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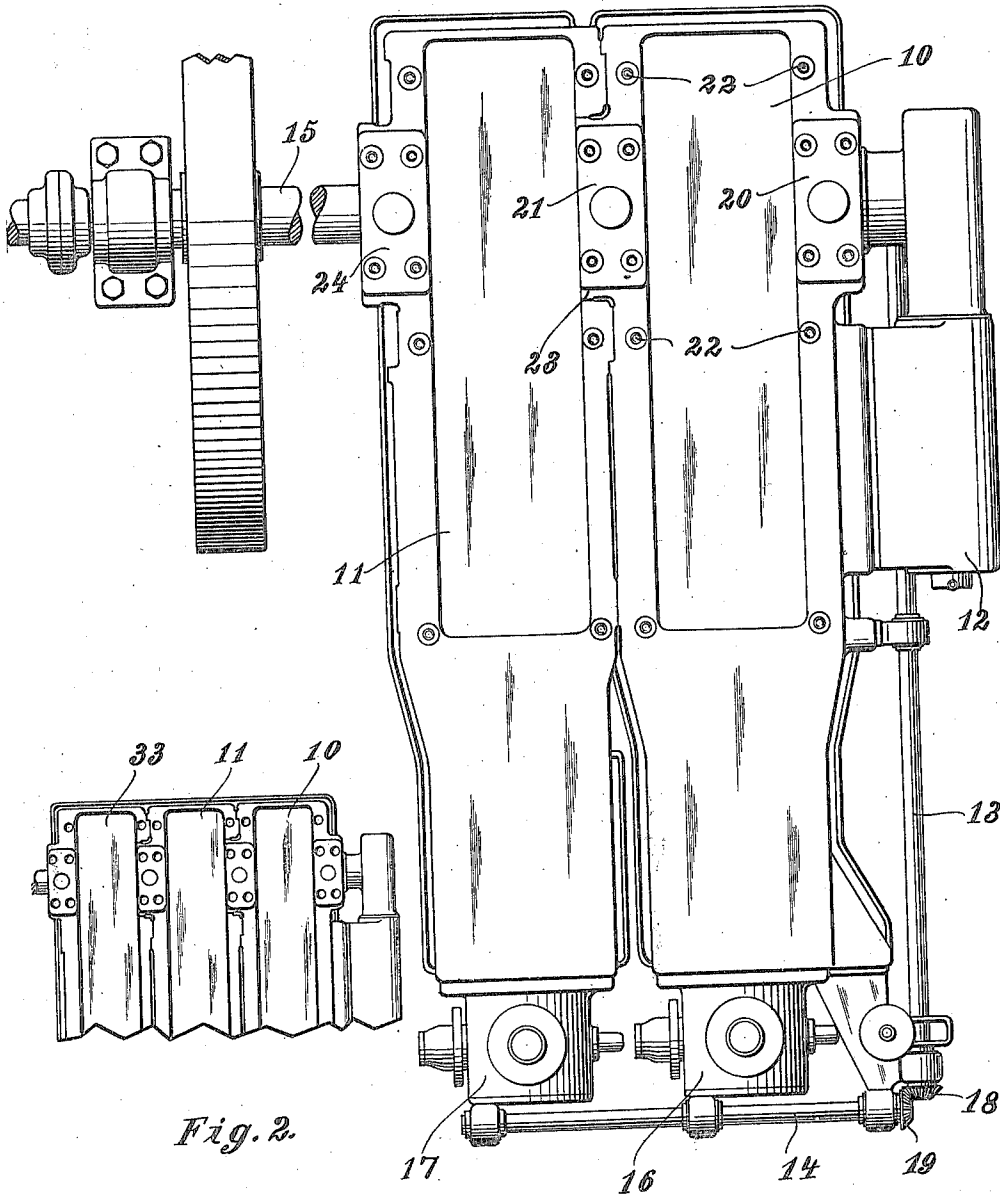


Fig. 2.

Fig. 1.

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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

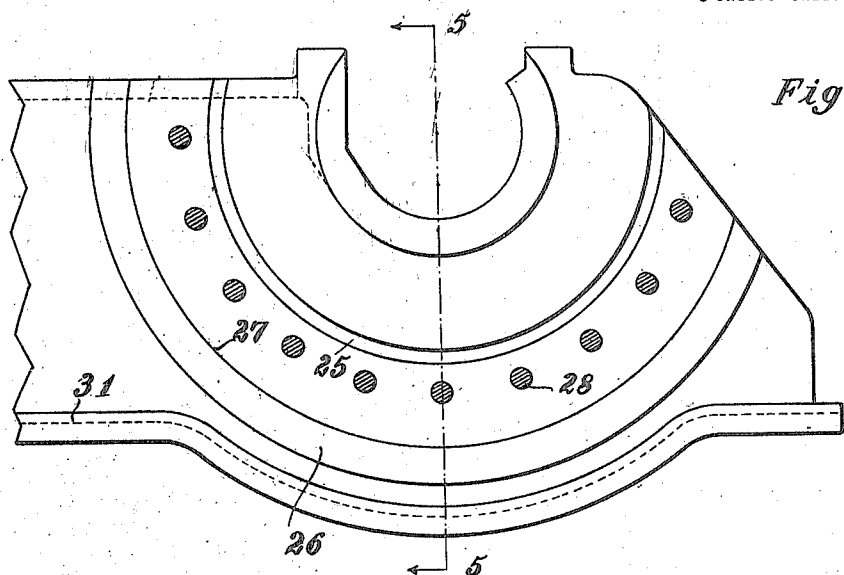


Fig. 4.

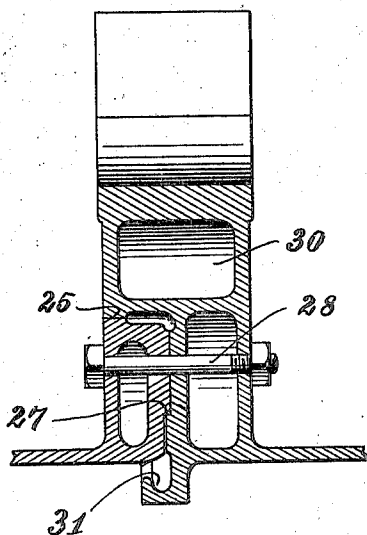


Fig. 5.

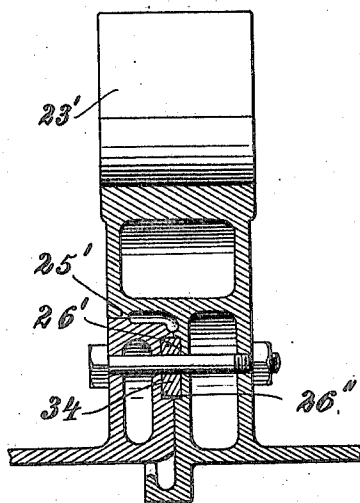


Fig. 6.

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UNITED STATES PATENT OFFICE.

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HORIZONTAL-ENGINE BED.

Application filed April 10, 1913. Serial No. 227,827.

To all whom it may concern:

Be it known that I, WILLIAM T. PRICE, a citizen of the United States, residing in New Rochelle, county of Westchester, and the State of New York, have invented certain new and useful Improvements in Horizontal-Engine Beds, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to a novel and improved construction of engine bed adapted for use in connection with oil and gas engines, steam engines, air compressors, and in fact all forms of horizontal type machines.

This invention refers more particularly to an improved construction of engine bed which is intended for machines of the multi-cylinder type, and its primary object is to provide a novel construction of engine bed built on the elastic principle, whereby an engine can be built with any number of cylinders desired simply by providing as many units, each unit being so constructed that a substantial saving both in cost of manufacture and space is effected, as compared with the present methods of manufacture.

Another object of my invention is to provide an improved construction of engine bed built on the elastic principle whereby the power of an engine can be increased by the addition of one or more units at any time at a comparatively little expense with the employment of a considerably smaller additional space than would be required, if the additional power were obtained in the usual way by adding a complete engine or by substituting a larger engine for the smaller one.

A still further object is to provide an improved construction of engine bed unit adapted for an elastic construction of engine bed of any desired number of units, which can be manufactured in quantities from the same pattern and which affords extensive application of interchangeable methods of manufacture, whereby a considerable economy is effected in the construction of engines of different capacities.

A still additional object is to provide an improved construction of bed unit adapted for the elastic construction of horizontal multiple cylinder machines, whereby each unit may be caused to interlock with

an adjacent one so that the tensile stresses in the frame of each unit due to the pressure in the cylinder during the compression and explosion periods as well as the stresses of the shaft against the bearings are supported by both units at the same time.

With these and other objects in view, as will more fully appear as the description proceeds, my invention furthermore consists in certain novel constructions and combinations of parts, as will be described and claimed in the appended claims.

In the manufacture of beds or frames for horizontal engines and the like a complete different set of patterns is usually required for the manufacture of each size of engine; the general practice being even to make a new set of patterns for manufacturing, for instance, a double cylinder engine having each cylinder of the same capacity as that of the corresponding single cylinder engine, in order to save space and unnecessary weight. In some cases, in order to produce a double cylinder engine, some manufacturers bodily connect two complete single cylinder engines with the result that the cost of the new engine and the space occupied by the same are virtually twice as much as is the case with the single cylinder engine.

All the above methods of manufacture result for one reason or the other in high cost of production, since it is evident that if different patterns and tools are used for different sizes of engines, not only is the first cost of said patterns and tools high, but the production of engines of different capacities is not as well adapted for quantity production under economical conditions as is the case where said engines are made out of sets of duplicate parts. Since it is always desirable, however, to have elementary unit engines for at least a few cylinder dimensions and corresponding capacities, the improvements forming the object of the present invention may be said to be more particularly directed to the construction of engines formed of two or more units of the same capacity, in which, as heretofore stated, considerable economy of cost and space may be obtained.

The main reason why many manufacturers prefer to construct separate engines in their entirety, and to provide therefore complete sets of drawings, patterns and tools for each

engine, when manufacturing single, double and three cylinder engines having the same piston, diameter and stroke, rather than to connect together two or three complete engines, lies in the fact that a double cylinder engine made from a special set of patterns, for instance, occupies less space, weighs less and altogether costs less than an engine of the same capacity obtained by connecting together two single cylinder engines.

It is apparent, for instance, that in the latter case it is necessary to machine four bearings, two in each frame as against three in the former case.

By means of my improved unit construction of multiple cylinder engine, I am able to retain all the advantages of quantity production, at the same time, also retaining all the advantages of saving in space and compactness pertaining to the manufacture of multiple cylinder engines with different sets of patterns for each engine; I am in other words able to obtain a multiple cylinder engine costing less than an engine of the same capacity obtained by connecting together two or more single cylinder engines and also costing less than an engine having the same number of cylinders made from a special frame, which does not at the same time occupy any more space than the latter type of engine would occupy.

With my invention I am also able to produce an engine to which a new unit can always be added with the addition of only one bearing, said new unit being caused to interlock or to connect with the former in a predetermined way, causing said new unit to remain in a known and definite relation to the old one and to remain automatically in perfect alignment and ready for the mounting of a new crank shaft and such other parts as may be necessary to provide to comply with the requirements of the new capacity of the engine.

In the annexed drawings I illustrate by way of example a few multiple cylinder engine beds embodying my invention and in the same—

Fig. 1 is a plan view partly broken away of a double cylinder oil engine;

Fig. 2 is a detail plan view on a smaller scale, partly broken away, of the same engine to which a new unit has been added;

Fig. 3 is a detail plan view on an enlarged scale, of the first unit of a set, showing also the connection to an adjacent unit;

Fig. 4 is a detail side view in elevation of the bearing portion of a body unit at the side where a new unit has to be added;

Fig. 5 is a detail cross sectional view in elevation through line 5—5 of Fig. 4;

Fig. 6 is a detail cross sectional view in elevation corresponding to the one shown in Fig. 5, but illustrating a modified form of joint between two units.

A multiple cylinder engine constructed according to my invention generally comprises a main unit which is a single cylinder engine complete with two bearings and accessories including devices for cam shaft and valve control, and one or more additional units each comprising a one cylinder engine bed or frame.

One of the specific features of these additional units is that each unit is provided with an outer bearing only, so that as each unit is added the bearing that was formerly the outer bearing of the engine will become an intermediate bearing.

Another specific feature in the preferred form of my engine construction consists in providing a transversely running cam shaft, preferably at the front of the engine; said cam shaft is controlled by gearings or other suitable devices provided in the main unit, and all that is necessary to do when a new unit is added is to provide a longer cam shaft or to extend the existing cam shaft to the required length, the controlling devices remaining absolutely the same. This naturally calls for a construction of main unit which departs to a certain extent from the general practice inasmuch as the cam shaft runs transversely to the engine, while on the ordinary type of machine the cam shaft is longitudinally arranged.

Referring to the drawings, Fig. 1 is a plan view of a two cylinder oil engine consisting of a main unit bed 10 and an additional unit bed 11; details of the same are also shown in an enlarged scale in Figs. 3, 4 and 5. 12 designates the air compressor, 13 a longitudinal shaft mounted on the end unit controlling the cam shaft 14, and 15 designates the crank shaft. Cam shaft 14 is mounted, as shown, in front of cylinder heads 16, 17 and receives motion from controlling shaft 13 through the medium of mitre gears 18, 19.

The main unit engine bed 10 is provided with two main bearings 20, 21 and these are secured to its foundation by means of foundation bolts 22. Main bearing 21 has a portion 23 overhanging from the frame, which, while the head unit is working as a single cylinder engine, is not subject to any considerable stresses, the crank being located between the two bearings and the inner portion of the bearings being supported by the main body of the frame. As soon as a new unit 11, however, is provided with an outer bearing 24 is added at the side of bearing 21, the overhanging portion 23 of said portion 21 becomes directly subject to the stresses in both directions coming from the crank located between said bearing 21 and bearing 24. It is quite possible to build said overhanging portion 23 sufficiently strong to withstand said stresses without any considerable deformation, but I prefer

to furnish a direct support for said overhanging portion of the bearing in the body of the unit, which is being added.

This can be obtained in many different ways, for instance by machining the outer surface of the bearing 25 and by machining a groove 26 all around it in the side of the bed frame, forming a shoulder 27; in this case surfaces 25 and 27 are concentric to the surface of bearing 21 and can therefore be machined simultaneously with said bearing by means of a suitable boring and turning tool. The corresponding portion of the additional unit frame is accordingly machined so as to form with said overhanging bearing portion 23 and groove 26 a male and female joint as clearly illustrated in Fig. 3; in this manner the stresses exerted against the rear part of bearings 21 will be taken up by the rear portion of shoulder 27 and by the portion of the additional unit abutting against the rear part of surface 25, while in the same manner the stresses directed against the front part of bearing 21 will be taken up by the front portion of surface 27 and by the portion of the additional unit frame abutting against the front portion of surface 25.

The male and female joint between two adjacent units as described, however, fills furthermore a most necessary function in respect to that portion of the additional unit frame which interlocks with the outer bearing of the other unit. By observing the drawings, it will be seen that in order to make room for the overhanging portion 23 of the bearing it is necessary to considerably weaken the section of the additional unit frame interlocking therewith, the weakest section being directly under the center of said bearing. From this it follows that the tensile stresses taking place in the frame between the bearings and the cylinder during the compression and explosion periods, tend to spread said weakened section apart. It is very necessary, therefore, that means be provided to prevent this spreading of the frame and this duty is effectively fulfilled by that part of the main portion of the joint which interlocks with the portion of groove 26 located between the bearings and cylinder.

It is obvious that in order to take up the stresses which tend to spread the bearing apart and which are therefore exerted in a longitudinal direction, it is not necessary that surface 25, 27 be concentric to said bearing; but the joint described between two adjacent units has been resorted to for convenience in manufacture.

The additional unit frame 11 can be connected to the main unit frame by means of bolts 28, and if necessary by means of additional bolts 29. 30 designates the oil well which is provided in the bearing for pur-

poses of lubrication, and 31 designates suitable oil grooves provided in the bed frames in order to collect the oil coming from the bearings and the cylinder and other parts of the engine.

Each additional unit is also secured to the foundation by means of foundation bolts adapted to be inserted through holes 32, which are located at the inner side of the additional unit close to the space where overhanging portion 23 of bearing 21, projects. The maximum compactness in the resulting structure is thus secured and a multiple cylinder engine is obtained which does not occupy any more space than a corresponding multiple cylinder engine made as a single unit.

Additional unit 11 may or may not be machined to provide further additions; and in the drawings, Fig. 1, the same is shown as being machined so that a new unit may be added if desired, as shown in Fig. 2 where a unit 33 has been added to form a three cylinder engine.

In the case of an oil engine it will generally be sufficient to change the stroke of the compressor piston in order to make the original compressors serve for the new engine capacity, so that generally the only changes that will be necessary will be in the crank shaft and in the cam shaft. The flywheel may also have to be changed, but of course a construction of flywheel to which additional elements may be added to render the same suitable for different capacities may be easily conceived.

In Fig. 6, I show a modified form of joint between two units where each unit is provided with a groove 26', 26'' and the joint is effected by means of an element 34 inserted within said two grooves as well as by causing, as before, the outer part of the bearing 23' to register with the body of the additional unit frame at 25'.

It is obvious that the various details of construction may be modified to a considerable extent to comply with the different duties and requirements called for by different applications.

It is not absolutely necessary in all cases that the additional units be secured to the foundation inasmuch as in light engines it will be sufficient to mount them securely on the original frame; nor is it absolutely necessary that the additional units be added on one side only, since it is obvious that a member similar to the one applied at one side of the original unit may with suitable modifications be simultaneously applied at the other side.

The drawings are intended merely to convey the fundamental idea on which my invention is based, and I reserve myself the right to put my invention into practice in all those forms and manners which may be

deemed best in each particular case and which may enter fairly into the scope of the appended claims.

I claim:

1. In a multiple cylinder engine, the combination of a main unit frame provided with two main bearings, and an additional unit frame provided with an outer main bearing only, said additional unit frame being adapted to be connected to said main unit frame so as to cause said outer bearing to be in axial alignment with said two main bearings, and thus causing one of said main bearings to become an intermediate bearing serving both units.

2. In a multiple cylinder engine, the combination of a main unit frame provided with two main bearings, and an additional unit frame provided with an outer main bearing only, said additional unit frame being adapted to interlock with and to be connected to said main unit frame so as to cause said outer bearing to be in axial alignment with said two bearings, and thus causing one of said main bearings to become an intermediate bearing serving both units.

3. In a multiple cylinder engine, the combination of a main unit frame provided with two main bearings, and a plurality of additional unit frames each provided with an outer main bearing only, each additional unit frame being adapted to interlock with and to be connected to the outer side of an adjacent unit so as to cause its outer bearing to be in axial alignment with the remaining bearings, and to become an intermediate bearing serving two adjacent units.

4. In a multiple cylinder engine, and in combination with a main unit frame provided with two main bearings, an additional unit frame provided with an outer bearing only, said additional unit frame being adapted to interlock with, and to be connected to said main unit frame so as to cause said outer bearing to be in axial alignment with said two main bearings, and thus causing one of said main bearings to become an intermediate bearing serving both units.

5. In a multiple cylinder engine, and in combination with a main unit frame provided with two main bearings, an additional unit frame provided with an outer bearing only, said additional unit frame being adapted to interlock with, and to be connected to said main unit frame so as to cause said outer bearing to be in axial align-

ment with said two main bearings, and so as to insure the transmission of longitudinal stresses from one frame to the other, and thus causing one of said main bearings to become an intermediate bearing serving both units.

6. In a multiple cylinder engine and in combination with a single cylinder engine frame having a main bearing formed with an outwardly projecting portion, an additional single cylinder engine bed frame having an outer main bearing and having its inner part interlocking side by side with the body of the previously mentioned bed frame and with the projecting portion of its main bearing; said first mentioned main bearing thus becoming an intermediate bearing serving both units.

7. In a multiple cylinder engine and in combination with a bed frame provided with a bearing and another bed frame connected side by side therewith, interlocking with the frame previously mentioned, so as to insure correct alinement and insuring the transmission of longitudinal stresses from one frame to the other, said interlocking relation being obtained through a male and female connection concentric to said bearing, said bearing thus becoming an intermediate bearing serving both units.

8. In a multiple cylinder engine, the combination of a main unit frame provided with a main bearing formed with an outwardly projecting portion, and a plurality of additional unit frames each provided with an outer main bearing only also formed with an outwardly projecting portion, and having its inner part adapted to interlock with the outwardly projecting part of the main bearing of an adjacent unit, all bearings remaining in axial alinement, and bearings intermediate any two units acting as bearings for both units.

9. As a new article of manufacture, a multiple cylinder engine consisting of a single cylinder engine provided with two main bearings, and one or more additional single cylinder engine units, each provided with an outer bearing only and each interlocking with and connected to an inner unit in the series, all bearings remaining in axial alinement, and bearings intermediate any two units acting as bearings for both units.

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