G. N. GOODRICH.

MULTICYLINDER ENGINE.

APPLICATION FILED MAY 26, 1917.

1,285,129.

Patented Nov. 19, 1918.

2 SHEETS—SHEET 1.

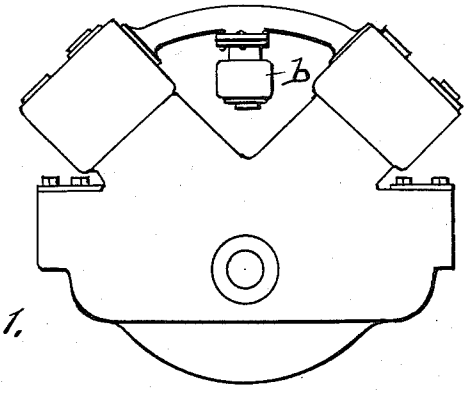


Fig. 1.

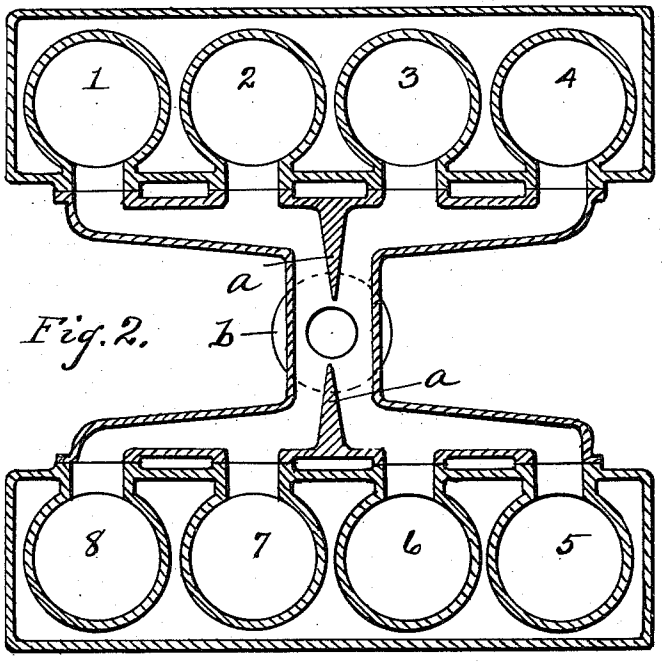


Fig. 2.

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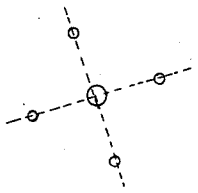


Fig. 3.

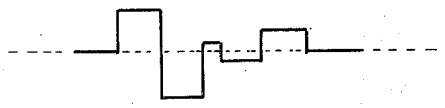


Fig. 4.

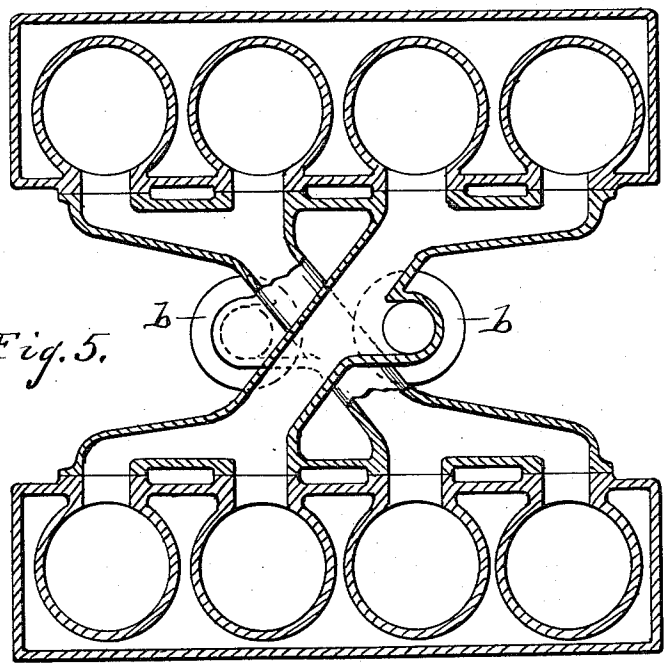


Fig. 5.

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MULTICYLINDER ENGINE.

1,285,129. Specification of Letters Patent. Patented Nov. 19, 1918.

Application filed May 26, 1917. Serial No. 171,281.

To all whom it may concern:

Be it known that I, GEORGE N. GOODRICH, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Multicylinder Engines, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to fuel distribution in multi-cylinder engines, especially engines having two opposed blocks of cylinders, as for instance, eight cylinder motors of the V type. In motors of this character where the crankshaft is a four-throw shaft with the throws at the 90 degree points, some of the cylinders do not get the same quantity of fuel mixture as others due to the inertia of the fuel mixture being greater when some of the cylinders are drawing in their charge than others, resulting in an unbalanced relation. This will more fully appear hereinafter.

In the drawings,—

Figure 1 is an end elevation of an eight cylinder engine of the V type.

Fig. 2 is a horizontal section of the same.

Figs. 3 and 4 are views of the crankshaft.

Fig. 5 shows a modified form for distributing the fuel mixture.

In an eight-cylinder engine of the V type having a crankshaft of the four throw 90 degree variety such as depicted in Figs. 3 and 4, it necessarily follows that the firing order is such that there will be immediately successive firings in one bank of cylinders. Of course, there will be also immediately succeeding suctions of fuel in one bank of cylinders. For illustration—the firing order of the cylinders as shown in Figs. 2 or 5 may be 1—3—6—4—5—8—2—7 or there are several other possible firing orders. It will be found that in any of these firing orders with a 90 degree four throw crankshaft there are immediately successive firings in one bank of cylinders. For instance, in the firing order just alluded to, 1 and 3 are immediately succeeding firing orders in the upper bank shown in the drawings, while 5 and 8 are immediately succeeding firing orders in the lower bank shown in the drawings.

In the ordinary eight-cylinder V type engine a four throw 180 degree crankshaft is employed, and it will be found that by tracing out the firing orders in such a crankshaft they can be made to cross each time from one bank of cylinders to the other, consequently avoiding two immediately successive firing orders in a single bank. The vice of this immediately successive firing order in one bank of cylinders is this: The next cylinder firing in the opposite bank has to pull against substantially double inertia effects where an ordinary manifold is used and that cylinder is really starved.

It is my belief that the reason why this four throw 90 degree crankshaft is not used in eight cylinder motors of the V type is for this very reason, that the manifolding problem has not been properly understood or corrected. The four throw 90 degree crankshaft has a much better running balance than the ordinary four throw 180 degree crankshaft now in use, but such better running balance of the four throw 90 degree shaft is more than offset by the unequal gas distribution when the ordinary manifolding is used. This unequal gas distribution has caused such a variety of impulses that the running balance of such a 90 degree shaft coupled up to an eight cylinder V type engine with the conventional manifold has been worse than the 180 degree four throw shaft so coupled.

I have remedied this condition by employing separate passage-ways from the fuel supply means which couple up a plurality of cylinders in each bank but which connect cylinders having non-immediately successive firing orders. This coupling up may be achieved in several ways; for instance, a single manifold may be used such as shown in Fig. 2 with a single carbureter and the partitions *a*, *a* to provide a manifold at each side divided into the two parts at its center. Or separate carbureters may be used, as shown in Fig. 5, and a single manifold to connect a pair of cylinders at one end of one bank with a pair of cylinders at the other end of the other bank.

It will be found that by this arrangement no two cylinders are connected by the same manifold passage-way in the same bank having immediately successive firing orders and consequently a cylinder does not have to oppose double inertia effects created by a pair of cylinders in the opposite bank.

In the manifolding shown in Fig. 2 of course two cylinders in one bank succeed each

other in firing but they are separated by the partitions. Consequently the last one to take in the gases not only pulls the gases from the carbureter and the manifolding connecting the other bank but it also pulls the gases around the partition. Hence when the suction stroke crosses to the opposite bank that cylinder has only to overcome the inertia of the gases traveling toward the opposite bank at one side of the partition *a*.

What I claim is:

1. The combination with an internal combustion engine having two banks of cylinders arranged angularly about the crankshaft, some of the cylinders in a bank having immediately succeeding firing orders, of fuel mixing means, manifolding leading from the said mixing means to the cylinders and divided into passage-ways so that the end of a single passage-way connects only cylinders having a non-immediately successive firing order.

2. The combination with an internal combustion engine having two banks of cylinders arranged angularly about the crankshaft, each bank including a plurality of cylinders, with some of the cylinders in a bank having immediately succeeding firing orders, of fuel supply means, manifolding reaching both banks of cylinders and arranged and divided so that there are passage-ways each of which leads to a plurality of cylinders in a bank but only the cylinders in such bank that have non-immediately successive firing orders.

3. The combination with an internal combustion engine having two banks of cylinders arranged angularly about the crankshaft and each bank including a plurality of cylinders, some of the cylinders in a bank having immediately succeeding firing orders, of fuel supply means and a single manifold reaching to all the cylinders and crossing from one bank to the other at the center, said manifold having a pair of partitions *a*, *a* which divide the manifold at the center into passage-ways which lead to a plurality of cylinders in each bank but only the cylinders in such bank that have non-immediately successive firing orders.

In testimony whereof I sign this specification.

GEORGE N. GOODRICH.