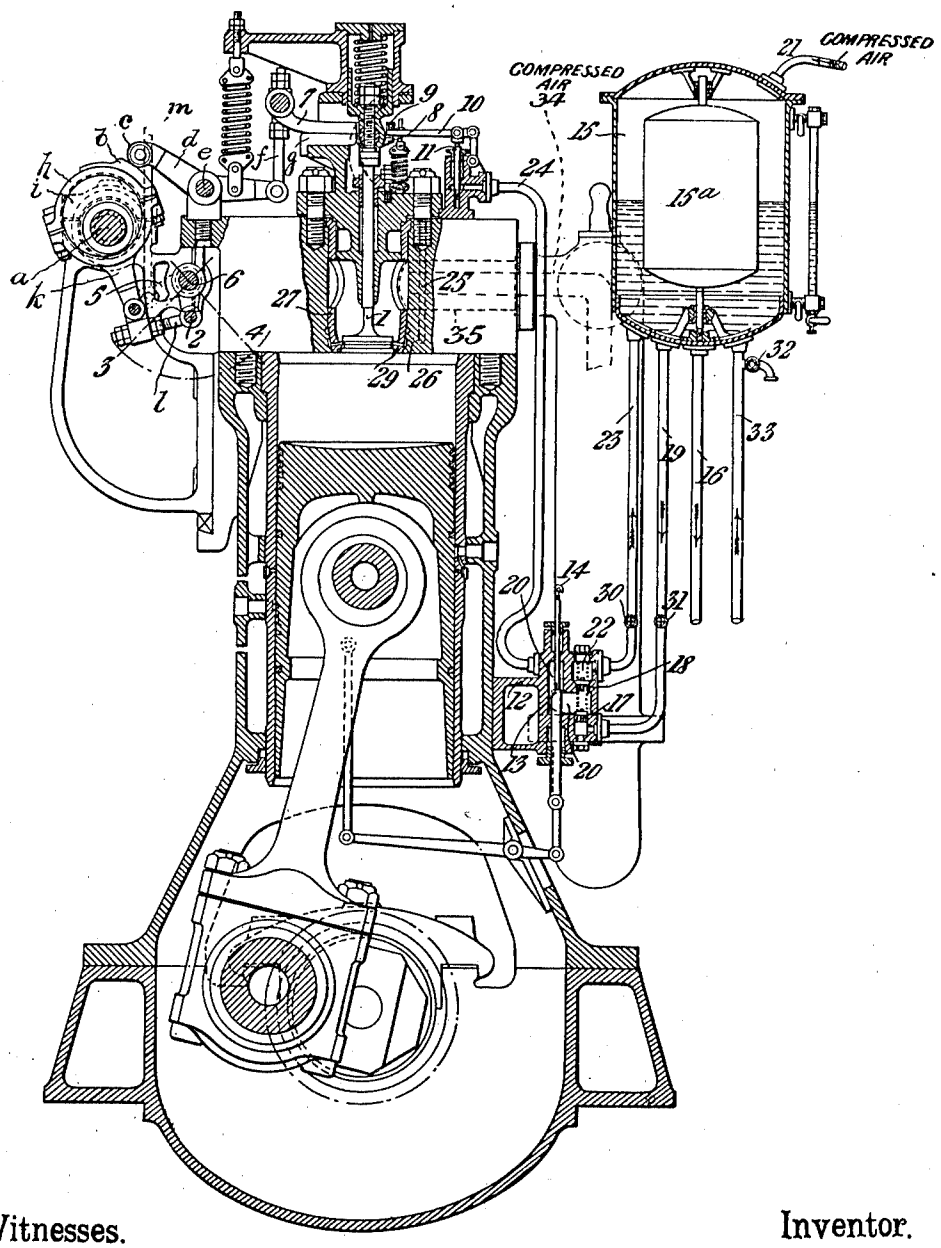
A. VOGT.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED OCT. 1, 1907.

1,066,768. Patented July 8, 1913.



Witnesses.

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INTERNAL-COMBUSTION ENGINE.

1,066,768. Specification of Letters Patent. Patented July 8, 1913.

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To all whom it may concern:

Be it known that I, ADOLF VOGT, a citizen of Austria-Hungary, residing at 149 Tulse Hill, in the county of Surrey, England, civil engineer, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

My invention which is a division of my pending application dated 18th May, 1906, Serial No. 317,591, relates to internal combustion engines working with uniform pressure, which do not compress their air for combustion in the engine cylinder and into the cylinder of which compressed air and liquid fuel are simultaneously introduced, from the dead-point onward during a portion of the working stroke, in which case, of course, the external pressure on the air and fuel supplied to the cylinder must always be slightly above the combustion pressure inside the working cylinder.

The object of this invention is to regulate the supply of liquid combustible during the combustion period of the working stroke in such a manner that this supply is proportionate to the motion of the piston at different speeds and different periods of admission, and also that the supply of combustible shall always be proportionate to the quantity of air admitted. For this purpose the liquid combustible is supplied by a measuring pump, the duration of the supply of liquid combustible at the admission period of the power stroke being controlled by a suitably operated combustible supply valve closing together with the air valve, and any excess of supplied combustible being allowed to return to the reservoir after the closing of the said valve by means of a suitably loaded overflow valve.

The drawing shows by way of example a section through the working cylinder of an engine embodying the features of my invention.

The general arrangement of the engine will be readily understood from the drawing. The admission valve 1 is operated by a valve gear of the known Zvonicek type, in which *a* is the cam-shaft driven from any suitable moving part of the engine, *b* the cam for controlling the valve when running forward (there being a similar cam, not shown, for use when the engine is reversed) which cam acts on a bowl or roller *c* mounted in one end of a two-armed lever *d* pivoted at *e* and whose opposite end is connected by the adjustable rod *f* to the curved valve lever 7 performing in a well-known manner a combined rolling and rocking movement on plate *g*, whereby a great leverage is obtained on first opening the valve. The lever 7 is pivotally connected to the stem of the inlet valve 1 and projects beyond this connection in beak 8. The cam *b* is secured to or forms part of an eccentric *i* secured to the shaft *a*. The strap around eccentric *i* has a projecting arm *k* connected by a link *l* to a lever 2 on the controlling shaft 6 to which is connected lever 5 connected to the rod *m* raised and lowered by the governor, not shown. When the lever 2 is on the dotted line 3 the cylinder receives no charge, while in the position 4 over 50 per cent. filling can be admitted. The governor acts upon the lever 5 which shifts the shaft 6 and consequently the lever 2 and the eccentric strap connected therewith. The spring-closed valve 11 for supplying liquid combustible is opened by the beak 8 of the lever 7 acting upon the adjusting screw 9 of the lever 10. The lever 7 is operated by the cam surface of the eccentric on the valve motion shaft.

The pump 12 for the supply of liquid combustible is operated from the engine piston or piston rod by a lever, as shown, but may be also operated either from the valve gear or the engine shaft. This measuring pump 12 has a differential plunger 13, the extension 14 of which may be used to operate an indicator apparatus for the engine should one be employed, but such an arrangement forms no part of this invention and further description thereof is unnecessary. The motion of the plunger 13 and consequently the supply of liquid fuel to the cylinder is rendered proportionate to the motion of the engine piston, by which means the combustion of the charge is made to take place at a uniform pressure, the proportions of the air supply and that of the liquid combustible being maintained practically constant, whereby a combustion as free from smoke as possible is obtained.

15 is a reservoir for liquid combustible which is supplied through pipe 33 communicating with a pump, not shown, but which may be worked for instance from the engine shaft, which is arranged to supply more

combustible than is normally required. Any excess of combustible is caused by a float valve 15ª to flow back through a pipe 16 into the main reservoir for liquid combustible. The measuring pump 12 has two spring-loaded valves 17 and 18. The combustible passes through pipe 19 into the space 20. The reservoir 15 is subject by pipe 21 communicating with a suitable source of compressed air supply, not shown to the pressure of the air supply. The space 20 will therefore always be filled with liquid combustible under pressure. When, after valve 11 has closed, the plunger 13 continues its upward motion, the liquid in the space 20 is forced through pipe 23 back into the vessel 15, the valve 18, which is loaded by a strong spring 22 being forced open by the liquid fuel displaced by the plunger 13. The valve 18 thus serves as an overflow or by-pass valve.

The space 20 is connected by a pipe 24 to the supply valve 11 from which a channel 25 leads to the annular space 26 surrounding the valve casing 27. From the space 26 small perforations 29 in the valve casing lead to the admission valve 1.

30 and 31 are shut-off cocks, 32 is a discharge cock, 33 is a fuel feed supply pipe leading from the main pump to the vessel 15. The differential piston 13 of the pump is so dimensioned as to supply the required quantity of combustible.

The operation is as follows: The ignition of the charge is normally effected by the compressed residues of the previous charge. The burnt gases are compressed up to 20–30 atmospheres, about 35 per cent. of the cylinder volume being sufficient to obtain the required degree of compression. In order to obtain a satisfactory combustion at an approximately, or perfectly, uniform pressure, it is essential that the residues shall always be compressed to a pressure slightly below the pressure of the admitted air or charge. The compressed air and fuel or combustible are mixed as they enter the cylinder, while the exhaust valve, not shown, is closed before the end of the expelling stroke. The exhaust valve which controls the exhaust pipe 35 surrounding the compressed air supply pipe 34 may be conveniently positioned in the head of the cylinder. The first ignition may be effected by any known igniting device in the cylinder or in the exhaust conduit or by increasing all the pressure on starting the engine to such a degree that the ignition is effected by the compression of air admitted into the cylinder by a separate valve. After the ignition has been effected the ignition device may be put out of action. The admission valve 1 and the valve 11 are opened by the controlling mechanism just in advance of the end of the upward stroke of the piston in order that the air and liquid combustible may enter the cylinder as soon as the engine piston reaches that position. As the engine piston moves downward on its power stroke the pump plunger 13 moves at the same time upward and forces liquid combustible from the space 20 into the cylinder, the supply of liquid combustible being exactly proportionate to the increase of volume behind the working piston caused by the motion of the piston. Compressed air from a suitable source of supply also enters through pipe 34 and valve 1 into the cylinder in the same proportion. The composition of the charge therefore remains practically unchanged. At the closing of the admission valve 1 the liquid combustible valve 11 also is closed, and the supply of combustible is throttled in the same manner by valve 11, as is the admission of air by the admission valve. When an excess of pressure occurs in the space 20, the spring-loaded by-pass valve 18 of the pump opens, and the combustible is forced back into the reservoir.

It will be understood that the reservoir 15 and the main pump feeding the same may be entirely dispensed with, but it is preferred to employ the pressure reservoir, especially with engines having a high number of revolutions. If the reservoir is omitted, the valve 17 works as an ordinary suction valve, which arrangement is applicable where a main reservoir for combustible situated at a great height is available. The stroke of the piston 13 of the measuring pump may be arranged to be variable by any known device.

Having thus described the nature of this invention and the best means I know for carrying the same into practical effect, I claim:—

1. In a uniform pressure internal combustion engine, the combination with the cylinder and a piston, of a valve controlling the admission of compressed air, mechanism to deliver fuel to the cylinder and mechanism to open said valve just before the piston has reached its dead point at the end of its compression stroke, and to hold said valve open during a portion of the power stroke.

2. In a uniform pressure internal combustion engine, the combination with the cylinder and piston therein, of a valve controlling the admission of compressed air, a fuel-feed control device having a valve, mechanism operated from a moving element of the engine to force fuel to said control device during a partial movement of the piston during the working stroke and means actuated by a moving part of the engine to open and close the said valves simultaneously.

3. In a uniform pressure internal combustion engine, the combination with a cylinder and its piston; of a valve controlling the admission of compressed air, a fuel reservoir

containing fuel under pressure, a pump having its feed and delivery ends connected to the reservoir, valves controlling said connections, one of said valves being a by-pass valve a pipe connecting the delivery end of the pump to the cylinder, a valve on the engine to control the supply of fuel thereto, mechanism to simultaneously operate and time the opening and closing of said air and fuel valves, and means to operate said pump from a moving element of the engine.

4. In a two-stroke uniform pressure, internal combustion engine, the combination with the cylinder and piston thereof; of a valve to control the admission of air and a valve on the engine to control the admission of fuel thereto while the air admission valve is open, valve mechanism to open said valves just before the piston has reached its dead point at the end of the compression stroke, and to hold said valves open during a portion of the power stroke.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ADOLF VOGT.

Witnesses:
EDWARD GARDNER,
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