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PATENT



SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in or relating to Internal Combustion Engines.

I, LEON DUFOUR, of 109, Route de Lyon, Geneva, Switzerland, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

- 5, This invention relates to valve gear for internal combustion engines of the V type using sleeve valves having a combined reciprocating and rotary movement. This combined movement has heretofore been effected by means of a cross bar connected with each sleeve and swung round by two parallel and similar cranks attached at its ends and keyed on two parallel intermediate or counter shafts which are revolved at half the engine speed, thus necessitating the use of four parallel intermediate or countershafts in adapting the construction to two groups of cylinders each having four or eight cylinders, which arrangement is equivalent to using two intermediate or countershafts for each group of cylinders situated in the same inclined plane. The object of this invention is to provide an improved and simplified arrangement of valve gear of the aforesaid type.

According to the present invention the two intermediate or counter shafts forming part of the valve gear, when applied to eight or twelve cylinder internal combustion engines of the inclined type are replaced by one intermediate or counter shaft, such shaft being provided with all the cranks to which are attached the inner ends of all the cross bars moving the distributing sleeves.

The connection between the cross-bar and the sleeve may be made in the manner as described in the Specification of British Letters Patent No. 25,398, A.D. 1913, granted to me.

25 The annexed drawing represents diagrammatically by way of example two constructional forms of a valveless engine having eight convergent cylinders.

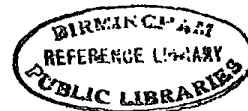
Figure 1 is a front view of the distributing members whereof the relative position only of the parts of the first pair of cylinders is shewn.

30 a_1 and a_2 are the two cylinders of the first pair of cylinders b_1 and b_2 the distributing sleeves, d_1 d_2 the cross-bars attached to these sleeves as at c_1 c_2 . e_1 , e_2 and e_3 are the three counter-shafts fitted with the cranks g_1 , g_2 , g_3 , g_4 and crank pins k_1 , k_2 , k_3 , k_4 . o is the main shaft, f the crank pin for working the connecting rods l_1 , l_2 attached to the pistons h_1 , h_2 . x is the angle between the two axes of the cylinders.

35 The working is as follows:

Starting from the position of the upper dead point of piston h_2 , this position

[Price 6d.]



corresponds to the upper dead point position of the sleeve b_2 , that is to a position where the cranks g_3, g_4 are parallel to the axis of the cylinder a_2 and where the crank pins k_3, k_4 are turned upwards. The corresponding position of the crank pins k_1, k_2 is that shown in the drawing, that is to say a position turned forwardly with regard to the crank pins k_3, k_4 at an angle equal to $\frac{x}{2}$ (the 5 direction of rotation of the shaft o being considered as clockwise). As the shafts e_1, e_2 and e_3 turn in the same direction as the main shaft o but at half the speed, the crank pins k_1, k_2 will have turned through an angle $\frac{x}{2}$ while the pin f will have turned through an angle x . In this new position the upper dead point will be reached by sleeve b_1 , and piston h_1 . It will thus be observed 10 that owing to the arrangement of the parts shewn in the drawing, the upper dead point of the pistons h_1, h_2 will alternatively correspond at each revolution of the main shaft with the upper dead point and the lower dead point of the respective sleeves.

Figure 2 is a plan of the countershaft e_1 showing the eight crank pins in 15 their respective positions in an eight cylinder engine. For each cylinder the upper dead point of the piston alternatively coincides at each revolution of the crank shaft with the upper and lower dead points of the respective sleeve.

Figure 3 shows a second constructional form of the distributing gear wherein for the two crank pins k_1-k_4 one single pin k has been substituted, which pin 20 is in an intermediate position, as shown in the drawing, a position which is turned forwardly at an angle $\frac{x}{4}$ with regard to the position of the pin k_4 and turned backward at the same angle with regard to the position of pin k_1 . To this pin k the inner ends of the cross-bars d_1 and d_2 of the sleeves b_1 and b_2 are attached. As compared to the positions of the sleeves b_1 and b_2 in the preced- 25 ing example the position of the sleeve b_2 will be changed here in a forward sense, while the position of sleeve b_1 is changed in a backward sense; but these changes of position are so small that their influence on the distribution can easily be compensated for by a suitable shape of the port-holes.

Figure 4 is a plan of the countershaft e_1 showing the four crank pins in their 30 respective positions for an eight cylinder engine.

The working of this form of gear is the same as the working of the preceding example if the intermediate position of the crank-pins is taken into account by a suitable form of port-holes.

In this second constructional form the number of cranks of the central 35 counter shaft is diminished to one half which simplifies and cheapens the construction of such engines.

The two constructional forms of distributing gear shown may be employed for engines with twelve convergent cylinders.

Having now particularly described and ascertained the nature of my said 40 invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In valve gear for internal combustion engines having a plurality of cylinders arranged in groups, the cylinders of each group being inclined relatively to the opposite group and each cylinder using a sleeve valve having a 45 combined rotary and reciprocating movement operated by a cross bar, the provision of an intermediate shaft or counter shaft axially arranged between the inclined cylinders and provided with all the cranks to which are connected the inner ends of all the cross bars necessary to effect the movement of the distributing sleeves. 50

2. Valve gear in accordance with Claim 1, characterised in that for each pair of cylinders arranged so as to form a **V**, the two cranks of the intermediate shaft or counter shaft, to which cranks the inner ends of the cross bars moving

the corresponding distributing sleeves are attached, are replaced by a single crank arranged centrally of the positions of the two cranks.

3. Distributing gear for internal combustion engines constructed and capable of operating substantially as hereinbefore described and illustrated with reference to the accompanying drawing.

Dated this 26th day of March, 1917.

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55, Liberty Street, New York City, U.S.A.,
Agents for the Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1917.

[This Drawing is a reproduction of the Original on a reduced scale.]

