

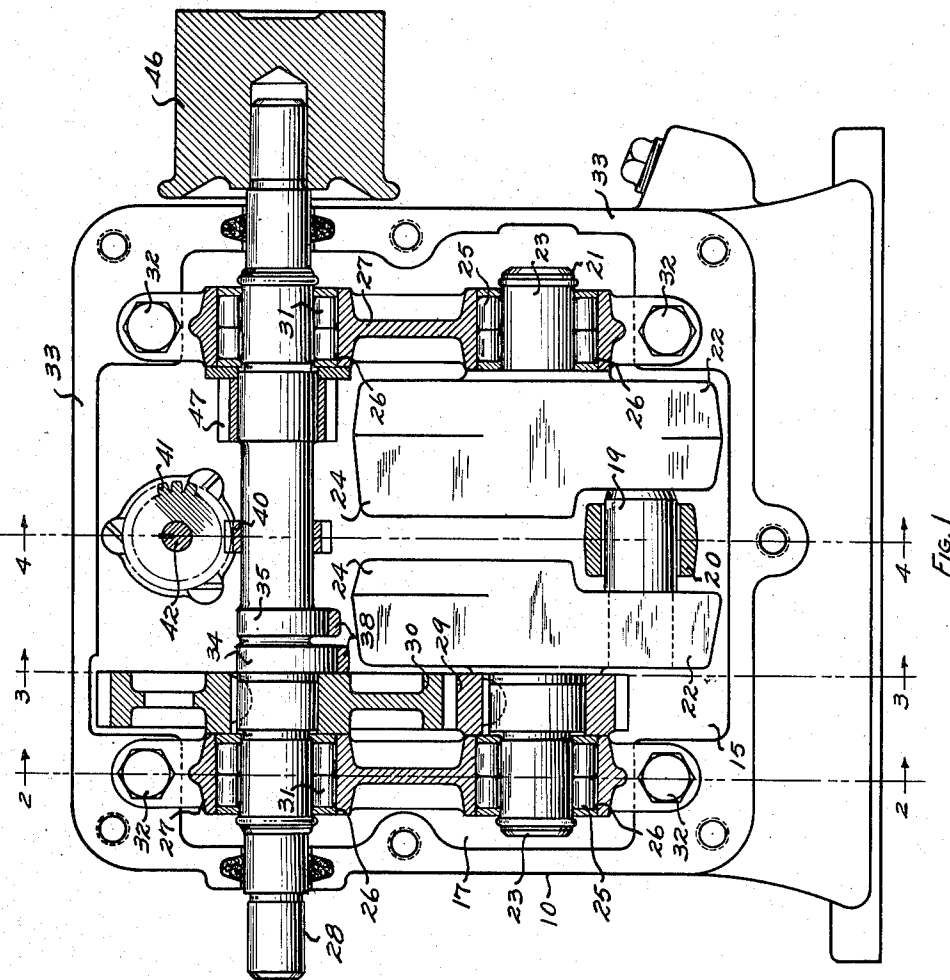
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A. C. BOOCK
INTERNAL COMBUSTION ENGINE

2,058,055

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4 Sheets-Sheet 1



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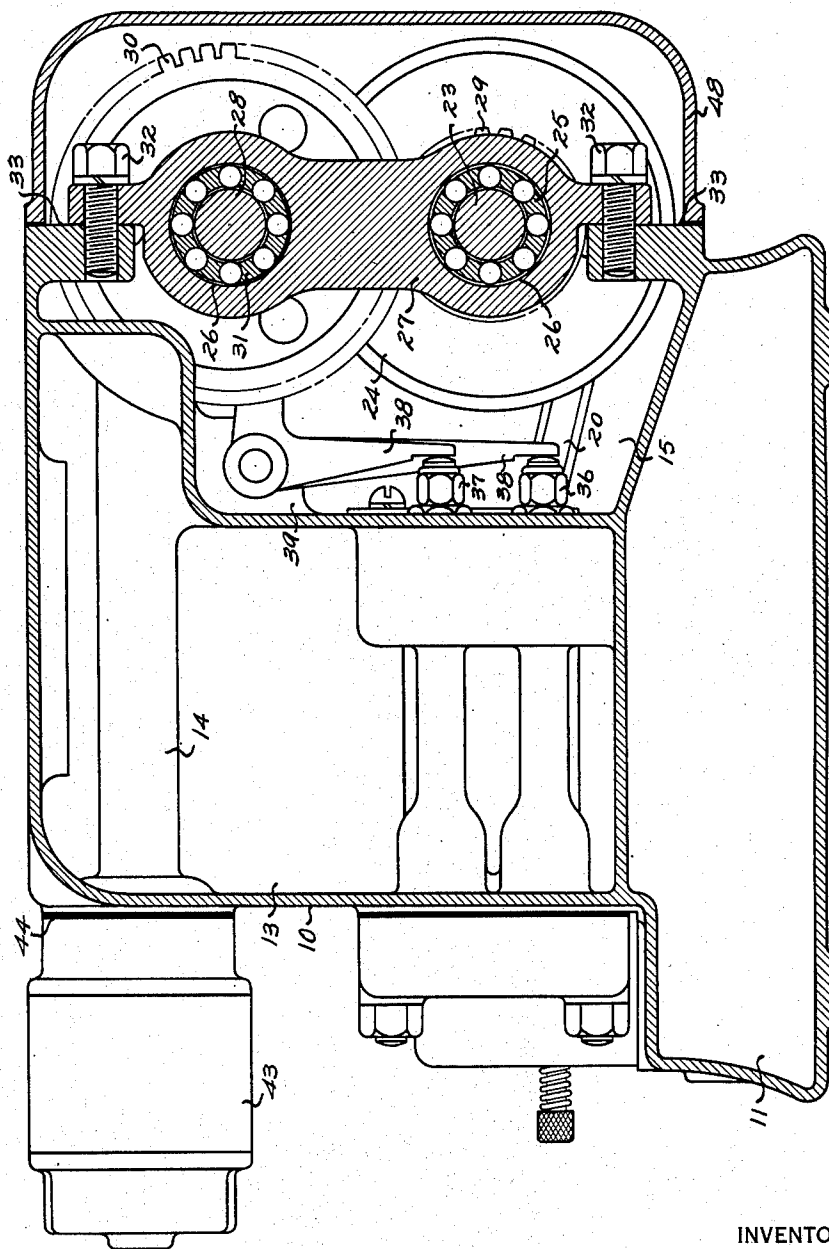


FIG. 2.

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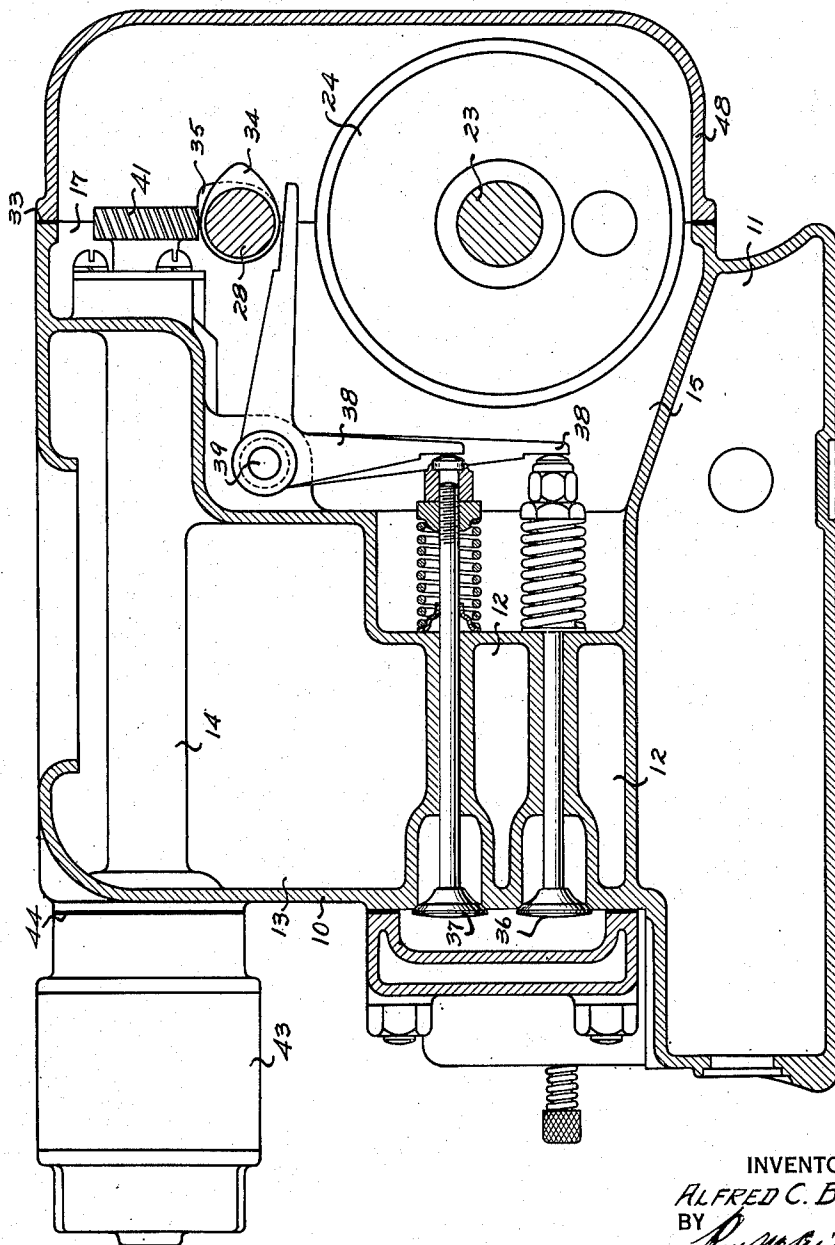


FIG. 3

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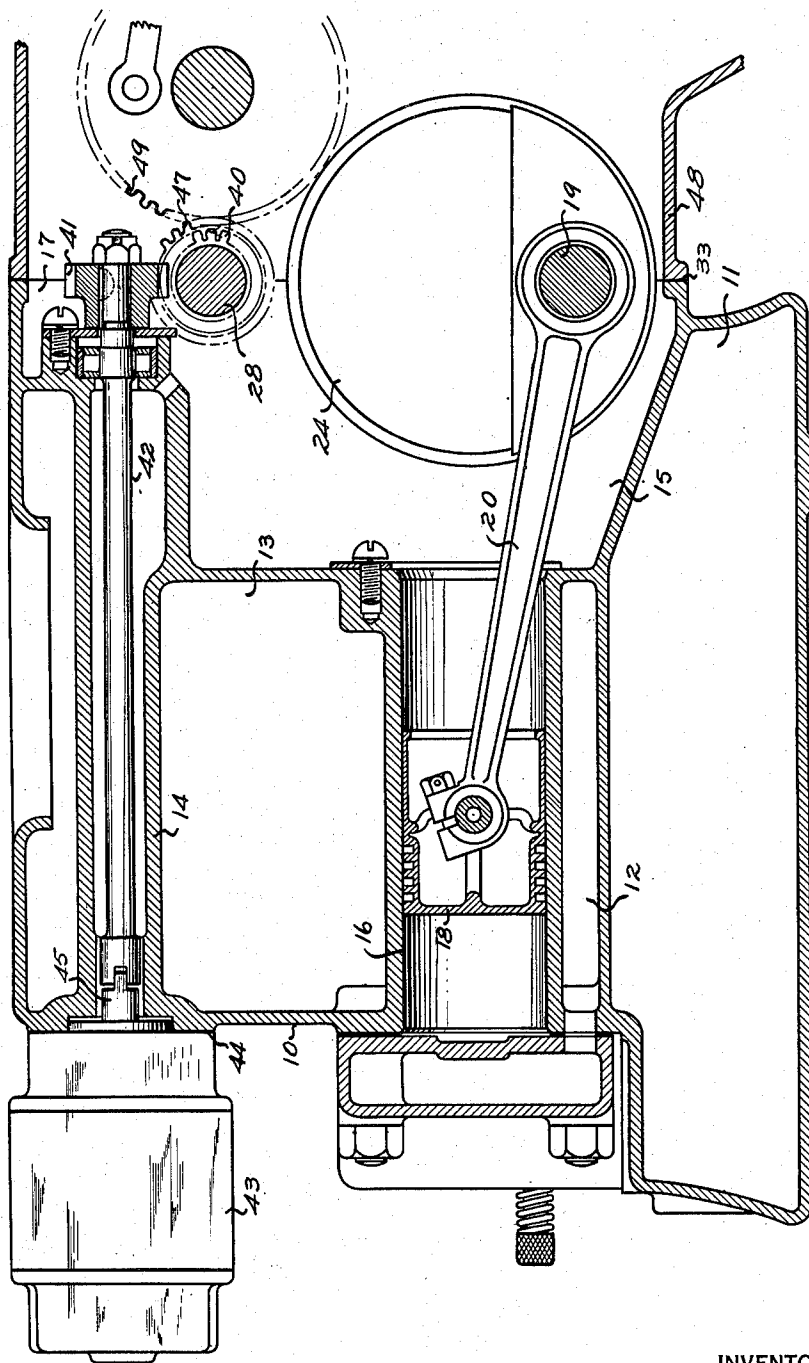


Fig. 4

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UNITED STATES PATENT OFFICE

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INTERNAL COMBUSTION ENGINE

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6 Claims. (Cl. 121—194)

This invention relates to improvements in internal combustion engines, and particularly to improved engine frame and bearing constructions.

5 An object of the present invention is to provide an improved bearing arm which serves to support and carry a plurality of related engine shafts, which is readily removable, with its related shafts, from the engine, as a unit, which permits maximum ease and simplicity of assembly, and which is simple and durable in construction.

10 A further object is to provide an improved enclosing means for the crank case of internal combustion engines, which serves to enclose entirely the crank case and bearing assembly, which provides an oil reservoir common to the crank case and enclosing means, and which is wholly and independently removable from the crank case without interference with or disturbance to, the bearing assembly.

20 A still further object is to provide an improved enclosing means for the crank case of an internal combustion engine of a type in which the crank case is employed partially to enclose apparatus to be gear driven from the engine, the enclosing structure providing a splash-oiling reservoir common to the geared means and the crank case of the engine.

30 Further objects and advantages will appear from the following detailed description of the parts and the accompanying drawings, in which Fig. 1 is an end elevation, partially in section, of an internal combustion engine embodying a preferred arrangement of the improvements; Fig. 2 is a sectional elevation taken along the line 2—2 of Fig. 1; Fig. 3 is a sectional elevation taken along the line 3—3 of Fig. 1; and Fig. 4 is a sectional elevation taken along the line 4—4 of Fig. 1.

40 It will, of course, be understood that the present detailed description of parts and the accompanying drawings relate to a single preferred executional embodiment of the present invention, and that substantial changes may be made without departing from the spirit and full intentment of the invention.

45 Referring by numerals to the drawings, 10 designates a unitary frame and base structure for an internal combustion engine, or the like, in or with which is cast integrally, a fuel tank 11, a water jacket 12, a cooling hopper 13, a magneto drive-shaft bearing and lubricating chamber 14, a crank case chamber 15, and a cylinder 16. By this provision it is practically possible to cast the necessary finish surface of the frame 10 in substantially vertical planes, in order to permit

maximum ease and simplicity in finish-machining such surfaces, and thereby to facilitate to a large extent the quantity production of such frames. It will be noted that the crank case 15 is provided with an open-end portion 17 for a purpose that will hereinafter appear.

Operating in the cylinder 16 is a piston 18 which is operatively related to a crank pin 19 by means of a connecting rod 20. This rod is, by preference, formed in one piece, in order to eliminate the removable cap portion at the crank end thereof. To facilitate the assembly of this preferred type of rod to the crank pin 19, a built-up or separable crank shaft 21 is used, constructed as best seen in Fig. 1. The preferred type of shaft, such as 21, comprises a pair of oppositely disposed crank members 22 with the crank pin 19 mounted therebetween. These members 22 are similarly forged to include crank shaft portions 23, and fly wheel or counterweight portions 24. It will be readily seen that the shaft portion 23, and the counterweight portion 24 are integrally formed with the member 22. The pin 19 is fixedly mounted in one of the portions 24, but removably mounted in the other or companion portion 24, in order to permit the separation of the parts of the crank shaft to enable the connecting rod to be assembled to the pin 19.

Roller bearings 25, or the equivalent, are mounted on each end of the shaft 23, and are adapted to be carried in bearing openings 26 of bearing carriers 27. Rotary movement of the crank shaft 21 is transmitted to a cam shaft 28 by means of meshing gears 29 and 30, carried on the crank shaft and cam shaft, respectively. Roller bearings 31 are rotatably mounted on each end of the cam shaft 28, and are carried in another pair of openings 26 provided in the carriers 27. It will be readily understood that each bearing arm 27, is, by preference, formed in one piece, and that it is arranged to support a plurality of related engine shafts only, or in combination with the roller bearings 25 and 31. Further, the shafts are, preferably, so disposed as to be mounted in the open portion 17 of the crank case and to be supported therein, by the bearing arms 27 which are, by preference, removably attached by means of cap screws or bolts 32 associated with a finished face 33 of the frame 10. By this provision, the bearing arms 27, together with their related shafts, are removable from the frame 10, as a unit.

The cam shaft 28 is provided with cams 34 and 35, which are operatively related to the inlet and exhaust valves 36 and 37 by means of rocker arms 55

38 pivotally attached to a stationary portion 39 of the frame (Fig. 3). A gear 40 is mounted on the cam shaft 28, and is adapted to mesh with a gear 41, in order to drive a magneto shaft 42.

5 It will be noted that the shaft 42 is, by preference, mounted in a tubular housing which is formed integrally with the frame and is adapted to provide a bearing and lubricating reservoir for the shaft. This tubular housing extends through the

10 cooling hopper 13 and is adapted to be cooled thereby, to effect a uniform operating temperature of this bearing. A magneto 43 is removably attached to a plane face 44 of the frame, and is provided with a stub drive-shaft 45 which is

15 tongued to be detachably but also drivingly engaged by a jawed portion of the drive shaft 42, (Fig. 4). By such a provision, the magneto 43 may be readily removed from, or assembled to the drive shaft 42, without disturbing the operative

20 mounting of this shaft, or the timing of the magneto with respect to the engine.

In order to provide means for delivering power from the engine, the cam shaft 28 is extended on either side beyond the frame 10, and is adapted

25 to be attached to a pulley 46, or the like, (Fig. 1). A gear 47 is, by preference, keyed to the cam shaft 28, and is adapted for connection with any desired gear-driven equipment. For enclosing the open-end portion 17 of the crank case and the

30 bearing assembly, there is provided a removable cover member 48, (Figs. 2 and 3) which is adapted to be bolted to the end face thereof, to effect an oil tight enclosure. It will be readily understood that the cover is wholly and independently removable from the frame without any disturbance

35 to the bearing assembly. This cover may be replaced by a power head, or the equivalent, (Fig. 4) which includes a gear 49 or the like, adapted to mesh with the gear 47 on the cam shaft, in order

40 to drive equipment such as a deep well pump or other gear driven apparatus.

In addition to the advantages heretofore noted in connection with the description of parts and their assembly, it will be noted that by the pro-

45 vision of a unitary crank shaft and cam shaft assembly, including the bearings therefor, all moving and wearing engine parts except the magneto shaft and valve mechanism, may be removed, endwise, from the engine, as a unit, simply

50 upon removal of the end closure member 48, and detachment of the stud bolts 32 or the equivalent. The described unit, as will be noted, includes all engine bearings, and the easy removability of the described crank- and cam-shaft assembly, enables any adjustment of the bearings,

55 to be made on the bench. It will be further seen that the present provision of engine bearings, supported entirely inside the crank case or frame portion of the engine, serves not only fully to protect the bearings from dirt and foreign matter, but is conducive to improved lubrication and oil economy, since the usual escape of oil about the crank shaft bearings is practically prevented by the present construction. This feature is of particular value in connection with high speed

60 engines of a type chosen as an example in the present disclosure.

The unitary frame portion, constructed preferably as a single casting, results in the formation

70 in one operation of the cylinder and all accessory containers, and eliminates the assembly costs usually incident thereto. It will be readily seen that the bearing assembly is removable from, and may be assembled to, the engine frame structure

75 as a unit, in a manner to eliminate any expensive

and troublesome machining of bearing surfaces in the frame or the enclosed means therefor.

I claim as my invention:

1. In an internal combustion engine, parallel crank and cam shafts, means connecting the shafts in predetermined timed relation, a crank case structure divided along a plane parallel to the shafts, a pair of spaced bearing plates disposed transversely of the shafts and adapted to be applied over the ends thereof, each plate including an integral annular bearing surrounding each shaft, seats for the ends of said plates, projecting internally of opposite walls of one division of said case structure, and threaded members associated with said plates, adapted to engage said seats and permit introduction and removal of said plates and shafts from said case as an assembled unit, upon removal of the adjacent division of the case structure.

2. In an internal combustion engine, means for mounting crank and cam shafts in preassembled timed relation, said means including gearing operatively connecting the shafts in predetermined phase relation, a crank case or housing structure having an end opening, a closure member for said opening, the closure and housing provided with plane marginal mating surfaces, and a pair of spaced parallel, one-piece plates disposed transversely of the shafts and serving as bearing brackets distinct from the housing and closure member, each of said brackets having a securement lug at each of its opposite ends, and paired shaft-receiving bosses formed by integral annular enlargements of the plates, each of said bosses completely surrounding one of the shafts over a portion of its length to enable the brackets to be inserted over the ends of the shafts, with the shaft gearing between the brackets, the assembly including said shafts, gearing and brackets adapted to be inserted and removed as a unit transversely of said housing opening, plane extensions projecting inwardly of the marginal portions of the housing, and adapted for engagement by said securement lugs, and separate threaded elements adapted, respectively, for securement of the closure member to the housing structure, and for securing the bracket lugs to said extensions.

3. In an internal combustion engine, an enclosed mounting for connected crank and cam shafts, including a crank-case open at one end, a hollow closure for the open portion, a pair of elongate plates disposed transversely of the shafts and serving as bearing brackets therefor, each of said plates having spaced annular shaft bearing bosses formed by integral plate enlargements, and inserted over the ends of the shafts, anti-friction bearings for said shafts, carried within the bearing apertures, shaft gearing between the brackets, threaded holding members for the brackets, apertured end projections on the brackets for receiving the holding members, tapped seats for said bracket projections, extended inwardly of the mating surfaces of the case and closure, said projections and seats arranged substantially in the plane of said shafts whereby said assembly is detachably disposed in bridging relation across the open end of the casing, and adapted to be readily inserted and removed as an operative unit with the shafts in timed relation, upon removal of said closure.

4. In an internal combustion engine, a structure for removably supporting and enclosing connected crank- and cam-shafts, said structure including a crank-case having an end opening and a cover therefor, the case and cover provided with

plane mating surfaces, a frame consisting of two spaced parallel bracket plates, each disposed at a right angle to the shafts, and each provided with two integral annular bearing bosses, adapted to be inserted over the ends of said shafts, the frame being detachably mounted across the said case opening, roller bearings for each of said shafts, carried within the annular bosses, gearing connecting said shafts, and disposed between said frame brackets, the case opening being of a size, and the bracket plates constructed to permit the ready introduction and removal of said frame, shafts and gearing as an assembled pretimed unit, bolts extended through the ends of said brackets at points inwardly of the mating surfaces of the closure portions, for securing the frame and assembled shafts and gearing within the case, independently of said cover.

5. Means for mounting a pair of connected parallel shafts as a pretimed operative unit, in a casing structure divided along a plane parallel to the shafts, including enmeshing gears carried by the respective shafts, a pair of spaced bearing plates disposed transversely of the shafts and adapted to be applied over the ends thereof, each plate including an integral annular bearing surrounding each shaft, seats for the ends of said plates, projecting internally of opposite walls of one division of said casing structure, and threaded members associated with said plates, adapted

to engage said seats and permit introduction and removal of said plates and shafts from said casing as an assembled unit with the shafts in predetermined phase relation, upon removal of the adjacent division of the casing structure.

6. An enclosed mounting for operatively supporting paired connected parallel shafts in pretimed relation, including a casing open at one end, a hollow closure for the open portion, a pair of elongate plates disposed transversely of the shafts and serving as bearing brackets therefor, each of said plates having spaced annular shaft bearing bosses formed by integral plate enlargements, and inserted over the ends of the shafts, anti-friction bearings for said shafts, carried within the bearing apertures, shaft gearing between the brackets, threaded holding members for the brackets, apertured end projections on the brackets, for receiving the holding members, tapped seats for said bracket projections, extended inwardly of the mating surfaces of the casing and closure, said projections and seats arranged substantially in the plane of said shafts whereby said assembly is detachably disposed in bridging relation across the open end of the casing, and adapted to be readily inserted and removed, as an operative unit while maintaining the shafts in predetermined phase relation, upon removal of said closure.

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