PATENT SPECIFICATION

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154,824

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COMPLETE SPECIFICATION.

Improvements in or relating to Multi-cylinder Explosion Engines.

I, VINCENZO LANCIA, Manufacturer, of 90, Via Monginevro, Turin, Italy, 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:—

This invention relates to multi-cylinder explosion engines with two sets of cylinders, the axes of which are in two different inclined planes, and it has for its object to provide a construction in which the heads of the cylinders of the two sets can be brought close together, whilst retaining the characteristic features of the engine, inherent in the use of two sets of cylinders.

It is known that in order to balance a multi-cylinder engine of this type, the phases in the different cylinders must follow each other with an angular interval equal to $\frac{360.k}{n}$ degrees where k is equal to 1 or 2, according as the engine is a two or a four stroke one, and n is the number of cylinders of the engine.

In V-shaped engines, this condition is fulfilled by giving the angle comprised between the cylinders a value equal to $\frac{360.k}{n}$ degrees, and according to prior Specification No. 102,373, the angle formed by the axes of the cylinders can be reduced by connecting the connecting rods of two cylinders of a pair, to the crank shaft at points arranged with reference to the axis of the crank shaft, at an angle which, with the angle formed by the axes of the cylinders, gives the value $\frac{360.k}{n}$ degrees.

This must be done assuming, as is generally the case in practice, that the axes of the cylinders of each pair meet on the axis of rotation, that is to say, that the axis of the cylinders coincides with the axis of the corresponding connecting-rod when the latter is on its dead centre.

This relation however is not due to any theoretical consideration, and may be dispensed with, provided the connecting-rod does not come into contact with the mouth of the cylinder when in its position of maximum inclination.

According to this invention, the angle formed by the axes of the cylinders, can be reduced, independently of the system described in the prior specification hereinbefore referred to, or in combination with the said system, for the purpose of bringing the axes of the cylinders closer to the vertical, which is advisable for the purpose of reducing the vibration to a minimum, as well as for the purpose of bringing the heads of the two series of cylinders closer together, which is advantageous for simplifying and rendering the valve gear less heavy, this being done by causing the axes of the cylinders to pass beyond the axis of the crankshaft.

The invention is diagrammatically illustrated in the accompanying drawing, in

Figure 1 for an ordinary V-shaped four-stroke eight-cylinder engine in which all the crank-pins are in one plane passing through the crank-shaft, in

Figure 2 for a four-stroke eight-cylinder engine having cranks arranged as in the hereinbefore mentioned specification, with a reduced cylinder angle, and in

Figure 3 for a four-stroke twelve-cylinder engine with a reduced cylinder angle and having crank-pins arranged as in the specification referred to above.

In the said figures 1 and 1^1 indicate the two cylinders of each pair, 2 and 2^1 are

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the corresponding pistons, 3 and 3^1 the connecting rods, and 4 and 4^1 the crank pins of the crank shaft. I—I and I^1—I^1 indicate the axes of the cylinders, III—III and III^1—III^1 indicate the axes of the connecting rods 3 and 3^1 when the corresponding pistons 2 and 2^1 reach their dead centres.

In the construction shown in Figure 1 which is a V-shaped four-stroke eight-cylinder engine, the angular distance between two explosions is, according to the rule $\frac{360.k}{n}$ degrees, equal to 90°, so that, the crank pins 4 and 4^1 to which are attached the connecting rods 3 and 3^1 being co-axial, the angle formed by the axes III—III and III^1—III^1, that is to say formed by the directions of the connecting rods 3 and 3^1 when their pistons are on the dead centre, will be equal to 90°.

According to the invention, the axes I—I and I^1—I^1 of the cylinders, do not coincide with the axes III—III and III^1—III^1, but intersect at an axis 5 parallel to the axis of rotation of the engine shaft and below the latter, so that the angle comprised between the axes of the cylinders, becomes smaller than 90°, and the two heads of the cylinders are closer together than in the usual constructions.

In the construction in Figure 2 (that is to say in a four-stroke eight-cylinder engine designed in accordance with the prior specification referred to) the crank pins 4 and 4^1 are at an angle of 45° relatively to each other, so that the angle between the axes III—III and III^1—III^1 is 45°.

Obviously by giving the angle between the crank pins 4 and 4^1 a greater or smaller value than 45°, the angle between the axes III—III and III^1—III^1 will be reduced or increased in proportion, it being merely necessary that the angle between the crank pins 4 and 4^1, and the angle between the axes III—III and III^1—III^1, should form together 90°. Also, in this case, the axes I—I and I^1—I^1 of the cylinders, instead of coinciding with the axes III—III and III^1—III^1, intersect at an axis 5 below the axis of rotation of the crank shaft, so that the angle comprised between the axes of the cylinders becomes smaller than that comprised between the axes III—III and III^1—III^1, and the heads of the cylinders are accordingly brought considerably closer together.

Finally, in the construction shown in Figure 3 in which the engine is a four-stroke twelve-cylinder one, the angle given by the rule $\frac{360.k}{n}$ degrees, is 60°, and the angle between the crank pins 4 and 4^1 being 40°, the angle between the axes III—III and III^1—III^1 will be 20°. The angle comprised between the axes I—I and I^1—I^1 is smaller than 20°.

With the construction described it is therefore possible, in multi-cylinder engines comprising two adjacent sets of cylinders, to reduce the angle between the axes of the cylinder, and thus to reduce the space occupied by the engine and the lateral vibrations due to the horizontal components of the forces arising from the reciprocating masses.

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

1. A multi-cylinder explosion engine of the V-type, characterised by the axes of the cylinders of each pair intersecting at an axis parallel to the axis of rotation of the crank shaft and beyond the latter for the purpose of reducing the angle between the two sets of cylinders.

2. An engine as set forth in Claim 1, characterised by the angular interval that should exist between the phases in the two cylinders of a pair in order that the engine should be balanced, being obtained partly by the angle formed by the positions of the connecting rods when their pistons are in the dead centre, and also by the angle at which their crank pins are set.

3. The multi-cylinder engine substantially as described or substantially as illustrated in the accompanying drawing.

Dated this 23rd day of February, 1920.

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Chartered Patent Agents.

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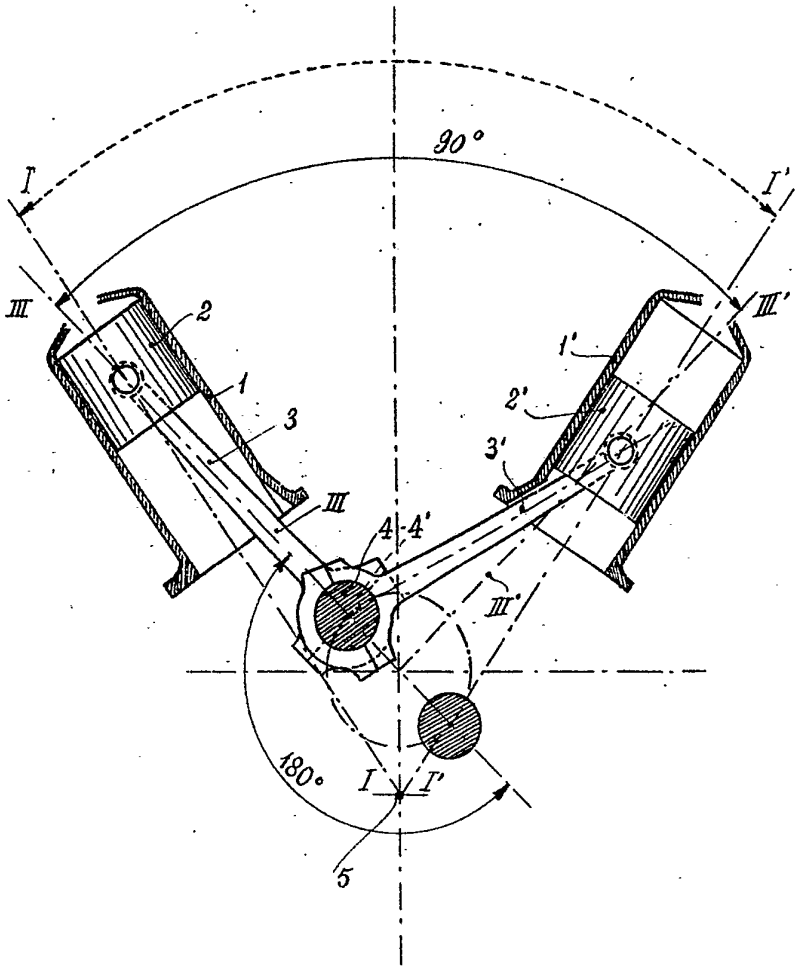
Fig.1.



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

Fig. 2

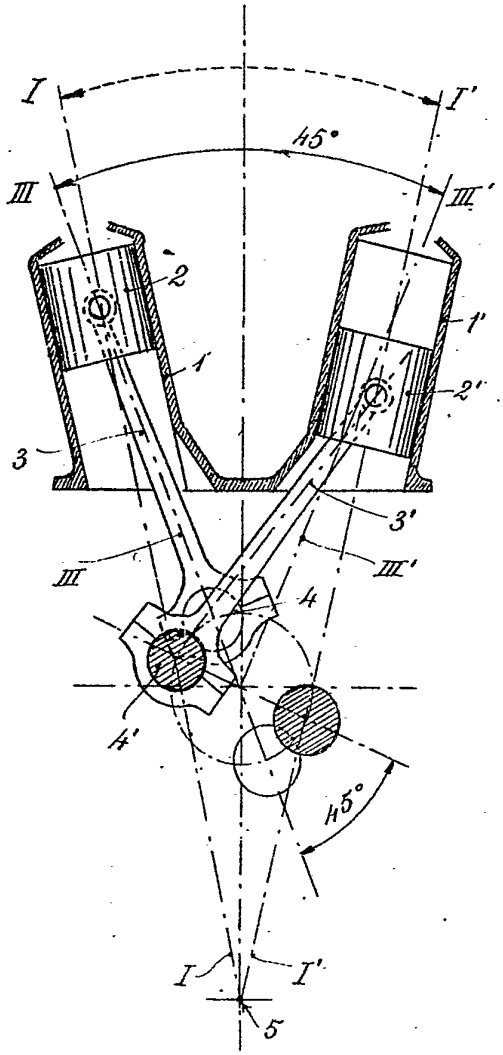
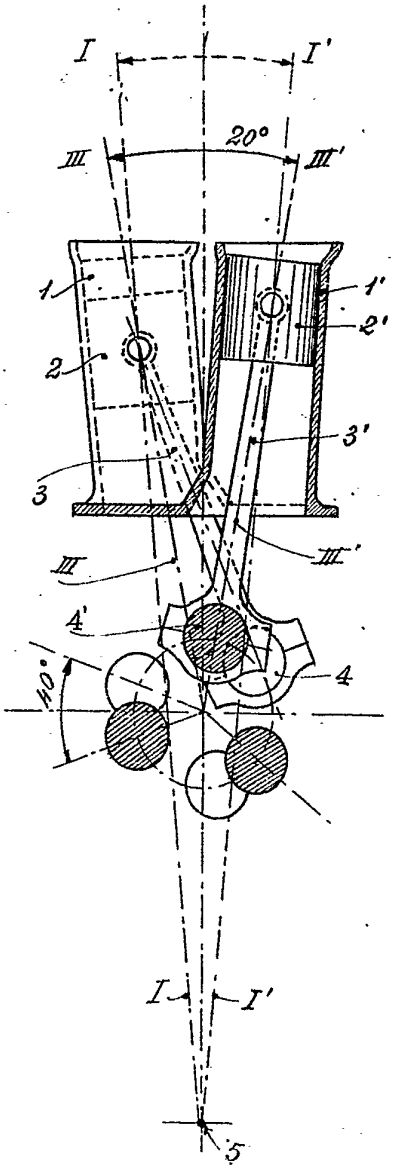


Fig. 3



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

Fig. 1.

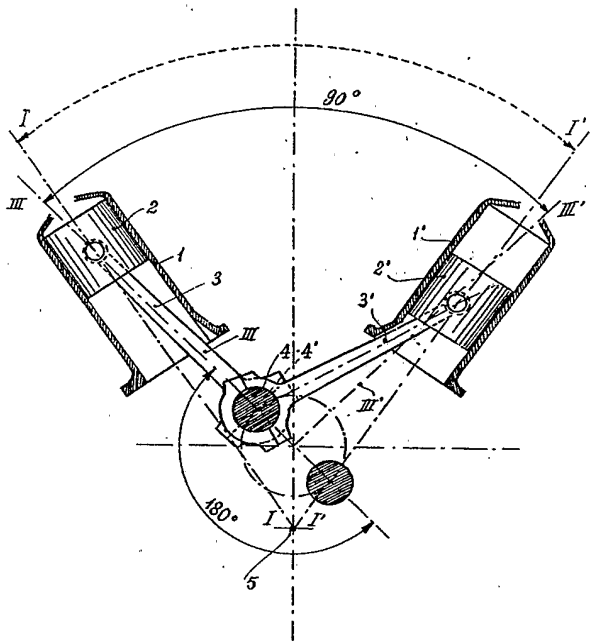


Fig. 2

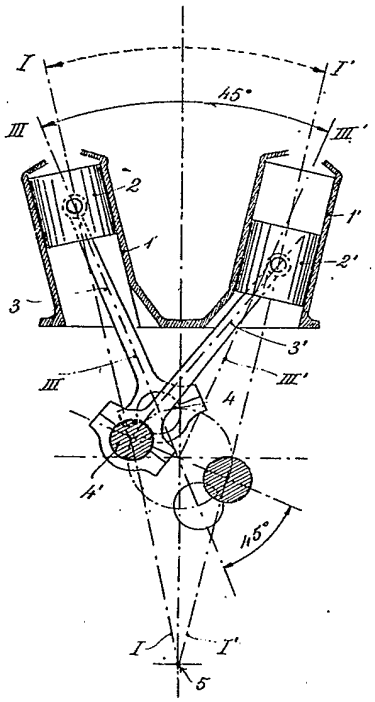
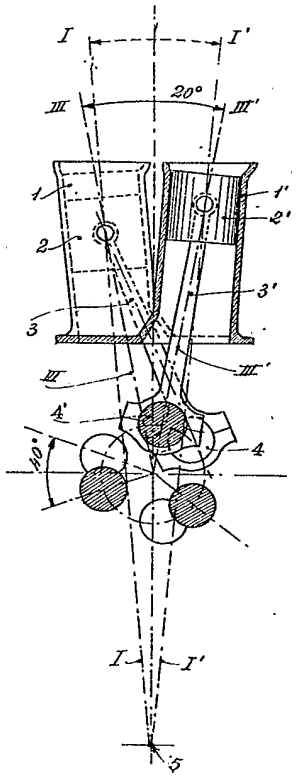


Fig. 3



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