rotate said impeller, and conduits formed therein radially disposed in a plane normal to the axis of revolution of said impeller and independent of said vanes.

5. A supercharger impeller for internal combustion engines comprising a body member having air directing vanes thereon and conduits therein having openings at the periphery of said body member, whereby fuel admitted to said conduits will be thrown therefrom uniformly in all directions in a plane when said impeller is rotated.

6. A supercharger impeller for internal combustion engines comprising in combination, a body member having air impelling vanes thereon, and a cover plate closing one end of said body member, said body member and cover plate forming between them radially disposed slots whereby fuel may be emitted from said slots into the air stream from said vanes.

7. An impeller for internal combustion engines comprising in combination, a rotatably mounted body member having a cover plate secured upon one face thereof, said body member and cover plate forming between them radially disposed slots in a plane normal to the axis of rotation of the body member.

8. An internal combustion engine comprising in combination, an intake conduit, an impeller therein, fuel admitting means to said impeller and radially disposed fuel conduits leading therefrom whereby said fuel will be forcibly thrown from the periphery of said impeller in a plane into said intake passage upon rotation of said impeller.

9. An internal combustion engine comprising in combination, an intake conduit, a supercharger impeller therein for forcing air through said intake conduit, fuel admitting means to said impeller, and fuel conduits leading therefrom to the periphery thereof whereby said fuel will be forcibly thrown radially from said impeller in a plane upon rotation thereof into said intake conduit.

10. An internal combustion engine comprising in combination, an intake conduit, a supercharger impeller therein for forcing air through said intake conduit, and fuel mixture admitting means to said impeller, obliquely disposed portions of said conduit surrounding said impeller, thin radial conduits within said impeller disposed in a plane normal to the axis of rotation thereof for said fuel mixture and extending to the periphery thereof, whereby fuel thrown radially from said impeller will enter said conduit centrally and obliquely to said entering air.

11. A rotatably mounted impeller comprising in combination, a body member having vanes thereon for directing air radially and tangentially of the impeller, means to admit fluid in finely comminuted form centrally within said impeller, thin and radial conduits disposed within said impeller in a plane normal to the axis of rotation thereof for forcing said liquid from said impeller upon rotation thereof.

12. An impeller for internal combustion engines comprising in combination, a base member having air directing vanes on one side, and a substantially radially disposed surface on the other side having radialy disposed recessed portions therein, a cover plate against said side whereby thin radially dis-

posed slots are formed extending to the periphery thereof, and means to admit liquid fuel to portions of said slots adjacent the axis of rotation of said impeller.

In testimony whereof, I hereto affix my signature.

LEONARD S. HOBBS.