Sept. 13, 1932. E. L. KASTLER 1,876,956

MOTOR

Filed Jan. 15, 1930 3 Sheets-Sheet 1

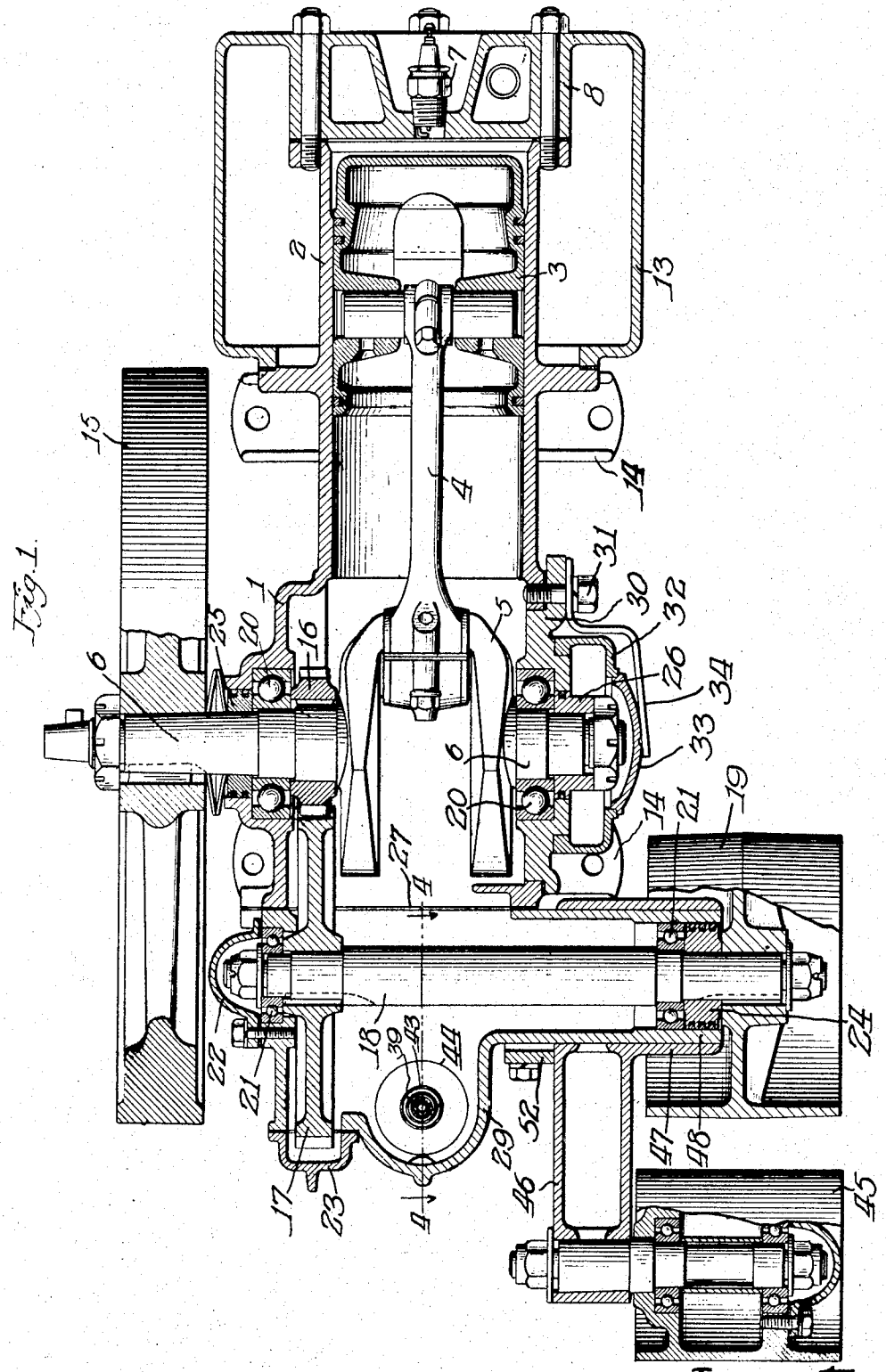


Fig. 1.

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Witness
R. B. Davison.

By Wilson, Dowell, McCanna & Rehm
Atty's

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Filed Jan. 15, 1930 3 Sheets-Sheet 2

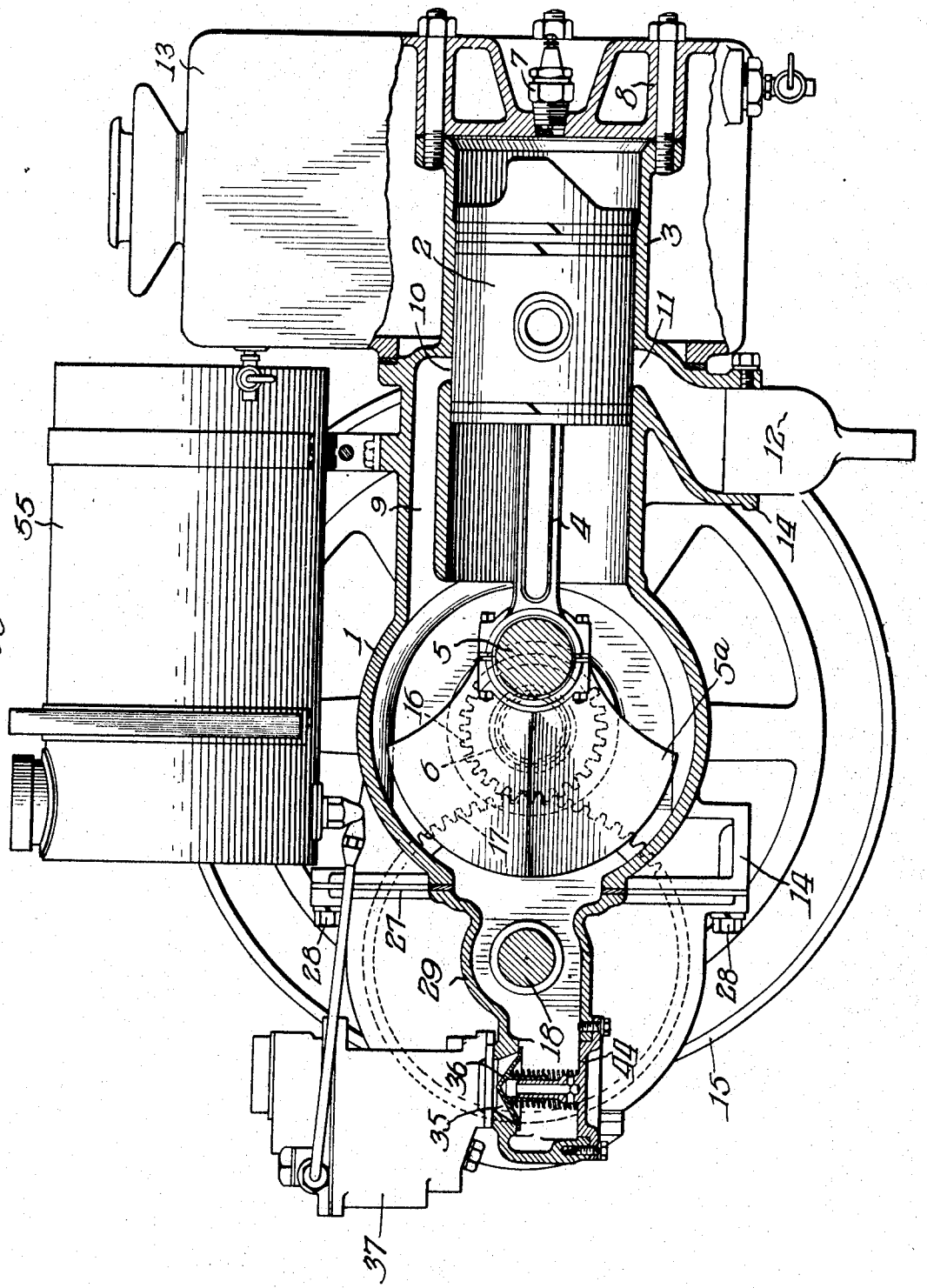


Fig. 2

Witness
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Fig. 4.

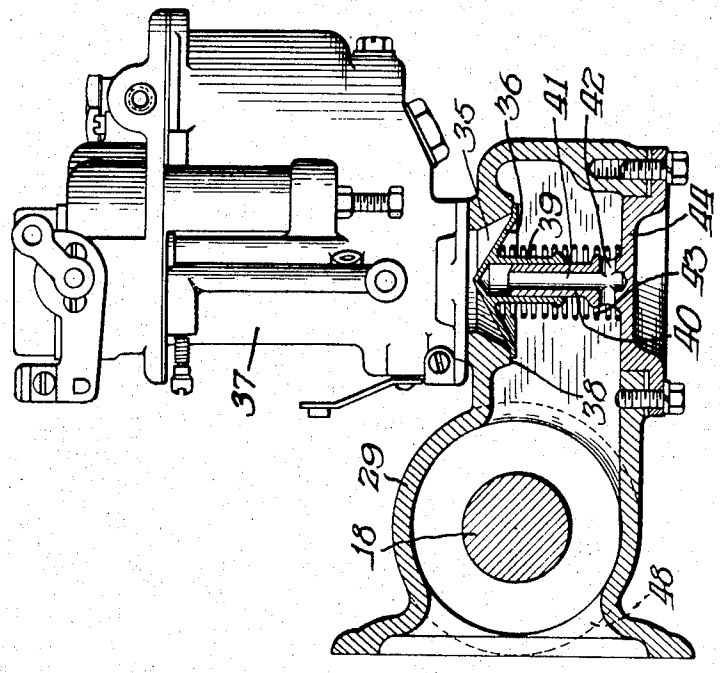
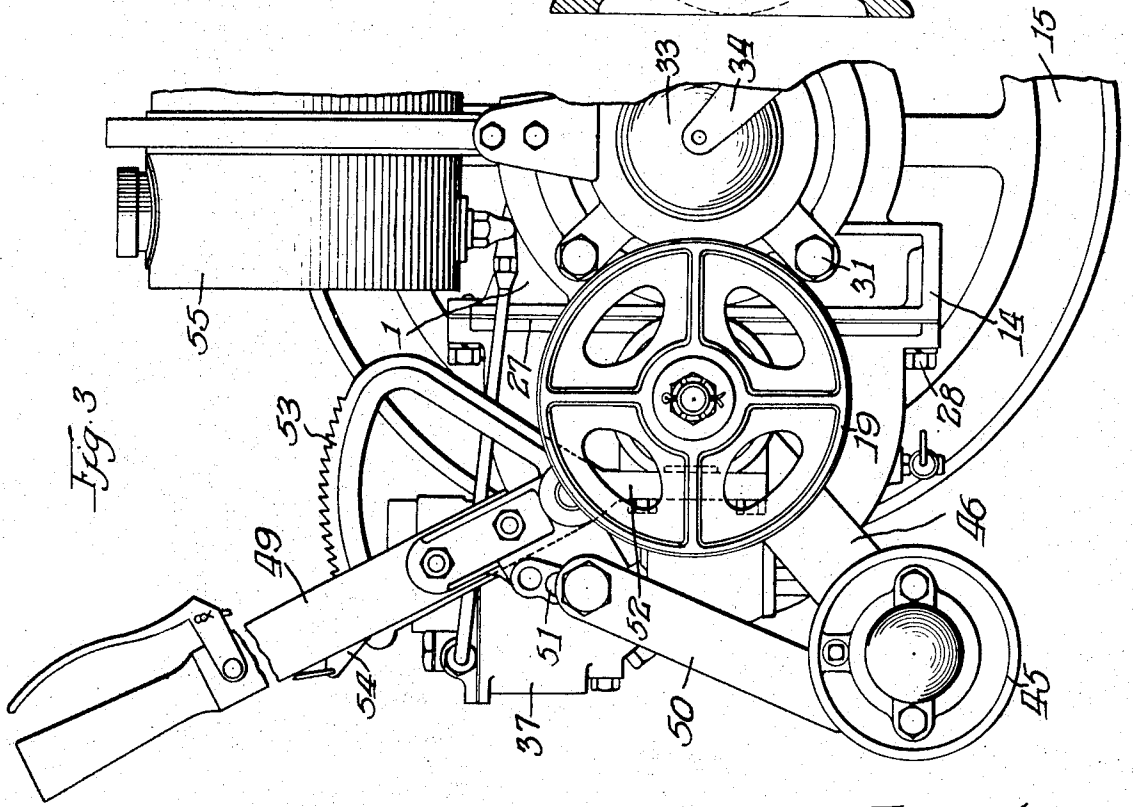


Fig. 3.



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Witness
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Patented Sept. 13, 1932 1,876,956

UNITED STATES PATENT OFFICE

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MOTOR

Application filed January 15, 1930. Serial No. 420,832.

The object of this invention is to provide an improved motor of the class employed for such purposes, for example, as the propulsion of the small railway motor cars which track laborers use in riding from point to point on a maintenance section of railroad.

An illustrative motor of one practicable construction embodying the invention is shown for example in the accompanying drawings, by reference to which the invention will be readily understood.

In said drawings:

Fig. 1 is a horizontal section of the illustrative motor.

Fig. 2 is a longitudinal sectional elevation thereof.

Fig. 3 is a partial side view.

Fig. 4 is a section taken on the line 4—4 of Fig. 1, looking in the direction of the arrow, and showing the carburetor in elevation.

While the illustrative motor is intended especially for use as the propelling instrumentality for a workmen's railway motor car, it will be understood that it is susceptible of other uses; and it will also be understood that the following description with reference to the specific embodiment of the invention herein selected for illustration is not to imply any limitation of the invention beyond the terms of the claims in which the invention is particularly pointed out and defined.

The motor represented in the drawings embodies a two-cycle internal combustion engine having a closed or sealed crank case 1 unitary with the engine cylinder 2 in which the piston 3 reciprocates. The piston is pivotally connected by the usual pitman rod 4 with the crank pin of the crank 5 on the crank shaft 6 housed in the crank case. A spark plug 7 in the detachable cylinder head ignites the fuel charge or explosive mixture which in this type of engine is introduced through the crank case. As will be understood by those familiar with such engines, the piston on its back stroke sucks the gaseous fuel charge into the crank case, and on its forward or working stroke compresses the charge which is thereby forced through the passage 9 into the working chamber of the cylinder as soon as the piston uncovers the admission port 10. The spent or exploded gas exhausts through the cylinder port 11 also controlled by the piston. An exhaust muffler is shown at 12. A water jacket surrounding the working chamber of the cylinder is shown at 13.

The engine is shown horizontally arranged and having its case equipped with supporting feet 14 by which the motor may be mounted on a suitable support such for example as the sill of the motor car for which the illustrative motor is intended.

The engine crank shaft 6, equipped outside the crank case with the usual flywheel 15, is shown connected inside the crank case by reducing gears 16 and 17 with a secondary power shaft 18 parallel with the crank shaft. The secondary power shaft is equipped outside the crank case with a pulley 19 for transmission of power by a driving belt to the car axle or other apparatus to be driven. The said shafts and speed reduction gears, together with the crank shaft bearings 20 and the secondary power shaft bearings 21, are all encased and completely housed by the crank case and its various sealing closures including the caps 22 and 23 and the packed bearing abutment collars 24, 25 and 26.

The crank case is transversely split between the two shafts as indicated at 27 where the abutting parts of the divided case, clamping an interposed gasket, are suitably flanged and detachably fastened together by the bolt screws 28. Thus the part of the crank case which contains the secondary power shaft is a separate end housing member 29 in direct communication with but separately connected with the main body of the crank case. Among other advantages the removability of the separate end housing 29 with its contained secondary power shaft and the gear 17 thereon, affords a convenient means for opening up the crank case for inspection and adjustment of the crank pin bearing.

Assemblage of the working parts in the crank case is permitted by virtue of the divided crank case construction described and by virtue of a removable part 30 of one of the side walls of the crank case, the removal of which will leave an opening large enough

for passage of the crank. This removable part 30, in which is fitted one of the crank shaft bearings, is shown as a flanged plate fitted in the said opening and detachably fastened by the bolt screws 31 to the main body of the crank case, with an interposed gasket. On the removable plate 30 there is shown fitted a cap 32 to contain the timer (not shown) for the ignition system. The timer cap is shown having a small removable cap 33 held in place by the leaf spring 34.

The internal form of the crank case around the smaller reducing gear 16 is such as to provide ample room to accommodate a considerably larger gear than the one shown, while of course the other gear 17 may be replaced by a correspondingly smaller gear, so that the construction is such as to permit a wide range of gear reductions; and by virtue of the sectional crank case construction, with its division or joint between the crank shaft and the secondary shaft, a change in the gear ratios may be made if desired after the motor is built.

For lubricating the motor, a suitable proportion of oil is incorporated in the gasoline supplied to the carburetor. As the gaseous mixture drawn from the carburetor is introduced to the engine through the crank case, where it is compressed before its admission to the working space of the cylinder, and as all the working parts including the reduction gears and the bearings for the secondary power shaft are housed in or exposed to the crank case compression space, the operation of the motor will automatically maintain all bearings and gears lubricated, by the oil contained in the mixture supplied to the engine, thus eliminating all external grease and oil cups.

The opening for the intake of the gaseous mixture into the crank case is shown in Fig. 4 at 35, being located in this instance in the top of the removable end housing 29 at the side of the secondary power shaft opposite from the crank shaft side and between the two secondary shaft bearings 21. This location will promote the distribution of the incoming oily mixture to these bearings, although in any event they, as well as all other bearings and parts within the crank case, will be subjected to the mixture by virtue of the compression thereof in the crank case which takes place during the inward or working stroke of the piston.

The intake opening 35, controlled by the inwardly opening check valve 36, is in communication with the superposed carburetor 37 mounted on the housing 29. It is desirable to employ a carburetor of the type which discharges downward from the point of vaporization of the liquid fuel. Any appropriate carburetor of this type may be employed, for instance a Stromberg downdraft carburetor, which is shown in the drawings in elevation, this being a known type of carburetor and therefore unnecessary to illustrate in detail. By employing a carburetor of this type discharging into the upper part of the crank case through a vertical bore or passage controlled by a vertically operating check valve seating against the underside of the wall surrounding the intake opening, a direct downward course of the carburetor mixture is insured during all stages of transit from the point of vaporization to the interior of the crank case. This promotes the efficient intake of the requisite supply of the mixture at each cycle of the engine and promotes an even or uniform action of the engine by preventing the formation of puddles or accumulations of liquid fuel between the check valve and the point of mixing.

The check valve 36 is shown formed to provide a conical or convex upper surface, so as to shed any liquid which may deposit thereon, and with a flat rim seated against a finished flat surface providing the valve seat 38, to insure tight closure or sealing of the intake opening when the valve is seated. The valve is shown formed with a depending tubular valve stem 39 slidably fitted on a vertical guide post 40 which is suitably vented by the central passage 41 and lateral passages 42 so as to avoid any trapping of air under the valve. A spring which holds the valve seated is indicated at 43. A bonnet or removable part of the case carrying the valve guide is indicated at 44. The described construction permits the valve to open and close freely, and enables the valve to maintain a tight seal indefinitely, regardless of wear of the valve stem and guide, and without necessitating accurate coincidence of the axis of the valve seat with the axis of the valve stem and guide.

Associated with the driving belt pulley 19 is a belt-tightening idler 45 carried by a swinging arm 46 the hub 47 of which is journaled on a tubular crankcase extension 48 which encloses the pulley end of the secondary power shaft 18, one of the bearings 21 of said shaft being fitted in said crankcase extension. This tubular crankcase extension 48, being in this instance an extension of the removable end housing 29, is exteriorly machined in a true cylindrical form and concentric with the axis of the secondary power shaft, whereby the controlled arm 46 carrying the belt-tightening idler 45 has its hub accurately journaled coaxially with the pulley 19, so that the belt-tightening idler in any adjusted position will be in perfect alignment with the driving pulley, to insure true running of the driving belt. The idler is controlled for slack adjusting or belt tensioning purposes by the hand lever 49 connected by the link 50 with the idler carrying arm 46. Provision for adjusting the pivotal connection of the link 50 to the hand lever is

indicated at 51. The hand lever is fulcrumed to a part 52 bolted or attached to the motor case. Said part carries a quadrant or segmental rack 53 engaged by a hand operated detent 54 with which the hand lever is equipped, for locking the belt tightening idler in desired position.

The motor described is of exceedingly practicable and efficient character for the class of service for which it is designed. It comprises a compact and simple unit with the secondary power shaft and its belt driving pulley and associated belt tensioning idler embodied in the unit, and with all its shafts, gears and various bearings encased. It is of a construction practicable for manufacture, and of a construction such as to permit convenient opening of the motor case for access to the crank pin bearing. Because of the simple two-cycle engine and the provision for automatic lubrication of the engine and the various bearings, the motor will not easily get out of order and will require little attention other than supplying gasoline with a suitable proportion of oil to the fuel tank 55. By reason of the downdraft carburetor and the improved construction and arrangement with respect to the gas intake opening and check valve, a more even and efficient action of the two-cycle engine is obtained than in previous engines of this type. On the whole the motor well fulfills the requirements for a comparatively simple and durable type of propelling instrumentality. The construction and arrangement with respect to the belt pulley and slack adjustor is very advantageous and convenient.

It will be understood that the details of construction and arrangement may be variously modified.

What I claim as my invention, and desire to secure by Letters Patent, is:

1. A motor comprising a two-cycle internal combustion engine having a crank shaft and a closed crank case through which the gaseous fuel mixture containing oil for lubrication is introduced to the engine, the crank shaft bearings being contained in and exposed to the compression space of said case, and having a secondary power shaft geared to the crank shaft and a housing therefor by which the bearings of the said secondary power shaft and the gears connecting said shafts are exposed to the compression space of the crank case, whereby the bearings of both of said shafts and the said gears as well as all other working parts housed by the crank case may be maintained lubricated by oil in the gaseous fuel mixture introduced into the crank case.

2. A motor comprising a two-cycle internal combustion engine having a crank shaft and a closed crank case through which the gaseous fuel mixture is introduced to the engine, the crank shaft bearings being contained in and exposed to the compression space of said case, and having a secondary power shaft geared to the crank shaft and a housing therefor by which the bearings of the said secondary power shaft and the gears connecting said shafts are exposed to the compression space of the crank case, whereby the bearings of both of said shafts and the said gears as well as all other working parts housed by the crank case must be maintained lubricated by oil in the gaseous fuel mixture introduced into the crank case, said housing being separably attached to and affording a removable closure of the crank case.

3. A motor comprising a two-cycle internal combustion engine having a crank shaft and a closed crank case through which the gaseous fuel mixture is introduced to the engine, the crank shaft bearings being contained in and exposed to the compression space of said case, and having a secondary power shaft geared to the crank shaft and a housing therefor by which the bearings of the said secondary power shaft and the gears connecting said shafts are exposed to the compression space of the crank case, whereby the bearings of both of said shafts and the said gears as well as all other working parts housed by the crank case must be maintained lubricated by oil in the gaseous fuel mixture introduced into the crank case, the intake opening for the said mixture being in the said housing.

4. A motor comprising a horizontally disposed two-cycle internal combustion engine having a crank shaft and a closed crank case through which the gaseous fuel mixture is introduced to the engine, the crank shaft bearings being contained in and exposed to the compression space of said case, and having a secondary power shaft geared to the crank shaft and a housing therefor by which the bearings of the said secondary power shaft and the gears connecting said shafts are exposed to the compression space of the crank case, whereby the bearings of both of said shafts and the said gears as well as all other working parts housed by the crank case must be maintained lubricated by oil in the gaseous fuel mixture introduced into the crank case, the intake opening for the said mixture being located at a position above the shafts and gears.

5. A motor comprising a horizontally disposed two-cycle internal combustion engine having a crank shaft and a closed crank case through which the gaseous fuel mixture is introduced to the engine, and having within the crank case a secondary power shaft geared to the crank shaft, the bearings of both of said shafts being exposed to the compression space of the crank case, and the crank case being transversely divided between the crank shaft and secondary power shaft to provide an end housing carrying said secondary power shaft, which housing is

separably connected to the main body of the crank case, the main body of the crank case constituting the supported motor frame and the end housing being removable therefrom for access to the interior of the main body from the rear.

6. A motor comprising a two-cycle internal combustion engine having a crank shaft and a closed crank case containing the crank shaft bearings, through which case the gaseous fuel mixture is introduced to the engine, said case embodying a removable housing equipped with a carburetor and having the intake opening for the mixture, and a secondary power shaft geared to the crank shaft and which with its bearings and gears is contained in said housing.

7. A motor comprising a two-cycle internal combustion engine having a crank shaft and a closed crank case through which the gaseous fuel mixture is introduced to the engine, and oil for lubricating the bearings of which is introduced with said fuel mixture, said motor having within the crank case a secondary power shaft geared to the crank shaft, the bearings of both of said shafts being exposed to the compression space of the crank case.

8. A motor having, in combination with the cylinder and piston of a horizontally disposed internal combustion engine, a crank shaft operatively connected with the piston, a closed crank case through which the gaseous fuel mixture for the engine is introduced, the crank shaft and the bearings being housed in said case, a secondary power shaft arranged behind and geared to the crank shaft, a rear end housing containing said secondary power shaft and its bearings, said housing being separably attached to and affording a removable closure for the crank case and interiorly in communication with the interior of the crank case.

9. A motor comprising an internal combustion engine having a closed crank case to receive the gaseous fuel mixture for the engine and having a downdraft carburetor discharging into the upper part of the case through a vertical bore or passage providing the intake opening for the gaseous mixture, and having a vertically operating check valve controlling the said passage, said valve seating against the under side of the valve seat surrounding said intake opening, thereby assuring the direct downward passage of the carbureted mixture from the point of vaporization and preventing the formation of puddles or accumulations of liquid fuel between the check valve and the point of mixing.

10. A motor comprising an internal combustion engine having a closed crank case to receive the gaseous fuel mixture for the engine and having a downdraft carburetor discharging into the upper part of the case through a vertical bore or passage providing the intake opening for the gaseous mixture, and having a vertically operating check valve controlling the said passage, said valve seating against the under side of the valve seat surrounding said intake opening, the valve being formed to provide a liquid shedding upper surface and with a flat rim to engage the valve seat.

11. A motor comprising an internal combustion engine having a closed crank case to receive the gaseous fuel mixture for the engine, said case having an intake opening in a top wall of the case and vertically operating check valve controlling the source, said valve closing against the under side of said wall and being formed with a flat rim to seat against said under side of the wall around the intake opening and having a hollow stem, and a vertical guide on which the valve stem is slidably fitted, said guide vented to avoid interference with the free motion of the valve by trapping of air.

12. A motor embodying a crank case and a shaft mounted therein equipped outside the case with a pulley for a driving belt, and a belt-tightening idler associated with said pulley, said crank case having a tubular extension enclosing said shaft and exteriorly machined concentrically with said shaft, and a controlled arm carrying said idler, the hub of which arm is journalled on said machined extension, whereby the idler is maintained in proper alignment with reference to the pulley to assure true running of the belt.

In witness of the foregoing I affix my signature.

EDWARD L. KASTLER.