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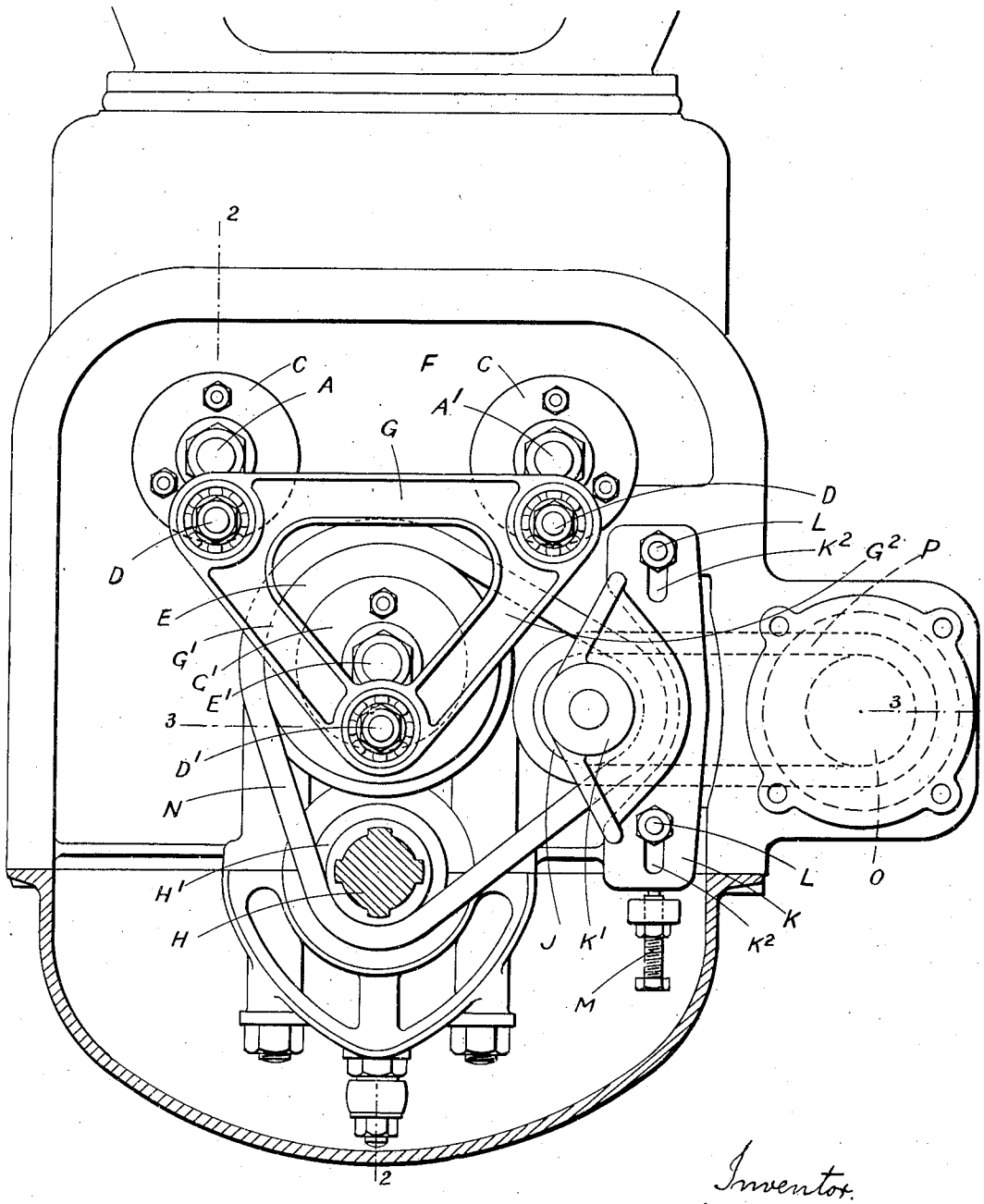
MECHANISM FOR THE DRIVING OF CAM SHAFTS OF INTERNAL COMBUSTION ENGINES.

APPLICATION FILED FEB. 12, 1919.

1,392,597. Patented Oct. 4, 1921.

3 SHEETS—SHEET 1.

FIG. 1.



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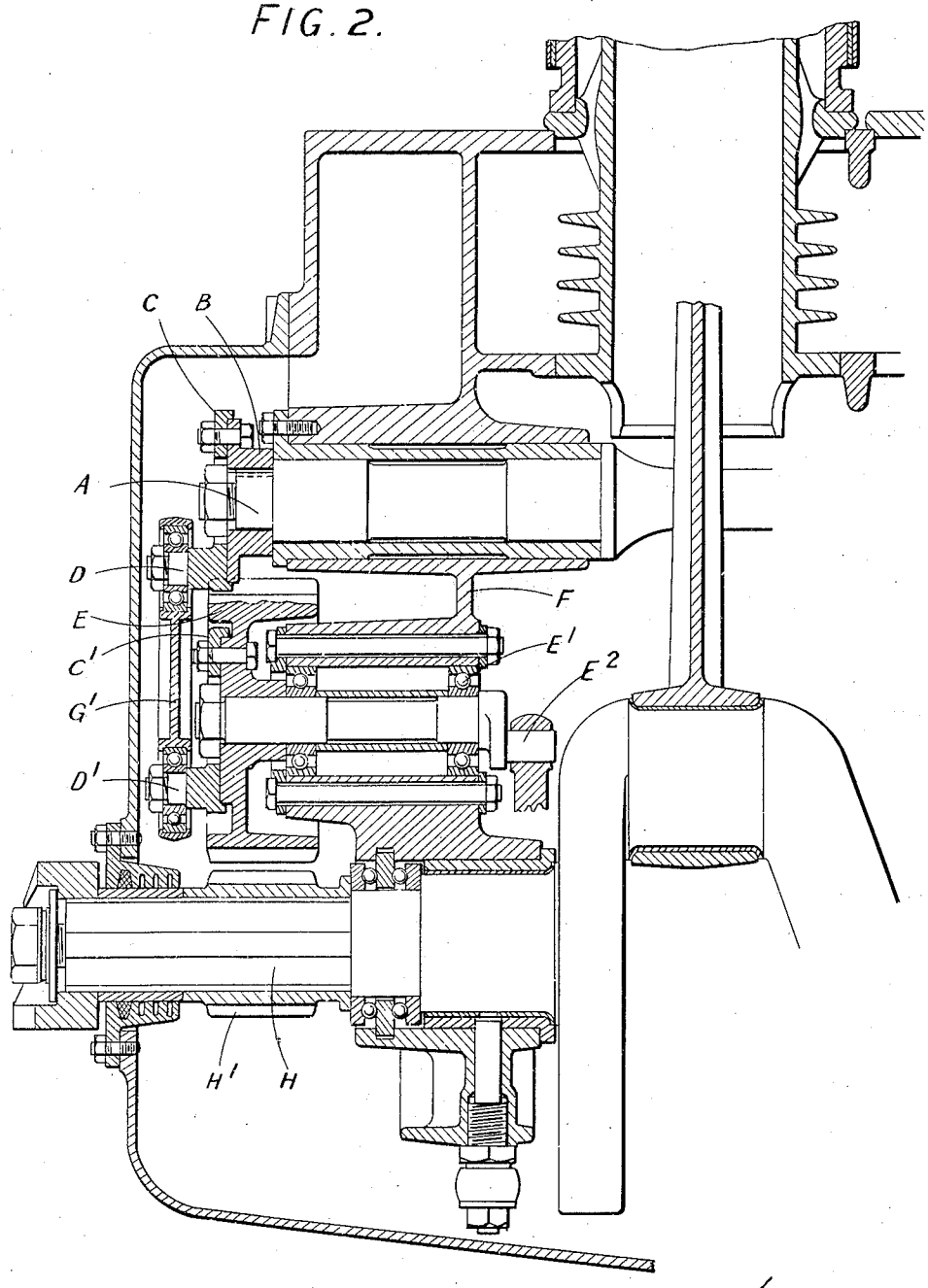
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3 SHEETS—SHEET 2.

FIG. 2.



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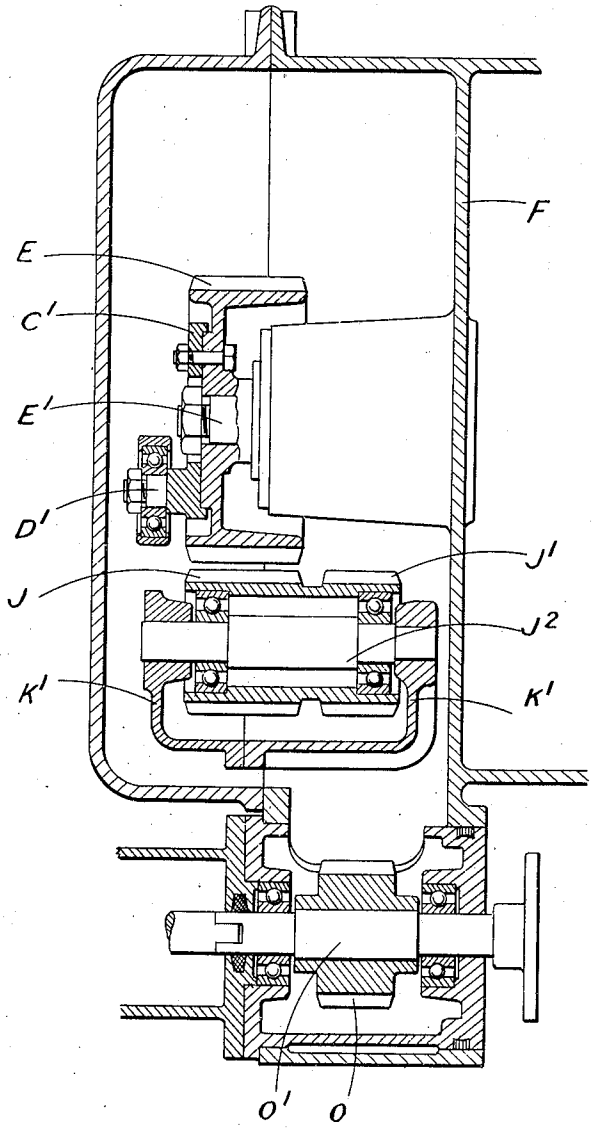
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3 SHEETS—SHEET 3.

FIG. 3.



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UNITED STATES PATENT OFFICE.

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MECHANISM FOR THE DRIVING OF CAM-SHAFTS OF INTERNAL-COMBUSTION ENGINES.

1,392,597. Specification of Letters Patent. Patented Oct. 4, 1921.

Application filed February 12, 1919. Serial No. 276,567.

To all whom it may concern:

Be it known that I, HARRY RALPH RICARDO, a subject of the King of England, and resident of London, England, have invented certain new and useful Improvements in Mechanism for the Driving of Cam-Shafts of Internal-Combustion Engines, of which the following is a specification.

This invention relates to mechanism for the driving of cam shafts of internal combustion engines and has for its object to provide a silent drive which is capable of adjustment and more particularly applicable to engines provided with twin cam shafts while at the same time occupying less space than mechanism at present in use for this purpose.

When it is desired to provide a particularly silent valve gear it is customary to drive the cam shaft and other auxiliary parts by means of chains of the type usually designated "silent." Owing to the great width of these chains and the large diameter of the sprockets which it is necessary to use in such a driving mechanism considerable space is occupied and moreover some means must be provided for taking up the chain when it stretches, such adjustment being usually effected by mounting one or more of the driven shafts in eccentric bearings or by employing jockey wheels. Where the engine is provided with two cam shafts and also some auxiliary part which has to be driven the utilization of silent chains is almost prohibitive by reason of the space occupied by the chains, the sprockets and the adjustable bearings or jockey wheels. On the other hand an almost equally silent drive can be obtained by using helical spur gearing but in this case the silence depends upon the pitching of the wheels and such a degree of accuracy is required as can not ordinarily be insured when employing the usual manufacturing processes. Secondly when such gearing is used it becomes necessary to mount a certain number of the wheels on adjustable bearings in order that all pitch centers can be accurately adjusted. This adds greatly to the cost and also to the space occupied while at the same time giving rise to the risk of derangement or faulty adjustment.

According to this invention on the end of each of two cam shafts is mounted a crank and pin while an idle wheel is provided which is disposed a short distance from the cranked ends of the cam shaft and also carries a similar crank and pin. A triangular connecting rod serves to couple together these three crank pins while the idle wheel is driven off the engine crank shaft by a chain. The idle wheel is formed as a toothed wheel which is driven by a chain off a toothed wheel mounted on the engine crank shaft, this chain passes over a second idle wheel from which power can be taken for the driving of an auxiliary shaft. This second idle wheel is mounted on a member which can slide for the purposes of adjustment and this adjustment serves not only to take up the main driving chain which passes around the toothed wheel on the crank shaft but also to take up the chain which is used to transmit power from the second idle wheel to the auxiliary shaft driven thereby. Preferably it is desirable that the axis of the first idle wheel should be equidistant from the axes of the two cam shafts, and that the triangular connecting rod should be as nearly as possible an equilateral triangle. Conveniently the crank pins respectively on the ends of the cam shafts and on the idle wheel are mounted on similar and interchangeable disks which can be fixed to the several parts.

The accompanying drawings illustrate by way of example one construction according to the present invention. In these drawings,

Figure 1 is an end elevation of a portion of an internal combustion engine provided with the improved driving mechanism.

Fig. 2 is a section on the broken line 2—2 of Fig. 1 the section being arranged to pass through the end of one of the cam shafts, one limb of the triangular connecting rod and through the idle wheel axis.

Fig. 3 is a transverse section on the line 3—3 of Fig. 1.

Like letters indicate like parts throughout the drawings.

On the end of each of the two cam shafts A and A′ is mounted and keyed a flanged sleeve B and on to the flange of this sleeve is bolted a disk C carrying a crank pin D. Around the periphery of the disk C is a flange adapted to closely embrace the periphery of the flange on the sleeve B as shown in Fig. 2. An idle toothed wheel E is mounted on a spindle E′ which is carried in suitable

bearings in the framing or casing F in which are also bearings for the ends of the cam shafts A and A'. On the outer face of the wheel E is bolted a disk C' carrying a crank pin D' both of which are similar to the disk and crank pins C, D mounted on the ends of the cam shafts A and A'. The flange on the periphery of the disk C' embraces a cylindrical projecting part formed on the face of the wheel E. The crank pin disks C, D and C', D' are thus interchangeable. A triangular connecting rod couples together the two cam shaft crank pins D and the idle wheel crank pin D' this triangular connecting rod comprising a limb G which lies horizontally between the cam shaft crank pins D and two inclined limbs G' and G^2 which extend respectively between one of the cam shaft crank pins D and the idle wheel crank pin D'. The center of the idle wheel spindle E' is so disposed as to be equidistant from the centers of the cam shafts A and A'. Thus the limbs G' and G^2 of the triangular connecting rod are of equal length and the length of these arms is slightly less than the length of the horizontal arm G. The triangle thus formed by the centers of the cam shafts A and A' and the center of the idle wheel spindle E' thus preferably approximates to an equilateral triangle as is desirable in order to reduce the variation in angular velocity due to any given amount of slack in the crank pin bearings.

The idle wheel E is preferably disposed directly over the end of the crank shaft H on which is mounted a toothed wheel H'. At one side of the idle wheel E is arranged a toothed wheel having a double set of teeth J and J' this wheel being carried in bearings on a spindle J^2 as shown in Fig. 3. This spindle J^2 is carried in a bracket member comprising a plate K and a divided part K' which lies on either side of the double toothed wheel J J' and supports the ends of the spindle J^2. In the plate K are slots K^2 through which pass bolts L which enter convenient parts of the casing or framing F where flat surfaces are formed against which rests the face of the plate K. The arrangement is such that the plate K together with the double wheel J J' can be adjusted vertically and fixed by means of the nuts on the bolts L. This sliding adjustment may be carried out by means of a set screw M which bears against the lower end of the plate K.

A chain N passes around the toothed wheel H' on the end of the crank shaft, around the idle wheel E and around portion J of the second idle wheel mounted on the spindle J^2. By means of this chain the idle wheel E is driven from the crank shaft and by adjustment of the plate K which carries the toothed wheel J it is possible to take up any slack in this chain. Rotation of the idle wheel E causes similar rotation of the cam shafts A A' through the triangular connecting rods G, G' G^2.

Some auxiliary mechanism such as a pump may be driven off the second idle wheel J J' and this drive may be arranged in the following manner. A toothed wheel O is mounted on a spindle O' in a suitable position at one side of the double wheel J J' and a chain P passes around the wheel O and the toothed part J' of the double idle wheel. The spindle O' may be arranged to transmit rotary motion to a pump or other mechanism and this spindle is preferably disposed in substantially the same horizontal plane as the spindle J^2. It will be seen that by adjusting the member K K' which carries the spindle J^2 and double wheel J J' it is possible not only to take up the slack in the main driving chain N in the manner indicated but also to take up the slack in the auxiliary driving chain P.

The spindle E' may be provided at its inner end with a crank pin E^2 which may be used for driving a pump or other mechanism.

The details of construction may be modified to suit requirements and the construction of the engine to which the invention is applied.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In mechanism for driving the cam shafts of an internal combustion engine the combination of two cam shafts each of which carries at one end a crank pin, an idle toothed wheel provided with a similar crank pin, a triangular connecting rod by means of which these three crank pins are coupled together, a second idle toothed wheel having a double set of teeth, a toothed wheel mounted on the engine crank shaft, a driving chain which passes over the first idle wheel over the first set of teeth of the second idle wheel and over the toothed wheel on the crank shaft, a shaft serving to drive auxiliary mechanism, and means for driving this auxiliary shaft off the second set of teeth of the second idle toothed wheel as set forth.

2. In mechanism for driving the cam shafts of an internal combustion engine the combination of two cam shafts each of which carries at one end a crank pin, an idle toothed wheel provided with a similar crank pin, a triangular connecting rod by means of which these three crank pins are coupled together, a second idle toothed wheel having a double set of teeth, a toothed wheel mounted on the engine crank shaft, a driving chain which passes over the first idle wheel, over the first set of teeth of the second idle wheel and over the toothed wheel on the crank shaft, a shaft serving to drive auxiliary mechanism, a toothed wheel on this shaft, and a chain passing over the

toothed wheel on this shaft and over the second set of teeth on the second idle toothed wheel as set forth.

3. In mechanism for driving the cam shafts of an internal combustion engine the combination of two cam shafts each of which carries at one end a crank pin, an idle toothed wheel provided with a similar crank pin, a triangular connecting rod by means of which these three crank pins are coupled together, a second idle toothed wheel having a double set of teeth, a toothed wheel mounted on the engine crank shaft, a driving chain which passes over the first idle wheel over the first set of teeth of the second idle wheel and over the toothed wheel on the crank shaft, a shaft serving to drive auxiliary mechanism, a toothed wheel on this shaft, a chain passing over the toothed wheel on this shaft and over the second set of teeth of the second idle toothed wheel, and means for adjusting the second idle toothed wheel in relation to the first idle toothed wheel and the toothed wheel on the auxiliary shaft as set forth.

4. In mechanism for driving the cam shafts of an internal combustion engine the combination of two cam shafts each of which carries at one end a crank pin, an idle toothed wheel provided with a similar crank pin, a triangular connecting rod by means of which these three crank pins are coupled together, a second idle toothed wheel having a double set of teeth and carried in bearings on a plate, means for connecting this plate to the engine framing so that the plate with the wheel can slide on the framing and adjust the position of the wheel in relation to the first idle toothed wheel, a toothed wheel mounted on the engine crank shaft, a driving chain which passes over the first idle wheel over the first set of teeth of the second idle wheel and over the toothed wheel on the crank shaft, a shaft serving to drive auxiliary mechanism and means for driving this auxiliary shaft off the second set of teeth of the second idle toothed wheel as set forth.

5. In mechanism for driving the cam shafts of an internal combustion engine the combination of two cam shafts each of which carries at one end a crank pin, an idle toothed wheel provided with a similar crank pin, this wheel being positioned so that its axis is equidistant from the axes of the two cam shafts, a triangular connecting rod by means of which these three crank pins are coupled together, a toothed wheel mounted on the engine crank shaft, and a driving chain which passes over the idle wheel and over the toothed wheel on the crank shaft as set forth.

6. In mechanism for driving the cam shafts of an internal combustion engine the combination of two cam shafts each of which carries at one end a crank pin, an idle toothed wheel provided with a similar crank pin, this wheel being positioned so that its axis is equidistant from the axes of the two cam shafts, a triangular connecting rod by means of which these three crank pins are coupled together, a second idle toothed wheel having a double set of teeth, a second wheel mounted on the engine crank shaft, a driving chain which passes over the first idle wheel over the first set of teeth of the second idle wheel and over the toothed wheel on the crank shaft, a shaft serving to drive auxiliary mechanism, a toothed wheel on this shaft, a chain passing over the toothed wheel on this shaft and over the second set of teeth of the second idle toothed wheel, and means for adjusting the second idle toothed wheel in relation to the first idle toothed wheel and the toothed wheel on the auxiliary shaft as set forth.

7. In mechanism for driving the cam shafts of an internal combustion engine, the combination of two cam shafts each of which carries at one end a crank pin, an idle wheel provided with a similar crank pin, a triangular connecting rod by means of which these three crank pins are coupled together, a second idle wheel having teeth thereon, an engine crank shaft, means operatively connecting the first idle wheel, the second idle wheel and the crank shaft, a shaft serving to drive auxiliary mechanism, a toothed wheel on this shaft, and a chain passing over the toothed wheel on this shaft and over the teeth of the second idle wheel.

8. In mechanism for driving the cam shafts of an internal combustion engine, the combination of two cam shafts each of which carries at one end a crank pin, an idle wheel provided with a similar crank pin, a triangular connecting rod by means of which these three crank pins are coupled together, a second idle wheel, an engine crank shaft, means operatively connecting the first idle wheel, the second idle wheel and the crank shaft, a shaft serving to drive auxiliary mechanism, and means operatively connecting this last mentioned shaft and the second idle wheel.

In testimony whereof I have signed my name to this specification.

HARRY RALPH RICARDO.