Feb. 1, 1927. 1,616,428

C. RINGWALD

IGNITION APPARATUS

Filed Feb. 27, 1925 3 Sheets-Sheet 1

Fig. 1.

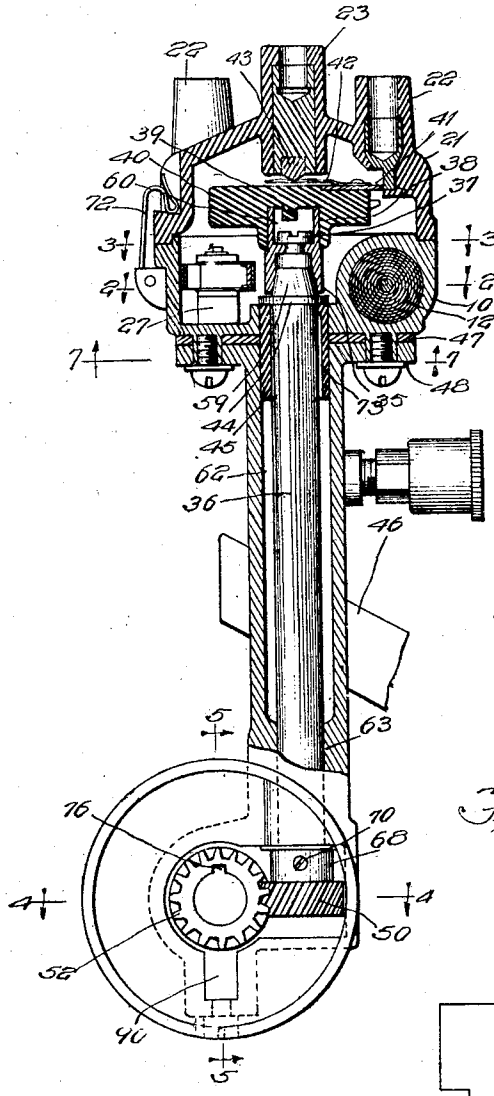


Fig. 2.

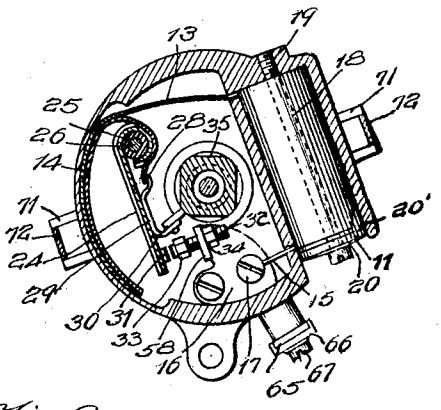
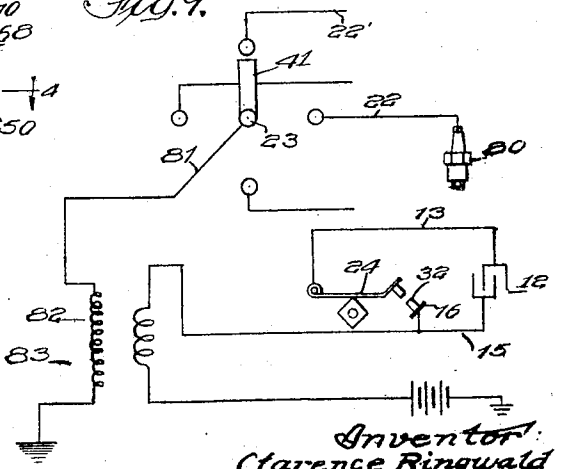


Fig. 9.



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Feb. 1, 1927. 1,616,428

C. RINGWALD

IGNITION APPARATUS

Filed Feb. 27, 1925 3 Sheets-Sheet 2

Fig. 3.

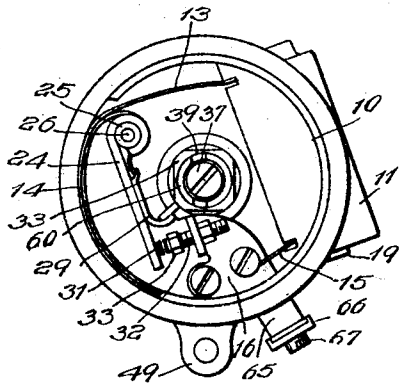


Fig. 4.

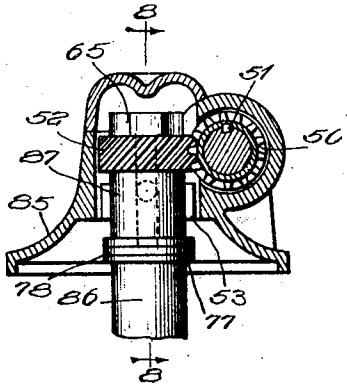
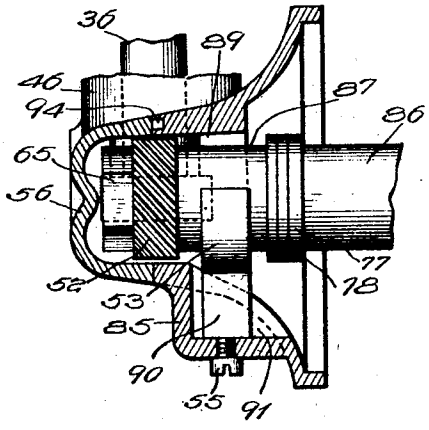


Fig. 5.



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Feb. 1, 1927. 1,616,428

C. RINGWALD

IGNITION APPARATUS

Filed Feb. 27, 1925 3 Sheets-Sheet 3

Fig. 6.

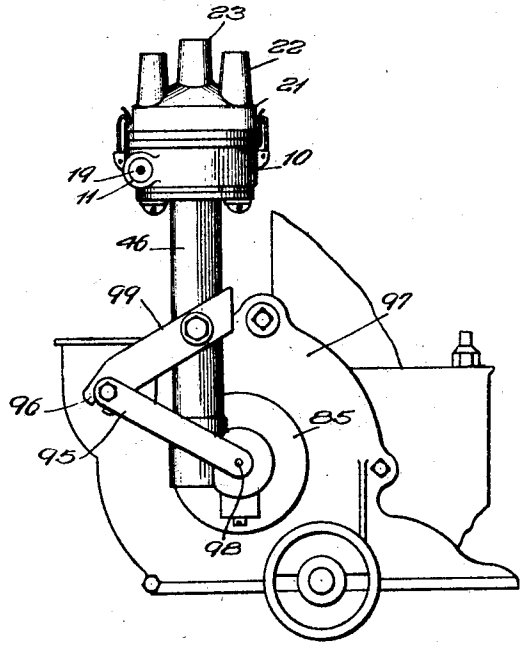


Fig. 7.

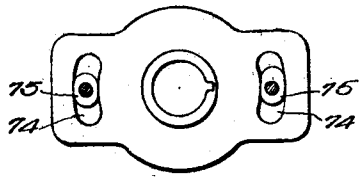
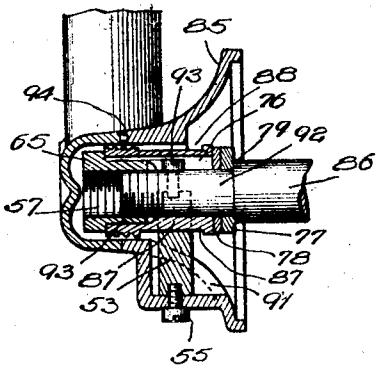


Fig. 8.



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Patented Feb. 1, 1927. 1,616,428

UNITED STATES PATENT OFFICE.

CLARENCE RINGWALD, OF CHICAGO, ILLINOIS, ASSIGNOR TO BROWN & CAINE, INC., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

IGNITION APPARATUS.

Application filed February 27, 1925. Serial No. 11,903.

My invention relates to ignition apparatus for internal combustion engines.

While the particular embodiment which I shall hereafter disclose is adapted for use on Ford automobiles, that is, forms a replacement system for the system provided by the manufacturer, I do not intend to limit the invention to such an embodiment but intend the invention to be applicable to general use.

I am aware that numerous replacement systems for Ford automobiles have been put upon the market with various degrees of success. I find that a common fault of all of them is that the owner of the automobile, unless he is an expert in such matters, is not able to apply the system himself, but must employ the services of a mechanic to have the system installed.

I have endeavored to provide a simple and inexpensive but high grade system for sale by catalog, as for example, through mail order channels. The inherent difficulty of applying and installing a system of this kind, as known to the prior art, is so great as to prohibit any but restricted distribution. Hence I have found that, unless the system is so designed and constructed as to require only simple or elementary acts on the part of the purchaser, he will not buy through the aforesaid channels but shall prefer to pay a higher price and take a lower grade system, so long as he can purchase it and have it applied locally.

It appears that the crux of installing a system of this kind, as heretofore known, is in getting the system timed to the engine. The matter of applying the various parts and of bolting them together is simple enough, but that is not all that there is to it. The system must then be timed. In systems heretofore known, the operator has been compelled to mesh and unmesh the timing gears in an attempt to get them in properly timed relation and, by this cut and try method, finally secures synchronism between the ignition mechanism and the engine.

I have conceived the possibility of providing a system in which all the parts of the system, which are required when it is finally installed, to be in synchronism or fixed angular relation to each other, are assembled and held in such fixed relation when the unit is delivered to the purchaser that all the purchaser needs to do is to apply the system in the only way in which it can be applied and it is then in operative condition without further work to time the same.

Systems of this class employ a breaker and timer head which, due to the requirements of space and working conditions under the hood of the automobile, is raised above the cam and timer shaft of the engine and operated by a vertical or substantially vertical shaft. This latter shaft is connected to the cam and timer shaft of the Ford engine by a pair of gears. In the Ford engine the cam and timer shaft has a pin fixed in a predetermined angular position, which has a certain invariable definite relation to the main shaft which is the same in all Ford engines. This cam and timer shaft is rotated in exact synchronism with the main shaft but at half speed. In systems, as previously constructed, it was customary to provide the lower or horizontal gear loose so that it could be readily attached to the cam shaft of the engine. The other, or vertical gear, was usually mounted on the lower end of the distributor and interrupter shaft. After the lower gear was attached to the cam shaft, the device was assembled by meshing the two gears. But such meshing at random could not be depended upon to time the ignition system to the engine.

Now, according to my invention, I provide a system in which the two gears are assembled in timed relation when the device leaves the manufacturer, and the device is so constructed that the lower gear can be attached to the cam shaft of the engine without taking the gears, which are so assembled and timed, out of mesh. Also due to the key way in the horizontal gear and the pin on the horizontal shaft of the engine, the unit can be assembled in only one predetermined position. Hence the purchaser is required to perform only the simple operation of fastening the lower gear mechanically to the end of the shaft and the system is thereupon properly timed and ready for immediate operation.

Since the lower gear is mounted upon the cam shaft, a difficult problem of construction and operation is presented. The space provided for disposing and mounting the vertical interrupter and distributor shaft is highly limited. The cam shaft has end play which cannot be prevented by the ignition mechanism. Furthermore, because of the

small space available, the shafts must be disposed as close to each other as possible. If bevel or spur gears were employed, under the circumstances, the wear would be excessive because of the small number of teeth in mesh and motion would be irregular for the same reason. I solve all of the above difficulties by employing helical gears. These gears permit close spacing of the two shafts. They give highly satisfactory transmission of motion with uniform effect and they permit endwise motion of the cam shaft without any appreciable disturbing effect on the timing of the engine. In addition, they provide easy and convenient means for attaching the horizontal gear while it is in mesh with the vertical gear. Helical gears in this relation are old and I lay no claim to their use per se.

Now in order to acquaint those skilled in the art with the manner of constructing and operating a device embodying my invention, I shall describe in connection with the accompanying drawings, one embodiment in which the invention appears.

In the drawings:

Figure 1 is a rear elevational view of the interrupter and distributor device and its mounting showing the upper part in section;

Fig. 2 is a horizontal cross section taken on line 2—2 of Fig. 1, and illustrates the novel manner of mounting the condenser, the breaker arm, and the stationary contact;

Fig. 3 is a top plan view of the interrupter mechanism taken on line 3—3 of Fig. 1;

Fig. 4 is a cross section taken on the line 4—4 of Fig. 1, showing the timer gears;

Fig. 5 is an enlarged cross section taken on the line 5—5 of Fig. 1 and illustrates the novel means employed to keep the timer gears in position;

Fig. 6 is a front elevational view of the interrupter and distributor illustrating the manner of mounting the device of my invention on the Ford engine;

Fig. 7 is a section taken on line 7—7 of Fig. 1;

Fig. 8 is a section taken on line 8—8 of Fig. 4 and shows the manner of securing the timer gear to the shaft; and

Fig. 9 is a wiring diagram.

In the preferred embodiment of my invention, as illustrated in the drawings, the numeral 10 designates a die cast housing or head containing the interrupter mechanism. A horizontal cylindrical recess 11 for receiving the cylindrical condenser 12 is formed at one side of the housing 10. One terminal, i. e., the grounded terminal of the condenser is connected to a bare copper strap 13, the opposite end of which is placed under the breaker arm spring 14 and is held by the spring 14 against and in contact with the inner wall of the casing 10 which is grounded. The strap 13 passes through a slot in the rear part of the condenser pocket. The other terminal of the condenser 12 is connected by means of an insulated wire 15, which passes through a similar slot in the front part of the condenser housing, to a live contact plate 16 which is fixed in position relative the housing 10 by machine screws 17, but is properly insulated therefrom. This plate 26 supports the live contact screw 32. The top of the housing or head 10 is covered by a distributor cap 21 which bears suitable high tension terminals 22 to which are attached suitable high tension leads 22′ leading to the plugs 80 of the engine. The central terminal 23 is connected to the high tension lead 81 which leads from the live side of the high tension winding 82 of the induction coil 83. The casing 10 is provided with a pair of lugs 71 to which are fitted the spring catches 72 for holding the distributor cap 21 firmly upon the casing 10.

Terminal plate 16 has an integral lug 58 bent up at the side facing the interrupter arm 24 and this lug is threaded to receive the adjustable contact screw 32. The plate 16 has an external terminal 65 formed as an extended ear projecting through an opening in the casing. At its outer end the ear has a bent up end or lug threaded to receive a clamping screw 67. A terminal clip 66 is held by screw 67. The plate 16 is insulated from the housing 10 by a sheet of insulating material and insulating bushings for the holding screws which insulation is not shown in the drawings.

The condenser 18, which is a rolled condenser cylindrical in form, has an axial hole therethrough. This condenser fits in its recess in the head 10 and is held in place by screw 18 and a sealing disc 20 for closing the front end of the housing 11. The washer or disc 20 is preferably dished so as to be expanded by the screw 19 when the same is drawn tight. A felt disc or washer 20′ is placed under the fiber washer 20.

The distributor mechanism consists of a breaker arm 24 which in cross section is channel shaped and has one of its ends formed into a loop. The looped end embraces the fiber bushing 25. This bushing in turn is mounted on a pin 26 which projects vertically upward from the lug 27 which is formed integral with the housing 10. A plate 28, which like the arm is preferably formed of sheet metal, is secured to the breaker arm 24 by means of the rivets 29. The rear end of the member 28 is bent into a hook or finger for catching the front end of spring 14. This spring 14 may consist of one or more leaves bent around the looped end of arm 24 and tending to close the contacts 31, 32. The other end is bent upwardly and to it is secured the cam follower or finger 30, which is preferably

formed of a piece of bakelized fiber or cloth sheet, or other suitable insulating material. An interrupter contact 31 is secured, as by riveting on the front end of the breaker arm 24, and this contact is adapted to co-operate with contact screw 32. The screw 32 threads through the bracket or lug 58 of the plate 16. The front end of the contact screw 32 is formed with a hexagonal portion so that it may be suitably gripped by a wrench. A lock nut 34 serves to lock the screw 32 in adjusted position.

The breaker arm 24 is rocked on its pivot 26 by a cam member 35 which is secured upon the upper end of the vertically extending arm shaft 36. The cam 35 is, in this instance, shown as designed for a four-cylinder engine. It is understood, however, that the number of cam points may be varied to correspond with the engine. The cam 35 is made of steel and is provided with a bore, the lower part of which is conical for clutching the cam to the upper tapered end 59 of shaft 36 and the upper part of which is cylindrical to be piloted upon the upper reduced cylindrical part of the shaft 36 above the conical clutch part 59. The cam 35 has an integral portion extending upward to form a driving connection for the distributor arm 40. The upper part is drilled and counterbored to permit the screw 37 to extend down into the end of shaft 36 for clutching the cam member 35 to said upper end of shaft 36. The upper end 60 of cam member 35 forms a clutch to distributor arm 40, an eccentric cross notch 39 being formed in said end 60, so that the arm 40 can be applied in only one predetermined position which will correspond to the timing of the engine and the driving gears later to be described. A cross rib is formed in the bottom of socket 38 to co-operate with the cross notch 39. A distributing plate or finger 41 is securely mounted, as by a moulded in rivet, in a recess provided for it in the outer end of the rotor 40 and is adapted to rotate with it and distribute the high tension current to the stationary distributing terminals 22 in order. The distributor finger or contact 41 is connected by a radially extending spring 42 which is secured by the same rivet as the one which holds the contact 4. This spring 42 makes contact with the carbon button 43 which is mounted on the bottom of the central terminal 23.

The shaft 36 is provided with a collar 44 which is shrunk, or otherwise firmly secured thereon. A bushing 45 serves as a suitable bearing surface for the collar for taking the end thrust of shaft 36. The bushing 45 thus takes the axial and radial load of shaft 36. The bushing 45 is secured permanently in position by being pressed into the upper open end 62 of the vertical housing or frame 46. A groove 73 in the bushing 45 permits oil or grease to enter therein for lubricating the shaft 36. A grease cup is provided for filling the interior of the vertical frame 46 with grease.

The housing 46 has an integral collar or flange 48 which is provided with two arcuate slots 74 into which fit the arcuate lugs 75 which are integral with the housing 10. Screws 35 serve to hold these parts together. Suitable spring washers lie between the heads of the screws and the lugs 75, so that the parts are held together by friction. A steel antifriction plate 47 lies between flange 48 and the bottom of the housing 10. The housing 10 has an ear 49 integral therewith by which it may be swung back and forth relative the housing 46 for the manual advance and retard of the spark.

The shaft 36, which at its upper end, bears the interrupter and distributor mechanism, projects at its lower end through a bearing 63 formed integrally with the lower end of the frame 46.

A bell shaped housing 85, which is open at front and rear, is formed integral with the lower end of the frame 46. The frame 46 is united at one side of the bell shaped housing 85 with said housing, so as to provide in the lower end of the frame 46 and partially within the bell shaped housing 85 suitable space for the vertical gear 50, which vertical gear has an integral collar extending upwardly and engaging the end of the integral bearing 63. Thus the collar 68 forms an end bearing for the lower end of the shaft 36. The gear 50 is keyed to the vertical shaft 36 as by means of the key 51, shown in Fig. 4 and it is pinned against endwise movement by the screw 70.

It will thus be seen that the vertical shaft 36 and the vertical gear 50 are restrained from endwise play. The gear 50 has helical teeth thereon adapted to co-operate with the co-operating teeth on a horizontally disposed gear 52. The gear 52 is formed on the outer end of a sleeve member 87 which sleeve member is shown in section in Fig. 8. This sleeve member has a wide groove 88, circumferentially about the same. The sleeve member 87 fits into a cylindrical bore 89 in the bell housing 85 and is held in place therein by a forked retainer 53, which forked retainer 53 has fingers projecting into the annular groove 88 in the sleeve member 87, and this retainer holds the sleeve member in the bore 89 so closely that it cannot be moved out of the retainer, nor is the groove wide enough to permit sufficient end play to take the gear teeth out of mesh.

The small open end of the bell housing 85 is adapted to be closed by a cover member 56, the line of division between the cover member 56 and the bell housing 85 being such as to expose the front end of the gear 52.

The forked retainer member 53 which is

generally Y-shaped has its stem 90 seated in a recess 91 formed in the bottom of the bell housing, and a fastening screw 55 holds the stem 90 in said recess, the stem fitting nicely into said recess to prevent cocking or turning of the same.

The permissible space within which the parts may be disposed is limited, and in applying the device of my invention to the Ford automobile, the bell housing 85 is seated upon a circular seat which encloses or surrounds the end of the cam shaft 86. The cam shaft 86 has a reduced forward end 92 which is provided with a shoulder pin 93, this pin being driven into a hole in the reduced portion 92 and serving as a key. The extremity of the reduced portion 92 is threaded. Because of space requirement, the shaft 36 must be placed fairly far forward with respect to the end of the cam shaft 86 and yet there is not suitable space for gears of any size. I find that it is necessary to put the shaft 36 at such a place so that the helical gear 52 is partly projected beyond the end of the cam shaft 92. In order to secure the gear 52 firmly in place, I provide a cylindrical bore for the sleeve member 87 of which it is a part and slip the same over the reduced portion 92. The pin 93 serves as a key co-operating with the keyway 76 formed on the inside of the sleeve member 87. I also place a pair of spacing washers 77 and 78 between the shoulder 79 on the shaft 86 and the end of the sleeve member 87, so as to bring the helical gear at the proper point with respect to its co-operating gear.

The front end of the sleeve member 87, which lies over the threaded extremity of the cam shaft 86, is counterbored to receive the reduced sleeve 93 formed on the rear side of the nut 65. The sleeve and nut are threaded to co-operate with the threads on the end of the cam shaft 86, the shoulder between the nut and the sleeve 93 clamping the sleeve member 87 upon which the gear 52 is formed firmly upon the shaft 86 so that said sleeve with its integral gear forms substantially an integral mechanical extension of the cam shaft 86.

The cam shaft 86 in practice always has a certain amount of end play and the bore in the bell housing 85 and in the cap 56 permits a certain amount of endwise play of the shaft and its connected gear and nut. This endwise play does not seriously interfere with the timing of the ignition device.

The cap 56 is provided with a pin 94 which fits into a co-operating recess in the corresponding open end of the bell housing. This pin serves the purpose of a dowel pin and one or more of such pins may be provided for holding the cap member 56 upon the open end of the bell housing to prevent displacement of the same with respect to said housing. The cap 56 is held in place by the spring 95, which spring 95 is secured under one of the studs 96 of the gear housing 97 of the engine. The spring 95 is sufficiently stiff to hold the cap and the bell housing in place on the seat on the gear casing 97, and the forward end of the spring 95 is provided with a stud or projection 98 which extends into a co-operating recess formed in the cap member 56. The vertical frame 46 and its connected bell housing 85 are held in place by a diagonal strut or bracket arm 99, which is connected at its upper end to the frame 46 and at its free end it is slotted and passed under the head of the clamping stud 96, heretofore referred to. This holds the unit in a predetermined angular position with respect to the shaft 86.

Now it will be apparent that the gears 50 and 52, being held permanently in mesh, and the device being arranged to permit the connections and fastening of the gear 53 to the cam shaft 86 without disengaging said gears, the device may be inherently timed in the factory and it may be applied with such inherent timing undisturbed by the purchaser. At the same time a certain amount of adjustment to fit the individual requirements of the car owner may be desired. For this purpose the cone clutch formed of the parts 35 and 59 may be released to adjust the cam and timer structure with respect to the driving shaft 36.

This adjustment need not, however, be resorted to for the application of the device successfully to the automobile.

The device of my invention employs two classes of couplings or connections. One class includes elements like the gears which, from their very nature, may be meshed or coupled in more than one assembly or angular relation. The other class, like the key way 76 and pin 93 or like the eccentric cross groove 39 in the rotor, permit of assembly in only one assembly or angular relation. All devices of the first class are permanently assembled in fixed relation so that connections of the second class alone remain to be made. Since these cannot be incorrectly made the number of such connections which may be required is immaterial and it is within the present invention to make such connections at any desired point.

The specific form of interrupter and distributer mechanism which I have shown is not required for the practice of the invention herein claimed. Any suitable interrupter and distributer mechanism of the prior art may be employed at the upper end of shaft 36. While I have shown the shaft 36 as vertical and have so described it in the specification and named it in the claims, it is to be understood that whether this shaft is strictly vertical or not is immaterial to the invention.

I do not intend to be limited to the details shown or described.

I claim:

1. 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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

8. In combination, a frame member having a flared housing at its lower end, open at front and rear, the large flared end being adapted to seat on a seat on the engine frame, a vertical shaft in the first mentioned frame having a helical gear at its lower end, said gear extending into the housing, a horizontal helical gear meshing with the first said gear, said horizontal gear having a sleeve extending towards the open flared end of the housing, said sleeve providing a reduced portion forming a wide groove, and a fork member lying in said groove and embracing the sleeve, said fork member being secured in said housing, and holding the gears permanently in mesh and timed relation.

9. In combination, a frame having a bell housing at its lower end, the bell housing being open at front and rear, a vertical shaft in the frame having a gear secured at its lower end and extending into the housing, a co-operating horizontal gear disposed in the housing, said horizontal gear having a lat-

erally extending collar having a wide groove in said sleeve, said housing having a downwardly extending recess, a fork member having arms lying in said groove and holding the horizontal gear from movement out of mesh with the vertical gear, said fork member being secured in said recess.

10. In combination, a frame member having a horizontally disposed bell housing at its lower end, a vertical shaft in the frame member having a gear at its lower end extending into the housing, a co-operating horizontal gear meshing with the vertical gear, said horizontal gear having an axially extending sleeve, said sleeve having a wide groove therein, a fork having arms embracing the sleeve and lying in the groove, said groove being wide enough to permit endwise play of the horizontal gear, the fork preventing sufficient endwise movement to disengage the gears, a nut extending into the end of the gear for securing the gear to the cam shaft of an engine, and a cover member for the rear end of the housing, said cover member being removable for the application of said nut.

11. In combination, a housing, substantially bell shaped, open at front and rear, and having a cylindrical bore therein, a tubular member having a gear at one end and a relatively wide circumferential groove at the other end, said tubular member lying in said bore, a keyway formed in the tubular member, said housing having a recess in the side thereof, a fork member having its base set in said recess and having its arms extending into the groove for holding said tubular member in said door, and a cover for the rear end of the housing.

12. In combination, a bell shaped housing open at front and rear and having a cylindrical bore therethrough, a sleeve member having a gear at one end thereof and a wide circumferential groove at the other, said sleeve having a keyway therein, a shaft projecting into the sleeve, said shaft having a key co-operating with said keyway, said sleeve being counterbored, a nut having an extending sleeve projecting into said counterbore and threading on the end of the shaft, and a cover member for the small end of the bell housing, said cover member enclosing said nut.

13. In combination, a bell shaped housing open at front and rear and having a cylindrical bore therethrough, a sleeve member having a gear at one end thereof and a wide circumferential groove at the other, said sleeve having a keyway therein, a shaft projecting into the sleeve, said shaft having a key co-operating with said keyway, said sleeve being counterbored, a nut having an extending sleeve projecting into said counterbore and threading on the end of the shaft, a cover member for the small end of the bell housing, said cover member enclosing said nut, and a holding member secured to the casing, said holding member having arms embracing the groove portion of said sleeve.

14. In combination, a bell shaped housing having a cylindrical bore, said housing being open at front and rear, a sleeve member lying in said bore, said sleeve member having a gear at the end thereof adjacent the small end of the housing and having a wide circumferential groove in the opposite end of the sleeve, a cover member for the rear end of the housing, a shaft projecting into the sleeve, said shaft and sleeve having key means for connecting the two together for rotation in unison, means mounted inside the casing and co-operating with said groove for holding the sleeve in the bore, and means introducible through the small end of the housing for clamping the sleeve and the shaft together.

15. 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-operating 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.

16. 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.

17. In combination, an interrupter and distributor 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.

18. 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 key way 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.

19. 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.

20. In a device of the class described, a pinion having helical teeth at one end, and an extending integral sleeve, said pinion having an axial bore and a longitudinal key way in said bore, said pinion having an enlarged counterbore at its outer end, said sleeve having a retaining groove on its external surface terminating in shoulders.

21. In a device of the class described, a pinion having helical teeth at one end, and an extending integral sleeve, said pinion having a axial bore and a longitudinal key way in said bore, said pinion having an enlarged counterbore at its outer end, said sleeve having a retaining groove on its external surface terminating in shoulders, a shaft having a reduced outer end, a shoulder where said reduced end begins, a pin in the said shaft adapted to lie in the key way, said pinion having its sleeve member mounted on a reduced end of the shaft and extending beyond said reduced end, and a nut having a polygonal end portion and a reduced sleeve fitting into said counter bore and threaded upon the end of said reduced portion of the shaft.

22. In combination, a pinion having helical teeth, an integral sleeve extending from the rear end of the pinion, a retaining groove in said sleeve, said pinion having a central aperture comprising a main bore adjacent the sleeve end and a counterbore adjacent the pinion end, a key way extending throughout, and a tubular nut having a shoulder engaging the pinion end.

23. In a device of the class described, a housing comprising a vertical tubular portion, a lower bell portion having therein a horizontal cylindrical opening, a cover for the front end of the opening, said bell portion having a recess opening into said horizontal bore for receiving a retaining member.

24. In a device of the class described, a housing comprising a vertical tubular portion, a lower bell shaped portion having therein a horizontal cylindrical bore, said pinion having a retaining groove, a tubular helical pinion in said bore, a cover member for the front end of said bore, said housing having a recess opening into said horizontal bore, and a retaining member extending into said groove for retaining said pinion and being mounted in said recess.

In witness whereof, I hereunto subscribe my name this 24th day of February, 1925.

CLARENCE RINGWALD.