July 23, 1929. V. W. THOMAS 1,721,720

IGNITION DEVICE

Filed May 7, 1925 3 Sheets-Sheet 1

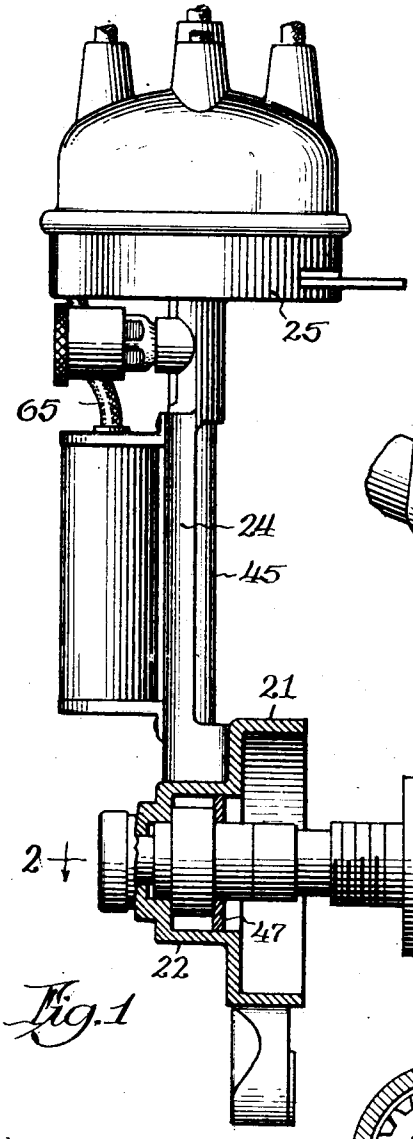


Fig. 1

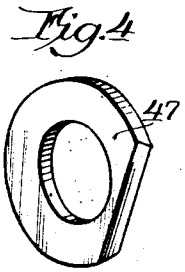


Fig. 4

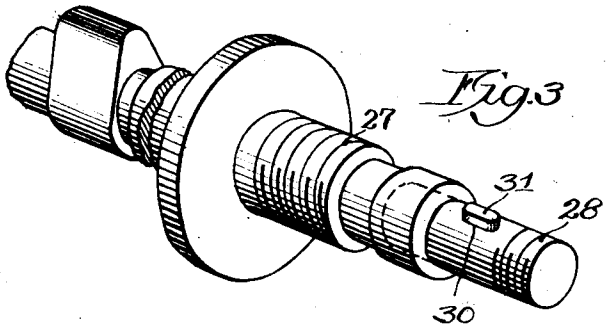


Fig. 3

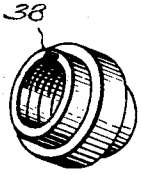


Fig. 5

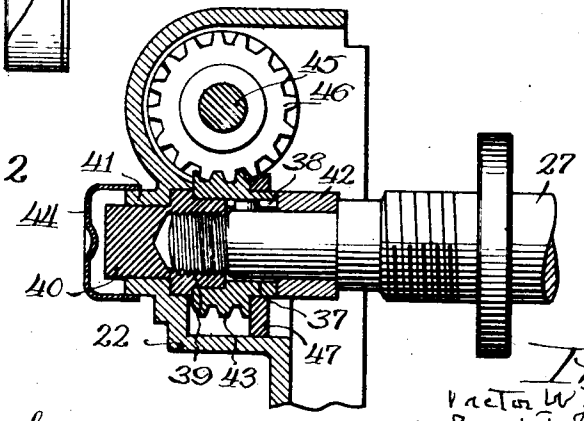


Fig. 2

Witness:
Chas. R. Knowles

Inventor,
Victor W. Thomas
by Benj. T. Rumphrey
Atty.

July 23, 1929. V. W. THOMAS 1,721,720

IGNITION DEVICE

Filed May 7, 1925 3 Sheets-Sheet 2

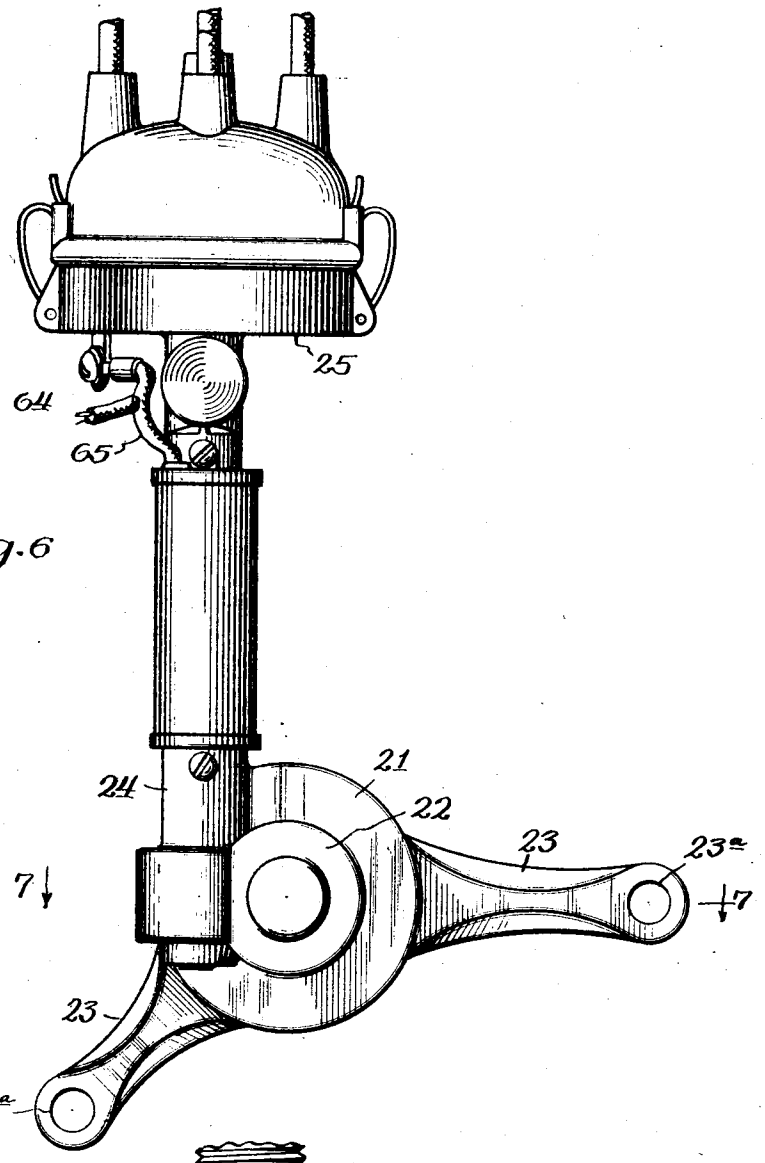


Fig. 6

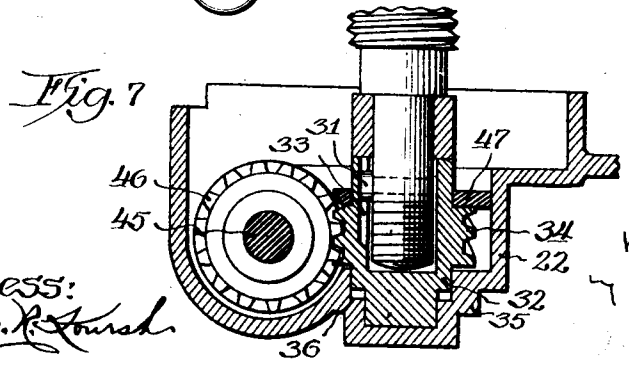


Fig. 7

Witness:
Chas. R. Fourish

Inventor,
Victor W. Thomas
by Benj. T. Fordham
Atty.

July 23, 1929. V. W. THOMAS 1,721,720

IGNITION DEVICE

Filed May 7, 1925 3 Sheets-Sheet 3

Fig. 8

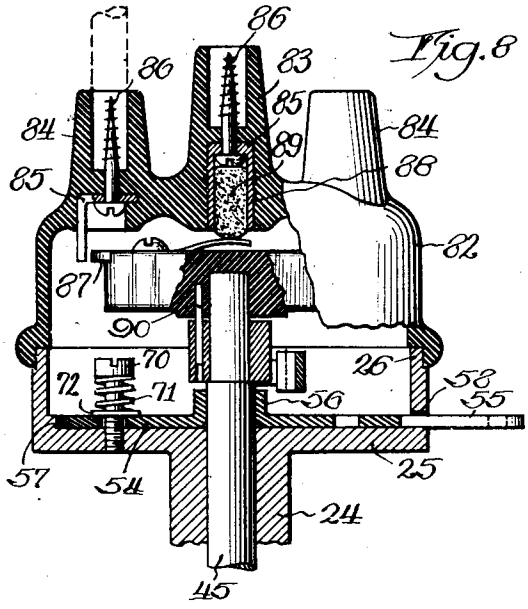


Fig. 10

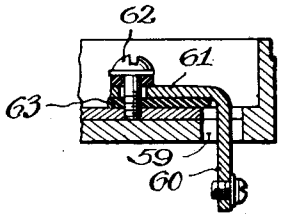


Fig. 9

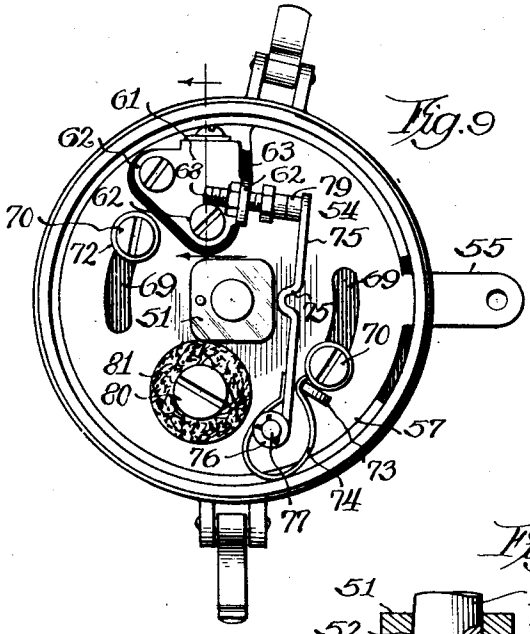


Fig. 11

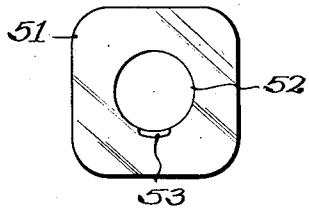


Fig. 12

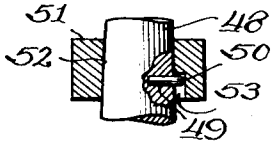
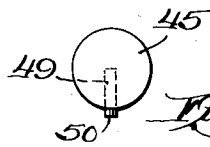


Fig. 13



Witness
Chas. L. Tourek

Inventor,
Victor W. Thomas
by Benj. T. Rood & Mowell
Atty.

Patented July 23, 1929. 1,721,720

UNITED STATES PATENT OFFICE.

VICTOR W. THOMAS, OF WAUKEGAN, ILLINOIS.

IGNITION DEVICE.

Application filed May 7, 1925. Serial No. 28,632.

My present invention relates to improvements in ignition devices for internal combustion engines, and the particular embodiment of my invention herein shown and described is suitable for ready installation with the motors used in Ford cars, although the features herein described, with slight changes of form and dimension, could be used to advantage with a great many kinds of internal combustion motors.

In Patent No. 1,460,806, granted to me July 23, 1923, for timer elevator I disclosed a desirable form for such a structure which provided a bearing for the outer or forward end of the cam shaft of the motor with which the timer mechanism is assembled. My present structure is not a mere timer elevator, but involves the provision of a primary circuit breaking mechanism with a condenser and mechanism for distributing the secondary current to the spark plugs in the proper cylinders at the proper times. With such mechanism, after installation on the motor, it has heretofore been necessary to make timing adjustments, which, in order to do correctly, requires both skill and experience. In endeavoring to make these adjustments not an inconsiderable number of car owners manage to put their cars entirely out of operation and but few car owners are able to make a critically correct adjustment of the timing of their cars.

It has therefore been one of the principal objects to be attained by the present invention to provide an ignition device which may be set in good operative adjustment at the factory and cannot be placed on the motor without being in time and will thereby save the installer and owner the necessity of making this adjustment before the car can be started.

I have also provided with such an ignition device as may be adjusted at the factory a limited adjustment which cannot be moved sufficiently to put the motor out of good running time, but which will permit of the finest critical adjustment to compensate for wear and put the motor in the best possible running time.

I have also improved the construction shown in my patent above referred to for providing the forward end of the cam shaft with a bearing and at the same time controlling the mesh of the gears.

I have also mounted the primary circuit breaking mechanism upon a revoluble stamped plate which is journaled about the timer shaft and which is rotated to advance and retard the spark.

I have also provided simple, economical, and dependable means for connecting the secondary or high tension circuit leads to the distributor head.

In order to attain the foregoing objects I have provided the mechanism shown in the accompanying drawings, in which,—

Fig. 1 is a side elevation of my ignition device, the lower portion thereof being shown in section to illustrate its relation to the end to the cam shaft;

Fig. 2 is a horizontal section on line 2—2 of Fig. 1;

Fig. 3 is a perspective of the end of the cam shaft;

Fig. 4 is a perspective of the washer for holding the cam shaft gear in mesh with timer shaft gear;

Fig. 5 is a perspective of the lock nut for the end of the cam shaft gear;

Fig. 6 is a front elevation of my timing device;

Fig. 7 is a section of line 7—7 of Fig. 6 showing a slightly modified form of cam shaft gear;

Fig. 8 is a vertical central section through the breaker and distributor mechanism;

Fig. 9 is a plan of the breaker plate and its associated parts;

Fig. 10 is a detail of the connection of the low tension primary lead with the breaker mechanism; and

Figs. 11, 12 and 13 are respectively a plan of the breaker cam, and a perspective of the pin, or feather or key construction for orienting the breaker cam and cam shaft.

The same reference characters will be used in designating similar parts in the several views:

The mechanism, as will be seen by reference to Fig. 1, is carried in and upon a bracket conveniently made by a die casting process, which bracket, although integral, may be considered as comprising a circular casing, 21, a gear housing, 22, extending centrally from the face of the casing 21, arms, 23, for attaching the structure to the forward end of the motor housing, which arms extend radially from the casing 21, a vertical shaft housing, 24, occupying and rising from the re-entrant angle between the casing 21 and the gear housing 22. Upon the upper end of the vertical

shaft housing 24, is a recessed platform, 25, upon which the circuit breaking mechanism is mounted and upon the reduced upwardly extending rim, 26, of which is mounted the cap carrying the high tension or distribution leads.

The casing 21 takes the plate of the timer now employed upon Ford motors. The outer ends of the arm 23 are bored, as at 23ª, for the passage of bolts already employed upon the Ford motor, the bores being made sufficiently large to allow for variation in center spacing of cam shaft with the motor bolt holes occurring in the process of the manufacture of the motor casing.

The forward end of the cam shaft, 27, as shown in Fig. 3, is threaded, as at 28, and always transversely bored correctly, as at 30. I provide a pin with a preferably elongated head, 31 to enter the bore 30, so that the head will supply a spline or feather with reference to the cam shaft.

It is now possible to proceed in either one of two ways. One way, as shown in Fig. 7, is to provide an integral headed cap, 32, for the end of the cam shaft. This cap has no interior threading and is provided with an interior longitudinal keyway groove or splineway, 33, to accommodate the head of the pin 31. About the center of the exterior of the cap 32 teeth, 34, are provided to form a spiral gear. In this form of construction the outer end of the cap is reduced, as at 35, and the center of the gear housing 22 is extended and chambered, as at 36, to provide a journal therefor and properly mesh the gear of the timer shaft with the gear on the cam shaft. The alternative form of construction suggested, shown in Figs. 1 and 2, is to provide an open ended collar or sleeve, 37, which is interiorly and longitudinally channelled or grooved, as at 38, to receive the head of the pin 31. The interior bore at the outer end of the collar 37 is enlarged to receive the reduced inner end, 39, or an interiorly threaded cap nut, 40, the forward reduced end of which extends through and is journaled in an aperture, 41, provided centrally of the gear housing 22. With this form of construction I provide an additional collar or sleeve, 42, to properly locate the collar 37 longitudinally of the cam shaft 27. The collar or sleeve 37 is exteriorly provided with teeth, 43, to form a spiral gear similar to the gear formed by the teeth 34. Also in this form of construction the aperture 41 in the gear housing can be covered with a suitable cap, 44.

Journaled in the vertical shaft housing 24 is a vertical shaft, 45, the upper end of which extends above the platform 25, and the lower end of which is provided with a spiral gear, 46, which meshes with the gear provided by the teeth 34 or 43. It will now be evident that the movement of the shaft 45 will be angularly related with the movement of the cam shaft 27 through the gears by means of the slots 33 or 38, as the case may be, and the head of the pin 31. To anticipate the description, it will also be evident that if the timer cam, hereafter to be described, is fixed with relation to the shaft 45 it will also be fixed or angularly related in movement with the cam shaft, and this fixing can be most readily and certainly done at the factory. To prevent the disturbance of this adjustment after the article leaves the factory, and also to provide an inner bearing for the gear fitting the cam shaft, I provide the annulus or washer, 47, shown in perspective in Fig. 4, and in position in Figs. 1, 2 and 7, which is forced into the rear end of the gear housing 22 after the mechanism has been completely assembled and properly timed, and is not readily removed therefrom.

To provide a limited timing adjustment well within the latitude of motor operation I taper the upper end of the shaft 45, as at 48, and transversely bore the shaft as at 49. In the bore 49 is placed a pin, 50, which extends beyond the surface of the tapered portion. The timing cam, 51, is centrally bored, as at 52, to fit the taper, and the bore is channelled with a channel, 53, deep enough to accommodate the pin 50 but slightly wider than the thickness of the pin. To make a critical timing adjustment the timer cam 51 is pried up on the taper 49 and rotated within the latitude of rotation permitted by the width of the channel 53 and when the proper position has been ascertained the cam is again gently driven down on the taper. If for any reason this adjustment is disturbed in operation, which is not at all likely, the pin 50 and slot or channel 53 will prevent the movement of the cam beyond a point where the motor will refuse to function.

The primary circuit breaking mechanism comprises a circular plate, 54, and its associated mechanism. The plate 54 is provided with a radial arm, 55, by means of which the spark is advanced or retarded. The plate 54 is also centrally perforated, and a portion of the metal removed to form the perforation is formed into an upstanding collar, 56, which constitutes a journal for the shaft 45 and serves to center the plate 54 with respect to this shaft and the timer cam 51 which it carries. The rotation of the plate 54 is further controlled by an annular channel, 57, provided in the bottom of the upper surface of the recessed platform 25. The rim 26 of the platform 25 is slotted, as at 58, for the passage and movement of the arm 55. The bottom of the platform 25 is provided with an arcuate slot, 59, through which extends an arm, 60, which arm is a portion of a bracket, 61, secured to the plate 54, by the screws, 62, but insulated from said bracket by the insulation, 63. The arm 60 affords means for connection with the ungrounded lead, 64, of

the primary circuit and also with the lead, 65, from the ungrounded side of the condenser, 66. From one edge of the bracket 61, is produced an upstanding arm, 67, which carries a screw, 68, the head of which constitutes the stationary breaker terminal or point. Two arcuate concentric slots, 69, are provided in the plate 54, through which extend screws, 70, tapped into the platform 25. About the screws 70 are coiled expansion springs, 71, which exert their pressure betwen the heads of the screws and washers, 72, resting upon the plate 54 to keep the plate seated under gentle pressure and retain it in adjusted position, and at the same time insuring contact with frame of motor.

The metal displaced from the plate 54 to form one of the slots 69 is bent upwardly to form a spring post, 73, for anchoring one end of the breaker arm spring, 74. The breaker arm, 75, is an integral piece of metal formed on one end into a journal, 76, to co-operate with a pin, 77, fixed in and arising from the plate 54. At about the center of the breaker arm it is given a short bow, 78, so as to form a projection to co-operate with the timer cam. The outer unattached end of the breaker arm is provided with a contact point, 79, all as clearly seen in Fig. 9. Also fixed in the plate 54 is a screw, 80, which revoluably secures a felt washer, 81, the periphery of which impinges against the side of the timing cam 51. When the washer 81 is impregnated with lubricant it will supply to the surface of the timing cam 51 the desirable thin film of lubricant for a very long time.

As will be noted in Fig. 8, upon the reduced upper edge of the rim 26 is mounted a cap, 82, formed of insulating material. The upper surface of this cap is provided with a number of hollow embossments. A central embossment, 83, for the cable from the non-grounded end of the secondary circuit, and a number of eccentric embossments, 84, equal to the number of cylinders, the spark plugs whereof are to be supplied with current. Directly below each embossment is a perforated plate, 85, preferably embedded in the material of which the cap is made. The perforation of each plate aligns with the axis of the hollow or recess in its respective embossment. After the ends of the cables are seated in the recesses of the respective embossments, a wood or other tapered screw, 86, is driven through the perforations in the plates into the ends of the cables which distend the ends of the cables and wedge them in their respective recesses.

A circuit closing element or rotor, 87, is mounted on the top of the shaft 45, the outer end of which extends to within sparking distance with the respective plates 85 as it is rotated. An interior recess, 88, is provided immediately below the central exterior embossment 83, and contact between the central cable and the center of the rotor 87 is maintained by preferably a carbon rod, 89, fitting in said recess 88.

In order to synchronize or angularly relate the movement of the rotor 86 with that of the timing cam 51 I fix a pin, 90, in the rotor and bore an eccentric hole, 91, in the top of the cam into which the said pin enters.

From the foregoing description, taken in connection with the drawings, it will be seen that I have provided a timing device of comparatively few parts and of dependable operation which can be manufactured economically and which can be angularly related at the factory for installation with motors of a particular design, thereby eliminating the necessity of a timing adjustment as an incident to installation. Also with such a structure I have provided a limited timing adjustment which will permit of any degree of nicety of adjustment without permitting the impairment of the effective operation of the motor.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. An ignition device for internal combustion engines comprising a housing, a helical or spiral gear journaled in said housing against axial movement, a shaft journaled in said housing, a second helical or spiral gear meshing with said first mentioned gear fixedly secured to said shaft, a cam, means for securing said cam to the top of said shaft, separate means for orienting said cam with said shaft, circuit interrupting mechanism mounted in said housing in co-active relation with said cam, and means for definitely relating said first mentioned gear with the cam shaft of an engine.

2. An ignition device for internal combustion engines comprising a housing, a helical or spiral gear journaled in said housing against axial movement, a shaft journaled in said housing, a second helical or spiral gear meshing with said first mentioned gear fixedly secured to said shaft, a cam, means for securing said cam to the top of said shaft, separate means for securing a latitudinal orientation of said cam with said shaft, circuit interrupting mechanism mounted in said housing in co-active relation with said cam, current distributing mechanism mounted within said housing in definte relation to said cam, and means for definitely relating said first mentioned gear with the cam shaft of an engine.

3. In combination with a motor having a transversely bored cam shaft, a headed pin co-operating with said bore to provide a feather for said shaft, gears one of which is bored and journaled against axial movement and is provided with a splineway to co-operate with said shaft and feather, a shaft having a tapered head fixedly secured to the other of said gears, a timing cam fitting the tapered head of said shaft, said cam being provided

with a splineway, a pin carried by said tapered head and of less width than said splineway co-operating therewith and circuit breaking mechanism journaled about said shaft in co-operative relation with said cam.

4. In an ignition device for internal combustion engines, a shaft having a tapered end, a timing cam fitting the tapered end of said shaft, said shaft and said cam being provided with orienting means comprising interengaging parts of different width, and circuit breaking mechanism journaled about said shaft in co-operative relation with said cam.

5. In an ignition device for internal combustion engines timing adjustment means limited within the functional range of the device, comprising a shaft, a cam mounted thereon, means limiting the annular relation of said cam and shaft, and a circuit breaking and distributing mechanism in co-active relation with said cam.

6. In ignition apparatus of the class described, a frame having a housing at its lower end, a shaft extending up through the frame, a gear mounted on the lower end of the shaft and disposed in the housing, igniter mechanism secured to the upper end of the shaft, a horizontal gear meshing with said first gear held in and by said housing permanently in mesh with said first gear and being removable with the housing.

7. In ignition apparatus, a vertical frame having a housing at its lower end, a vertical shaft in the frame having interrupter and distributor mechanism at its upper end, a gear on the lower end of said vertical shaft disposed in said housing, a co-operating horizontal gear permanently mounted in said housing and means for securing said latter gear to the driving shaft of an engine, said securing means being capable of attaching said gear to said shaft in one predetermined position only.

8. In combination, igniter mechanism comprising a vertical tubular frame member bearing a head member at its upper end, a vertical shaft journalled in said frame member, a bell housing at the lower end of the frame member, the mouth of the bell housing being adapted to seat on a circular seat on the engine frame, a vertical gear in the bell housing secured on the lower end of the aforesaid shaft, a horizontal gear mounted in the bell housing in permanently timed relation to the first gear, and means for connecting the horizontal gear to the driving shaft of the engine in one position only to secure correct timing of the igniter mechanism upon connection of the latter gear to the driving shaft.

9. In combination, igniter mechanism comprising a vertical tubular frame member bearing an igniter head at its upper end, a vertical shaft journalled in said frame member, a bell housing at the lower end of the frame member, said bell housing being opened at front and rear, the mouth of the bell housing being adapted to seat on a circular seat on the engine frame, a vertical gear in the bell housing secured on the lower end of the aforesaid shaft, a horizontal gear mounted in the bell housing in permanently timed relation to the first gear, means for connecting the horizontal gear to the driving shaft of the engine in one position only to secure correct timing of the igniter mechanism, and a threaded clamping member for the horizontal gear insertable through the rear opening in the bell housing, and a cover for the rear opening in the bell housing.

10. In combination, a frame member having a bell housing open at front and rear, a vertical shaft mounted in the frame member and having a skew gear connected to the lower end thereof, a co-operating skew gear horizontally disposed in the bell housing, said horizontal skew gear having a keyway therein, a driving shaft projecting into the horizontal gear, said shaft having a key member co-operating with said keyway, means for holding said gears in permanently timed relation, and a tubular nut threaded on the end of the driving shaft, said nut being inserted through the rear end of the bell housing, and a cover member for the rear end of the bell housing.

11. In combination, a frame member having a bell housing, a vertical shaft in the frame member, a skew gear secured on the lower end of the vertical shaft, a horizontal shaft projecting into the bell housing, a skew gear having a sleeve extending over the end of the shaft, said sleeve and shaft having means for keying the same together in one position only, a tubular nut extending inside of the gear and threaded on the end of the horizontal shaft, and a cover for the rear end of the housing enclosing said nut.

12. In combination, a frame member having a bell housing at the lower end, said bell housing being open at the front and rear, a vertical shaft disposed in the frame member and having a helical gear on its lower end disposed in the housing, a co-operating helical gear having a laterally extending sleeve mounted in the bell housing, said gears being in mesh, and means embracing the sleeve for holding the gears in permanently meshed relation, a cover member for the rear end of the housing and a fastening nut adapted to be telescoped with the gear for connecting the gear to the driving shaft.

13. In combination, an interrupter and distributor mechanism, a housing, an interrupter and distributor driving shaft journaled in the housing, a gear fixed on the lower end of the shaft, a co-operating driving gear meshing with said first gear, means in said housing for holding said gears permanently in mesh, said driving gear having means permitting connection with the co-op-

erating timer shaft in one angular position only, said gears being timed when assembled in said housing so that upon application of the driving gear to its timer shaft the distributor and timer are properly timed to fire the motor.

14. In a device of the class described, the combination of a shaft housing having an integral portion in the form of a gear casing, a pair of gears in right angle relationship mounted permanently in said casing, one of said gears being mounted on a vertical shaft extending through said shaft housing and having a cam member mounted at the other end thereof, a second gear being adapted for mounting on a timer shaft, a distributor member co-operating with said cam member, means on said shaft housing for mounting same, the relationship of the distributor, cam and gears being such as to permit of the device being inherently timed at all times independently of its application to the timer shaft.

15. In combination, an interrupter and distrubutor mechanism, a housing, an interrupter and distributor driving shaft journalled in the housing, a gear fixed on the lower end of the shaft, a co-operating driving gear meshing with said first gear and means in said housing for holding said gears permanently in mesh, said driving gear having means permitting connection with the co-operating timer shaft in one angular position only.

16. Ignition apparatus for use with a Ford type of engine comprising as a unit construction, a horizontal pinion for attachment to the timer shaft of the Ford engine, a vertical shaft bearing distributor and interrupter mechanism at its upper end and a co-operating pinion fixed on its lower end, said horizontal pinion having a keyway for coupling it in only one position to the said timer shaft, said pinions being assembled and meshed in predetermined relation to synchronize the action of the timer and interrupter mechanism with the timer shaft, and a frame for said pinions and said shaft for holding said parts permanently in connected position, said frame having means for attaching the same to the frame of the engine at a predetermined position.

17. An inherently timed ignition device for attachment to an engine shaft, comprising a housing, circuit breaker and distributor mechanism having drive members terminating in a coupling in said housing, said coupling being attachable in only one definite angular position to the said engine shaft, said drive members being permanently assembled in and retained by said housing.

VICTOR W. THOMAS.