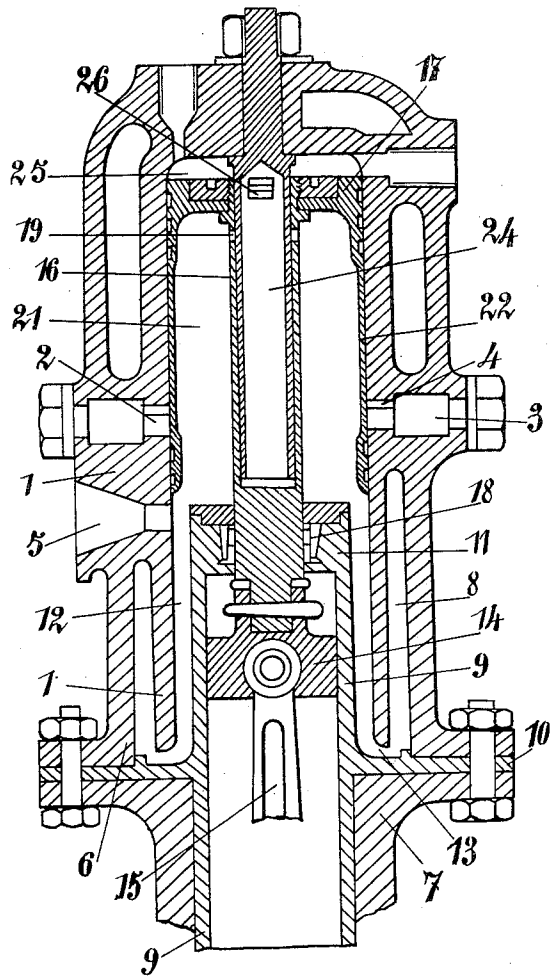
Dec. 9, 1924. 1,518,983

J. HYVERNAUD

TWO-STROKE CYCLE VALVELESS INTERNAL COMBUSTION ENGINE

Filed July 13, 1922 2 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

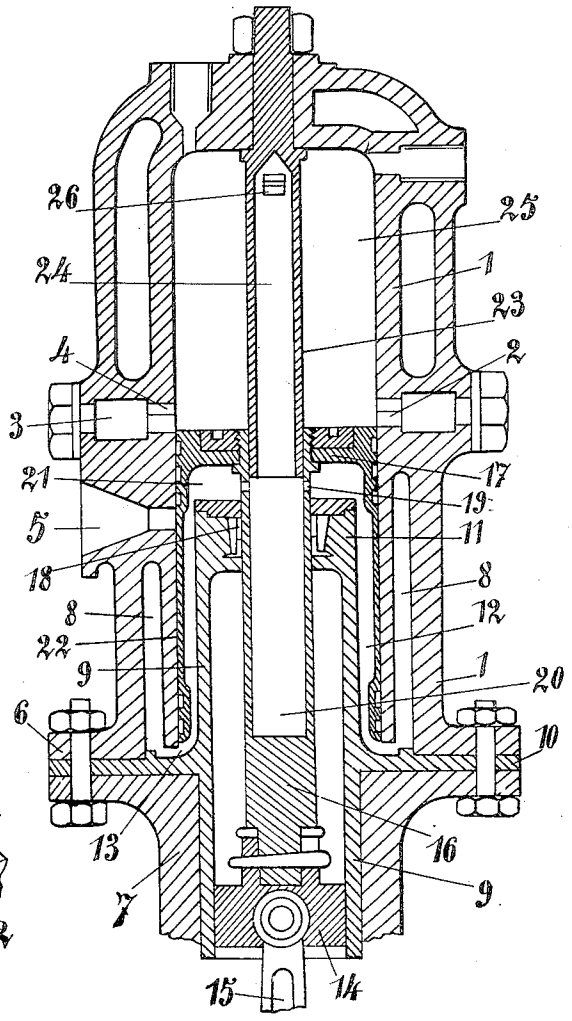
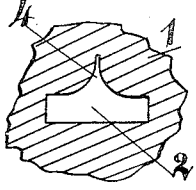


Fig. 3.



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UNITED STATES PATENT OFFICE.

JACQUES HYVERNAUD, OF PARIS, FRANCE.

TWO-STROKE-CYCLE VALVELESS INTERNAL-COMBUSTION ENGINE.

Application filed July 13, 1922. Serial No. 574,745.

To all whom it may concern:

Be it known that I, JACQUES HYVERNAUD, a citizen of the French Republic, residing at Paris, in the Department of the Seine, France, have invented certain new and useful Improvements in Two-Stroke-Cycle Valveless Internal-Combustion Engines, of which the following is a specification.

This invention relates to a two-stroke cycle valveless internal combustion engine which is characterized by the simplicity of its working due to its construction which also allows of rapid assemblage and disassemblage of the engine.

This engine forming the subject matter of the invention is hereinafter described and illustrated in the drawings attached to the present specification in which:

Figure 1 is a diametral section showing the parts in the positions they occupy when the piston is on the upper dead centre.

Figure 2 is a similar view when the piston is on the lower dead centre.

Figure 3 is a vertical sectional view of a portion of the inside face of the cylinder showing the section of the exhaust orifice.

As shown, in the drawings the engine consists of a cylinder 1 comprising as usual the apertures for the sparking plugs and the pressure-relieving devices, the water circulation passages etc.

In this cylinder 1 there are formed one, two or more exhaust parts or orifices 2 so arranged as to be completely uncovered at the moment when the piston reaches the lower dead centre.

These orifices 2 which open into the exhaust collectors 3 have the characteristic feature that the upper part 4 of their wall has the form of an inverted V as shown in Figure 3. This peculiar section 4 having the form of an inverted V which is given to the exhaust orifices 2 is designed to diminish the noise made by the burnt gases in exhausting suddenly from the cylinders in the sense that the exhaust takes place gradually by reason of the fact that as the piston uncovers the orifice 2 the gases escape first in the form of a jet at the apex of the inverted V, then in the form of a triangular jet of increasing section until its section coincides with the complete section of the orifices 2.

Below the exhaust orifices 2 as well as below the sleeve piston when it is on its upper dead centre there are arranged one, two or more admission parts or orifices 5 opening into the interior of the cylinder 1. Finally the lower portion of the wall 1 of the cylinder whose base 6 is fixed to the upper part of the support or casing 7 comprises in its thickness an annular chamber 8 of suitable capacity the use of which is hereinafter set forth.

The cylinder 1 constructed and characterized as above stated is mounted upon the casing 7 after the previous insertion inside those two constituent parts of the engine of a cylindrical sleeve 9 which is kept centred and in its correct position by means of a circular flange 10 clamped between the flange 6 of the cylinder 1 and the flange of the casing 7.

This sleeve which opens at its lower end into the casing and is closed at its upper end 11 projecting into the cylinder 1 has a chamber or chambers such as to enable said sleeve to constitute a kind of internal jacket for the casing 7 leaving an annular chamber 12 between it and the inner inside wall of the cylinder 1. This annular chamber communicates with the chamber 8 of the cylinder 1 at the base of the latter as shown at 13 either by reducing the height of the said wall or by forming wide apertures or notches therein. This sleeve 9 thus separates the casing 7 from the cylinder 1 in a gas-tight manner. It serves at the same time as a slide-way for a slide block 14 connecting the driving piston rod 15 to the rod 16 of the piston 17, this rod working through the end 11 in a stuffing-box 18 of any suitable design. This rod 16 is hollow throughout the greater portion of its length and it terminates at the top or inner surface of the piston 17 at the centre thereof; it comprises in its portion situated below and between the piston 17 when the latter is at the lower dead centre, and the end 11 of the sleeve 9, apertures 19 which establish communication between its hollow chamber 20 and the free space 21 situated below the piston head and terminating the annular chamber 12.

The piston 17 whose head is extended in such a manner as to form a distributing sleeve 22 is guided by a central hollow tube 23 fixed at its upper part to the head of the engine and fitting telescopically at its lower portion through the piston 17 in the hollow rod 16.

Since the interior 24 of this tube is in

communication with the chamber 25 of the cylinder 1 above the piston 17 through one or more apertures 26 formed near the head of the engine, the total spaces 20 and 24 of the rod 16 and of the tube 23 constitute a chamber whose volume will vary according to the position of the piston 17. This being the general arrangement the two-stroke cycle engine characterized by its cylinder, its inner jacket and the central arrangement of the piston rod and hollow tube for guiding the piston and its chamber of varying volume operates as follows:

In the position shown in Figure 1, the piston being on its upper dead centre the explosive mixture is compressed to its maximum degree between the engine head and the piston 17 in the chamber 25. At the same time the admission orifices 5 being uncovered by the sleeve 22 of the piston 17 the fresh gases will enter the space 21 below the piston, passing through the annular chamber 12 between the sleeve 9 and the base of the cylinder, and through the annular passage 13 into the chamber 8 formed in the thickness of the wall of the cylinder 1.

The totality of these spaces at chambers 21, 12 and 8 will be filled the more rapidly as during the upward movement of the piston and so long as the admission orifices 5 are not uncovered there is produced a certain degree of rarefaction which enables the engine to run at high speeds.

After having passed the upper dead centre and explosion having taken place the piston 17 in moving down in order to make its power stroke, gradually reduces the space 21 with the result that nearly the whole of the fresh gases are enclosed in the spaces 12 and 8 whose whole capacity has been designed for this purpose.

Shortly before the piston reaches the lower dead centre the exhaust orifices 2 for the burnt gases become uncovered while the admission orifices 5 have been closed at the very beginning of the down stroke of the piston as is ordinarily the case.

In the position shown in Figure 2 the piston being on its lower dead centre the fresh gases enclosed in the chambers 8 and 12 as well as in the space 21 which is reduced to its minimum below the piston, will enter the chamber of varying capacity constituted by the chambers 20 and 24 of the piston rod 16 and the fixed tube 23 because at that moment the apertures 19 of the piston rod 16 are no longer closed by the tube 23, so that the fresh gases can pass into the chamber 25 of the cylinder 1 through the aperture 26 of the tube 23; this admission is accelerated thereby and it helps at the same time the expulsion of the burnt gases by the return of the piston 17 which causes a diminution of the varying-volume chamber 20—24; the orifice 26 being closed at the moment of arrival of the piston at its upper dead centre whereas the admission orifices 5 are again uncovered so that the two-stroke cycle begins again at once as just described.

As above indicated the orifice or orifices 26 are closed when the piston reaches the end of its compression stroke (see Fig. 1) so that the compressed charge will be exploded in the space 25 by virtue of a spark plug or plugs which, in practice, will be mounted in the holes in the cylinder head shown in the drawings.

In addition to the advantages due to the simple working of this engine thus constituted, it is to be noted that the combination of the cylinder mounted upon the casing with the interposition of the flange 10 of the sleeve 9 allows of rapid assembling and disassembling because the centering of these parts is effected mutually and automatically.

It is to be understood that modifications, alterations and improvements may be made in the arrangement, form and dimensions of the characteristic elements constituting the engine as well as in their combination and in the means for carrying into practice without departing from the essential nature of the said invention. For example, as regards the chamber 8 there may be only one such chamber, or in its stead there may be a plurality of chambers or compartments intercommunicating or not intercommunicating, their total capacity being equal to that of a single chamber whose volume is adapted according to requirements; this single chamber 8 or chambers or compartments provided in its stead being as already stated formed in the thickness of the wall of the cylinder or they may be attached to the cylinder.

In some cases the said chamber 8 or the chambers may instead of being formed in the wall of the cylinder be formed in the wall of the upper part of the casing 7 or be attached to the latter, communication with the annular space 12 being assured by orifices opening thereinto which are formed in the thickness of the flange 10 of the sleeve 9 in any suitable manner capable of producing the same result as does the constructional form which has been illustrated by way of example in the accompanying drawings.

What I claim is:

1. In a two-cycle valveless internal combustion engine, the combination with a support, of a cylinder having inlet and outlet ports, a suitably mounted, stationary sleeve extending into the chamber of said cylinder but being of a lesser diameter than said chamber, thus leaving an annular chamber between said sleeve and the inner wall of said cylinder, said annular chamber communicating with said inlet ports, said cylin-

der being provided with an annular chamber outside of and communicating with said first-named annular chamber, a piston working in said cylinder past said ports and of suitable extent to uncover the inlet ports at the end of each compression stroke, and to uncover the outlet ports at the end of each power stroke, a tube carried by said piston and having ports communicating with said first-named annular chamber, a stationary tube telescoping into said first-named tube and having ports opening into the chamber of said cylinder, said ports in said stationary tube being so arranged as to be closed at the end of each compression stroke of said piston, so that explosions will occur in the chamber of said cylinder.

2. In a two-cycle valveless internal combustion engine, the combination with a support or casing, of a cylinder having inlet and outlet ports, a suitably mounted, stationary sleeve extending into the chamber of said cylinder but being of a lesser diameter than said chamber, thus leaving an annular chamber between said sleeve and the inner wall of said cylinder, said annular chamber communicating with said inlet ports, said cylinder being provided with an annular chamber outside of and communicating with said first-named annular chamber, a piston working in said cylinder past said ports and of suitable extent to uncover the inlet ports at the end of each compression stroke, and to uncover the outlet ports at the end of each power stroke, a tube carried by said piston and having ports communicating with said first-named annular chamber, and a stationary tube telescoping into said first-named tube and having ports opening into the chamber of said cylinder, said ports in said stationary tube being so arranged as to be closed at the end of each compression stroke of said piston.

3. In a two-cycle valveless internal combustion engine, the combination with a support or casing, of a cylinder having inlet and outlet ports, a sleeve having a flange interposed between said support or casing and said cylinder, said sleeve extending into the chamber of said cylinder but being of a lesser diameter than said chamber, thus leaving an annular chamber between said sleeve and the inner wall of said cylinder, said annular chamber communicating with said inlet ports, said cylinder being provided with an annular chamber outside of and communicating with said first-named annular chamber, a piston working in said cylinder past said ports and of suitable extent to uncover the inlet ports at the end of each compression stroke, and to uncover the outlet ports at the end of each power stroke, a tube carried by said piston and having ports communicating with said first-named annular chamber, and a stationary tube telescoping into said first-named tube and having ports opening into the chamber of said cylinder, said ports in said stationary tube being so arranged as to be closed at the end of each compression stroke of said piston.

4. In a two-cycle valveless internal combustion engine, the combination with a support or casing, of a cylinder having inlet and outlet ports, a suitably mounted, stationary sleeve extending into the chamber of said cylinder but being of lesser diameter than said chamber, thus leaving an annular chamber between said sleeve and the inner wall of said cylinder, said annular chamber communicating with said inlet ports, said cylinder being provided with an annular chamber outside of and communicating with said first-named annular chamber, a piston working in said cylinder past said ports and of suitable extent to uncover the inlet ports at the end of each power stroke, a tube carried by said piston and having ports communicating with said first-named annular chamber, a stationary tube telescoping into the said first-named tube and having ports opening into the chamber of said cylinder, said ports in said stationary tube being so arranged as to be closed at the end of each compression stroke of said piston, and a piston-rod slide-block fitting in said sleeve below said piston.

In testimony whereof I affix my signature, in presence of two witnesses.

JACQUES HYVERNAUD.

Witnesses:
LUCIEN CRESPIN,
CHARLES DÉLID.