June 19, 1928. 1,673,943

H. T. HERR

METHOD OF ASSEMBLING INTERNAL COMBUSTION ENGINES

Filed March 31, 1927 2 Sheets-Sheet 1

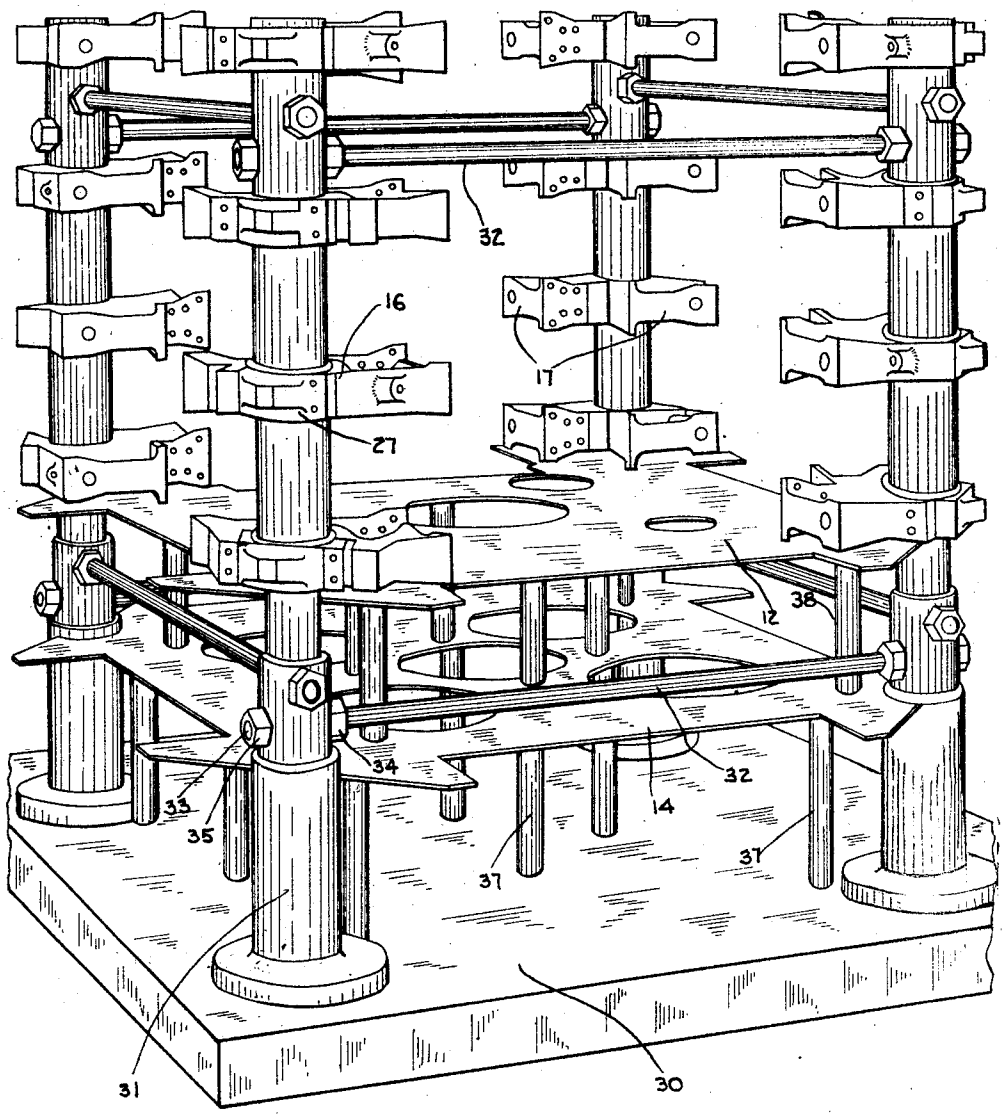


Fig. 1.

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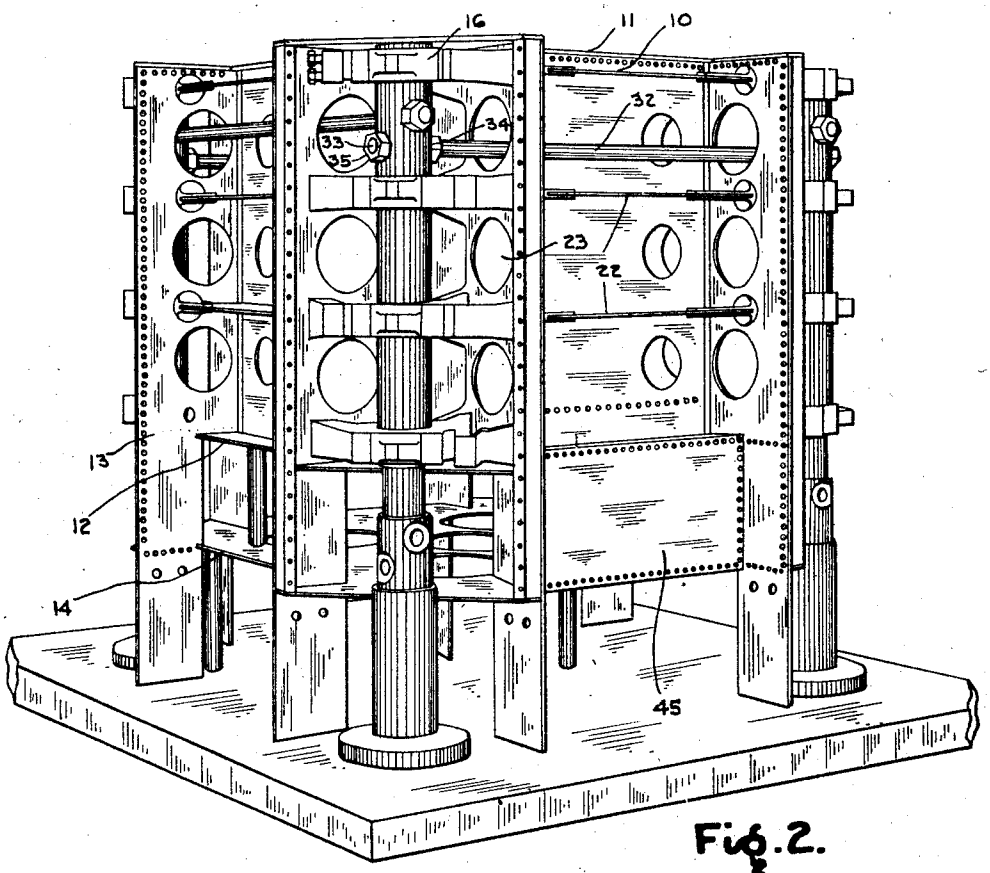


Fig. 2.

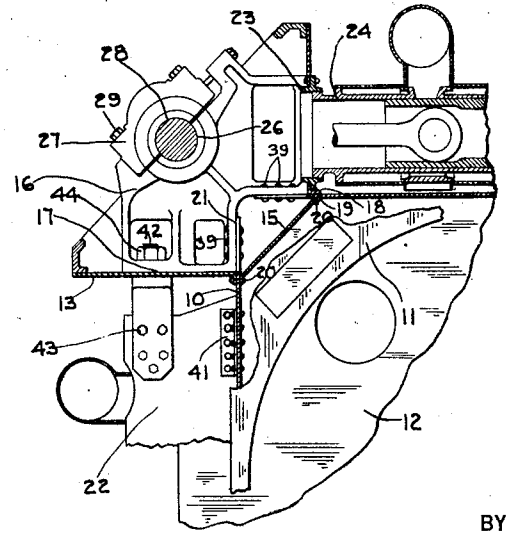


Fig. 3.

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Patented June 19, 1928. 1,673,943

UNITED STATES PATENT OFFICE.

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METHOD OF ASSEMBLING INTERNAL-COMBUSTION ENGINES.

Application filed March 31, 1927. Serial No. 179,812.

My invention relates to engines of the polyhedral type having horizontally disposed cylinders, such as disclosed and claimed in application Serial No. 179,184, filed March 31, 1927, and assigned to the Westinghouse Electric & Manufacturing Company. An engine of this type is characterized by a vertically disposed frame, which has engine means disposed thereabout, the engine means including crank shafts carried by bearings at the corners of the frame. The frame is preferably formed to provide a scavenge air supply chamber; and, if it supports a generator, it may be formed to provide a generator cooling air supply chamber as well as supporting means and space for the transmission gearing for connecting the crank shafts of the engine means to the generator rotor.

It is the object of this invention to provide an expeditious method of assembling an engine of the character indicated, the improved method assuring of proper alignment and registry of parts.

In order that my invention may be better understood, reference should be had to the accompanying drawings forming a part of this application, in which:

Fig. 1 is a perspective view of a jig employed in carrying out my improved method, parts being shown assembled with respect to the jig;

Fig. 2 is a view similar to Fig. 1 but showing the assembly carried to a further stage; and,

Fig. 3 is a fragmentary detail sectional view of a corner of the engine.

Referring now to the drawing more in detail, the engine will be referred to briefly in order to more fully explain the method of assembly, the jig being employed to carry out the method.

The engine frame consists of vertically disposed side plates 10 connected to horizontal plates 11 and 12 and to vertically disposed corner plates 13, the corner plates 13 extending below the plate 12 and being joined to a lowermost horizontal plate 14.

As pointed out in the application aforesaid, and upon reference to Fig. 3, it will be seen that the side plates 10 are joined by gusset plates 15. The side plates 10, and the gusset plates 15, and the horizontally disposed plates 11 and 12 cooperate to define an interior air chamber space, as pointed out in the application aforesaid; and this space may further be divided by suitable means into a scavenge air chamber and a generator air cooling supply chamber. The horizontal plates 12 and 14, together with the vertically disposed plates 13, cooperate to define a space for the gearing which connects the corner crank shafts to the driven member.

Corner bearings 16 are arranged at the corners of the structure, each bearing being provided with faces 17, arranged at right angles to each other, for contact with the adjacent vertical plates 13, the latter plates preferably being provided with flanges 18 arranged outside of the vertical plates 10 and the gusset plates 15 preferably being provided with flanges 19 arranged inside of the vertical plates 10, and the flanges 18 and 19 being disposed in opposed relation and gripping the side plates 10 therebetween. Suitable rivets or bolts 20 are provided for securing the flanges 18 and 19, and the interposed plates 10 in proper relation.

The side plates 10 are provided with tongues 21 which extend beyond the associated vertical plates 13 and are secured to the corner bearings 16. The corner bearings are connected by tension members 22, the latter members serving to resist engine working forces. The vertical plates 13 are provided with openings 23 for engine cylinders 24, the openings being in interposed relation with respect to the corner bearings 16.

Each corner bearing 16 provides a half bearing portion 26 and a cap 27 cooperates with each bearing 16 and is provided with a bearing portion 28 conjugate to the first bearing portion 26, the bearing caps being held in place with respect to the bearing 16 by any suitable means as by the bolts 29.

Referring now to the jig in order that the method of assembly may be made more apparent, in Fig. 1, I show the jig consisting of a suitable bed plate 30 with corner posts 31 removably secured to the bed plate. The corner posts extend vertically and are uniformly spaced from top to bottom, the spacing being accurately determined and main-

tained by spacing rods 32 secured to the corner posts by any suitable means, as by threaded ends 33 and inside and outside nuts 34 and 35, respectively. Corner posts of a diameter equal to the diameter of the crank shaft journal portions are provided.

In assembling the engine frame, reference being made to Fig. 1, the corner posts 31 are first properly located with respect to the bed plate 30. The lowermost horizontal plate 14 is placed in position with the spacing members 37 located between the latter and the bed plate 30. Next, the lower set of spacing rods 32 are placed in position with the ends thereof passing through openings extending through the posts 31 and the nuts 34 and and 35 are properly adjusted to secure accurate spacing and parallel relationship of the corner posts 31. The intermediate horizontal plate 12 is then placed in position with the spacing members 38 located between the latter and the lowermost horizontal plate 14.

The next stage in the process of assembly is to locate the crank shaft bearings with respect to the corner posts and to connect the upper set of rods 32 to the corner posts in order to accurately fix the corner posts in parallel and vertical positions and spaced apart correctly. The bearings may be readily positioned about the posts merely by removing the caps 27 thereof and then assembling the bearings about the posts.

The vertical side plates 10, corner plates 13, and gusset plates 15 are next assembled in position with respect to the crank shaft bearings 16. The side plates 10 are first assembled with respect to the crank shaft bearings 16; and, to this end, the tongues 21 of the side plates 10 are riveted or bolted to the crank shaft bearings by rivets or bolts 39 (see Fig. 3) and the gusset plates 15 are next brought into position 18 and 19 thereof engaging on opposite sides of the side plates 10, whereupon rivets or bolts 20 are inserted and fastened to secure these parts together. The tension plates 22 are secured to the side plates by any suitable means, for example, by angle members 41, and the terminal threaded stems 42 theerof are passed through openings provided in the vertical cylinder support plates 13 and in the crank shaft bearings 16. In order that the tension plates with their threaded stems 42 may be brought to this position, the stem members 42 are preferably detachably secured, for example, by bolts 43, to the body portions of the tension plates 22. After the tension plates 22 are fastened to the side plates 10 with the stem members 42 located in the openings provided in the vertical cylinder support plates 13 and in the bearings 16, the bolts 43 having been placed in position to secure the stem members to the body portions 22 of the tension members, the nuts 44 are adjusted to place the proper degree of tension in the tension members.

The important steps in the process of assembly have so far been noted; however, various other incidental steps may take place before the corner posts 31 are removed. For example, the lowermost horizontal plate 14 is secured in position with respect to the cylinder supporting plates 13; the intermediate horizontal plate 12 is secured in position with respect to the cylinder supporting plates 13, to the side plates 10, and to the gusset plates 15; and the top horizontal plate 11 is secured in position with respect to the top edges of the plates 10, 13 and 15. Also various other detail matters of assembly may take place at this stage in the process, for example, vertical cover plates 45 may be assembled in position with respect to the horizontal plates 12 and 14 and the vertical plates 13.

It will, therefore, be seen that the corner posts are accurately positioned and spaced by the rods 32 so that such posts constitute reference shafts or members with respect to which the engine structure is assembled. Alignment of each set of crank shaft bearings is assured since they are first assembled about the corner posts before any of the frame structure to which the bearings are attached is brought into position and secured to the bearings.

After the frame structure has been assembled in the manner stated, the spacing rods 32 for the corner posts are removed, the bearing caps 27 are removed, and the corner posts 31 are removed from the bed plate. Thereafter, the crank shafts are assembled in position with respect to the bearings 16 and the cylinders 24 are brought into position with respect to the openings 23 in the cylinder supporting plates 13. Since the corner posts are made of substantially the same diameter as a crank shaft to be located in the bearings 16, it is assured that the crank shafts shall fit the respective sets of bearings, although, of course, it will be understood that it is necessary to then accurately fit the bearings to the respective journal portions of each crank shaft.

From the foregoing, it will be apparent that I have provided a method of assembly which consists, first, in providing a jig having suitable and accurately spaced corner posts, second, in placing the crank shaft bearings about the posts, and, third, in then assembling the engine frame structure in place with respect to the crank shaft bearings and in connecting such assembled structure to the bearings. In this way it is assured that each series of bearings for a crank shaft shall be aligned due to this process of assembly. A frame may, therefore, be provided which consists largely of fabricated parts assembled expeditiously with the

assurance that each set of crank shaft bearings shall be aligned and that the axes of the sets shall be parallel. While I have shown in the drawing a horizontal bed plate with vertical corner posts, it will be obvious that these parts may be disposed in any suitable position as long as the corner posts are maintained parallel.

While I have shown my invention in one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. The method of assembling a polyhedral engine having horizontal cylinders and vertical crank shafts, which consists in providing a jig having corner posts occupying crank shaft positions, in assembling the crank shaft bearings about the posts, and in connecting together the engine frame and the bearings with the bearings disposed about the posts.

2. The method of assembling a polyhedral engine having horizontal cylinders and vertical crank shafts, which consists in providing a jig having a bed plate with removable corner posts carried by the bed plate, in assembling crank shaft bearings about the posts, in connecting together the engine frame and connecting the bearings to the latter, and in removing the corner posts after the frame is assembled.

3. The method of assembling a polyhedral engine having side cylinders and corner crank shafts which consists in providing a jig having a bed plate with removable corner posts carried by the bed plate, in assembling crank shaft bearings about the posts, in connecting together the engine frame and connecting the bearings to the latter, and in removing the corner posts after the frame is assembled.

4. The method of assembling a polyhedral engine having side cylinders and corner crank shafts which consists in providing a jig having a bed plate with removable corner posts carried by the bed plate, in assembling separate crank shaft bearings about each post, in joining the bearings in properly spaced relation by the assembly and connection thereto of additional engine structure, and in removing the corner posts after the bearings have been joined.

In testimony whereof, I have hereunto subscribed my name this 22nd day of March, 1927.

HERBERT T. HERR.