

May 28, 1929.

H. CAMINEZ

1,714,847

INTERNAL COMBUSTION ENGINE

Filed April 2, 1927

2 Sheets-Sheet 1

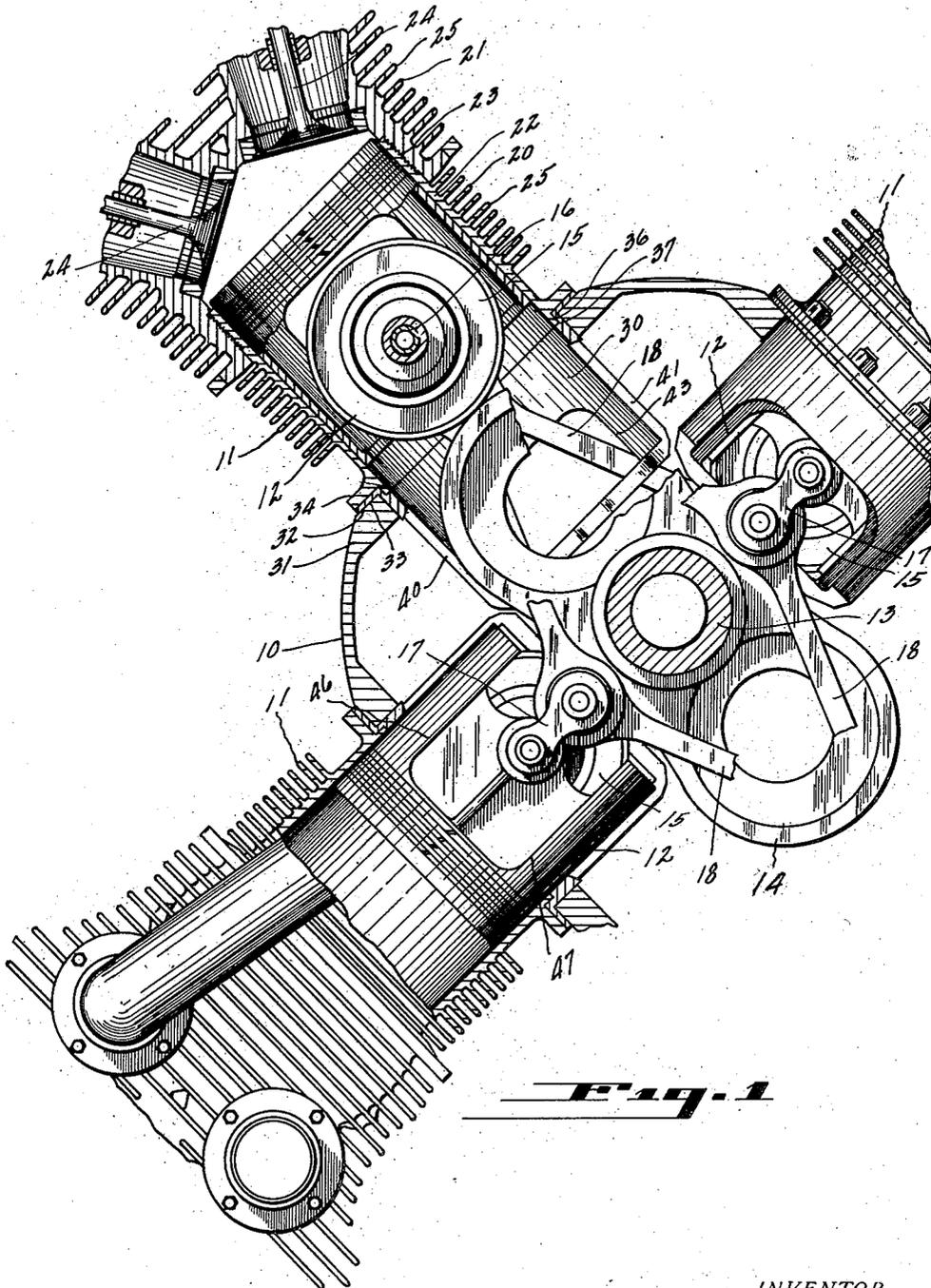


Fig. 1

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Fig. 2

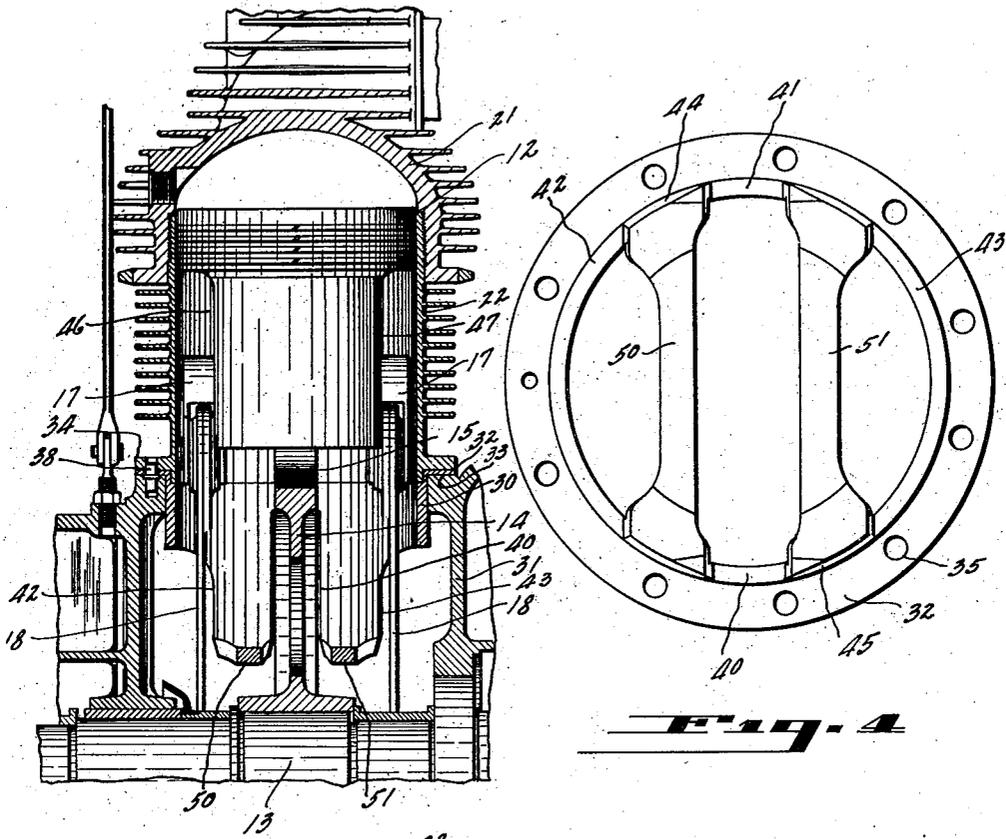


Fig. 4

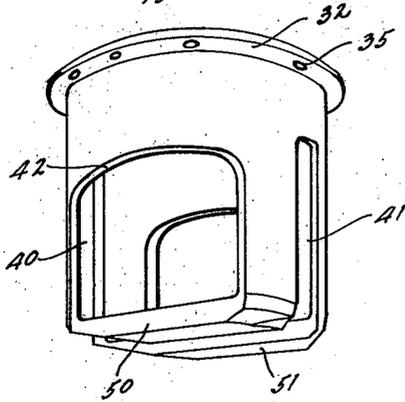


Fig. 3

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INTERNAL-COMBUSTION ENGINE.

Application filed April 2, 1927. Serial No. 180,496.

This invention relates to internal combustion engines and is particularly applicable to the type of engine in which the explosive force within the engine cylinders is caused to be effective upon a central cam to cause the revolution of the engine shaft, the pistons in the cylinders being interconnected so that they are maintained in bearing relation with the cam.

One object of the invention is the provision of an engine cylinder in an engine of the character mentioned, which will be strong and rigid yet light in its construction and which is provided with cutaway spaces at its inner portions through which the cam may pass as the latter revolves about the engine shaft axis.

Another object of the invention is the provision of an engine cylinder which is constructed of separate outer and inner cylinder portions in such a manner as to permit the removal of the outer cylinder portion from the engine without disturbing the inner cylinder portion.

A further object of the invention is the provision of a cylinder portion which is provided with rigidifying means at its inner end adjacent cutaway spaces provided on opposite sides of the cylinder wall.

Other objects and advantages of the invention will be apparent from the following description and from the drawings in which:

Fig. 1 is a side elevation of part of an internal combustion engine embodying the present invention, parts being shown in section;

Fig. 2 is a central section through an engine cylinder of the present invention;

Fig. 3 is a perspective view of the inner cylinder portion; and

Fig. 4 is an end view of the inner cylinder portion.

Referring more particularly to the drawings by reference numerals, in which corresponding numerals designate similar parts in the various views, the internal combustion engine designated generally 10, is shown in Fig. 1 as a four cylinder engine having radially disposed cylinders 11 in each of which is a piston assembly as indicated at 12. A central shaft 13 is supported in any suitable manner at the center of the engine and carries a double lobed cam 14, shaped generally in the form of a figure 8. The piston assemblies 12 each carry a roller 15

mounted on the piston pin 16 in the piston, and these rollers bear on the periphery of the cam so that the explosions in the various cylinders are caused to be effective in transmitting force to the cam and produce a revolution of the drive shaft 13 on which it is fixed. The piston assemblies are interconnected means of links 18, arranged in pairs on each side of the piston assembly, as shown, the ends of these links being connected to the piston pins by means of short links or arms 17 one of which is provided on each side of the piston pin.

Each cylinder embodies an outer portion 20 which is preferably formed of a cylinder-head casting 21 and a cylinder wall section 22, the cylinder-head casting being screwed on the end of the cylinder wall section by means of the threads 23 provided on these parts, so that they are rigidly and firmly attached together. The cylinder-head casting 21 is provided with the customary valves 24, and suitable cooling means such as the cooling fins 25 are provided on the casting 21 and the cylinder section 22 as shown. An inner cylinder portion 30 forms a continuation of the outer cylinder portion 20 and extends for a considerable distance within the interior of the engine case 31. The engine case is provided with openings corresponding in number to the number of cylinders of the engine, four cylinders being provided in the embodiment of the invention herein disclosed.

These openings are of a size so that the inner cylinder portions 30 may be inserted in place, each inner cylinder portion 30 having a flange 32 at its outer end which is adapted to be seated on the corresponding surface 33 of the engine case. The inner end of the outer cylinder section 20 is provided with a flange 34 which is seated on the outer side of the flange 32 and suitable attaching bolts extend through attaching holes 35 spaced around the flanges 32 and 34 and are threaded into the adjacent portions of the engine case 31 so as to rigidly fix the cylinder portions to the engine case. A locating pin 38 in the engine case may be provided to register with corresponding holes in the flanges 32 and 34. The inner and outer cylinder sections 30 and 20 are of complementary form so that together they provide a complete cylinder for the engine, the outer cylinder section being preferably constructed so that a projecting extension 36 is formed on its inner end, which

is received in a correspondingly shaped end groove 37 on the outer end of the inner cylinder section 30. The engaging surfaces of the extension 36 and end groove 37 may be accurately machined so that the cylinder portions may be maintained in exact alignment.

The cylinder portion 30 has opposed cutaway spaces 40 and 41 at its inner end extending along the walls of the cylinder portion as clearly shown in Fig. 3, these spaces being of sufficient width so that the cam 14 may pass through them as the cam revolves about its central shaft. The outer lobes of the cam extend some distance within the inner cylinder portion when the longitudinal cam axis is in alignment with the cylinder, which is cut away as mentioned so that the cylinder walls will not interfere with the cam movements. The lower portions at the sides of the cylinder are also cut away as indicated at 42 and 43 so that the various links 18 and arms 17 by which the pistons are interconnected will not interfere with the cylinder walls and also to eliminate some of the weight of the cylinder. The portions of the cylinder wall which are cut away at 42 and 43 are comparatively ineffective as a guide for the piston since the thrust of the piston against the cylinder wall which may be produced is in the direction of the cylinder wall parts 44 and 45 between which the cam lobes may pass, and the cylinder can therefore be cut away as indicated without materially reducing its guiding effect on the piston. The piston itself is preferably formed so that its own side walls are cut away at the sides 46 and 47 below the piston rings.

The front and rear inner end parts 44 and 45 of the cylinder as shown, are rigidified and maintained in a definitely spaced and rigid position in their proper relationship by rigidifying straps 50 and 51 which are preferably integrally formed on the lower end of the cylinder portion 30. The interconnection provided by reason of the rigidifying straps 50 and 51 prevents the cylinder wall parts 44 and 45 from yielding and twisting when the piston, at the inner end of its stroke, exerts any great pressure on the cylinder walls. The skeleton formation of the inner cylinder section is thus maintained in its true form.

It will be apparent from the construction just described that the outer cylinder section may be removed by first removing the attaching bolts which mount it in place, without removing the inner cylinder section from its position in the engine case 31. With the piston at the outer end of its stroke the piston pin may be removed endwise as more clearly explained in my application for Letters Patent entitled Piston, Serial No. 180,497, filed April 2, 1927, and the removal of the piston for inspection or replacement of parts is then permitted. The removal of the inner cylinder section 30 may then be effected if de-

sired, the links and link connecting arms 17 passing through the inner side opening or cutaway portions 42 and 43 without obstructing the removal of this inner cylinder section.

By reason of the two-part construction of the cylinder the manufacture of the cylinder is simplified, as the two short sections may be more easily handled and operated upon than one long section. Furthermore the overhaul operations are made more convenient as the two-piece construction greatly simplifies work on the valves and cylinder-head. When a top overhaul on the engine is made the bottom portion of the cylinder need not be disturbed, and the cylinder-head and top portion may be easily removed, handled and again assembled in place.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. An engine cylinder of the class described comprising an outer cylinder portion, an inner complementary cylinder portion forming a continuation of the outer portion, said inner portion having opposed cutaway spaces in the inner parts of its side walls, and a rigidifying strap attached to opposite points on the inner end of said inner portion.

2. An engine cylinder for cam engines of the class described comprising a cylindrical cylinder portion, said portion being adapted to extend into the engine case, and having opposed cutaway spaces at its inner end, and a pair of straps joining opposed parts of the cylinder portion at the lower end thereof adjacent said cutaway spaces, said straps extending directly across the lower end of the cylinder portion.

3. An engine cylinder for cam engines of the class described comprising an outer cylinder portion, an inner complementary cylinder portion forming a continuation of the outer portion, said inner portion having opposed cutaway spaces in the inner parts of its side walls, and rigidifying straps integrally formed on the lower end of said inner portion and connecting opposite parts of the side walls thereof.

4. An engine cylinder of the class described comprising a cylinder portion, said portion extending into the engine case and having opposed cutaway spaces at its inner end, and a pair of straps integrally formed on the lower end of said cylinder portion and joining opposed parts of the cylinder walls.

5. An engine cylinder comprising an outer cylinder portion, an inner cylinder portion in alignment therewith and adapted to ex-

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tend into the engine case in extension of the other cylinder portion, flanges on the adjacent parts of each of said portions by which they may be attached in place, said inner portion having opposed cutaway spaces at its inner end, and means for rigidifying the inner end of said inner portion to prevent flexing movements thereof.

6. An engine cylinder for cam engines of the class described comprising an outer cylinder portion, an inner cylinder portion in alignment therewith, flanges on the adjacent parts of each of said portions by which said portions may be attached in place, said inner portion having centrally opposed cutaway spaces at its inner end of the side walls thereof and having cutaway spaces on each side of the said central space, and a pair of rigidifying straps attached to opposite points on the inner end of said inner portion and between the cutaway spaces on the cylinder walls.

7. An engine cylinder for cam engines of the class described comprising an outer cylinder portion forming the cylinder-head and a part of the cylinder wall, a peripheral flange at the inner end of said portion, an inner cylinder portion extending into the engine case having a peripheral flange cooperating with said first named flange for attaching said cylinder portions in position, said inner cylinder portion having cutaway spaces located on opposite sides of the cylinder wall adjacent the end remote from the flanged end thereof, and a pair of cross straps integrally provided on said inner cylinder portion interconnecting and relatively spacing opposed points of the said inner portion for the purpose described.

8. In an air-cooled multiple-cylinder engine having a series of radially arranged cylinders, an engine case, an inner cylinder portion adapted to extend into the engine case, an outer cylinder portion in alignment

therewith, said portions together providing a continuous cylindrical passage extending inwardly as well as outwardly beyond the adjacent portions of the engine case, and flanges on the adjacent ends of each of said portions by which they may be attached together and to the engine case.

9. An engine cylinder comprising an outer working chamber portion and an inner working chamber portion secured thereto in alignment therewith, said inner portion having opposed cutaway spaces at its inner end, and means extending across the inner end of the inner working chamber for rigidifying said inner end.

10. In an engine, a cylinder having a working chamber open at its inner end and formed with strengthening means for said cylinder extending across the inner end of said working chamber and with cutaway spaces adjacent said strengthening means.

11. An engine cylinder having a working chamber formed with opposed cutaway spaces at its inner end and strengthening means for said cylinder extending across the inner end of said chamber adjacent said cutaway spaces.

12. In combination with an engine case, an outer cylinder portion, an inner cylinder portion in alignment therewith and adapted to extend into the engine case, said portions together providing a continuous cylinder passage extending inwardly as well as outwardly beyond the adjacent portions of the engine case, a flange at the inner end of said outer cylinder portion and a flange at the outer end of said inner cylinder portion by which the portions may be attached together and to the engine case, said inner portion having opposed cut away spaces at opposite sides of the cylinder wall thereof at its inner end.

In testimony whereof I hereto affix my signature.

HAROLD CAMINEZ.