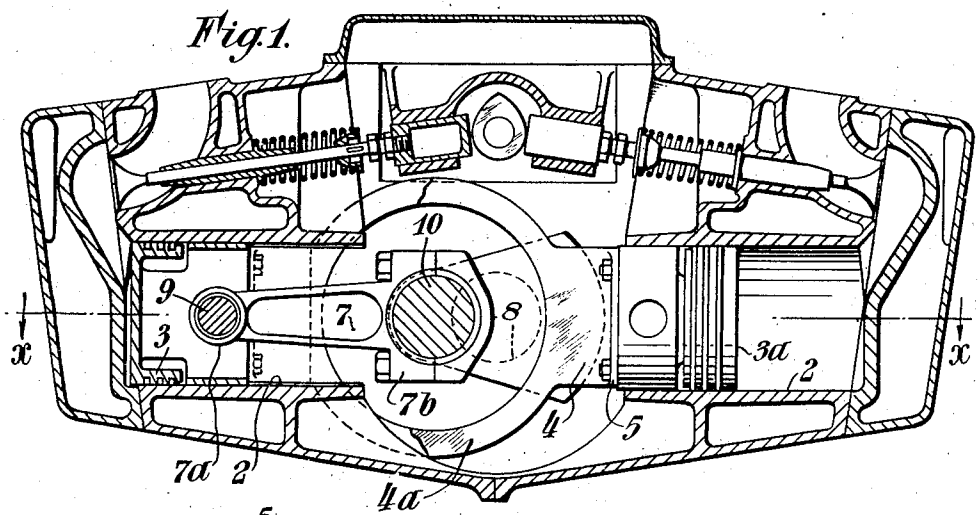
Aug. 22, 1939. A. J. STUBINGS 2,170,099

ENGINE HAVING DIAMETRICALLY OPPOSED CYLINDERS

Filed Nov. 30, 1937

Fig. 1.



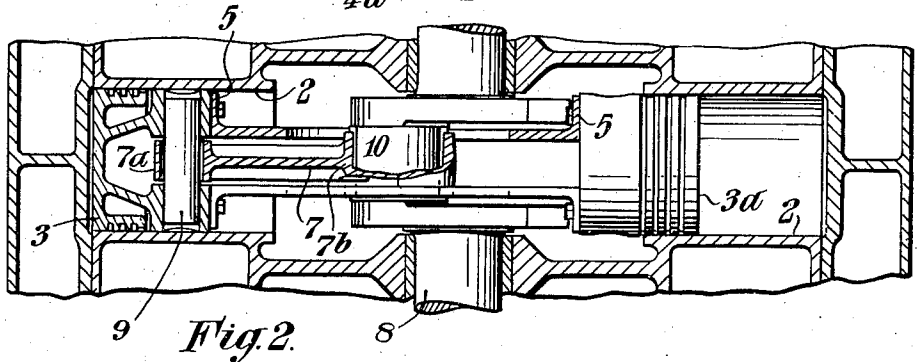


Fig. 2.

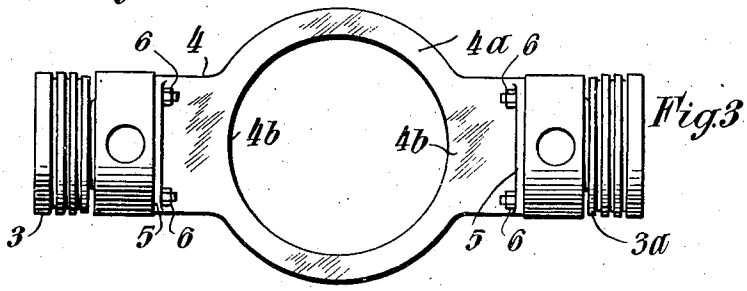


Fig. 3

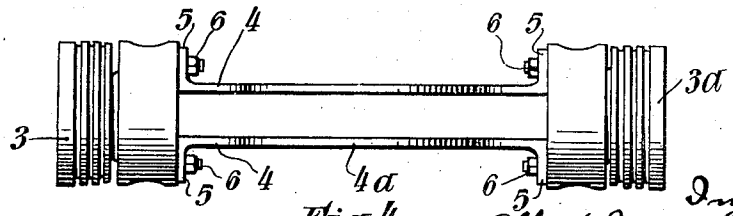


Fig. 4.

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ENGINE HAVING DIAMETRICALLY OPPOSED CYLINDERS

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2 Claims. (Cl. 123—56)

This invention relates to engines having one or more pairs of diametrically opposed cylinders, and more particularly to the coupling of the two opposed pistons to the crank pin of the crankshaft of internal combustion engines.

Hitherto three different methods have been employed for this purpose, viz:

1. Each piston of the pair was attached to a connecting rod of which one, the master connecting rod, is journaled at its big end on the crank pin in the usual way, whilst the corresponding end (the articulated end) of the other connecting rod was pivotally secured to the big end of the master connecting rod by a wrist pin. This construction had the disadvantage that owing to the elliptical path of movement of the articulated end of the latter connecting rod, forces were set up which were not easy to balance. Also the load imposed on the crank pin by centrifugal force was greatly increased owing to the additional mass centred about the crank pin.

2. The big ends of the two connecting rods were journaled on a common axis (the crank pin), one rod being forked so as to bestride the other.

The disadvantage here lay in the fact that the fork made for a weak construction of connecting rod big end.

3. The big ends of the two connecting rods were mounted side by side on a common axis, namely the crank pin, the axes of the two cylinders of each pair being off-set or staggered to the necessary amount.

The undesirable feature of this construction was that the overall length of the engine was increased, particularly if there were several pairs of cylinders; moreover this side-by-side arrangement of the connecting rods on the crank pin gave rise to a "couple" at this point.

The object of this invention is to provide a construction possessing all the advantages of the constructions enumerated above and yet avoiding all the undesirable features mentioned, and generally to provide an engine of compact dimensions which will be efficient in use.

According to this invention there is provided, in or for an engine of the type described, the construction wherein the two opposed pistons are coupled together and drive the crank pin by a single connecting rod attached at its small end to one of said pistons.

The invention moreover embraces, in or for an internal combustion engine, a rigid connection between the two opposed pistons and a single connecting rod for coupling the pistons to the crank pin.

According to a further feature of the invention each piston is relatively short in the skirt and is guided and supported in its movement by a member rigidly attached thereto, and deriving its support from a point remote from the piston.

According to yet another feature of the invention, the piston of one cylinder acts as a guide and support for the piston in the opposing cylinder through the medium of the member which rigidly connects the two pistons together.

One embodiment of this invention will now be described, merely by way of example, with reference to the accompanying drawing, as applied to an internal combustion engine having, say, four pairs of horizontally opposed cylinders. The number of pairs of cylinders being immaterial so far as the invention is concerned, the following description is directed to the construction relating to any one pair of opposed cylinders and pistons.

In the accompanying drawing—

Fig. 1 is a transverse sectional elevation of the engine.

Fig. 2 is a sectional plan taken in the line x—x of Fig. 1, looking in the direction of the arrows.

Fig. 3 is a side elevation of the pair of opposed pistons with the connecting plates attached, and

Fig. 4 is a plan of Fig. 3.

Referring to the drawing, the axes of the two cylinders 2 are in alignment and the pistons 3, 3^a in these two cylinders are, in accordance with the invention, rigidly interconnected by two spaced connecting plates 4.

Each connecting plate 4 is of identical construction and comprises a central ring-shaped portion 4^a having diametrically opposite extensions 4^b (Fig. 3) provided with flat portions 5 adapted to be bolted by bolts 6 to corresponding flat surfaces machined on the pistons 3, 3^a. These surfaces on the pistons are adjacent the point where the usual gudgeon pin bosses are to be found.

The connecting plate 4 is shown in the drawing to be of flat section, but it may be composed of members of any desired section, either wholly or partly solid, hollow or of angle section, with or without webs, fillets, bracings or other reinforcements.

The piston 3 is coupled by means of a single connecting rod 7 to the crankshaft 8, the small end 7^a being secured to the piston 3 by a gudgeon

pin 9 and the big end 7b being journaled on the crank pin 10, both in the normal manner.

In this way both pistons 3, 3a are coupled to the crankshaft 8 and the difficulties arising out of the use of two connecting rods involving two bearings in the vicinity of the crank pin are thus overcome.

The two connecting plates 4 are spaced apart so as to lie one on each side of the connecting rod 7 and between the planes defined by the confronting surfaces of the crank pin supporting webs of the crank shaft and the purpose of the central ring-shaped portions 4a is to afford clearance for the crank pin 10 and the big end 7b of the rod 7.

In an engine of orthodox pattern, the length of the piston skirt must be sufficient to provide an adequate guide in the cylinder, but an important advantage arises from the present invention in that the overall width of the engine may be materially decreased by cutting down the length of the piston skirt. This may be done because the rigid connection between the two pistons 3, 3a causes one piston to act as a guide and support for the other piston in a manner similar to a cross-head.

Consequently extremely short pistons can be employed with a material saving in weight and overall width of the engine.

What I claim is—

1. In an engine having a pair of diametrically opposed cylinders, a crank-shaft journalled between said cylinders, said crank-shaft including spaced web members supporting a crank-pin therebetween, opposed pistons operating in said cylinders and a connecting rod coupling one of said pistons to the crank-pin; rigid connecting means between said pistons comprising two spaced connecting plate members the extremities of which are fixedly secured to the respective pistons, said plates disposed on opposite sides of the connecting rod and between the planes defined by the confronting inner surfaces of the crank-pin supporting web portions of the crank-shaft, each of said plates having a centrally disposed ring shaped portion defining an opening of sufficient size to accommodate the movement of the crank-pin and the bearing portion of the connecting rod secured thereto.

2. In an engine having a pair of diametrically opposed cylinders, a crank-shaft journalled intermediate said cylinders having spaced web members forming the crank portion thereof which web members support a crank-pin therebetween and have portions projecting beyond said shaft opposite said crank-pin, opposed pistons operating in said cylinders and a connecting rod coupling one of said pistons to said crank-pin; rigid connecting means between said pistons comprising two spaced substantially parallel plate members rigidly connected at their extremities to the respective pistons, said plates being disposed on opposite sides of said connecting rod and between the planes defined by the confronting inner surfaces of the web members of said crank-shaft, each of said plates having a centrally disposed ring shaped portion defining an opening of sufficient size to accommodate the throw of said crank-pin and associated bearing end of said connecting rod.

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