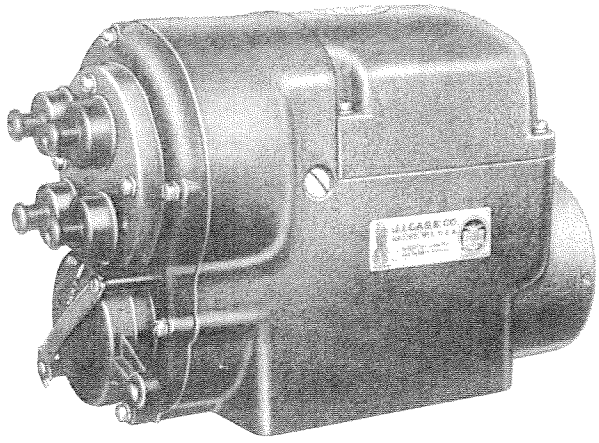
SECTION 11

MODEL "4-CMA" MAGNETO



DESCRIPTION

The Model CMA Magneto is a precision built, self-contained unit which should not be taken apart in the field, under "Field Servicing." Many magnetos are ruined because they are tampered with by inexperienced operators, under dirty, dusty conditions, or at places where proper service tools are not available.

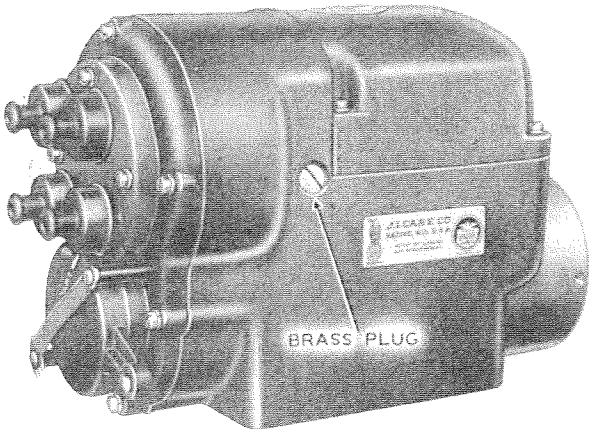


Figure 70. Model 4CMA Magneto

LUBRICATION

Remove brass plug, Figure 70, and fill with SAE 30 oil every 2000 operating hours, or once a year. All other parts of this magneto are packed with sufficient lubrication to last until time of general overhaul.

FIELD SERVICING

Field servicing should include only those repairs involving the timing of the engine or replacement of the entire magneto unit. IN TIMING THE MAGNETO TO THE ENGINE, REFER TO THE MANUAL FURNISHED WITH THE ENGINE.

TESTING MAGNETO RETURNED FROM FIELD

When a magneto is returned from the field for service, it should be tested to determine what the trouble is, before the magneto is torn down.

Place the magneto, (just returned from the field), on a synchroscope where it can be turned by hand, Figure 11. Put four spark plug wires from distributor on the magneto to four three point spark gaps, set at 3/8" spark jump gap. Turn the magneto by hand in the same direction as it would revolve

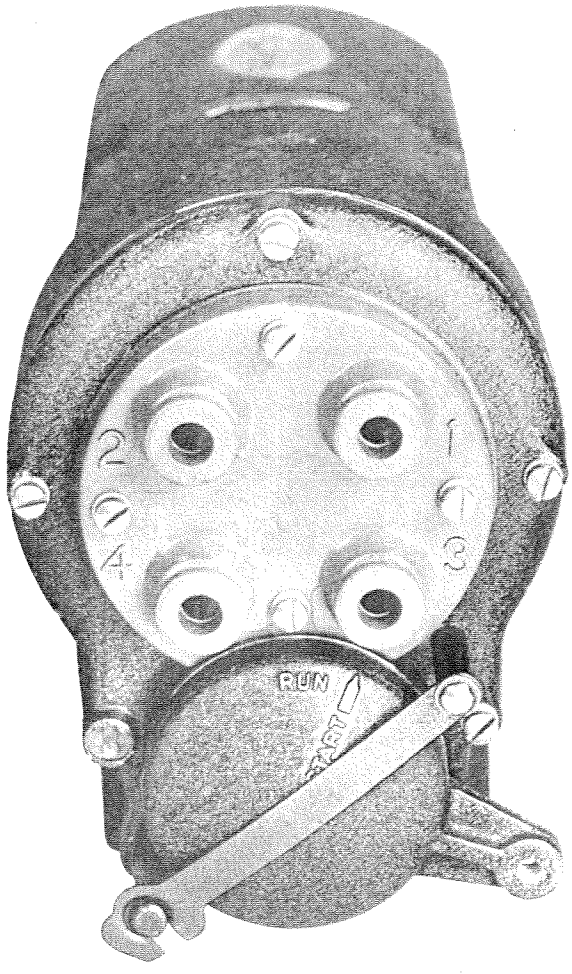


Figure 71. Breaker Box Cover Full Advance

on an engine, to see if there is sufficient spark to jump the "s" gap at all terminals, when impulse trips; also, to see if the impulse latches and trips freely like a new magneto, the FEEL of which a man should accustom himself to. Do this at half advance and full advance or running position. (Marked on breaker box cover as "Start" and "Run"), Figure 71. If magneto is dead, remove the breaker box cover and see that the cam opens the breaker arm between .011" and .020" or 1/64".

When breaker arm is not free, remove the breaker box tube from the magneto. Remove breaker arm from tube and clean fulcrum pin very thoroughly, also the bushing in the breaker arm. Try fulcrum pin in bushing after it is cleaned and be sure it is perfectly free; then replace and grease in the slots provided for same in the bushing, using CASE grease and reassemble arm in breaker box tube, Figure 72.

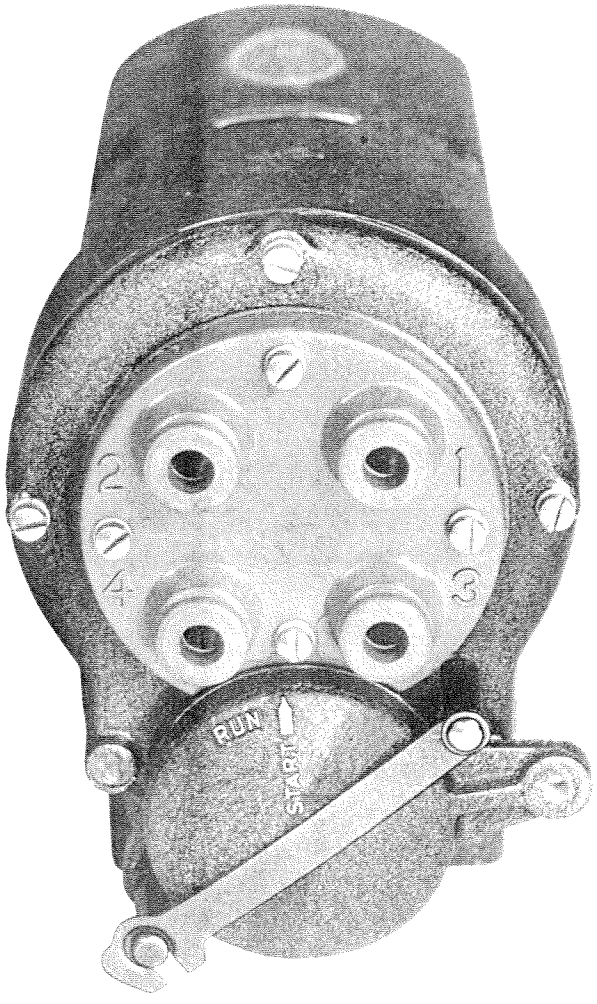


Figure 72. Breaker Box Cover Full Retard

Recent breaker bars have an oilite bearing which replaces the slotted bushing. This should not require any additional oil.

In cleaning the contact points, if they have a blue or black surface it will be necessary to remove this. It should be done with a whetstone and NOT A FILE. Use a very fine stone and set the point as nearly square on the stone as possible, rubbing it so that the point is made flat, See Figure 24. Be very careful to leave a very smooth surface on the point, which is essential. After stoning the points be sure they are clean and free of oil, washing them with degreasing fluid, Figure 31.

Then test the magneto again.

Should the magneto still be dead, then with the breaker box cover off and the breaker tube still in full advance position, run the magneto 1000 to 1200 RPM, and see if there is any arcing at the contact points. In normal running, there should be some pin point arcing between the contact points. If there is no arcing at contact points, make sure contact points are clean. If there is still no arcing at the contact points

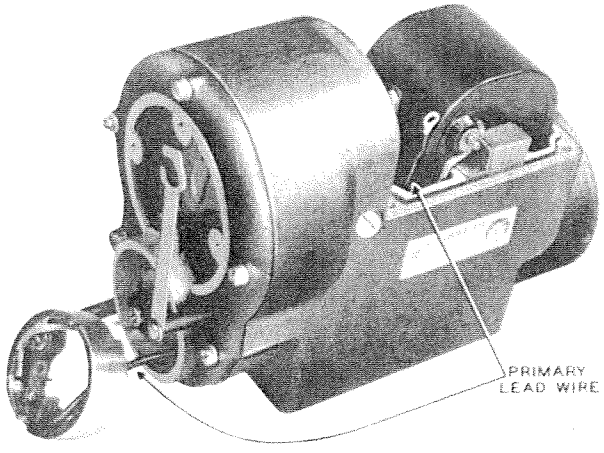


Figure 73. Primary Circuit

then there is a ground in the primary circuit, Figure 73, or the condenser is shorted. Remove the condenser lead wire from coil and check condenser, (it is not necessary to remove the condenser from magneto to check) being very careful to follow instructions sent with condenser tester. When checking the condenser, it is necessary to check both the capacity and the insulation resistance to determine if a condenser is good or bad. The capacity of the 4-CMA

condenser should be .20 microfarad plus or minus 10%. The resistance should be 2,000 or more ohms at room temperature. When the resistance gets below this amount, it will become destructive to the contact points. If condenser is defective, install new condenser.

Should the primary circuit (which follows the wire leading from the coil to the breaker box tube and from the breaker box tube through the shunt wire back to the end cap and frame through the grounding wire to the coil), Figure 73, be shorted or open-circuited, it will be necessary to check with a test lamp by first checking the wire from the coil to the breaker box tube to see if it is grounded to the frame or end cap. This wire must be disconnected from the coil when testing.

Then check the stationary contact support in the breaker box tube, by placing some insulating material between the contact points and seeing if the stationary contact support is grounded to the tube, Figure 74.

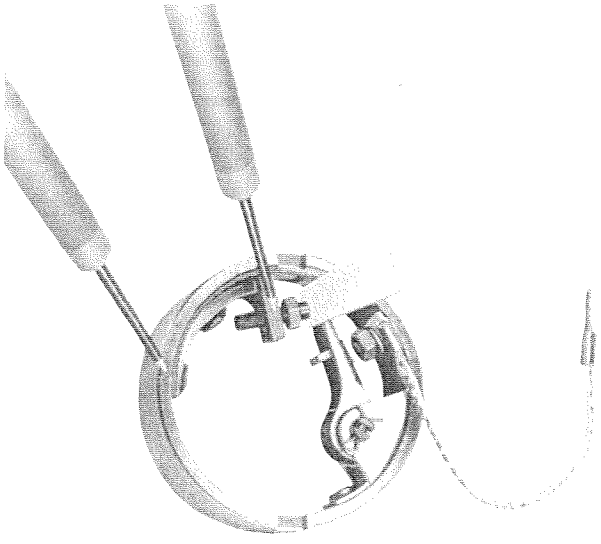


Figure 74. Testing Stationary Contact Support

If there is no shunt wire or grounding wire between the breaker box tube and end cap, then drill a 7/64" hole and tap No. 6-32 threads in the end cap as shown in Figure 75. Be sure to get the hole as close to hub on end cap, (shown in Figure 75), as possible, so the shunt wire terminal will not interfere with breaker tube while it is being advanced and retarded. When installing the shunt wire in the breaker box tube, be sure the terminal on shunt wire

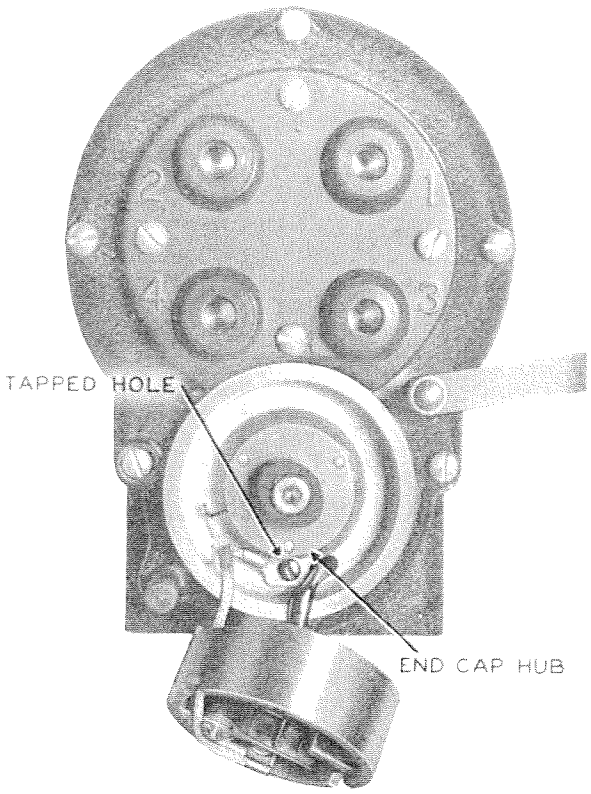


Figure 75. Shunt Wiring to End Cap

is placed between the breaker bar spring and the 1/32" breaker bar screw washer as shown in Figure 76. The shunt wire should be assembled in the breaker tube, the same as shown in Figure 76, so it will not interfere with the operation of the breaker tube or short circuit any of charged parts.

Check the coil ground wire with the test lamp between the primary lead wire terminal, and the frame, Figure 73. This should be an open circuit.

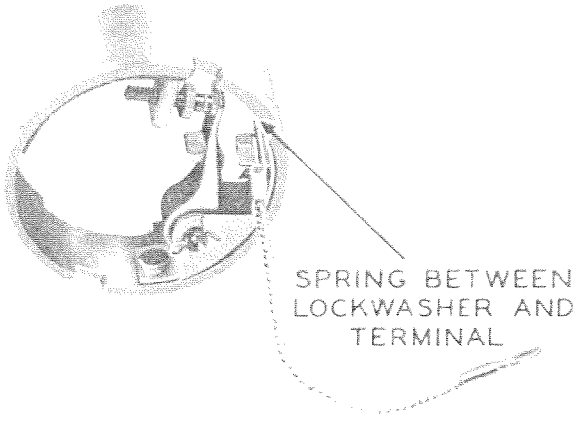


Figure 76. Shunt Wiring to Breaker Tube

The lead wire should be insulated from the frame and the stationary contact support insulated from the breaker box tube when tested. Check all soldered joints, as these sometimes become loose from corrosion. This would make a weak magneto.

When the arcing is minute at the contact points, this indicates that the primary circuit is correct; but if the magneto is still dead, remove the distributor block and top cover and run the magneto at full speed with the distributor block off. The spark should jump

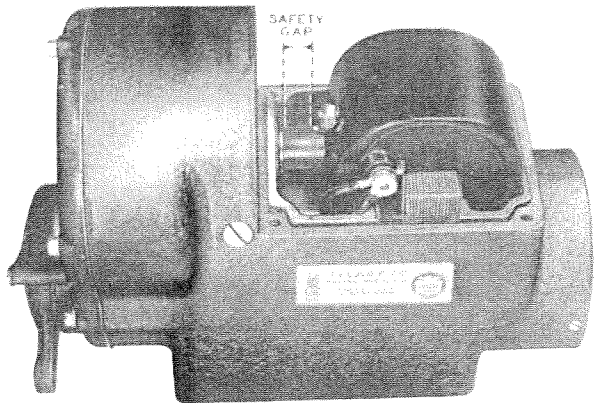


Figure 77. Safety Gap

the safety gap, Figure 77, which is a metal point projecting toward the distributor end of the magneto from the coil over the distributor disc stem. If the spark jumps the gap when the block is off, it indicates that the distributor block is defective and should be replaced with a new one.

Should the magneto still be dead then, with the distributor block removed, remove the snap ring and washer at the coil end of the distributor shaft, Figure 78, and push the distributor gear assembly away from

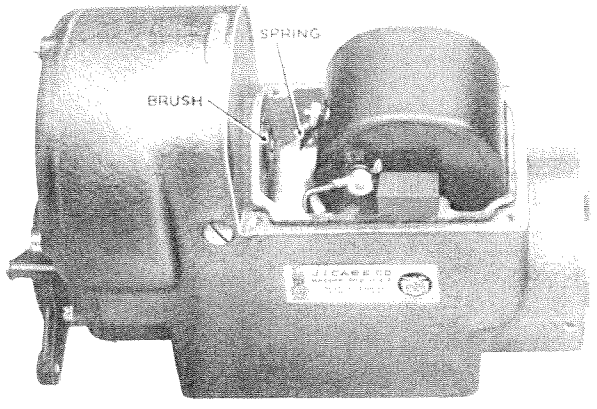


Figure 78. Testing Distributor Disc

the coil as far as is possible, at which position the distributor disc stem with the brush should clear the secondary electrode or spring on the coil by 3/8". Run the magneto in this position and see if the spark jumps from the secondary electrode to the distributor stem brush, Figure 78. If the spark jumps to this brush, or jumps the safety gap, this indicates that the distributor disc is defective and should be replaced.

When there is still no spark, check the coil with the coil tester. Be very careful to follow the instructions furnished with the coil tester. It is not necessary to remove coil from frame to test.

Should the coil be good and there is still no spark, hold some grounding means near to the safety gap point on the coil to see if there is a weak spark which would jump 1/16" or 1/8". This would indicate there might be a weak magnet, in which case recharge the magnet (refer to "Running Test on Synchroscope." This is done the same on the Model 4-CMA as on the Model 4-JMA magneto) and test as before.

If a returned magneto sparks when turned by hand, then run the magneto at full speed to see if the spark cuts out at high speed; this should be tried at the half advance and full advance positions. On the full retard position the spark should be grounded out. If the spark cuts out at high speed, it indicates that the breaker arm is sluggish on the fulcrum pin which must be free. This can be remedied by cleaning.

When the magneto does not ground out at full retard, see if the small grounding spring, Figure 75, which is supposed to touch the stationary contact support when the breaker box tube is retarded, is bent down so the stationary contact support does not touch it. If so, bend up toward the stationary contact support so that the spring touches it about 1/32" before the breaker box tube touches the stop.

Should the magneto spark correctly when tested, then run it at full speed to see if the spark is still good. It is then checked for timing on the synchroscope, where the impulse should trip 31° plus or minus 1° from the full advance spark. Refer to "Timing Magneto on Synchroscope."

If the magneto still operates correctly, remove the breaker box cover and see if there is any dirt or grease left between the contact points which could have caused the magneto to fail.

The impulse coupling timing should only be tested while the magneto is being turned very, very slowly on the synchroscope, shown at Figure 38, and should be 31° plus or minus 1° from the full advance spark. In timing the magneto, should the cam be worn, so that in order to properly time the magneto the contact points would open too far, then it is possible to reverse (or turn over) the cam which will create the same condition as a new cam; at this point the opening should be the proper amount when the spark occurs at the right time. It is possible to adjust the timing of the running spark by adjusting the contact points as closing the gap tends to retard the spark, while opening the gap tends to advance the spark. This should take care of the necessary adjustment and still remain within the tolerance of our opening. It is important that the breaker box tube is at full advance position, when timing the magneto.

Should there be any dirt in the frame, when rebuilding, be sure this is cleaned out. Then remove the ball bearings and wash and repack with CASE Grease, putting only that amount of grease in the bearing as can be easily packed in the ball retainer. Do not pack excessive grease in the bearing chamber, as the amount which can be placed in the retainer is sufficient to last for several years. (AFTER THE MAGNETO IS BUILT UP, THERE SHOULD BE .003″ to .010″ END PLAY IN THE ROTOR SHAFT AT NORMAL TEMPERATURE or 70°). If there is no end play when the magneto is used in severely cold climates or adverse weather conditions, it will tend to make the impulse throw the rotor over very sluggishly and create hard starting.

If when checking, the impulse coupling does not work according to these instructions, remove the felt washer and the impulse couplings from the magneto and see if there are any mechanical defects in the coupling. The impulse coupling hub should be free in the impulse shell, with the spring holding it against the stop in the shell. The impulse pawls should be very free on the bosses on the impulse coupling hub, and the end of the pawls, which strike the stop pin, should not be worn or broken off at the corner which drags over the stop pin. Do not use any grease on the bosses where the pawls fulcrum. A very light oil at time of overhaul would be desirous.

HOW TO DISMANTLE MODEL 4-CMA MAGNETO

Impulse Coupling

Remove the three flat head screws holding the cupped washer in the impulse end of the frame; then carefully pry out the cupped washer evenly, so it will not jam or cramp on the sides. Remove the felt ring and flat washer. Remove the impulse coupling by

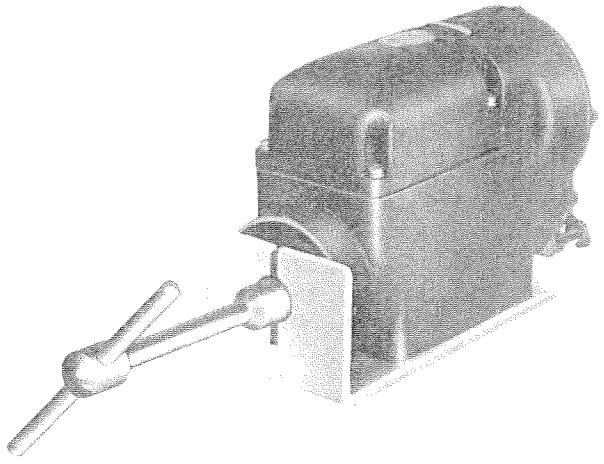


Figure 79. Removing Impulse Coupling Nut

unscrewing the castellated nut, Figure 79, remove outer shell as shown in Figure 80, applying the im-

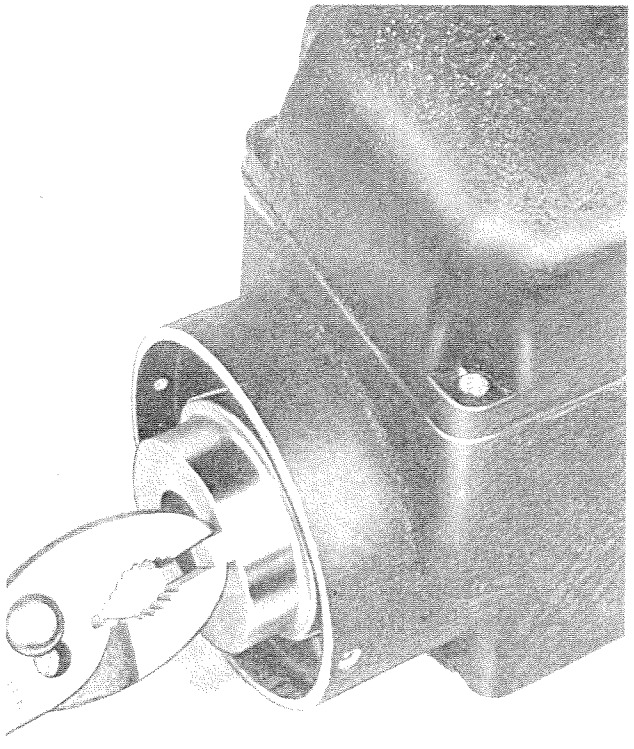


Figure 80. Removing Impulse Outer Shell with Pliers

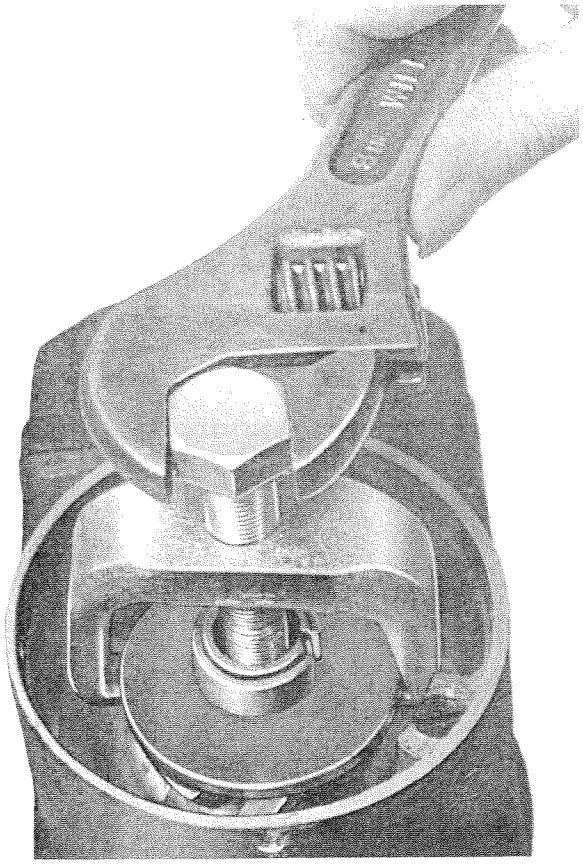


Figure 81. Removing Impulse Hub with Puller

pulse Coupling Puller No. 11-CMTA as shown in Figure 81. Turn the cap screw to pull the impulse coupling hub. If the impulse hub does not come off after the cap screw is tight against the shaft, tap the end of the cap screw lightly with a hammer.

Distributor Block

Remove four screws and draw straight forward.

End Cap

Remove spring over breaker box cover, take off cover. Remove spring locking cam on shaft. Remove cam. Unscrew contact screw nut and remove primary wire terminal from contact screw. Draw breaker box assembly straight forward out of end cap. Break lead seal and unscrew six screws holding end cap to frame. Draw end cap straight forward off the frame and rotor.

Top Cover

Remove four screws and lift up.

Distributor Disc and Gear

Remove spring ring from the end of the distributor shaft nearest the coil, Figure 77, and draw the distributor disc assembly forward out of the bearing.

Rotor

Draw rotor out of frame, REALIZING THAT THE MOMENT YOU HAVE DONE SO, YOU HAVE WEAKENED THE MAGNETS, AND THAT THEY MUST BE CHARGED AFTER INSERTING ROTOR INTO THE FRAME.

It is necessary to have a charging coil strong enough to force charge through frame to pole pieces, as you get a much better charge in the magnet by this method than by charging the rotor and then inserting it into the frame.

Ball Bearings

Remove the spring rings holding the steel retaining washers in both frame and end cap. Remove retaining washers, also ball retainers with balls, and wash them with some degreaser; also wash outer ball races without removing from frame or end cap. Examine balls, ball retainers and both outer and inner races for wear. If they are in good condition they may be used again; if not, remove outer races by means of outer race puller No. 10-CMTA, Figure 7,

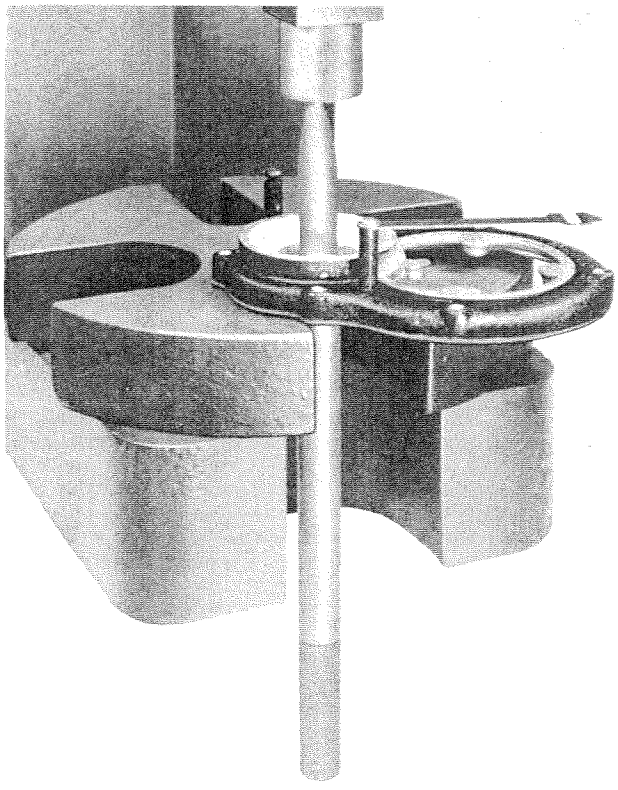


Figure 82. Pressing Outer Race Out of End Cap

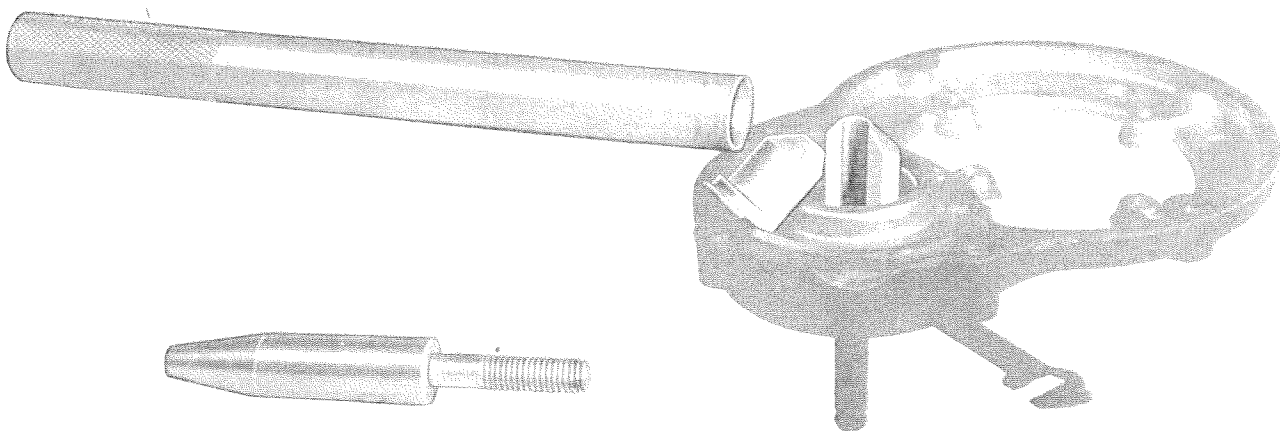


Figure 83. Placing Outer Race Puller in End Cap

as shown in Figures 82 and 83, or remove Inner Races by means of Inner Race Puller No. 4-CMTA as shown in Figure 84.

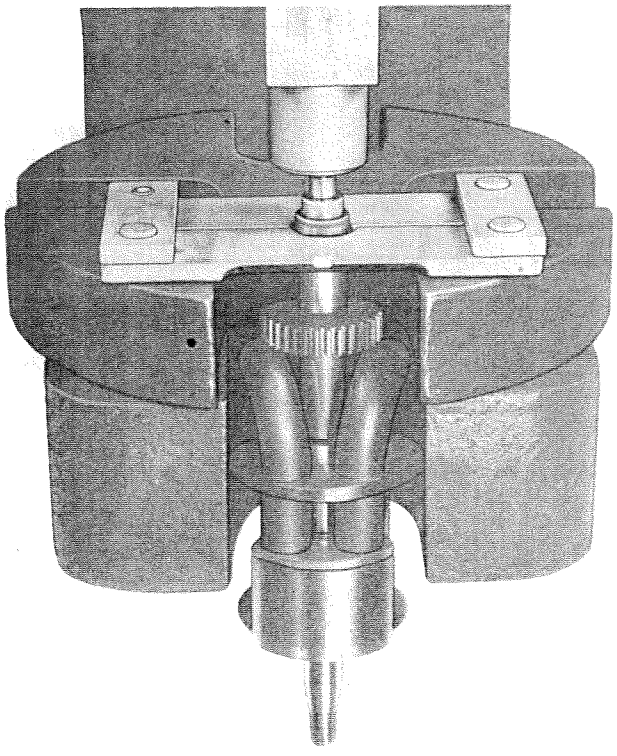


Figure 84. Removing Inner Race

Condenser

Remove two screws and lift out.

Breaker Bar

Remove cotter pin; press fulcrum pin back until it is out of breaker bar and support. Remove nut and spring, Figure 76.

Stationary Contact Point and Screw

Unscrew the Contact Screw Wrench No. 17-CMTA, Figure 7, and replace with new screw and point, adjusting the opening between the screw point and the point on the breaker bar to not less than .011″ nor more than .020″ with contact point opening gauge.

Driving Gear on Rotor

A fabric distributor gear cannot be furnished separate from the assembly; however, a steel driving gear can be supplied for the rotor. Remove the old gear with the Gear Puller, No. 4-CMTA, as shown in Figure 85.

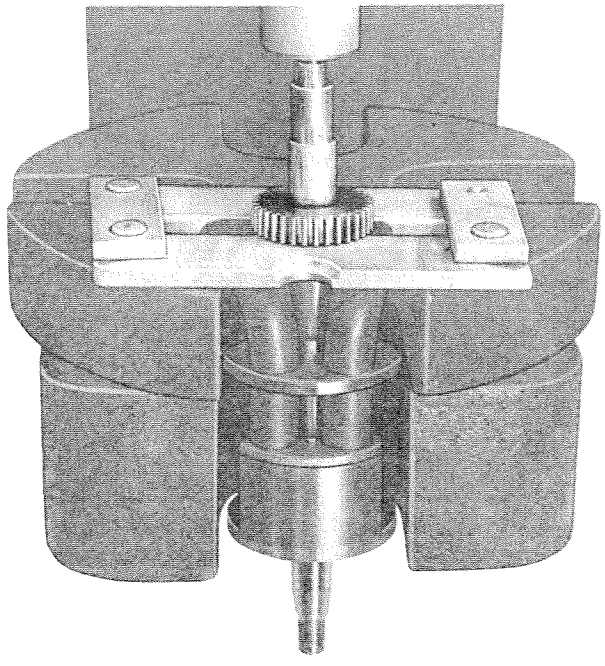


Figure 85. Removing Rotor Drive Gear

Coil

Remove coil from frame by using Coil Pullers Nos. 6-CMTA and 1-CMT, Figure 7, as shown in Figure 86. Do not attempt to remove coil unless you have the proper tools, such as coil puller and yoke with

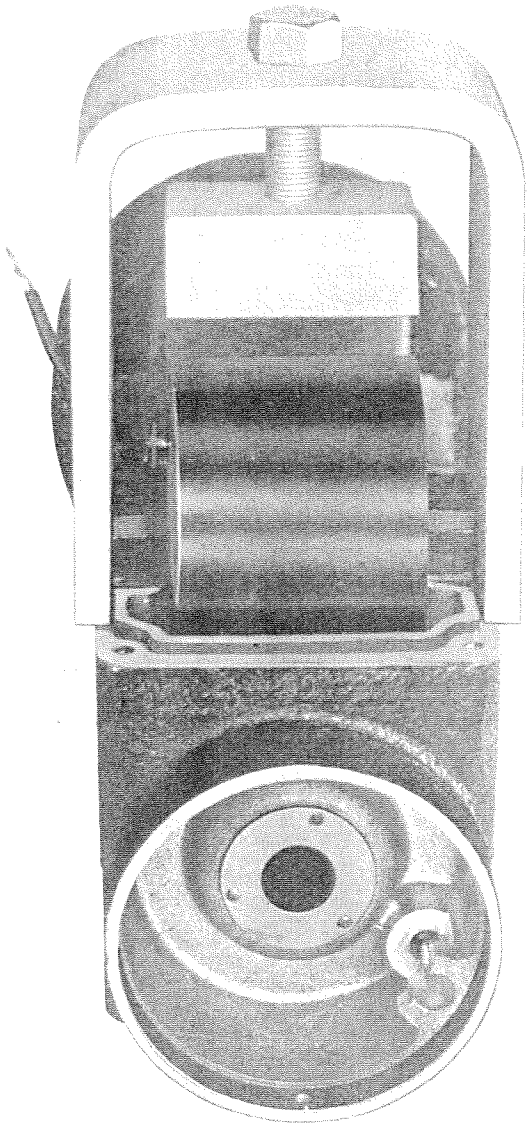


Figure 86. Removing Coil

arbor press to reassemble coil, and charging coil to recharge magneto, as this will have the same effect as it does on the Model 4-JMA magneto.

HOW TO REASSEMBLE MODEL 4-CMA MAGNETO

Be sure all parts are exceptionally clean before assembling. Do not try to clean one part then assemble it, as too much dirt will get into the magneto.

Be sure bearings are clean, then fill space between balls in ball retainer with CASE Grease. Assemble outer race in frame by using tools Nos. 13-CMTA and 0-16-CMT as shown in Figure 87. Assemble

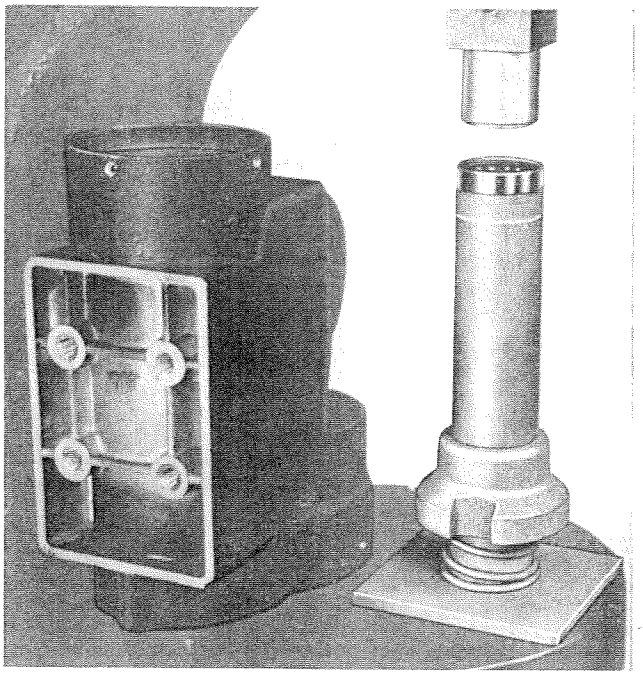


Figure 87. Assembling Outer Race in Frame

outer race in end cap by using tools No. 0-15-CMT and 0-16-CMT, as shown in Figure 88. Before press-

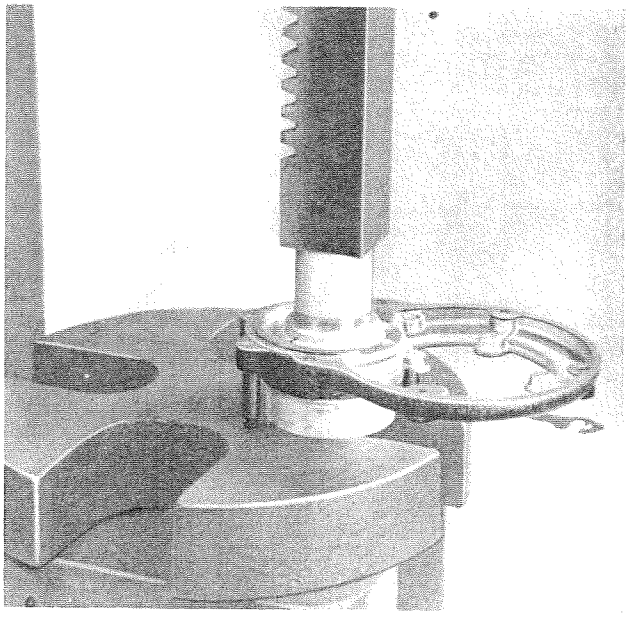


Figure 88. Assembling Outer Race in End Cap

ing large ball bearing inner race on the rotor shaft, see if there is a shoulder turned on the shaft that holds the brass Thrust Washer, No. 0-149-CM, which

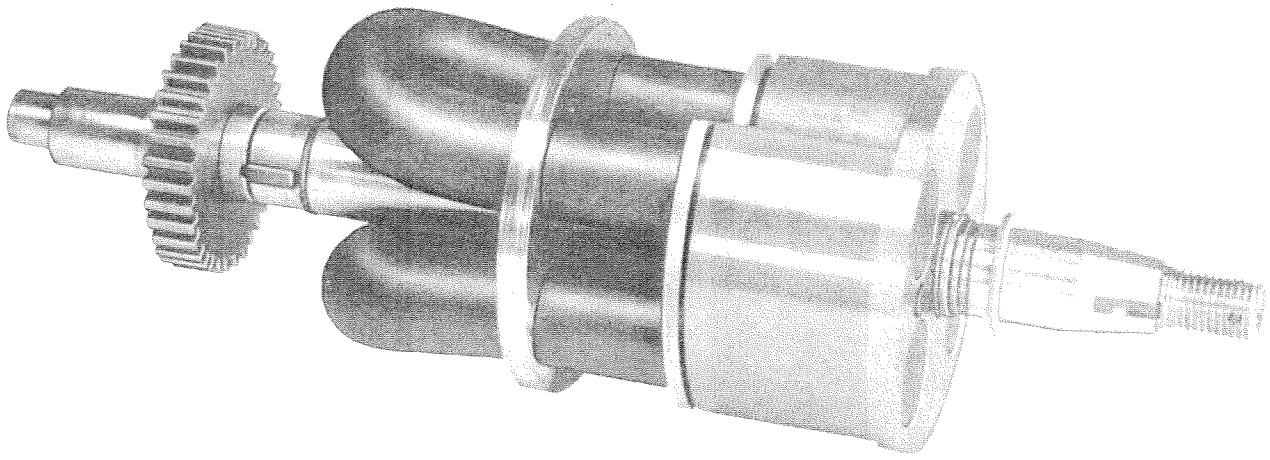


Figure 89. Retaining Washer for Rotor

keeps the inner race from going onto the shaft too far, Figure 89. This is only on the more recent rotors.

Assemble new inner races on rotor shaft, using tools Nos. 0-15-CMT and 0-17-CMT, as shown in Figure 90.

If necessary to change coil, place coil in frame, as shown in Figure 91, to start interlacing bridge with

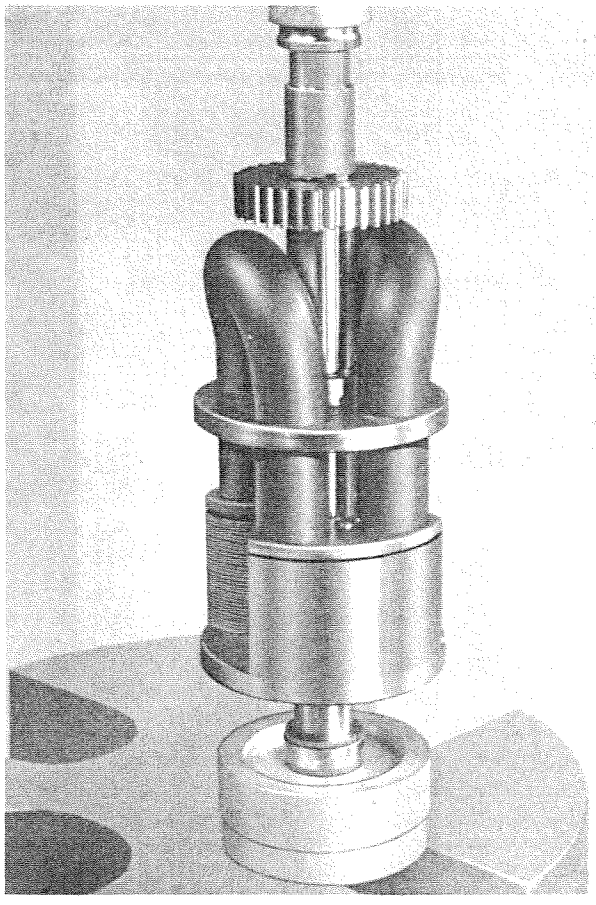


Figure 90. Assembling Inner Race on Rotor Shaft

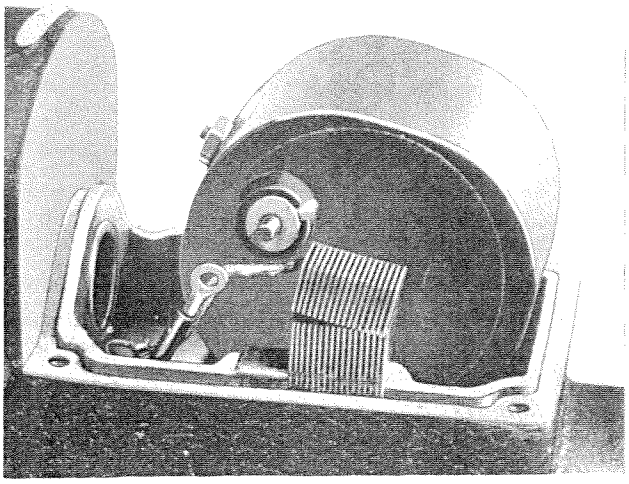


Figure 91. Starting Coil Assembly

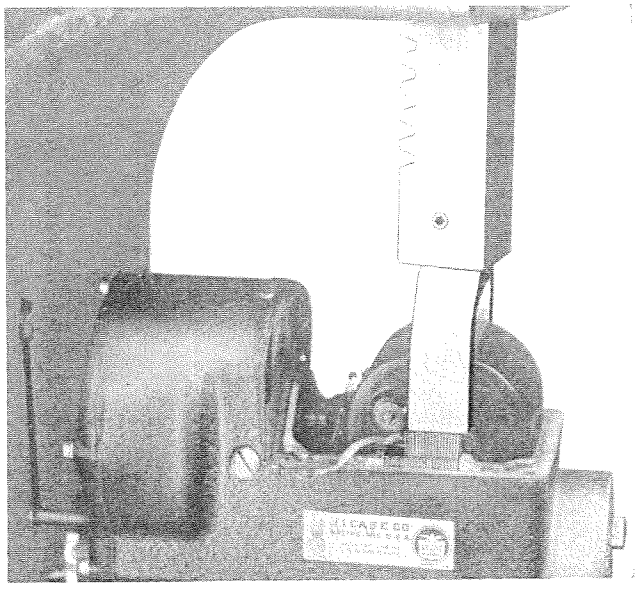


Figure 92. Pressing Coil Into Position

pole pieces. Then press into place by using No. 15-CMTA as shown in Figure 92.

Place condenser in frame with ground wire from coil under fastener screw and lockwasher of condenser. Be sure both screws and lockwashers are tight.

Put new gear on rotor using tools Nos. 0-15-CMT and 0-17-CMT, as shown in Figure 93.

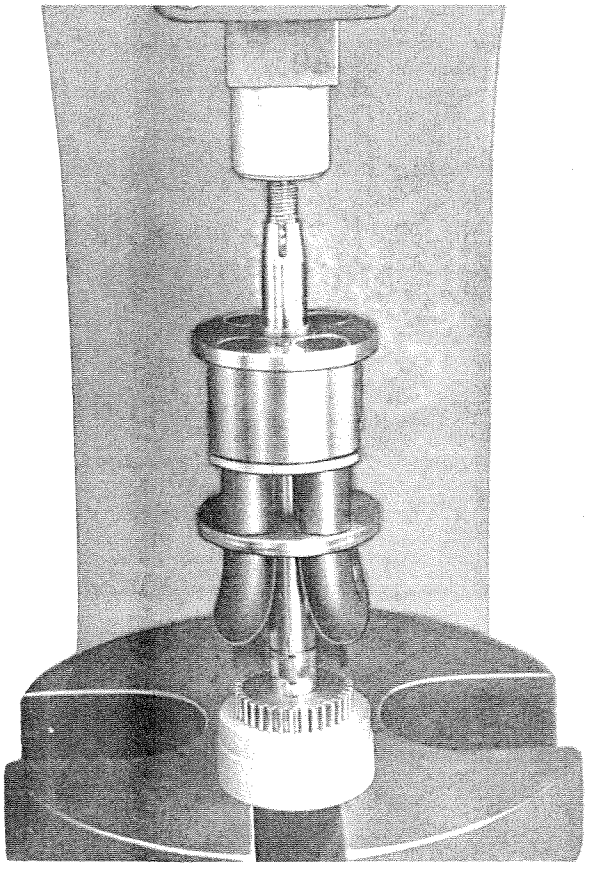


Figure 93. Installing Rotor Drive Gear

When replacing the old style distributor disc No. 13-CMA with distributor disc No. 13-CMA-1, you have the old style coil No. 20-CMA which has a monel metal insert to make contact with distributor disc stem brush, then you will have to use distributor block brush No. 32-JMA in place of distributor disc stem brush No. 33-CMA-1, Figure 94. If you have the present style coil No. 20-CMA-1 that has a spring on coil box, which makes contact with the distributor disc stem brush, then use distributor disc stem brush No. 33-CMA-1.

If you have a present style coil No. 20-CMA-1 and an old style distributor disc No. 13-CMA (which has a key to drive distributor disc brush), it will be necessary to ream out key in brush hole with a 3/16" reamer and use distributor disc brush No. 33-CMA-1. When using No. 32-JMA distributor disc brush in No. 13-CMA distributor disc stem, be sure brush is free in hole and will not stick in any position. When using No. 33-CMA-1 distributor disc stem brush, be sure brush is tight in distributor disc stem, and extends out of end of stem approximately 1/32". Be sure brush track is smooth on face of disc. If any

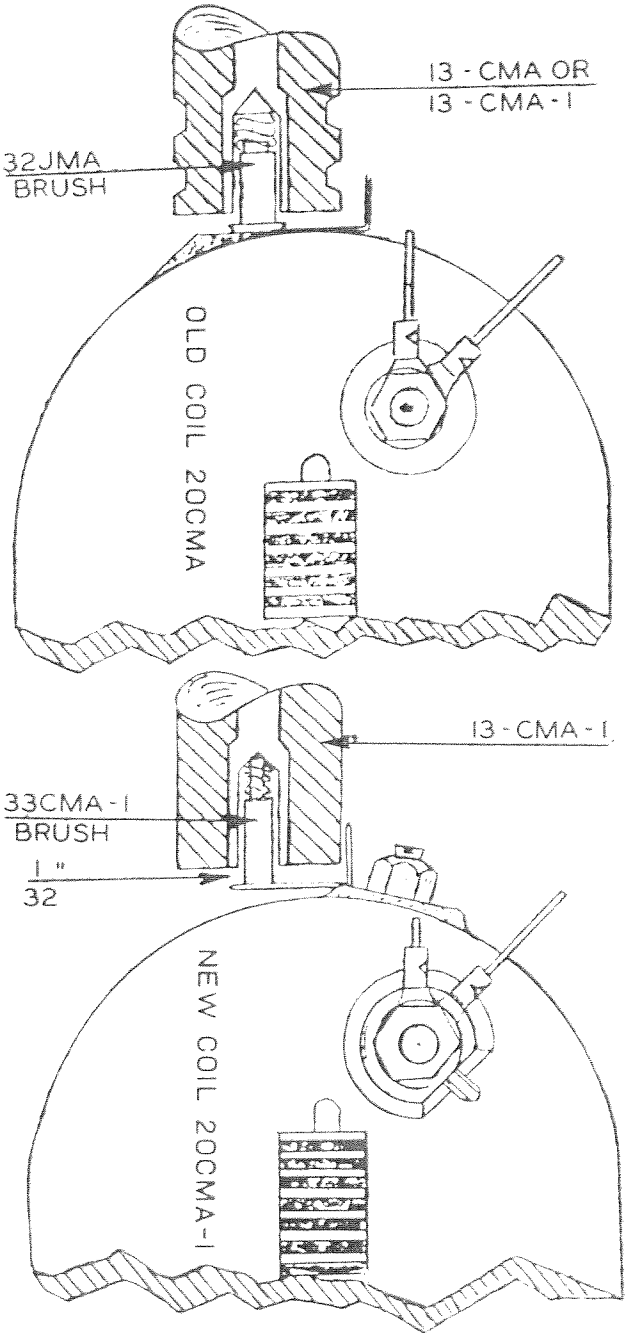


Figure 94. Old and New Coil

black carbon is on track, remove with an ink eraser. Do not use sand paper or emery cloth.

Place distributor gear assembly in frame, being careful to match gear teeth as marked. Tooth over red dot on steel gear is to be placed between two beveled teeth, on fabric gear, which are also painted red on bevels, Figure 95.

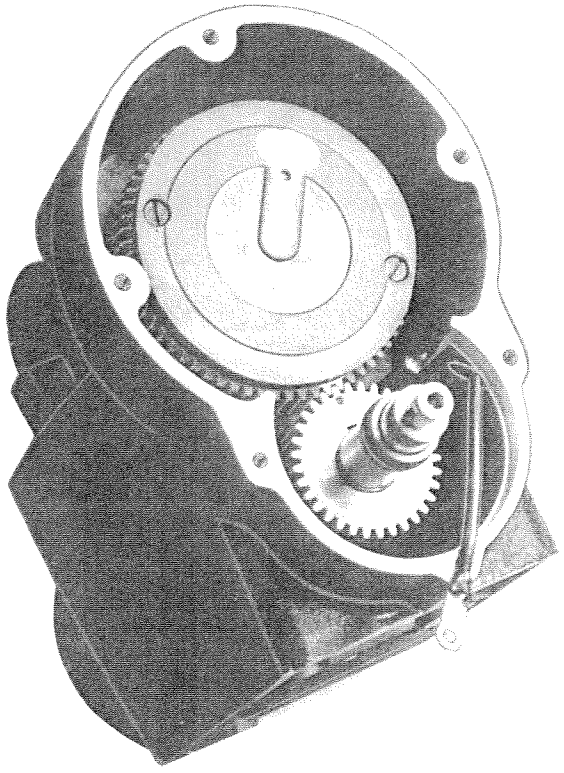


Figure 95. Meshing Distributor CMA Disc Gears

Place distributor shaft thrust washer and snap ring on distributor shaft coil end. Check again to see that teeth are properly matched. After assembly there should be a slight amount of end play in distributor shaft.

Be sure end cap gasket is not broken; then thread primary wire through hole in end cap and assemble end cap onto frame. After screws and lockwashers are securely fastened there should be .003″ to .010″ end play in rotor. IF THERE IS TOO MUCH END PLAY, ADD SPACER SHIMS, AS NEEDED, BACK OF SMALL BALL BEARING No. 0-46-CM INNER RACE.

Be sure top cover gaskets are not broken and primary wire lock nut and lockwashers are tight on coil terminal, Figure 73, and assemble top cover.

Be sure distributor block gasket is not broken, and brushes are free in distributor block. Test brushes for freeness by pressing them as far into the holes as you can with the end of fingers. They should not stick at any point. Then assemble end cap.

Be sure fulcrum pin is free in breaker arm.

Test by placing fulcrum pin in arm. It should be free enough to swing like a pendulum. Remove fulcrum pin and fill slots in bushing with CASE Grease.

Assemble stationary point in stationary contact support.

Assemble breaker bar in breaker box tube, being very careful not to drive fulcrum pin through fulcrum pin support and breaker bar bushing, so as to shear key on fulcrum pin support. It is very essential that the fulcrum pin be tight in the fulcrum pin support. When assembling the shunt wire into the breaker box between the breaker box screw washer and the breaker bar spring, be sure wire extends out on the side next to the breaker box cover Figure 73. After assembling the breaker box tube, loop the loose end of the shunt wire around, as shown in Figure 73, so it will not break when advancing and retarding magneto, and screw the loose end to the end cap as shown in Figure 76.

After this is assembled and the contact points adjusted, there should be .001″ to .002″ end play between the breaker bar and fulcrum pin support.

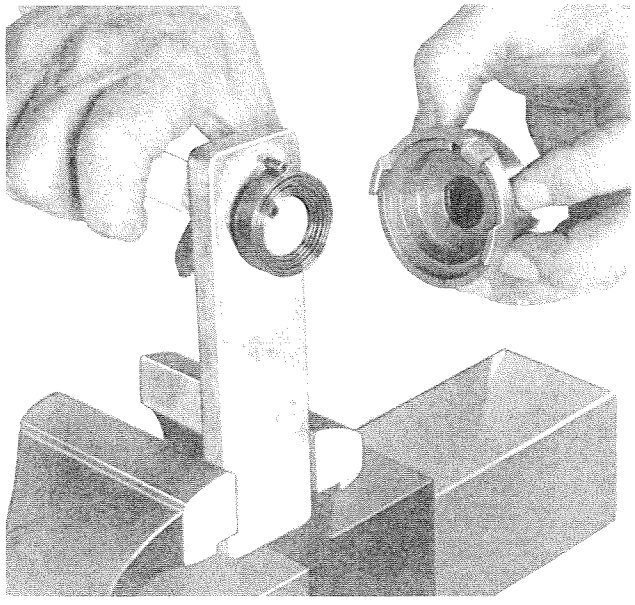


Figure 96. Winding Up Impulse Spring

Arm should be free, without spring binding in any position. It should require 15 to 18 oz. on rubbing block to open contact points.

Assemble cam on shaft. Place snap ring on shaft.

Assemble breaker box tube assembly in end cap, placing primary lead wire terminal on contact screw between nut lockwasher and wall of contact support.

Screw impulse stop pin in frame.

Place light coating of grease between coils of impulse coupling spring with a brush, and assemble spring in shell using Impulse Spring Wind-up No. 5-CMTA, as shown in Figure 96. Assemble impulse hub in impulse outer shell. Hub should be very free in shell. Pawls should be free on hub. DO NOT USE GREASE OR HEAVY OIL ON PAWLS.

Place Woodruff key in rotor shaft and assemble impulse coupling on shaft, being very careful not to push key out of keyway in shaft. This key can be seen in the keyway after impulse coupling is in place, before nut is assembled.

Assemble nut tightly on shaft, using impulse nut spanner wrench. Place lockwire through slot in nut and hole in shaft and bend wire out tight against the shaft. Cut off protruding ends, with a small chisel, towards shaft on both sides, so wire will be tight against shaft.

Be sure felt washer is full of grease and fits tightly to polished outer surface of impulse coupling outer shell. If this is loose so water or dust can seep by, replace with new felt.

Assemble flat washer, felt washer, and cupped washer around impulse coupling.

Test magneto on synchroscope and adjust contact points so spark occurs 31° ahead of point where impulse trips on 30° magneto, and 21° ahead of point where impulse trips on 20° magneto. Check time where impulse trips by turning synchroscope very slowly by hand. Figure 38; as when magneto is in motion there is always a lag in the time between where the impulse trips and the time where the spark occurs. When the magneto is timed correctly, there should be .011" to .020" opening between contact points, when the rubbing block is on the high point of the cam.

Assemble breaker box cover. Magneto is standard with 30° advance. This can be changed to 20° advance by substituting No. 34-CMA Breaker Box Cover for No. 35-CMA Breaker Box Cover.

Breaker box cover should be free enough on the breaker box tube so that the compression spring will push it off tube.

STATEMENT TO DEALERS

Dealers who do not have the magneto service equipment listed below, should not attempt any major service work on either the Model 4-JMA or Model 1-CMA magnetos.

Magnetos requiring service beyond the scope of dealers having only small tools, should be taken to a Case magneto service station that is equipped with the proper magneto service equipment.

Magneto Service Equipment

Charging Coil.

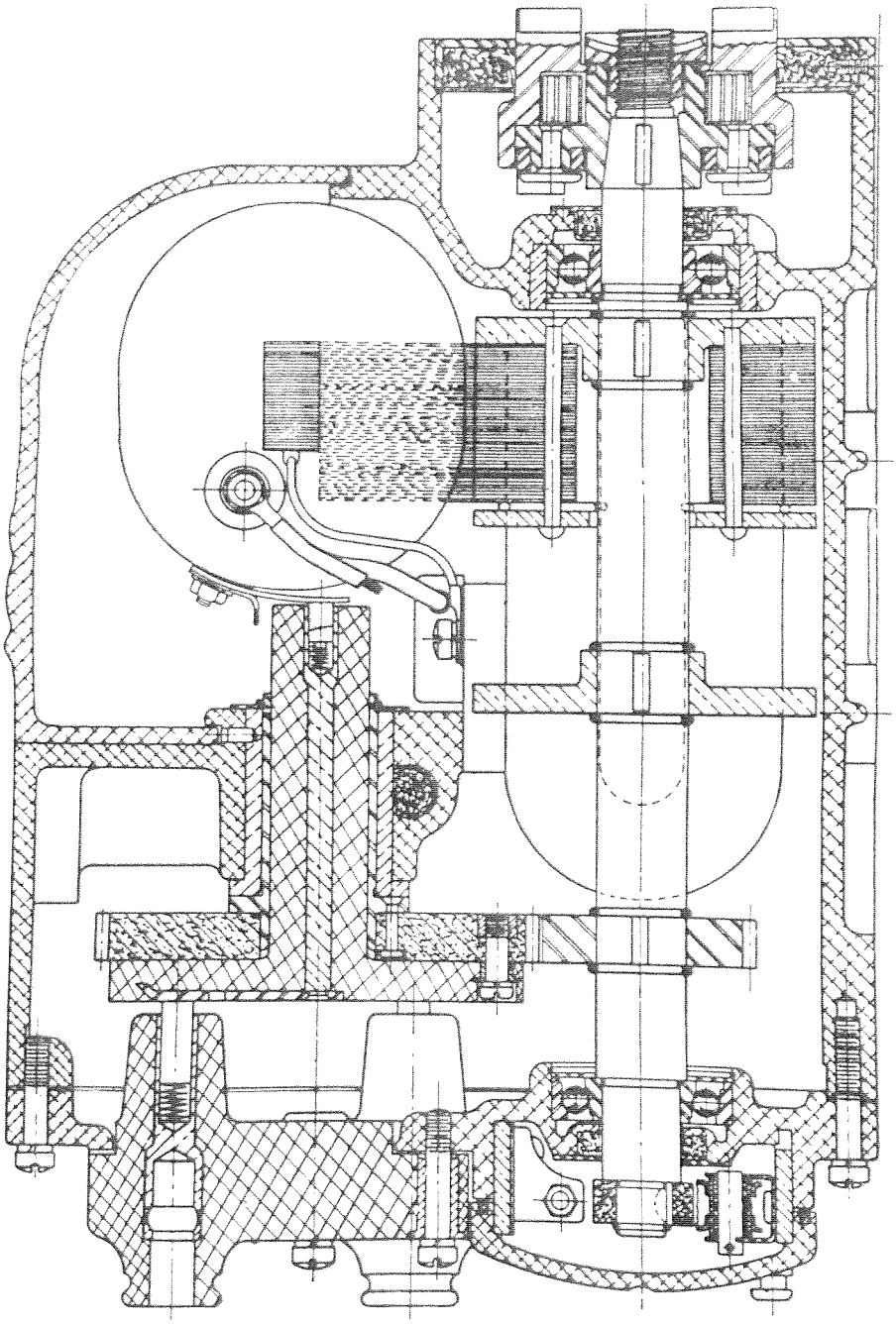
Synchroscope.

Coil Tester

Test Lamp for primary circuit.

Arbor Press.

Condenser Tester.



Sectional View of Model 4-CMA Magneto

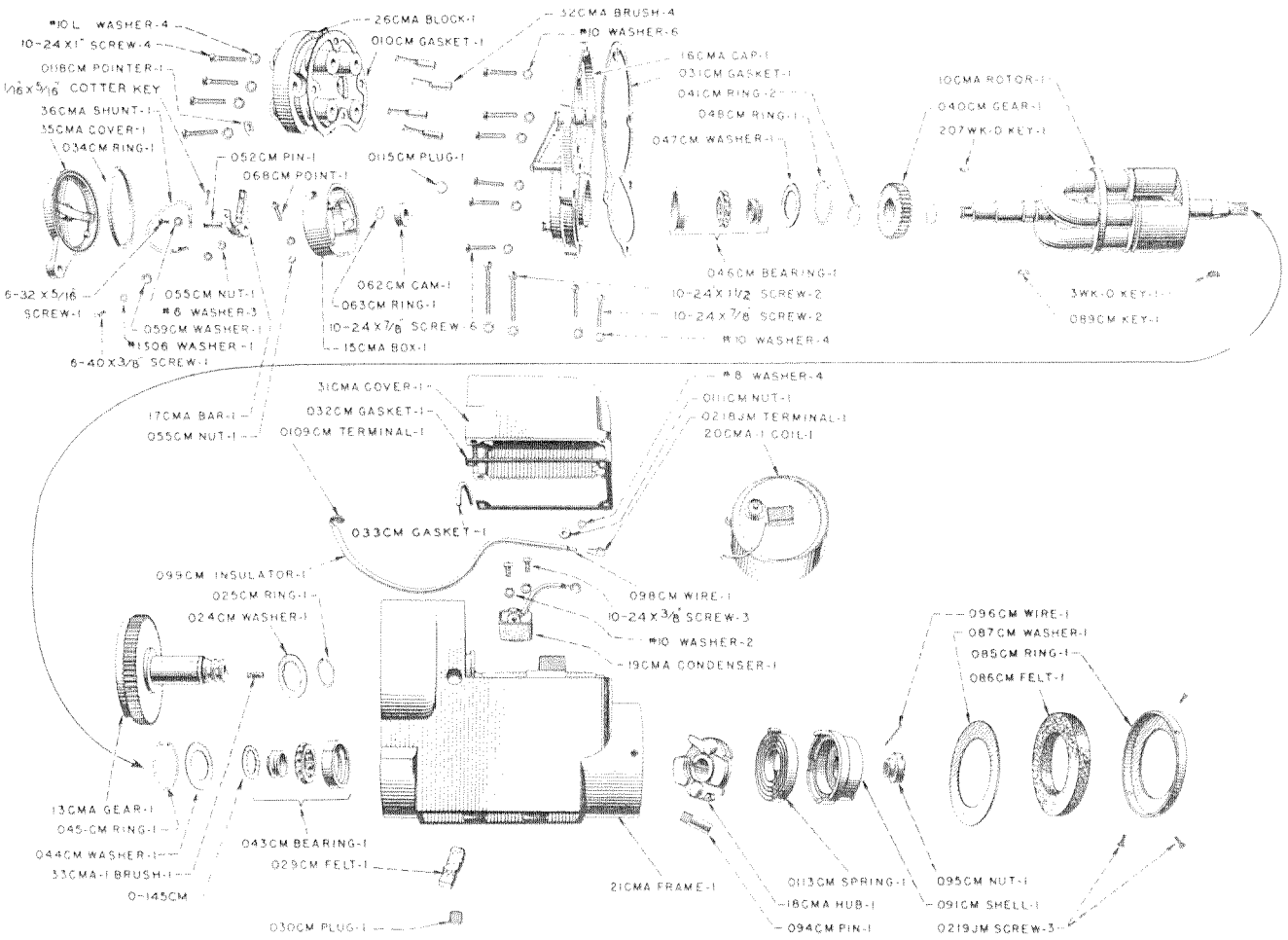


Figure 97. Exploded View of Model 4-CMA Magneto.