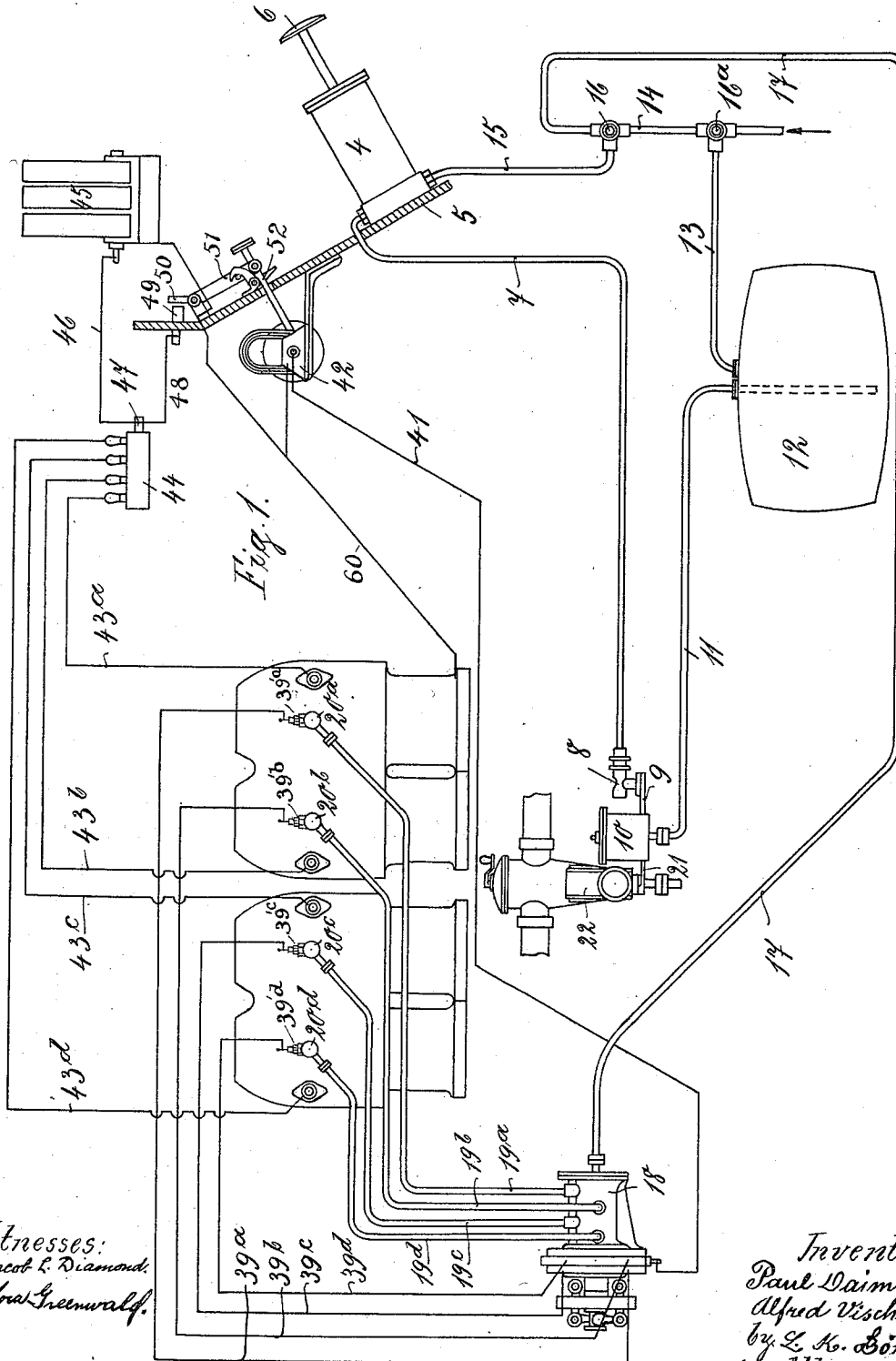


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 STARTING GEAR OF INTERNAL COMBUSTION MOTORS.
 APPLICATION FILED NOV. 12, 1908.

972,512.

Patented Oct. 11, 1910.

3 SHEETS—SHEET 1.



Witnesses:
 Jacob L. Diamond,
 Horst Greenwald.

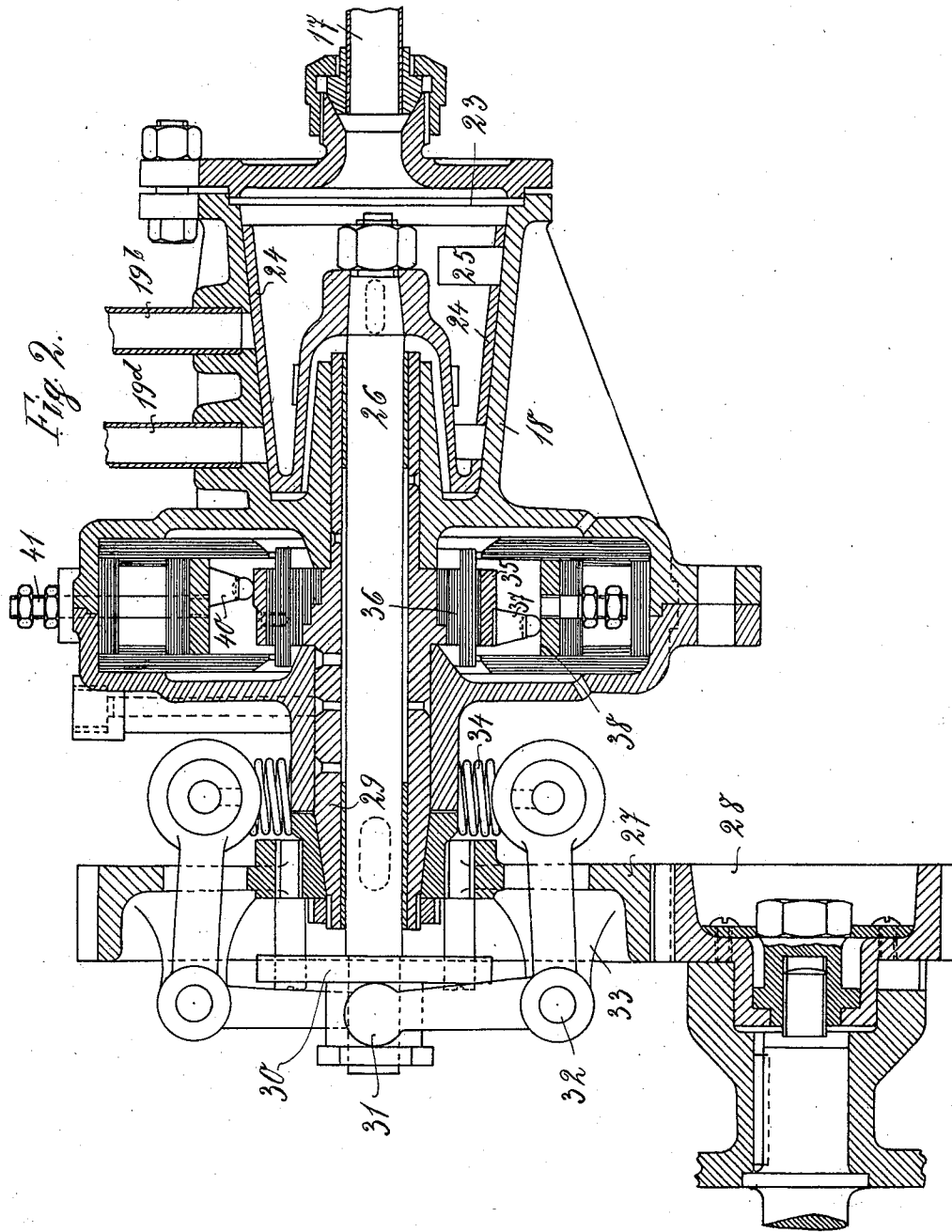
Inventors
 Paul Daimler,
 Alfred Vischer
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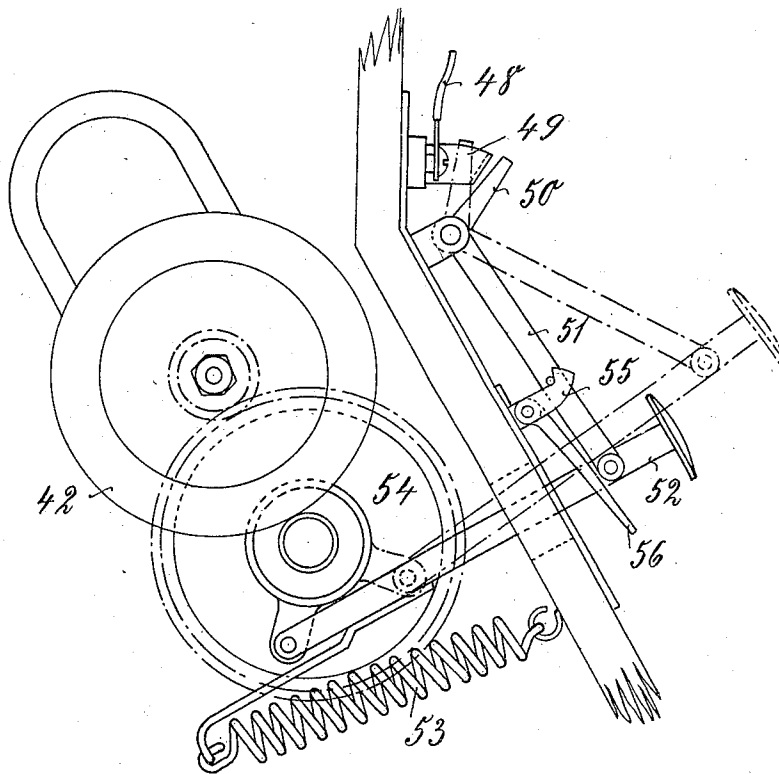
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3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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ASSIGNORS TO DAIMLER MOTORENGESELLSCHAFT, OF UNTERTÜRKHEIM-STUTTGART, GERMANY.

STARTING-GEAR OF INTERNAL-COMBUSTION MOTORS.

972,512.

Specification of Letters Patent.

Patented Oct. 11, 1910.

Application filed November 12, 1908. Serial No. 462,200.

To all whom it may concern:

Be it known that we, PAUL DAIMLER and ALFRED VISCHER, both subjects of the King of Württemberg, and residents of Untertürkheim-Stuttgart, in the Kingdom of Württemberg, Germany, have jointly invented a new and Improved Starting-Gear of Internal-Combustion Motors, of which the following is an exact specification.

10 This invention relates to the starting gear employed in internal combustion motors especially to such as are used in motor cars.

In the arrangement according to the present invention a mixture of gas and air is drawn from a starting carbureter by a pump and is forced into a distributor which distributes said mixture to the engine cylinders; the mixture thus distributed is ignited by an auxiliary igniter.

20 According to the present invention the pump which draws the gas and air mixture from the starting or auxiliary carbureter is adapted to be placed also in communication with the liquid fuel holding tank so as to supply compressed air to said tank for the purpose of feeding the liquid fuel to the carbureter. Switch cocks are placed in the pressure pipe leading from said pump and these switch cocks are adapted to switch the pump into communication with branch pipes leading either to the liquid fuel holder or to the distributor as desired.

Further according to the present invention the distributor is of the rotary type and a centrifugal governor is associated with its driving shaft so that when the engine is properly started the centrifugal governor withdraws the rotary distributor from its seat and thereby renders it inactive.

40 A further improvement consists in the arrangement of the auxiliary or starting ignition. It is advantageous, when employing a high pressure magneto-ignition device, to cut out the main magneto ignition-device when starting. According to the present invention the operating gear for the starting magneto is articulated to a switch which short circuits the main magneto during the time of operating the auxiliary or starting magneto.

The apparatus forming the subject matter of the present invention will be more clearly understood from the accompanying draw-

ings and the novel features will be pointed out in the claims.

In the drawings Figure 1 is a general arrangement of the starting gear, the parts are only shown diagrammatically, Fig. 2 is a section through the distributor, and Fig. 3 is a diagrammatic view on an enlarged scale showing a short circuiting device for the main magneto.

In carrying the invention into effect according to the form illustrated a pump 4 is arranged conveniently on the front board 5 of a motor car to be operated by a foot pedal 6. The pump 4 is adapted to suck through a pipe 7 from a carbureter 8. The carbureter 8 is connected by a pipe 9 with a float chamber 10; the float chamber 10 is in turn connected by a pipe 11 with a fuel reservoir 12. The air space of the fuel reservoir 12 is connected by a pipe 13 to a branch pipe 14 adapted to be placed in communication with the pressure pipe 15 leading from the pump 4 by means of a cock 16. The cock 16 is also adapted to switch the pipe 15 into communication with a pipe 17 leading to a distributor 18 which is illustrated in enlarged detail in Fig. 2. From the distributor 18 pipes 19^a, 19^b, 19^c, 19^d lead to inlet valves 20^a, 20^b, 20^c, 20^d in the cylinders. The float chamber 10 is connected by a pipe 21 with the main carbureter 22. Communication with the atmosphere is controlled by a valve 16^a.

The apparatus described operates as follows:—When starting, the cock 16 is set so as to establish communication from the pump 4 through the pipes 15, 14 and 13 to the air space in the liquid fuel reservoir 12. The liquid fuel is thereby forced through the pipe 11 into the float chamber 10 and thereby through the pipe 9 into the carbureter 8. When the piston of the pump 4 returns, air is drawn through the starting carbureter 8 and also liquid fuel so that the cylinder 4 is charged with a mixture of air and hydrocarbon. The cock 16 is then operated so as to establish communication between the pressure pipe 15 and the pipe 17 leading to the distributor 18. In this way a mixture of hydrocarbon and air is supplied to the cylinders of the motor as desired at starting.

The pipe 17 as shown in Fig. 2 opens into

the interior of a casing 23 in which there revolves a rotary distributing valve 24 having ports 25 adapted to register successively with the openings to the pipes 19^a, 19^b, 19^c, 19^d. The rotary distributor 24 is formed conically and is connected to a driving shaft 26 which is driven by a toothed wheel 27 gearing with a wheel 28. The gearing 28 and 27 is such that the shaft 26 makes one turn for every two revolutions of the engine shaft. The wheel 27 is keyed to a sleeve 29 which is splined to the shaft 26. The shaft 26 can thus move axially within the sleeve 29. On the end of the shaft 26 there is formed a flange 30 against which there bear the ends 31 of the right angle governor levers 32. These levers are pivoted to brackets 33 carried by the wheel 27. Springs 34 normally press the levers 32 so as to cause the ends 31 to press against the flange 30. This pressure however is not sufficient to raise the distributor 24 from its seat. When the engine starts the centrifugal action of the governor levers 32 moves the shaft 26 to the right in Fig. 2 and thereby the distributor 24 is raised from its seat and runs idle. In this way all unnecessary wear of the starting distributor is avoided during normal running of the engine.

Carried by the sleeve 29 is a ring 35 separated from the sleeve by insulation 36. This ring carries a spring contact 37 adapted to run over fixed contact surfaces 38 and establish electrical connection in the desired order with the terminals of the conductors 39^a, 39^b, 39^c, 39^d leading to the plugs for the starting ignition 39^a, 39^b, 39^c, 39^d for the independent auxiliary inlet valves 20^a, 20^b, 20^c, 20^d. A spring contact 40 is adapted to bear on the ring 35 and this spring contact is connected by a guide 41 to the auxiliary starting magneto 42. The electric circuits during the starting period are therefore as follows: magneto 42, wire connection 41, timing device 40, 35, 37, conductors 39^a, 39^b, 39^c, 39^d to the plugs 39^a, 39^b, 39^c, 39^d, return through the motor and conductor 60 back to the magneto 42. The main ignition plugs 43^a, 43^b, 43^c, 43^d, of the engine are connected through leads 43^a, 43^b, 43^c, 43^d to the main timer 44. The main ignition magneto 45 is connected by a lead 46 to the terminal 47 of the timer 44. From the terminal 47 also leads a conductor 48 to a switch 49. The arm 50 of the switch 49 is articulated by a lever 51 to the push rod 52 for operating the auxiliary magneto 42 in any well known manner. The push rod 52 is normally held in its lower position shown in full lines in Fig. 3 by means of a trigger or pawl 55 in which position the spring 53 is in tension. When the trigger or pawl 55 is released by pressing the lever 56, push rod 52 is rapidly brought into the position shown in dotted

lines by the spring 53 ready for operation of the magneto. It will be observed that the switch 49 is closed in the early portion of the movement of the rod 52 from the position shown in dotted lines. After starting, the push rod 52 is held by the foot of the operator in the position shown in full lines, and the pawl 55 is moved over so as to hold the switch 49, 50 open. During the normal running of the motor the main ignition electric circuits are as follows:—main magneto 45, lead 46, timer 44, connections 43^a, 43^b, 43^c, 43^d to the main sparking plugs 43^a, 43^b, 43^c, 43^d, return through the motor and lead 46 to the magneto 45. During the starting period the main magneto is short circuited through lead 46, terminal 47, lead 48, switch 49, 50 back to the magneto 45.

We claim:—

1. In combination with the cylinders of a motor, a starting device comprising a carbureter, a starting pump, a fuel reservoir, a suction pipe leading from said carbureter to said pump, a pressure pipe leading from said pump, branch pipes from said pressure pipe leading one to the fuel reservoir and another to the motor cylinder, and a switch cock at the branching point between said pressure pipe and the branch pipes for the purpose of establishing communication as desired between the pump and the fuel reservoir or between the pump and the engine cylinders.

2. In combination with the cylinders of an internal combustion motor, a starting device comprising a carbureter, a starting pump, a fuel reservoir, a rotary distributor, a suction pipe leading from said carbureter to said pump, a pressure pipe leading from said pump, branch pipes from said pressure pipe to the fuel reservoir and distributor, a switch cock at the branching point of said pipes for establishing communication between the pump and the fuel reservoir or between the pump and the distributor as desired, and pipes leading from the distributor to the engine cylinders.

3. In combination, an internal combustion motor, a distributor for supplying mixture to a plurality of cylinders comprising a casing having ports therein in communication with the cylinders, a rotary valve controlling said ports and slidable from its seat, and a centrifugal governor associated with the driving gear of said valve and adapted to raise said valve from its seat when the engine is started, whereby said valve is rendered inactive.

4. In combination, an internal combustion motor, a distributor for supplying mixture to the various cylinders of the motor comprising a casing having a plurality of ports therein, in communication with various cylinders, a conical distributing valve rotatable in said casing and controlling said

ports, an auxiliary slidable driving shaft for said conical distributing valve, a fixed driving sleeve splined to said driving shaft, and a centrifugal governor associated with said sleeve and adapted to act on said driving shaft.

5. In an internal combustion motor having a plurality of cylinders, the combination with the crank shaft, cylinders, a receptacle for combustible fuel, carbureter, inlet and exhaust valves to each of said cylinders, a sparking plug for each cylinder, a generator and a timer, of a second carbureter, a rotary distributing valve, ports in said valve adapted to afford communication with each of said cylinders in the desired order, a connection between each of said ports and the corresponding cylinder, gearing between said crank shaft and said distributing valve, means for providing said

second carbureter with a supply of combustible fuel, a pump capable of operation by the driver for drawing a mixture of air and combustible through said second carbureter and discharging the mixture through said distributing valve into the cylinders, a second source of electric energy and means capable of operation by the driver for short circuiting said generator and utilizing said second source of electric energy for igniting the mixture passed into the cylinders through said distributing valve.

In witness whereof we have hereunto set our hands in the presence of two witnesses.

PAUL DAIMLER.
ALFRED VISCHER.

Witnesses:

HELENN DAIMLER,
ROBERT UHLAND.