Nov. 27, 1945. H. MOSSBACH 2,389,632

INTERNAL-COMBUSTION ROTARY MOTOR

Filed July 6, 1943 3 Sheets-Sheet 1

Fig. 1

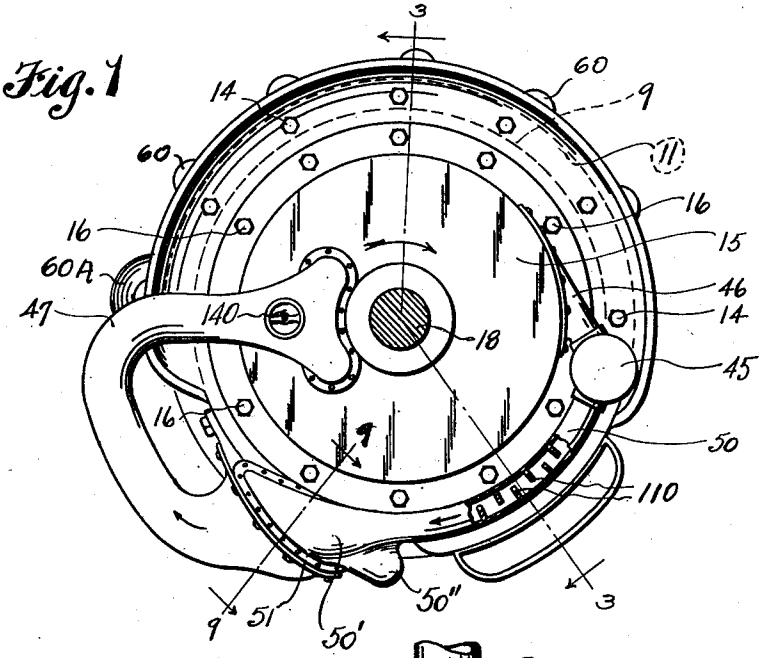


Fig. 2

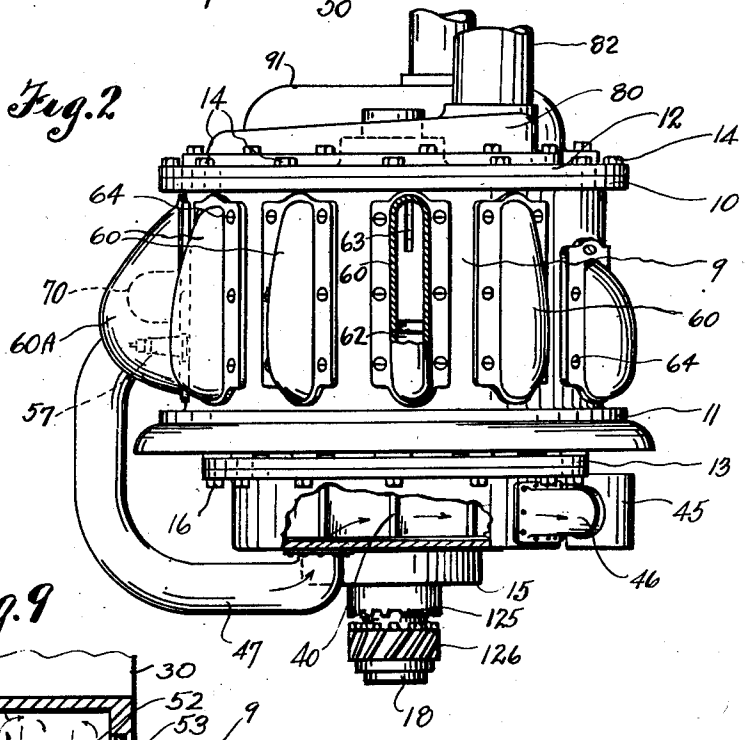
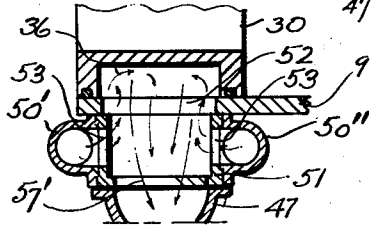


Fig. 9



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INTERNAL-COMBUSTION ROTARY MOTOR

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Fig. 3

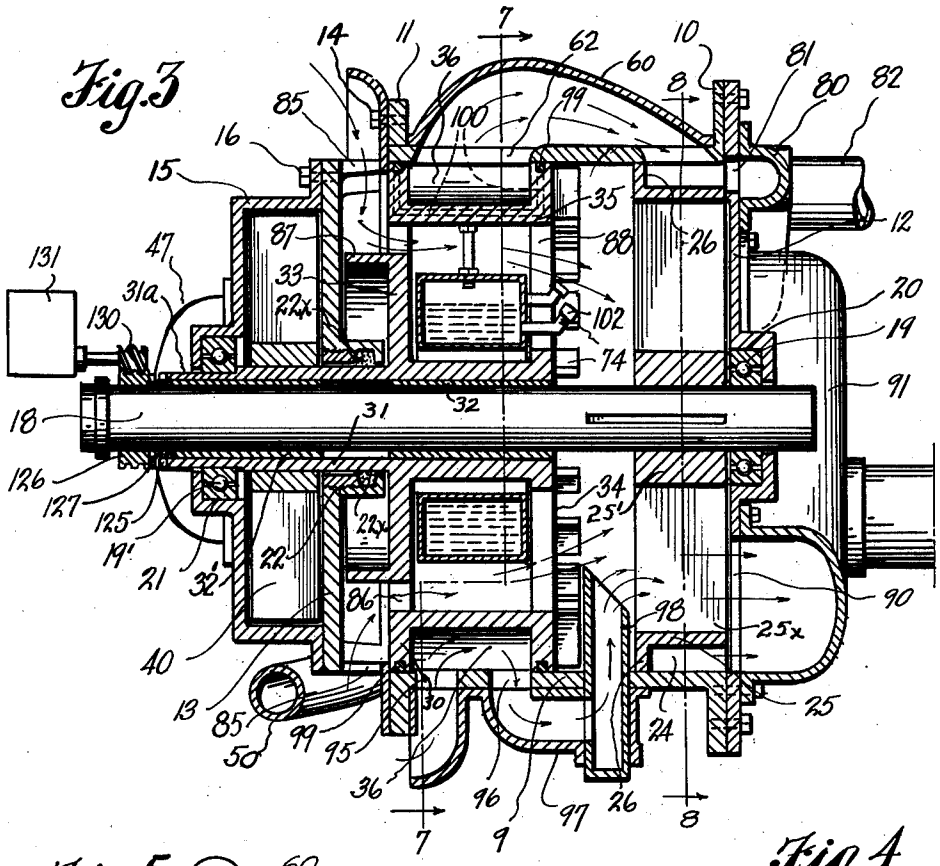

Fig. 5

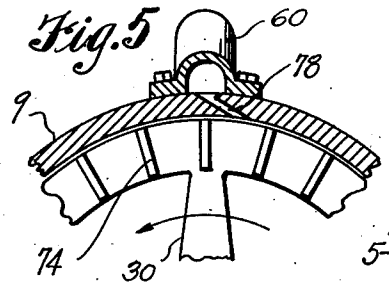

Fig. 6

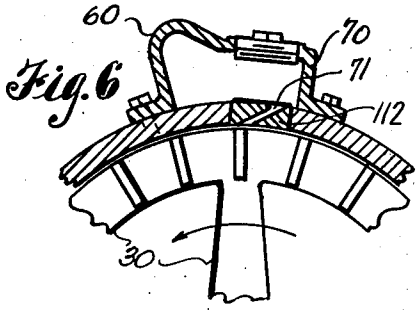

Fig. 4

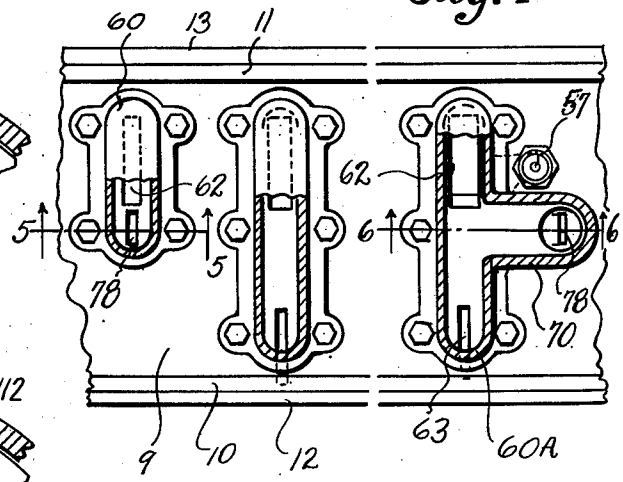

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Fig. 7

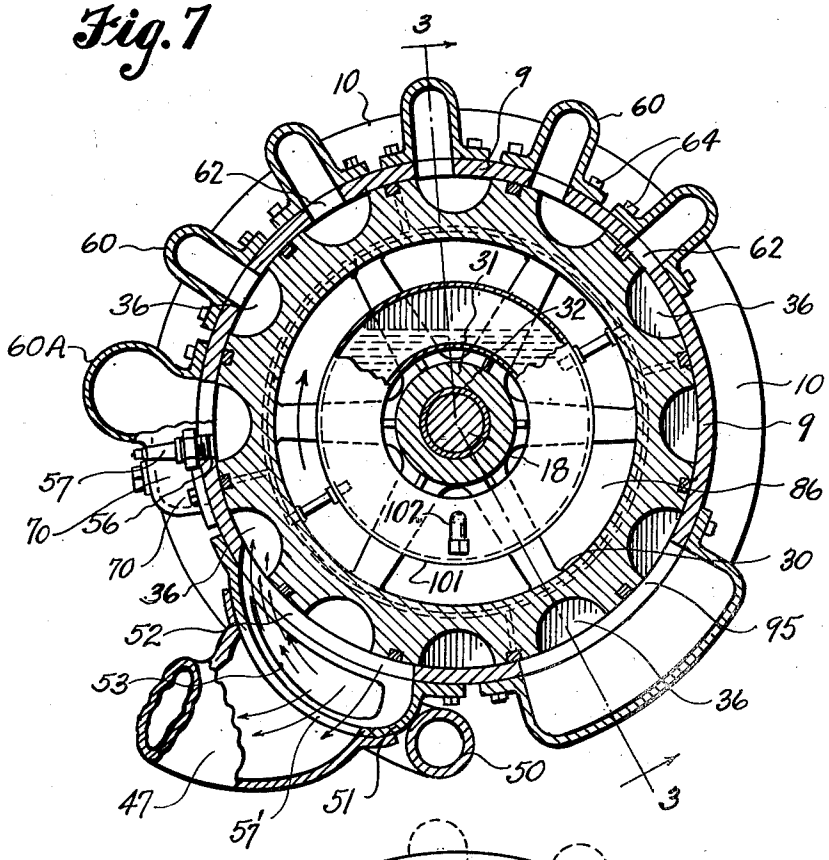
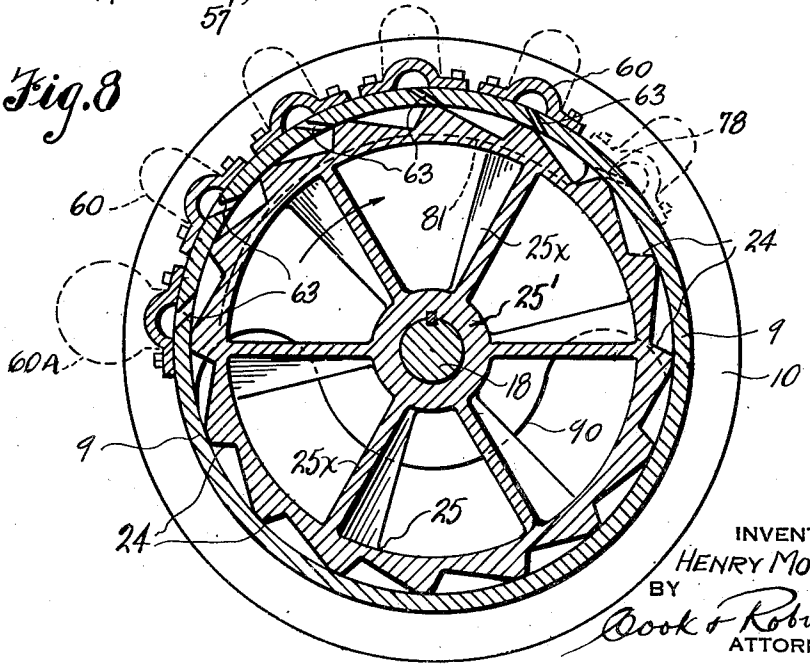


Fig. 8



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Patented Nov. 27, 1945

2,389,632

UNITED STATES PATENT OFFICE

2,389,632

INTERNAL-COMBUSTION ROTARY MOTOR

Henry Mossbach, Seattle, Wash.

Application July 6, 1943, Serial No. 493,634

16 Claims. (Cl. 60—41)

This invention relates to internal combustion engines and it has reference more particularly to what might more properly be designated as an internal combustion rotary motor; the present motor being designed to be driven by the expanding pressure of burning charges of carbureted fuel, delivered through a succession of nozzle jets against abutments of a rotor that is fixed to the drive shaft of the motor.

It is the principal object of this invention to provide a rotary, internal combustion motor in which principles and features of the ordinary steam turbine are employed as a means of obtaining smoothness of operation and high operating efficiency in an engine wherein power is supplied through the delivery, ignition and burning of charges supplied from a fuel carbureting system.

It is also an object of the present invention to provide a motor of the type above stated wherein provision is made for extending the application of force of each exploded or ignited charge through a maximum interval of time so as to utilize the greatest possible amount of power therefrom.

It is also an object to so space the points of application of force of expanding fuel charges with respect to the spacing of abutments on the rotor that no pulsating action is to be observed and greater smoothness of operation is assured.

More specifically stated, the objects of the present invention reside in the provision of a rotary internal combustion motor having a housing rotatably mounting a drive shaft on which a fuel supply wheel is revoluble and on which shaft a driving rotor is fixed; the rotor being equipped at its periphery with abutments against which the forces of burning, expanding fuel charges are directed from orifices of a succession of fixed nozzles; the nozzles being arranged on the housing at regular spacing, circumferentially of the rotor, and supplied with fuel charges that are delivered thereto within peripheral pockets of the wheel that revolves freely on the shaft and is driven by reason of some of the force of exploding fuel charges being diverted against a row of impellers on the wheel.

It is another object of the invention to provide a rotary motor wherein the fuel charges, while burning and expanding, are conveyed in the pockets of the wheel, in succession, to the nozzles and wherein the orifices of successive nozzles are progressively reduced in size so as to maintain velocity of the expanding charges as delivered therefrom regardless of the diminishing of pressure of the charges as they burn.

Another object of this invention is to provide means whereby to limit the maximum speed of operation of the wheel which delivers the ignited fuel charges to the nozzles, thereby to control the speed of operation.

Still another object is to provide a novel and satisfactory means for the scavenging or burned fuel from the engine.

Still further objects of the present invention reside in the provision of means for adequately cooling the engine, particularly the internal parts thereof, and means for effecting a forced delivery of fuel charges to the pockets of the fuel supplying wheel.

In accomplishing these and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings wherein—

Fig. 1 is an end view of an internal combustion, rotary motor embodied by the present invention.

Fig. 2 is a top view of the same.

Fig. 3 is a central, longitudinal section of the engine, on the line 3—3 in Figs. 1 and 7.

Fig. 4 is a plan of a portion of the motor housing showing the arrangement of nozzles thereon, with parts broken away for purpose of better illustration.

Fig. 5 is a sectional detail of the retarding nozzle; the section being on line 5—5 in Fig. 4.

Fig. 6 is a sectional detail of the timing nozzle, on line 6—6 in Fig. 4.

Fig. 7 is a vertical cross section on line 7—7 in Fig. 3.

Fig. 8 is a cross section on line 8—8 in Fig. 3.

Fig. 9 is a sectional detail on the line 9—9 in Fig. 1.

Referring more in detail to the drawings—

The motor, in its present preferred form of construction, comprises a cylindrical housing 9 equipped at its ends with peripheral flanges 10 and 11, to which, respectively, end plates 12 and 13 are secured by bolts 14. As noted best in Fig. 3, the end plate 13 has a cylindrical fan housing 15 mounted coaxially thereon and secured by bolts 16.

Supported coaxially within the housing 9 is the motor drive shaft 18; this being rotatably supported at its ends within anti-friction ball bearings 19—19' which are contained in seats 20 and 21 in the end plate 12 and fan housing 15. This shaft passes with clearance through an opening 22 in the end plate 13.

Keyed on the shaft 18, closely adjacent the end plate 12, is a rotor wheel 25 which is formed about its periphery with a cylindrical rim portion that is closely fitted within that end of the housing 9. This rim portion is formed with transverse abutments 24 across its outer surface at regular intervals of spacing, and, as noted in Fig. 8, these abutments resemble the teeth of a ratchet wheel, and at that side of the rim portion of the wheel that is away from the end plate 12, the pockets formed between the successive abutments are closed by a wall or flange 26 while the pocket is open at the other side of the rim. It is against the abutments 24 that the force of exploding fuel charges are directed by the nozzles, as presently described, to drive the shaft.

In Figs. 3 and 8, it is shown that the rim of the wheel 25 is carried from a central hub portion 25' by a plurality of radial spokes 25x which are inclined to operate as a fan for the drawing of air through the engine for cooling and scavenging purposes which also will presently be more fully described.

Freely revoluble on the shaft 18 within that end portion of the housing 9 that is adjacent end plate 13, is a wheel 30 of cylindrical form having a central hub portion 31 containing a bushing 32 that is fitted to the shaft. The wheel is formed with spaced opposite end walls 33 and 34 and a rather heavy rim 35 that fits closely within the cylindrical housing 9. This rim is formed at regularly spaced intervals, here shown to be 30°, with outwardly opening, semicylindrical pockets 36 directed thereacross and closed at their ends as shown in Figs. 3 and 9. The wheel 30 also has a hub extension 31a at its outside that extends through the opening in end plate 13 and through the fan housing, and is supported within the bearing 19'. Within the housing 15 this hub extension has a fan wheel 40 fixed thereto. This fan operates, as presently will be explained, to propel the carbureted fuel charges to the pockets 36 of the wheel 30. A bushing 32' is fitted about the shaft 18 within the hub extension for its support, and packing 22x is applied about the hub 31a in the opening 22.

Fuel oil charges are supplied to the motor by a carburetor 45 which, as observed in Fig. 1, is supplied with air delivered thereto under pressure from the fan housing 15 through a pipe 46. Air is drawn into the fan housing through a supply pipe 47, and this pipe, as will presently be explained, draws warmed air from within the engine and conducts it to the fan casing 15 from which it is driven to the carburetor through pipe 46.

The fuel mixture passes from the carburetor through a pipe 50 to a manifold 51 which is fixed to and extends in a circumferential direction along the outside wall of housing 9, as seen in Fig. 7, and in open communication with a coextensive opening 52 in the housing wall. This manifold directly overlies the path of travel of the pockets 36. Thus, with the rotation of wheel 30, the pockets 36 are caused to pass, successively, in registration with the opening 52 and to be charged with the carbureted fuel mixture that is supplied to the manifold 51 from the carburetor through pipe 50.

Rotation of the wheel 30 to deliver these fuel charges, is effected and is controlled by means presently to be explained in detail.

As shown in Fig. 1, the pipe 50 is branched at its delivery end, and the two branches are designated in Figs. 1 and 9 by numerals 50' and 50''. These branches communicate with the manifold 51 through elongated slots 53—53 which are formed in its opposite side walls. The curvature of the outside wall of the manifold 51 and the location and shape of the openings in its various walls, which provides communication with pipe 47 and with the two branches of pipe 50, have an important bearing in this operation.

By reference to Figs. 1, 7 and 9, it will be understood that the pipe 47 has a rather large mouth which communicates with the manifold 51 through a relatively large opening 57' in the outside wall of the manifold. While the branches of the pipe 50 communicate with the manifold through the slots 53 which are formed in its opposite side walls, the manifold curves gradually toward the housing in the direction of rotation of the wheel 30. Also the slots in the opposite side walls of the manifold taper to points in the direction of rotation of the wheel. The construction is such that with the wheel 30 revolving at high rate, the air that will be contained in the pockets 36 will be discharged centrifugally through the slot 52 directly into the mouth of the pipe 47 in which suction is maintained by the operation of the fan 40. This centrifugal action automatically clears the pockets of air while the rotation of the wheel across the slot 52 creates suction in the direction of rotation of the wheel, and this suction operates to draw in the fuel mixture from the pipe 50 through the slots 53 so that the pockets will become filled as they pass across the tapered end portion of the manifold. The air that is discharged from the pockets is warmed by contact with the wheel and it is conveyed through the pipe 47, fan housing 15 and pipe 46 to the carburetor. The flow of fuel mixture through the slots 53 to the pockets has been indicated by the arrows in Fig. 7 as has also been the direction of discharge of air from the pockets into the pipe 47.

It will here be explained that the rotation of the wheel 30 at high speed operates to drive the fuel mixture that is intaken through the slots 53 toward the tapered end of the manifold 51, and the curvature of its outer wall causes this intaken mixture to be wedged into the pointed end of the manifold and forced under some compression into the pockets as they pass the tapered end. The arrows in Fig. 7 indicate this driving of fuel into the pockets.

By reference to Fig. 7, it will be further understood that with the wheel 30 rotating in the direction indicated by the arrow thereon, the pockets 36, as charged with fuel from the manifold 51, will be caused to successively pass in registration with an opening 56 in the housing 9, into which a spark plug 57 is threaded. This plug is connected with an electric circuit through a switch, not herein shown, whereby a circuit can be caused to flow between the terminals of the plug to create a spark to ignite fuel charges in the pockets as they pass the plug. The forces of exploding fuel charges are directed against the rotor to drive the shaft 18.

It is shown in Figs. 7 and 8 that nozzle housings 60 are mounted at regular intervals of spacing on the housing 9 in the circumferential direction thereof; each nozzle housing being transversely directed and having one end in full and direct communication with an opening 62 in the housing wall, and its other end communicating with a nozzle orifice 63 which is in the form of an elongated slot and which opens through the housing wall at an angle inclined toward the tangen-

tial direction. The openings 62 are directly in the path of, and extend to the full length of the pockets 36, as seen in Fig. 3. The force of exploding fuel charges, delivered into the nozzles through openings 62, will be directed through the nozzle orifices 63 against the abutments 24 of the impeller wheel to drive the latter.

Figs. 2 and 3 show that the nozzle housings 60 are secured by screws or bolts 64 to the main housing 9 between its opposite end flanges, and that each is shaped in a manner whereby the exploding charges, brought thereto in the pockets of wheel 30, will be directed to the nozzle orifices in the most effective manner.

Due to the fact that the force of charges are greatest as they reach the first nozzle, it is desirable that it be enlarged to adapt it to use as a pressure storage reservoir. This enlarged nozzle has been designated in Figs. 2 and 7 by numeral 60*a*.

Fig. 8 illustrates an important feature of construction in that it is to be noted therein that the angular spacing of the nozzles and nozzle orifices about the housing 9 is greater than the angular spacing of the abutments on the rotor wheel. Therefore, the forces of expanding fuel charges as delivered through the nozzle orifices can not be simultaneously applied against the rotor abutments but are successively applied thereto, and in this way, a smoother action and a turbine-like operation result.

By reference to Figs. 4 and 6, it is to be noted that the first nozzle housing, 60A, to which a fuel charge is presented, is equipped with a central lateral extension 70 leading in a circumferential direction to a point forwardly of the spark plug and providing a communication duct therein to a nozzle orifice or passage 71 that is so directed through the housing wall that the force of expanding ignited fuel charges delivered therethrough will be directed against a circular row of impeller fins 74 that are formed about the inner end wall of the wheel 30, as shown in Figs. 3 and 6, thus to rotate the wheel, in the direction of the arrow thereon in Fig. 7.

With the understanding that fuel charges are being supplied from the manifold 51 to the pockets 36 of wheel 30 as it rotates, and that each charge is ignited as its containing pocket moves into registration with the opening to the plug and first nozzle, in which fuel continuously burns by reason of the rapid delivery of fuel charges thereto, it will then be apparent that part of the expanding force of the burning charge is directed from this nozzle housing through the nozzle orifice 71 against the fins 74 to drive the wheel 30. Another part of the burning charge is directed through the nozzle orifice 63 against the abutments 24 of the rotor 25 to drive the latter. The wheel 30, under the force of expanding gas passing through orifice 71, gradually picks up momentum, and as the pockets 36 move at high speed past the succession of nozzles, each nozzle receives a portion of the burning charge; these portions as successively delivered to the nozzles, gradually diminishing and normally each charge is fully expended when its containing pocket passes into registration with the opening 62 into the last nozzle of the series, this being the nozzle shown at the left-hand side of Fig. 4. This last nozzle has a discharge orifice 78 opening therefrom through the housing wall at such location and in such direction as to discharge against the impeller fins 74 in a direction opposite the direction of charges from the orifice 71. Therefore, if the rate of rotation of the wheel is such as to carry any part of a charge to this final nozzle, its expansive force will be applied against the wheel as a retarding influence, thus to limit the speed of operation of the motor.

Assuming that the wheel 30 is being rotated at a normal operating speed, and that fuel charges are being conveyed in the pockets 36 in rapid succession past the spark plug opening, and are there ignited so that the expanded, burning charges are dissipated from the pockets to the succession of nozzles, it will be understood that the force of the expanding charge is directed from the nozzle orifices against the abutments of the rotor will cause the latter to rotate and the drive shaft 18 to be rotated accordingly. Since the force of each exploding charge gradually diminishes in its pocket, as the pocket passes the succession of nozzles, I have decreased the cross sectional area of the nozzle orifices accordingly so as to maintain velocity and effectiveness of gases delivered from each nozzle.

Burned fuel charges are exhausted from the outer open ends of the pockets that are formed between the rotor abutments, into a manifold 80 that is fixed to the end plate 12 and which extends through an arc corresponding to the extent of the nozzles about the housing. This plate has an arcuate slot 81 opening into the manifold and the manifold has an exhaust pipe 82 for conveying gases therefrom.

Manifestly, in a motor of this kind, it is necessary to include cooling facilities, and therefore I have provided means for causing a flow of cooling air through the housing. As observed best in Fig. 3, the end plate 13 has peripheral openings 85 for an inflow of cooling air into the housing at that end. Also, there are openings 86 in the adjacent end wall of the wheel 30; these openings being just within the rim portion of the wheel. Formed on the end wall, coaxial of the wheel, is a circular, outwardly directed flange 87 that serves to divert air that is drawn in through the openings 86, to the interior of the wheel. The wheel 30, as shown, is hollow and has openings 88 in its inside wall. Therefore, when the rotor is in operation, the fan-like structure of its spokes creates suction whereby outside air is drawn into the housing through the end plate openings 85, thence through the wheel openings 86 and 88, thence through the rotor and finally is discharged through an opening 90 in the end plate 12 into an exhaust manifold 91 fixed to the plate.

In order that the fuel pockets 36 may be swept clean of burned charges after passing the nozzles, and filled with fresh air before they reach the charging position, the housing 9 is provided with a circumferentially directed air inlet slot 95, as shown in Fig. 7, along which slot one end of each pocket passes as the wheel rotates, as will be observed in Fig. 3. Parallel with the slot 95 and inwardly offset therefrom, is another slot 96. This latter slot opens into a manifold 97 from which a nozzle or pipe 98 extends into the housing in a radial direction, and at a location between the wheel 30 and rotor as seen in Fig. 3. The inner end of this nozzle or pipe 98 is beveled so that its end opening faces the rotor, and therefore the flow of air through the rotor by reason of its fan-like function, creates suction that causes an inflow of air through the slot 95, through the pockets 36, manifold 97 and pipe 98, that effectively sweeps all burned gases from the pockets 36. The sweeping of the burned gases

from the pockets 36 leaves them filled with fresh air, and this becomes warmed by reason of its contact with the hot wheel.

Gas leakage from the housing 9 is prevented by the placing of sealing rings or gaskets 99 about the flanges of the wheel in close contact with the housing walls. These parts are lubricated by oil that is delivered through channels 100 in the wheel from an annular tank 101 that is contained in the body of the wheel about the center shaft. The tank is equipped with an adjustable regulator valve designated at 102, and this may be adjusted to control the outflow of oil by control of inlet of air.

In order that the air and vapor of the fuel mixture may be thoroughly mixed in the pipe 51 before it is admitted to the pockets of the wheel 30, I have inserted baffles 110 in the pipe 50, as shown in Fig. 1, in spaced relationship and extending alternately from opposite sides of the pipe, thus to baffle the flow of air and produce a very thoroughly mixed charge.

Another feature of the invention is shown in Fig. 6 wherein it is observed that the nozzle orifice 71 is formed in a disk 112 that is rotatably fixed in the wall. This disk may be rotatably adjusted so as to more or less directly apply the force of the charges against the impeller fins, thus to determine the rate of rotation of the wheel that will be most effective for feeding fuel charges to the engine.

To start the engine, the shaft 18 and wheel 30 are mechanically rotated, preferably by one of the conventional electrical starting devices as used for starting automobile engines, and of such type that will give these parts considerable speed. In the present showing, the outer end of the hub portion 31*a* of the wheel 30 is equipped with teeth 125 and a clutch gear 126 is slidably keyed on the shaft 18 adjacent thereto. A spring 127 between the gear and hub end, urges them apart and the starter gear 130 of starter 131 acts on gear 126 to move it against the teeth 125, thus to drive the shaft 18 and wheel 30 in unison. Rotation of the fan 40 operates to draw carbureted fuel from the carburetor and propel it to the manifold 51 from which it is supplied to the pockets 36 of wheel 30, and, by them, is carried to the nozzles.

With the ignition of the first charge by a spark created by the spark plug 57, part of the force of the ignited charge is discharged from the first nozzle 60*a*, through the orifice 71, against the impeller vanes 74 of the wheel 30 to more positively drive it; then with a more rapid delivery of fuel charges to the first nozzle, the wheel driving force builds up accordingly and finally the rate of rotation of the wheel is such as to convey the burning charges to all nozzles; the last nozzle discharge acting through orifice 78, to retard the rate of turning of the wheel to thereby govern the engine speed. The fan-like function of the rotor 25 creates suction and flow of cooling air through the housing, entering through ports 85, passing through ports 86 and 88 in wheel 30, then through the rotor and into manifold 91. This flow of air creates suction in pipe 98 and thus scavenges the gas from the pockets 36 as they pass the slot 96 and leaves these pockets filled with fresh air which is ultimately delivered to the carburetor for the fuel mixture.

After the engine has once been started, the rapidity of the delivery of fuel to the first nozzle keeps a constant flame of burning gas therein and continued ignition by means of the spark is not required.

Means for hand priming of the pockets 36 with fuel charges could be arranged if hand starting is necessary. Also, to provide for the admittance of additional air, should it be required either in starting or during operation, I have equipped the manifold 47 with a spring pressed flapper valve as indicated at 140 in Fig. 1.

Such engines can be made in sizes designed to produce horsepower as desired or required.

Having thus described my invention, what I claim as new therein and desire to secure by Letters Patent is:

1. An engine of the character described comprising a housing, a rotor revolubly contained in the housing and formed with a circumferential row of impeller abutments, a wheel fitted in the housing to rotate independently of the rotor and formed with a circumferential row of pockets, a plurality of nozzles arranged on the housing with receiving ends opening at spaced intervals through the housing wall in registration with the path of travel of the wheel pockets to receive fuel gases from the latter, and with discharge orifices opening through the housing for applying force of ignited fuel gases discharged therefrom against the rotor abutments, means for charging the wheel pockets with combustible fuel as they successively pass the charging point, means for igniting said charges as delivered by the pockets to the nozzles and means for applying a part of the force of ignited charges to rotate the said wheel.

2. An engine of the character described comprising a housing, a rotor revolubly contained in the housing and formed with a circumferential row of impellers abutments, a wheel fitted in the housing to rotate independent of the rotor and formed with a circumferential row of pockets and with a concentric row of impeller fins, a succession of nozzles arranged on the housing in its circumferential direction, with their receiving ends opening through the housing wall in registration with the path of travel of said wheel pockets to receive fuel gases therefrom, and with discharge orifices directed through the housing for applying force of gas discharged therefrom against the rotor abutments, means for charging the wheel pockets with combustible fuel as they successively pass a charging point, means for igniting the charges in the pockets as they are brought to the succession of nozzles, and means for diverting a part of the ignited gas charge from one of the nozzles against the wheel impellers to revolve the wheel.

3. An engine of the character described comprising a housing, a rotor revolubly fitted in the housing and formed with a circumferential row of impelling abutments, a wheel fitted in the housing revoluble independently of the rotor and formed with a succession of fuel gas conveying pockets, a succession of nozzles arranged on the housing in its circumferential direction, with receiving ends opening through the housing along the path of travel of the wheel pockets to receive fuel therefrom, and with discharge orifices opening through the housing wall in a direction to apply the force of ignited fuel gases therefrom against the rotor abutments, means for charging the wheel pockets with combustible fuel gases as they successively pass a charging point, means for igniting the gas charges in the pockets as they are successively conveyed to the succession of nozzles, means for diverting ignited gas from one of the nozzles against the wheel impellers to rotate the wheel, and means for effecting air displacement

of the burned gases from the pockets after passing the succession of nozzles and before reaching the charging point.

4. An engine of the character described, comprising a cylindrical housing, a rotor shaft coaxially thereof, a rotor fitted in the housing and fixed on the shaft, a wheel fitted rotatably in the housing and freely revoluble on the shaft; said rotor having a circumferential row of impeller abutments and said wheel having a circumferential row of gas conveying pockets and having a concentric row of impeller fins, a succession of nozzles arranged on the housing in circumferential alinement, with receiving ends opening through the housing in registration with the path of the wheel pockets each to receive gas charges from the pockets, and having discharge orifices opening through the housing wall to direct force of gas discharge against the rotor abutments and one of the nozzles having a discharge orifice for directing forces of exploding gases from the nozzle against the impeller fins of the wheel, a gas supply manifold having an opening through the housing through which said gas pockets of the wheel are charged as they successively pass across the opening, means for supplying fuel gases under pressure to the manifold for delivery into the pockets, means for igniting the fuel charges in the pockets as conveyed to the succession of nozzles, and means for effecting the scavenging of burned gases from the wheel pockets by displacement with fresh air after the pockets pass the succession of nozzles and before reaching the charging point.

5. An engine of the character described comprising a housing, a rotor revolubly fitted in the housing and formed with a circumferential row of impeller abutments, a fuel delivery wheel rotatable in the housing independent of the rotor and formed with a circumferential row of spaced, gas conveying pockets, and with a circumferential row of impeller fins, means for supplying fuel gas charges to the pockets as they successively pass a charging point, a series of nozzles on the housing, with receiving ends opening through the housing in registration with the path of travel of the wheel pockets to receive the fuel charges from the pockets, and having discharge orifices directed through the housing in a direction for applying the force of ignited fuel charges against the rotor abutments to drive the rotor, means for diverting force of ignited fuel from one of the nozzles against the impeller fins of the wheel to rotate it, and means for diverting the force of ignited fuel in the last nozzle of the series against the wheel impeller fins to oppose the driving force to retard speed of rotation of the wheel.

6. An engine as recited in claim 5 wherein the impeller abutments are equally angularly spaced, and wherein the discharge orifices from the series of nozzles are equally angularly spaced and at an angular spacing unequal to that of the said impellers.

7. An engine of the character described comprising a housing, a rotor revolubly fitted in the housing and formed with a circumferential row of spaced impeller abutments, a fuel delivery wheel freely rotatable in the housing and formed with an encircling row of gas conveying pockets, means for charging the said pockets with fuel gas as they successively pass a charging point, means for igniting the fuel in the pockets as they successively reach an ignition point, and a succession of nozzles on the housing circumferentially thereof, with receiving openings registering with the path of travel of gas pockets to receive the ignited charges and with discharge orifices directed to discharge against the rotor abutments; said discharge orifices of the nozzles in the series being successively reduced in size from the beginning to the end of the series to maintain gas velocity therethrough.

8. An engine of the character described comprising a housing, a rotor shaft mounted coaxially thereof, a rotor fixed to the shaft having a circumferential row of impeller abutments, a wheel freely revoluble on the shaft; said wheel being formed with a circumferential row of spaced pockets for the conveyance of fuel gas charges, and having a concentric row of impeller fins thereon, a succession of nozzles arranged on the housing in the circumferential direction thereof, with receiving ends opening through the housing wall in registration with the path of travel of the wheel pockets, and with the exception of the last of the series, having discharge orifices opening through the housing wall toward the rotor abutments, means for charging the wheel pockets with fuel gas as they successively pass a charging point, means for igniting said charges in the pockets as they are delivered to the succession of nozzles, means for diverting a part of the force of burning gas from the first nozzles of the series against the impeller fins of the wheel to rotate it to deliver the fuel charges to the nozzles, and means for diverting the force of the fuel charges burned in the last nozzle of the series against the wheel impellers in a direction to retard its rate of rotation.

9. An engine as in claim 8 wherein the means for diverting a part of the force of burning gas from the first nozzle of the series comprises a lateral branch from the nozzle, a plug rotatably applied to a wall of the duct, and an inclined passage through the plug; said plug being rotatably adjustable as a means for applying the force of expanding gas more or less directly against the impeller fins as a means of regulating its rate of rotation.

10. In an engine of the character described, an engine housing having opposite end openings for inflow and outflow of cooling air, a rotor shaft coaxial of the housing, a rotor fixed on the shaft and comprising a rim portion formed with spaced impeller abutments, and having an open body portion, a wheel freely revoluble in the housing having a rim portion formed with a circumferential row of fuel gas pockets and having an open body portion; means for charging the said pockets with fuel gas as they pass a charging point, nozzles arranged on the housing with receiving ends opening through the housing wall in registration with the path of the wheel pockets and having discharge orifices to divert the force of charges ignited in the pockets against the abutments of the rotor to drive the rotor, means for igniting the fuel charges as brought by the pockets to the succession of nozzles and means for creating a flow of cooling air through the housing and causing it to pass through the open body portions of the wheel and rotor.

11. An engine as recited in claim 10 wherein the body portion of the rotor is formed with spokes that are shaped to function as a fan and to create a flow of cooling air through the engine.

12. An engine of the character described comprising a housing, a rotor shaft mounted coaxially therein, a rotor fitted in the housing and fixed on said shaft, a wheel revoluble on the shaft and fitted in the housing at one side of the rotor; said rotor having a circumferential row

of impeller abutments, and said wheel having an encircling row of spaced gas conveying pockets and a row of impeller fins thereon, a fuel delivery manifold on the housing having an opening through the housing wall in registration with the path of travel of the wheel pockets, means for supplying fuel to the engine including a carburetor, a fan housing having an outlet leading to the carburetor, a fan fixed on the rotor shaft operable in said housing to drive fresh air to the carburetor and to forcibly deliver a fuel-air mixture to said manifold for charging the wheel pockets, a succession of nozzles on the housing with receiving ends open to the path of travel of the wheel pockets, and with discharge orifices directed through the housing to discharge against the rotor abutments, means for igniting the fuel charges in the pockets as conveyed to the succession of nozzles and means for applying part of the force of burning fuel charges against the impeller fins of the wheel to drive the wheel.

13. An engine as recited in claim 12 including means whereby burned fuel gases are displaced from the wheel pockets after they pass the succession of nozzles, by fresh outside air, and means whereby said outside air is subsequently conveyed to the fan housing for supplying the carburetor with air for the fuel-air mixture.

14. In an engine of the character described, a housing, an open body rotor revolubly fitted in the housing and having a circumferential row of impeller abutments, an open body wheel rotatably fitted in the housing and having a circumferential row of gas conveying pockets, means for rotating the wheel, a succession of nozzles arranged on the housing in its circumferential direction, each having a receiving end opening through the housing wall in registration with the path of travel of the wheel pockets, and having a discharge orifice opening through the housing to discharge against the impeller abutments of the rotor, means for supplying fuel charges to the pockets as they successively pass a charging point, means for igniting the charges in the pockets as they reach the first of the nozzles; said housing having openings therein for inflow and outflow of cooling air, and said rotor comprising means for causing a forced flow of cooling air through said openings, and through the open body portions of the wheel and rotor.

15. In an engine of the character described, a housing, an open body rotor revolubly fitted in the housing and having a circumferential row of impeller abutments, an open body wheel rotatably fitted in the housing and having a circumferential row of gas conveying pockets, means for rotating the wheel, a succession of nozzles arranged on the housing in its circumferential direction, each having a receiving end opening through the housing wall in registration with the path of travel of the wheel pockets, and having a discharge orifice opening through the housing to discharge against the impeller abutments of the rotor, means for supplying fuel charges to the pockets as they successively pass a charging point, means for igniting the charges in the pockets as they reach the first of the nozzles; said housing having openings therein for inflow and outflow of cooling air, and said rotor comprising means for causing a forced flow of cooling air through said openings, and through the open body portions of the wheel and rotor; said housing also having an opening for inflow of outside air registered with the path of travel of the wheel pockets between the series of nozzles and charging point whereby the pockets are caused to be scavenged of burned fuel and filled with fresh air.

16. In an engine, a housing, a wheel fitted rotatably in the housing and rotatable at a high rate of speed; said wheel having a circumferential row of gas conveying pockets, and said housing having a slot along which said pockets move for being charged with fuel gas, a fuel supply manifold overlying and extending along the slot, means for supplying a carbureted fuel mixture under pressure to the manifold through a side wall opening, and a suction connection opening into the manifold through its outside wall for direct reception of air or gas that is centrifugally discharged from the pockets as they come into registration with the slot.

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