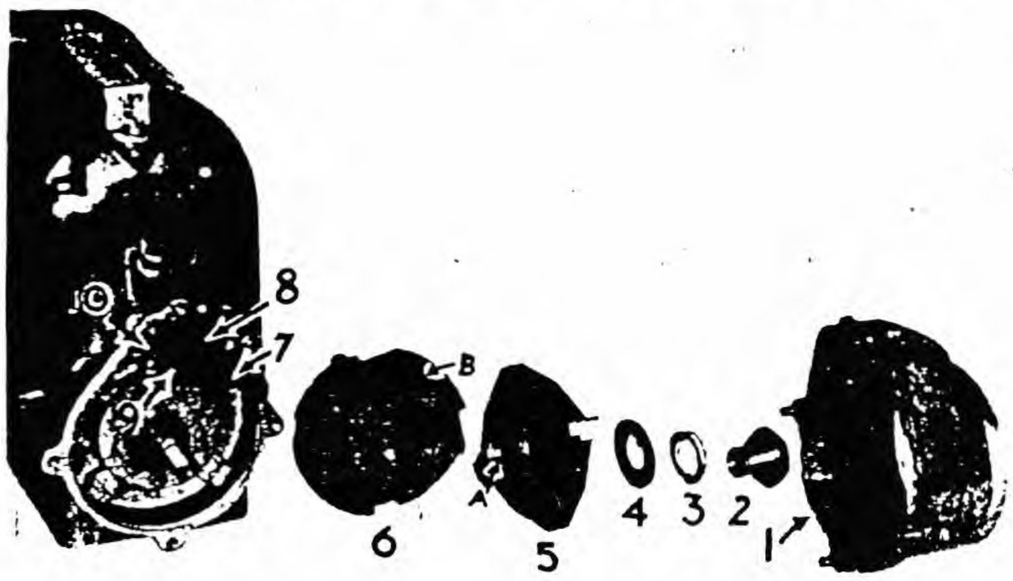
Dismantling F-Type Impulse Coupling



ILLUST. 43--F-TYPE IMPULSE COUPLING DISMANTLED FROM THE MAGNETO.

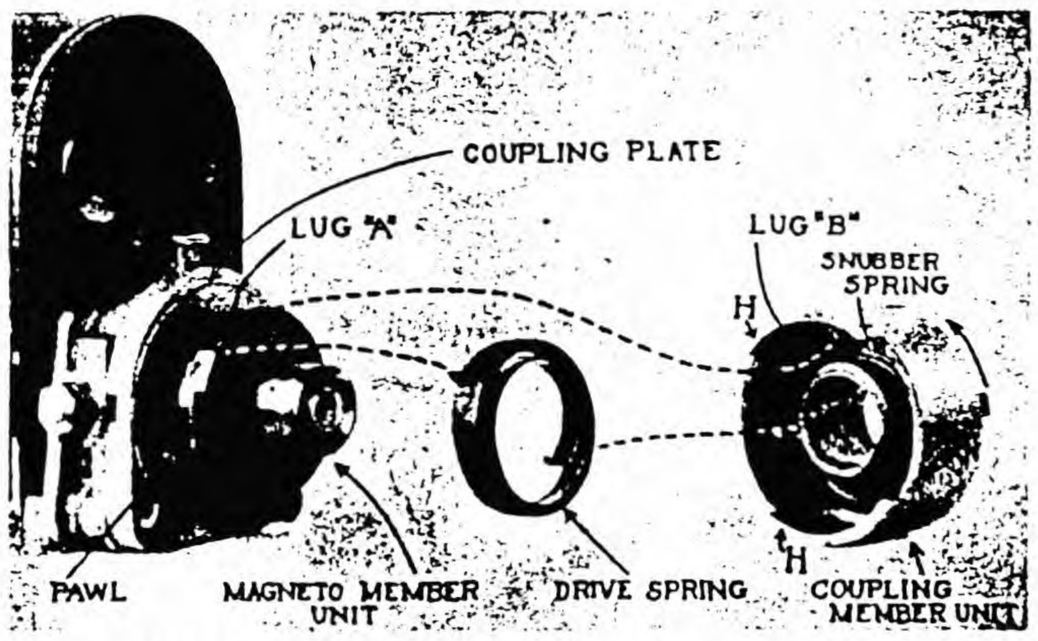
To remove the coupling member (6) start puller SE-912 in the threads (See Illust. 39, Item 9), then lock the member with pawl (7) and screw the puller until considerable effort is required to turn it. If the impulse has been allowed to stand or operate without sufficient oil, coupling member (6) is likely to be rusted and stuck on the shaft. It may be necessary to use two screw drivers, one from each side between the coupling and the magneto frame, and to hit the puller SE-912 a rather hard blow, at the same time exerting pressure on the screw drivers. Care must be used when this condition exists to remove the member without damaging the threads or the magneto frame.

To separate cam member from magneto member, pull outward until lugs clear, let unwind about one-half turn, and then remove. Drive spring can be easily pried out with a screw driver. In replacing spring, first hook it into position at "B", being sure it will wind in the direction shown. Wind the spring into position, using the right hand to push it gradually down and the left hand to hold the wound coils in place.

When assembling the coupling be sure that the hub of magneto member (6) is clean and well oiled, and if the latch spring (8) is rusty, replace it with a new one. Couplings must be oiled generously with cream separator oil at regular intervals. When the weather is extremely cold, kerosene should be used.

The earlier engaging pawls were held on the pawl pin by cotter pins. Be sure that these cotter pins are tight. If they are loose they will soon wear and drop out. Replace these cotter pins if they show any signs of wear. At present snap rings are used to hold these pawls on. They must be tight on the pawl pins when in place, otherwise they will wear and fall off. This causes a general wreckage of the magneto frame.

How the International E4A Impulse Coupling Works

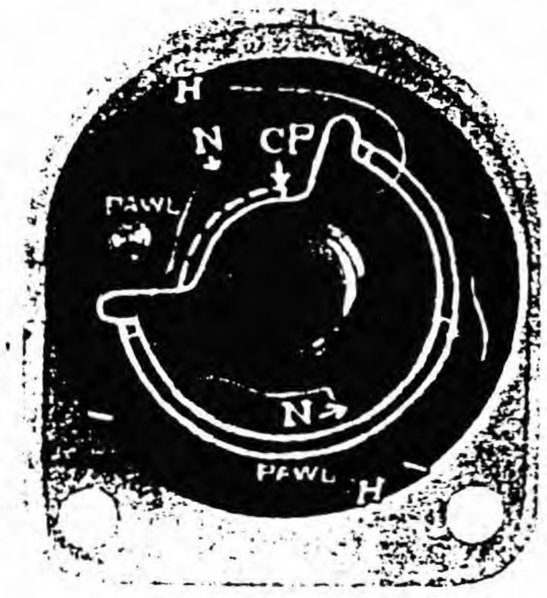


ILLUST. 44--E4A IMPULSE COUPLING PARTIALLY DISMANTLED TO SHOW HOW IT WORKS.

Following is a brief description of how the E4A Impulse Coupling operates: The coupling member unit (Illust. 44) is locked to the magneto drive shaft and always rotates steadily at engine speed. The magneto member unit is keyed to the armature driving end. These two units are connected to the drive spring as indicated in Illust. 44.



ILLUST. 45
PAWL ENGAGED AND ABOUT TO BE TRIPPED BY LUG "H"



ILLUST. 46
CENTRIFUGAL FORCE HOLDS PAWLS OUT OF ENGAGEMENT AT SPEEDS GREATER THAN 100 R.P.M.

Attached to the back of the magneto member unit are two pawls (Illusts. 44, 45, and 46). When the engine is turning at less than 100 R.P.M., gravity causes the uppermost pawl to catch the coupling plate at "CP", Illusts. 45 and 48, in notch "N", Illust. 45. This prevents the magneto member from turning until lug "H" of the steadily rotating coupling member trips the pawl by hitting its tail as shown in Illust. 45.

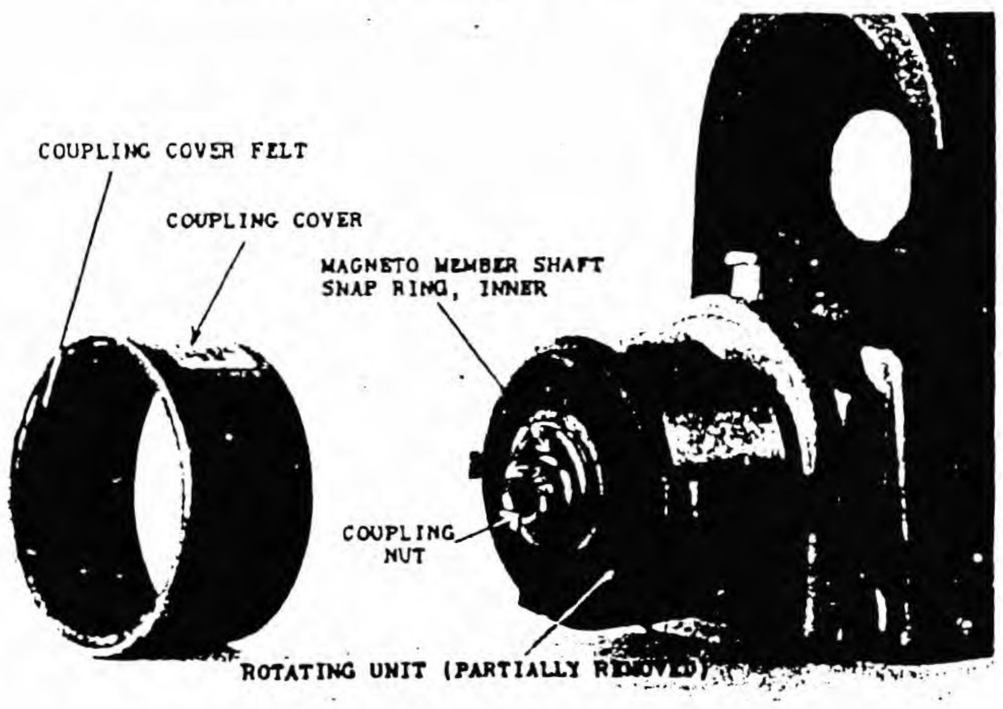
INTERNATIONAL E4A TYPE IMPULSE COUPLING

In the meantime, the drive spring has been wound up almost one-quarter revolution. Therefore, when the pawl is tripped, this spring unwinds, hurling the magneto member unit and rotor rapidly forward. Then, in the next one-half revolution, the second pawl comes to the top, catches, is tripped and the magneto armature is again hurled rapidly forward. Tripping of the pawls is timed so as to cause a spark when engine is on dead center or from dead center to 8° after dead center, provided the magneto is properly timed to the engine.

The snubber spring acts as a cushion against the impact of lugs "A" against lugs "B", Illust. 44, after the magneto member unit and rotor have been hurled forward by the drive spring. Cushioning movement of the snubber spring is limited by lug "L" which fits into groove "G", Illust. 53.

When the engine runs at a speed greater than 160 to 180 R.P.M., the centrifugal effect on the pawls is sufficient to hold them firmly against the inside of the two lugs "H" as in Illust. 46, so that notches "N" fail to catch at "CP". All parts of the coupling then rotate as a single unit.

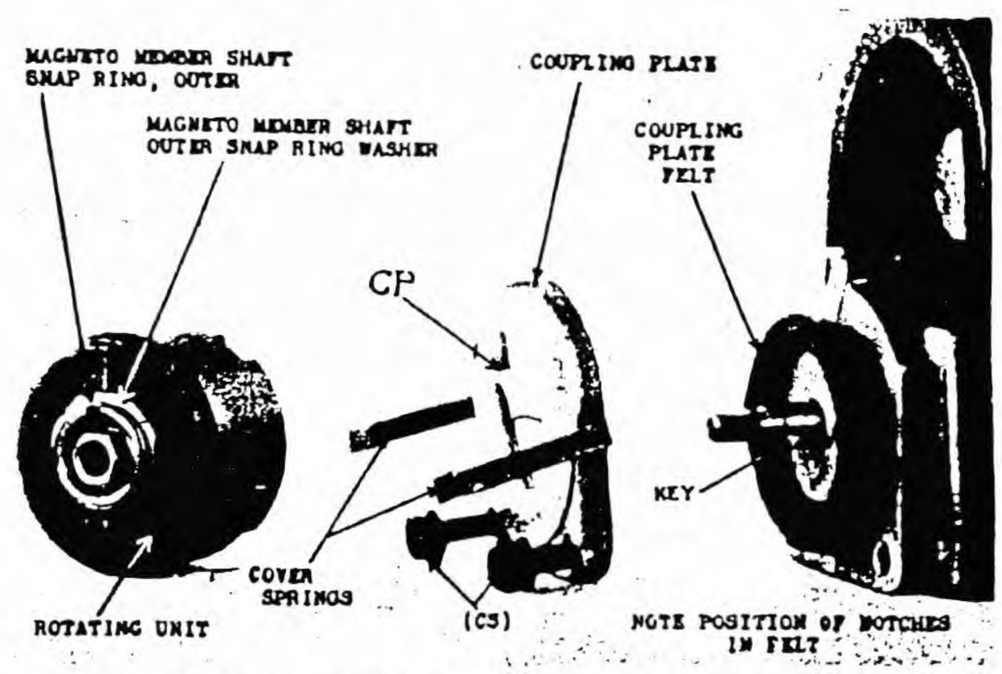
Dismantling E4A Type Coupling



ILLUST. 47--ROTATING UNIT IS PULLED OFF BY UNSCREWING COUPLING UNIT.

1. Release the two cover springs and remove coupling cover Illust. 47. Examine the coupling cover felt. If a new felt is necessary, remove old felt, clean coupling cover of all dirt, oil and grease and shellac new felt in place.

2. Using a 9/16" socket wrench, with a socket having an outside diameter of not more than 25/32", unscrew the coupling nut, Illust. 47, from the rotor driving end. While the nut is being unscrewed, its shoulder will bear against the magneto member shaft snap ring, inner, and will pull off the rotating unit.

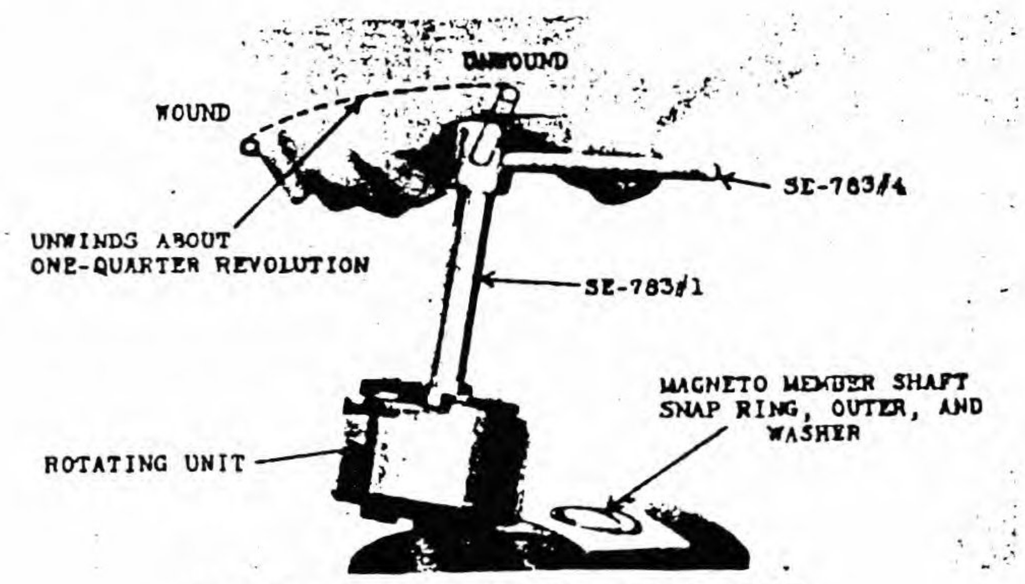


ILLUST. 48--ROTATING UNIT AND COUPLING PLATE REMOVED.

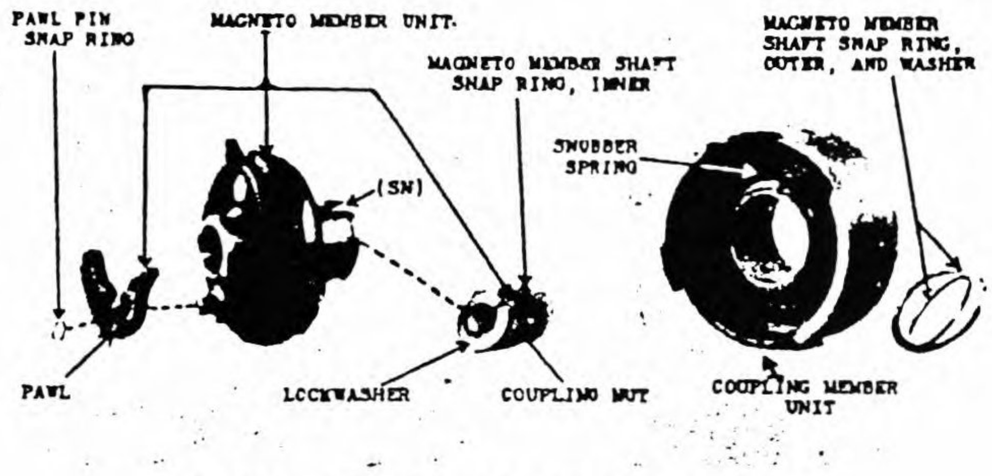
3. Should it be necessary to remove a pawl, this can be done after the pawl pin snap ring has been pried off. (See Illust. 50).

4. To separate the coupling member unit from the magneto member unit (see Illust. 50), first pry off the magneto member shaft snap ring, outer (Illusts. 48 and 49), and remove it and its washer. Place the rotating unit in a vise as shown in Illust. 49, and insert winder SE-783 No. 1. Turn winder clockwise with handle SE-783 No. 4 just enough to release pressure of lugs "A" against lugs "B", Illust. 44, and at same time press upward on the coupling nut as shown in Illust. 49.

When the magneto member has been pushed upward to the height shown, lugs "A" and "B" will clear each other. Carefully permit the drive spring to unwind. In unwinding, the spring will move handle SE-783 No. 4 counterclockwise as indicated in Illust. 49. The magneto member unit and coupling member unit can then be separated.



ILLUST. 49--SEPARATING MAGNETO UNIT FROM COUPLING UNIT.

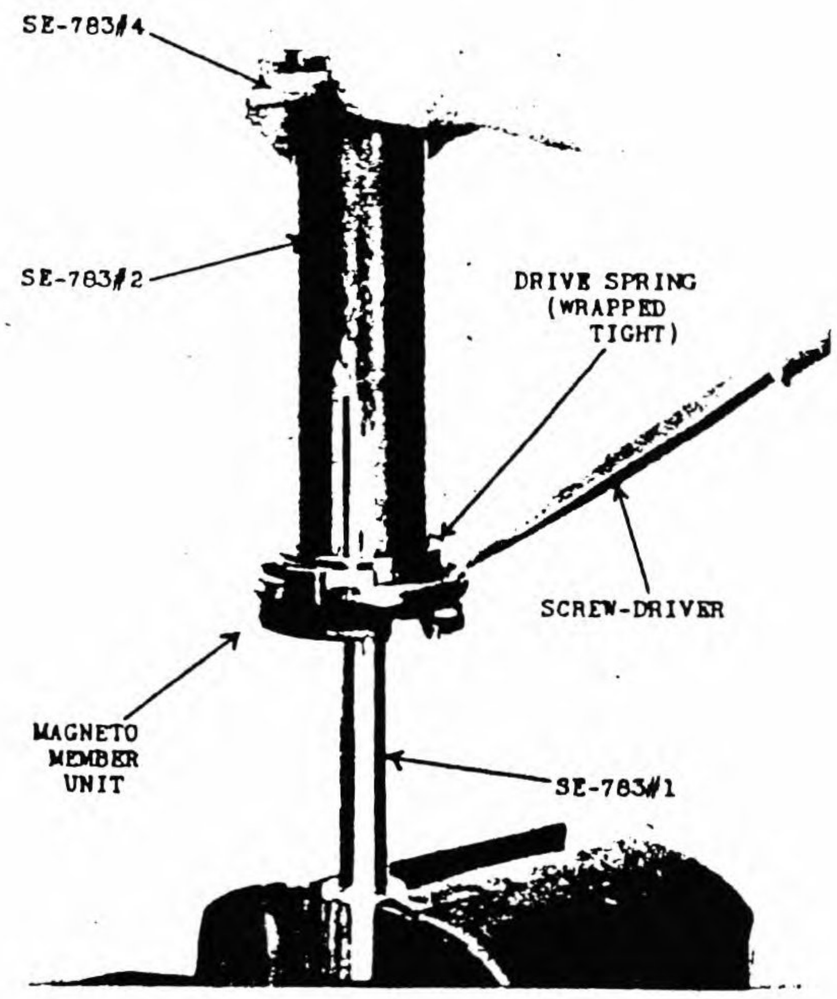


ILLUST. 50--MAGNETO MEMBER UNIT AND COUPLING MEMBER UNIT SEPARATED.

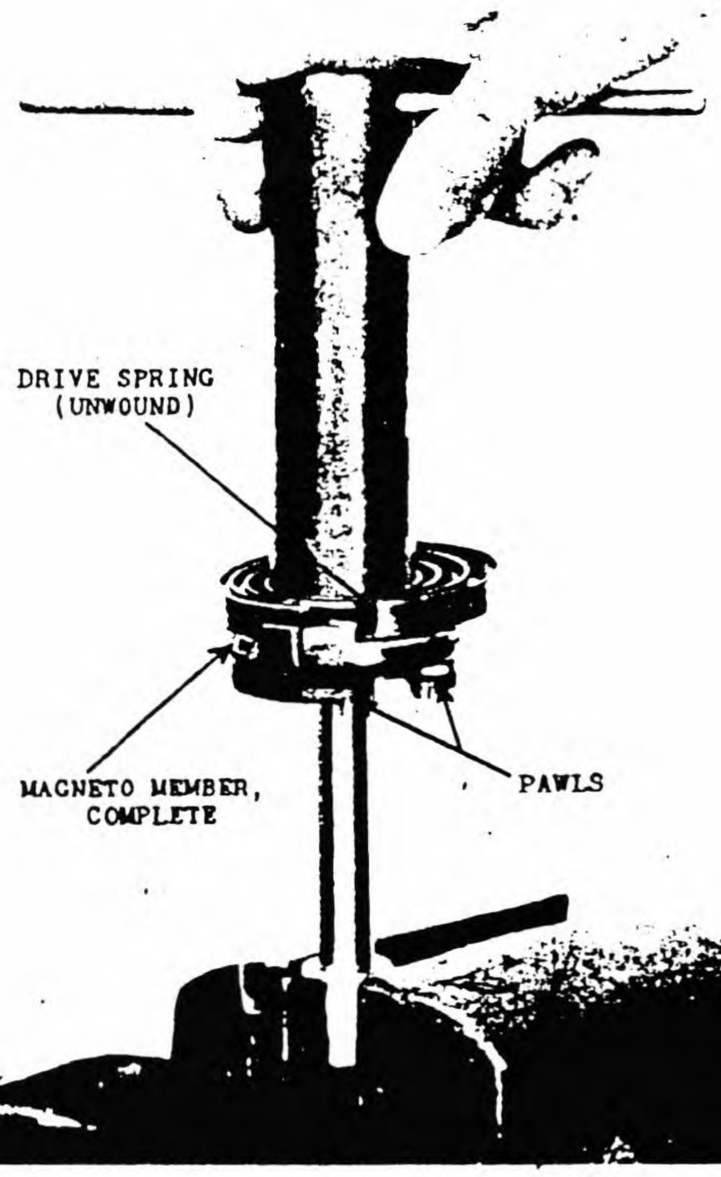
5. To remove the coupling nut, first pry out the magneto shaft snap ring, inner (Illusts. 47 and 50), by inserting a small screw driver in notch "SN". Note there is a special light lockwasher under the nut.

6. When a drive spring is broken, the coupling will fail to impulse and will automatically retard the spark. *To remove a drive spring*, grip winder SE-781 No. 1 in a vise as in Illust. 51. Catch inside hook of drive spring in slot of winder SE-783 No. 2 and by turning the winder clockwise, wrap spring fairly tight around it. Pry up spring with a screw driver applied as shown. Let spring slowly unwind until it assumes the shape and position shown in Illust. 52. It can then be picked up in one's fingers.

7. The coupling member stop ring with the snubber spring (Illust. 53) can be removed by hitting the wide-open end of



ILLUST. 51--REMOVING DRIVE SPRING.



ILLUST. 52--DRIVE SPRING RELEASED.

the coupling member, complete, sharply against a smooth board.

8. A broken snubber ring will make itself evident by a change in the sound of the impulse -- a single thud louder than usual, at each trip of the coupling. It will also advance the time at which the coupling trips.

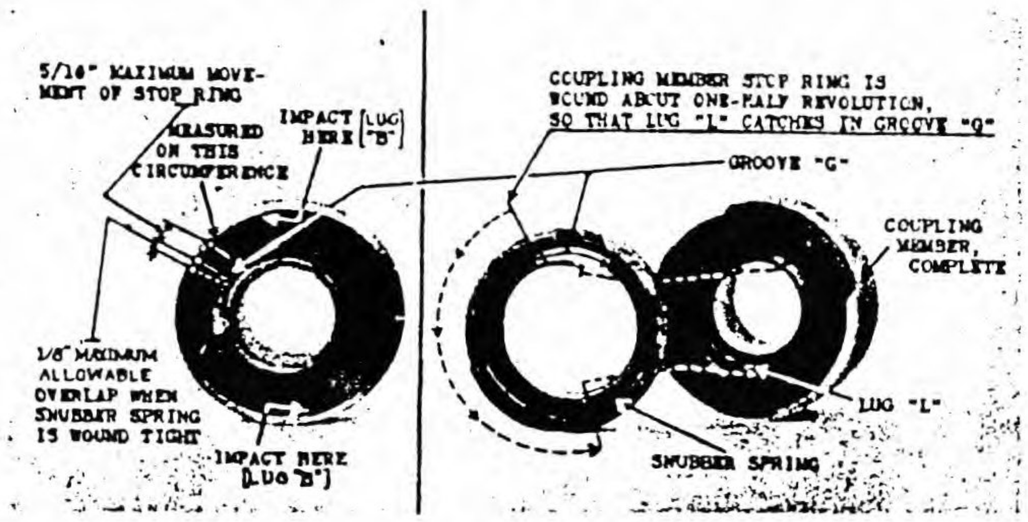
To remove the snubber spring from the coupling member stop ring, clamp the assembly in wood blocks SE-783 No. 5, Illust. 54. Catch the inside hook of the spring in winder SE-783 No. 2 as shown in Illust. 54, and proceed as instructed to remove drive spring, operation 6.

A study of the preceding illustrations and operations will reveal the simplest, safest and most efficient way to clean, inspect or remove any particular part of the coupling. Before reassembling the coupling, thoroughly clean and inspect all parts. In removing drive and snubber springs, care should be taken not to scratch or nick them as this may weaken them so as to result in breakage.

Reassembling the Coupling

Checking Snubber Spring Overlap:

Length of snubber springs will vary slightly, so that frequently the 1/8" maximum allowable overlap, given in Illust. 53, must be adjusted by means of



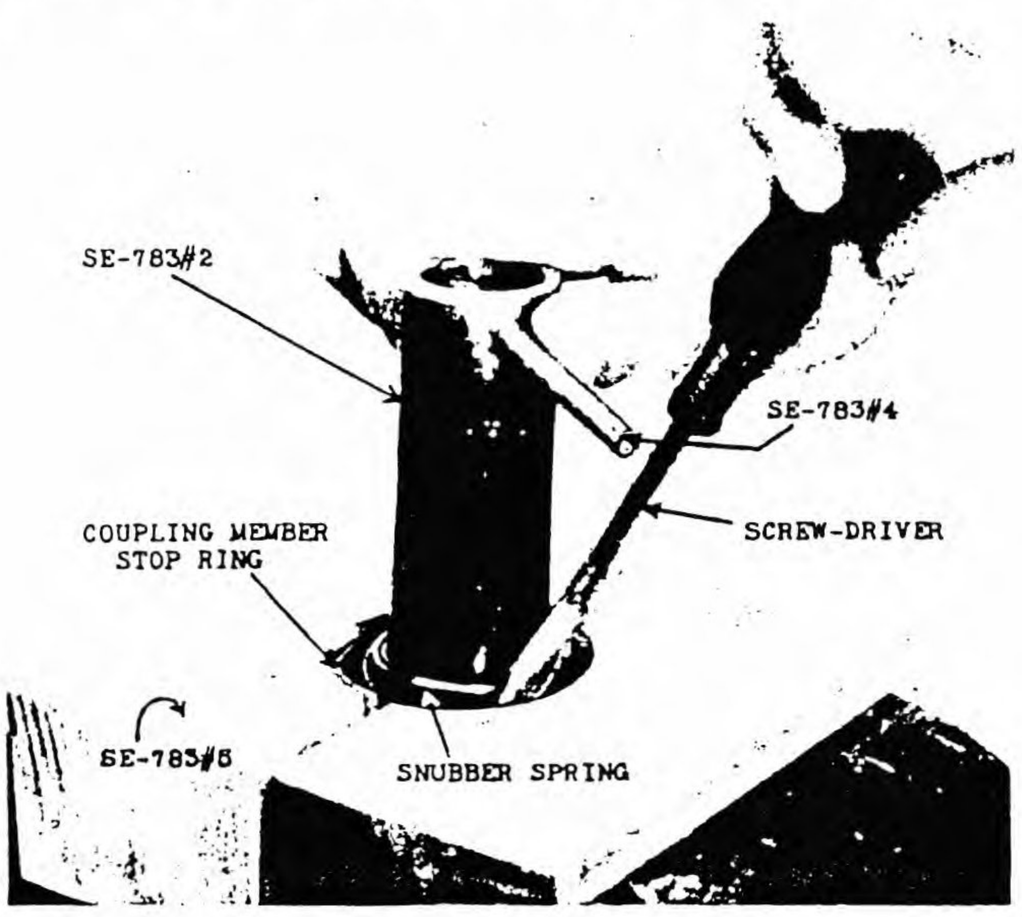
ILLUST. 53--COUPLING MEMBER UNIT. NOTE THAT SNUBBER SPRING IS WOUND THROUGH ABOUT ONE-HALF REVOLUTION.

the snubber spring felt in Illust. 58. Too much overlap will result in excessive coupling oscillation (or vibration) which may cause irregular impulsing at slow speeds. Overlap must be checked as follows:

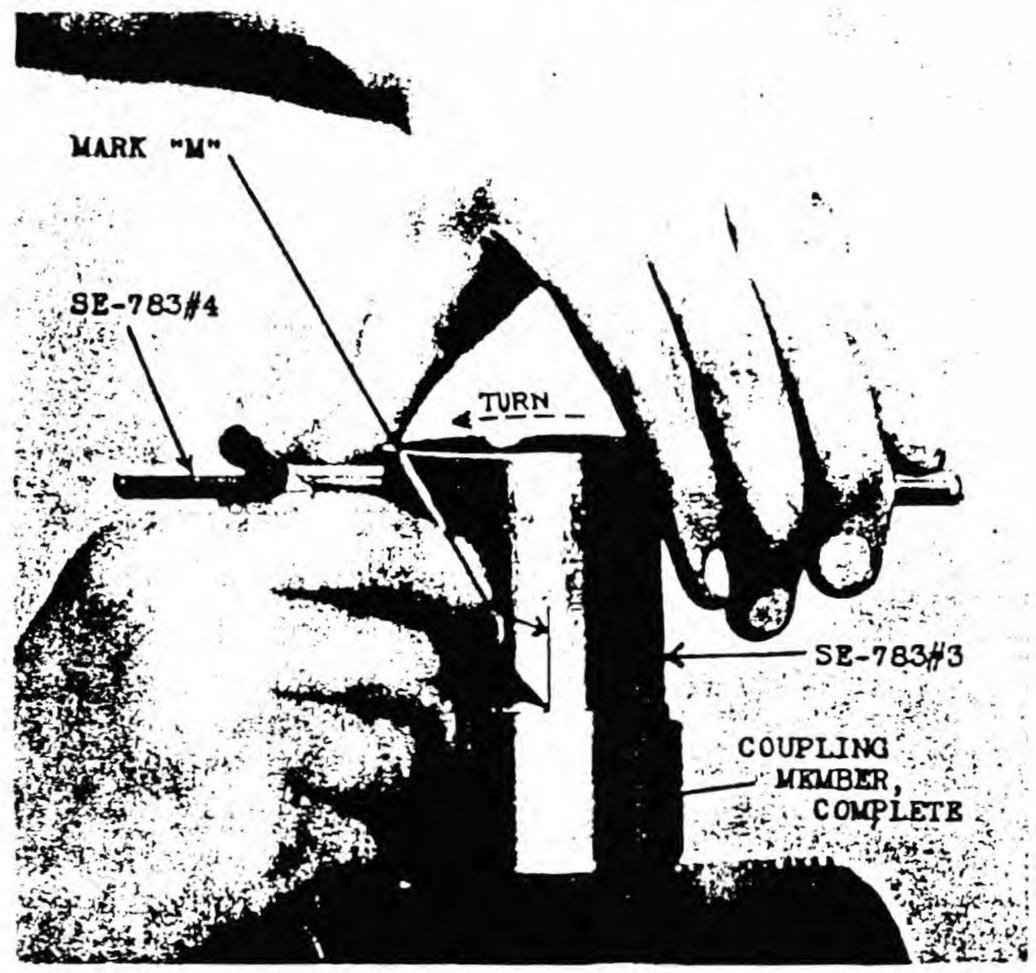
(a) Assemble the coupling member stop ring, without the snubber ring, so that lug "L" fits into groove "G",Illust. 53. Using winder SE-783 No. 3, turn the stop ring counterclockwise as far as it will go. (See Illust. 53). Note that there is a mark "M" (Illust. 57) on SE-783 No. 3. Using a pencil, extend a radial line from this mark cut across the edge of the coupling member. The pencil line must be plainly visible.

(b) Remove coupling ring and assemble the snubber spring into it by reversing operation 8.

(c) Bend a piece of heavy wire or wire solder into a loop as shown in Illust. 56 and place it inside the coupling member. The idea is to keep lug "L" from catching in groove "G", Illust. 53.



ILLUST. 54--REMOVING SNUBBER SPRING FROM COUPLING MEMBER STOP RING.

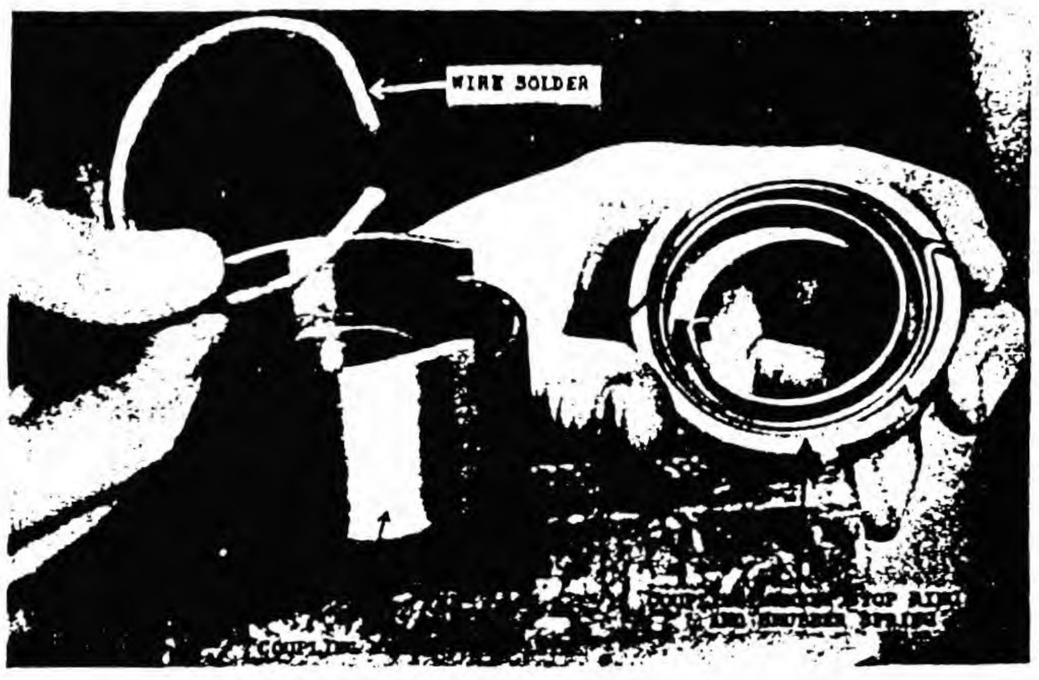


ILLUST. 55--DETERMINING SNUBBER SPRING OVERLAP.

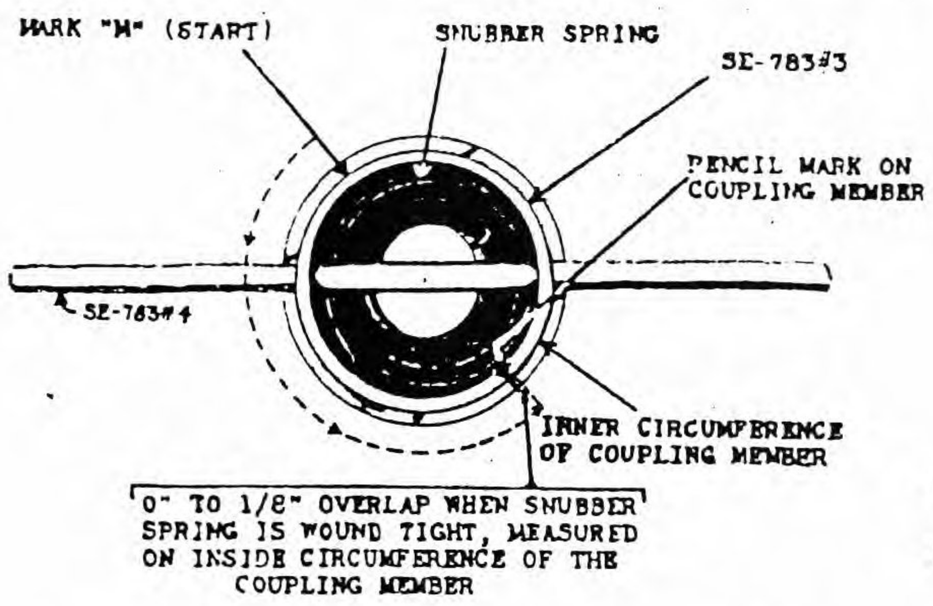
(d) Assemble the coupling stop ring with the snubber spring, into the coupling member. Again using SE-783 No. 3, start with mark "M", turned to the opposite side of the coupling from the pencil mark (Illust. 57), and wind the snubber spring counterclockwise until wrapped tight. Mark "M" on SE-783 No. 3 should then be 0 to 1/8" beyond the pencil line, in the direction that the winder was turned, measured as instructed in Illust. 57. If this measurement is within the specified limits, the snubber spring is of proper length and can be assembled without the use of felt.

When mark "M" fails to turn as far as the pencil mark, the spring is too short for the assembly being tested and must not be used. Assemble another spring and again check overlap.

When mark "M" turns beyond the 1/8" limit, remove snubber spring from coup-



ILLUST. 56--DETERMINING SNUBBER SPRING OVERLAP.



ILLUST. 57--FINAL OPERATION IN DETERMINING SNUBBER SPRING OVERLAP.

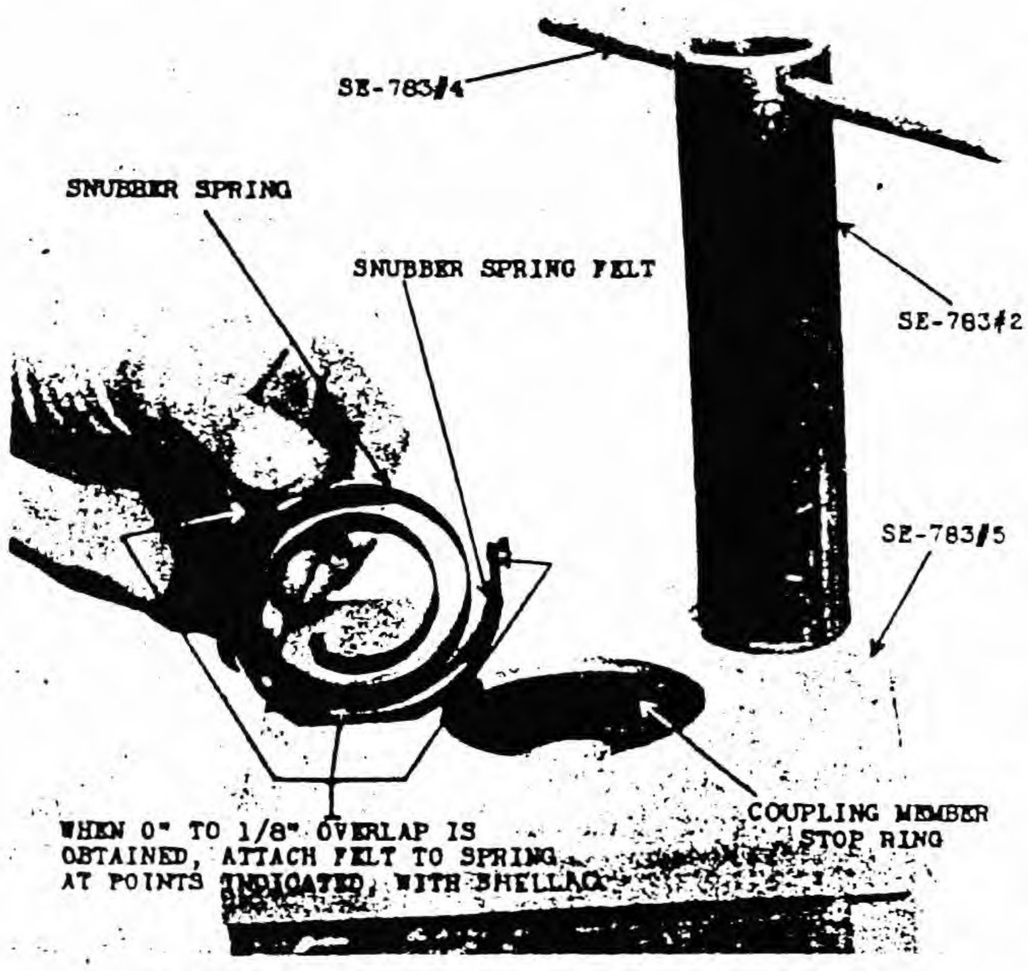
ling member stop ring and insert a strip of felt as shown in Illust. 58. Then repeat operation (D). If mark "M" then fails to turn as far as pencil mark, cut off a little of the felt and remeasure overlap. Repeat this procedure as often as necessary until desired 0 to 1/8" overlap is obtained. Then shellac felt to spring at several places as indicated in Illust. 58.

Winding and testing coupling: In reversing operation 7, remove the wire loop (Illust. 56) from the coupling member. Assemble the coupling member stop ring with the snubber spring (and felt if required), being sure to wind the spring counterclockwise with SE-783 No. 3 until lug "L" catches in groove "G" (Illust. 53). Reverse operations 6 and 5. The outside hooks of both the snubber spring and the drive spring must be all the way down in their retaining slots and the coil of the springs must be pushed down evenly.

In reversing operation 4, be sure to wind the magneto member clockwise as indicated in Illust. 49. This winding must be done with tne magneto member pushed upward as in the illustration.

After reassembling magneto member shaft snap ring, outer, and washer, grip rotating unit in vise as in Illust. 49. Insert winder SE-783 No. 1 and turn magneto member unit clockwise as far as it will go. Release it. The magneto member unit should instantly snap back to its original position, rebounding slightly on account of the snubber spring action. If the performance is satisfactory, reverse operation 3: immerse the rotating unit in cream separator oil, let excess oil drip off, and then reassemble coupling onto magneto.

When the coupling is impulsing normally with the cover off, the line mark on the coupling member unit should lie somewhere between the two timing marks



ILLUST. 58--ASSEMBLING SNUBBER SPRING FELT WHEN SNUBBER SPRING OVERLAP EXCEEDS 1/8".

on the coupling plate at the exact time of tripping. Before reassembling the magneto on the tractor, check this timing to verify the correctness of the coupling assembly. A coupling plate (Illust. 48) that is assembled eccentric with respect to the rotating unit may cause the pawls to catch and fail to trip.

When timing the magneto to the engine, unfasten the coupling cover (Illust. 47) and disengage the coupling by pressing down with one finger on the tail of the pawl that is on top, thus preventing this pawl from catching at "CP", Illusts. 45 and 46.

In regard to proper working and long life of this coupling, too much emphasis cannot be placed on keeping the coupling cover in place except when oiling. Emphasize strongly also that a good grade of cream separator oil or its equivalent must be squirted liberally into the coupling once a week. This forcible lubrication is necessary to insure that the bearing surface between the coupling member unit (Illust. 44) and the magneto member unit receives sufficient oil.

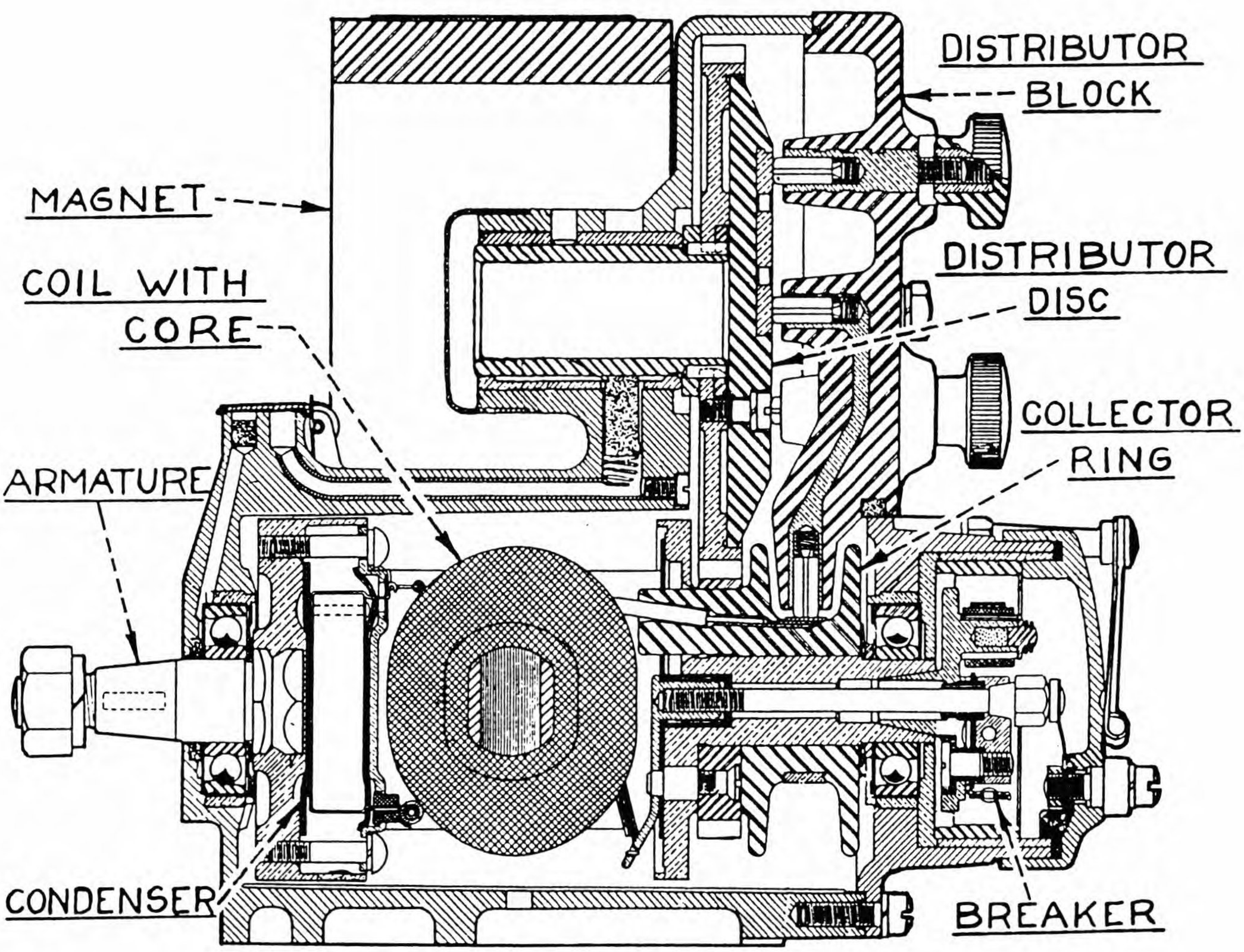
Rust, dirt, gummy lubricant or lack of proper lubrication is always sure to cause sluggish or irregular coupling action. A coupling that is working properly should engage uniformly up to a speed of 100 R.P.M. and should cut out completely at a speed of 180 R.P.M. or less. If the coupling will not engage and disengage at these speeds, clean thoroughly and lubricate with cream separator oil.

INTERNATIONAL E4A MAGNETO

International E4A Magneto—General

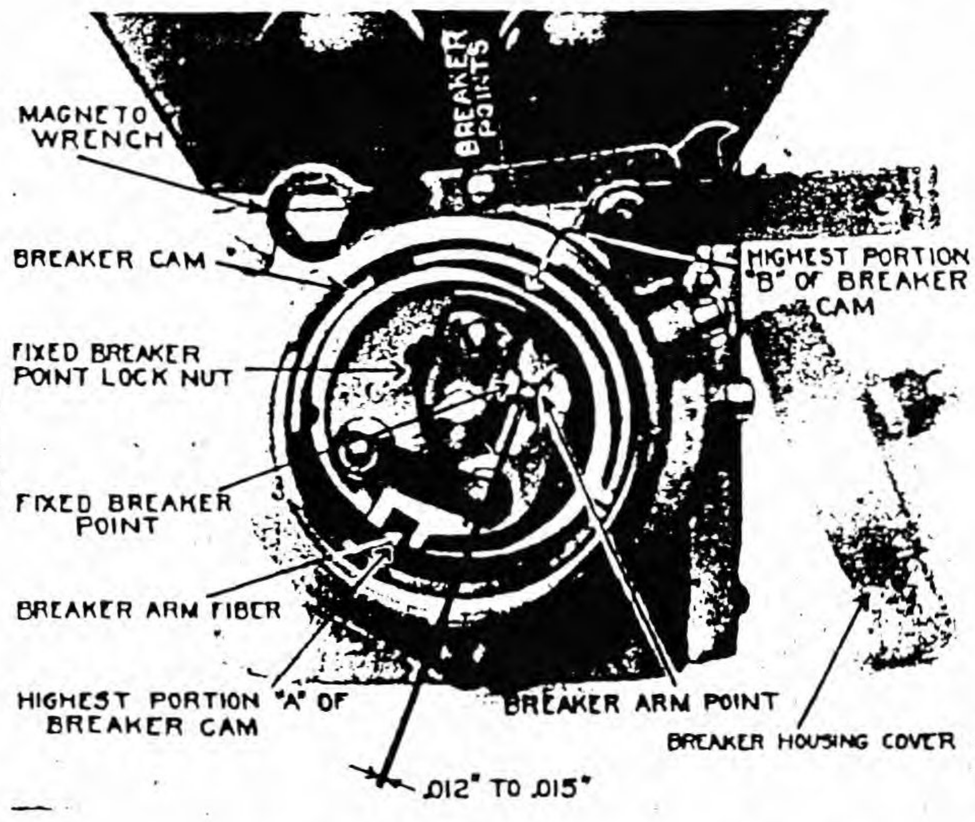
The International E4A magneto is designed for 4-cylinder engines. It is fully enclosed against dirt, dust and moisture. The condenser and coil are located in the armature which rotates between two pole pieces. A conventional horseshoe magnet runs over the magneto and contacts the two pole pieces on either side. Breaker assembly turns with the armature and operates off an internal cam in the magneto frame. The magneto is equipped with a distributor which delivers the spark to the individual spark plugs at just the right moment. It is also equipped with an automatic impulse starter which enables the magneto to furnish to the engine at all speeds an electric current capable of producing a good hot spark. Impulse starter couplings used with the E4A magneto are the International E4A type, the "BX" type, and the "BH" type.

The International F-4 has taken the place of the International E4A magneto. At the present time service parts only are being built for the E4A magneto.



ILLUST. 59--CROSS SECTIONAL DRAWING OF THE INTERNATIONAL E4A MAGNETO

Examination of Breaker Assembly



ILLUST. 60--BREAKER ADJUSTMENT--E4A MAGNETO.

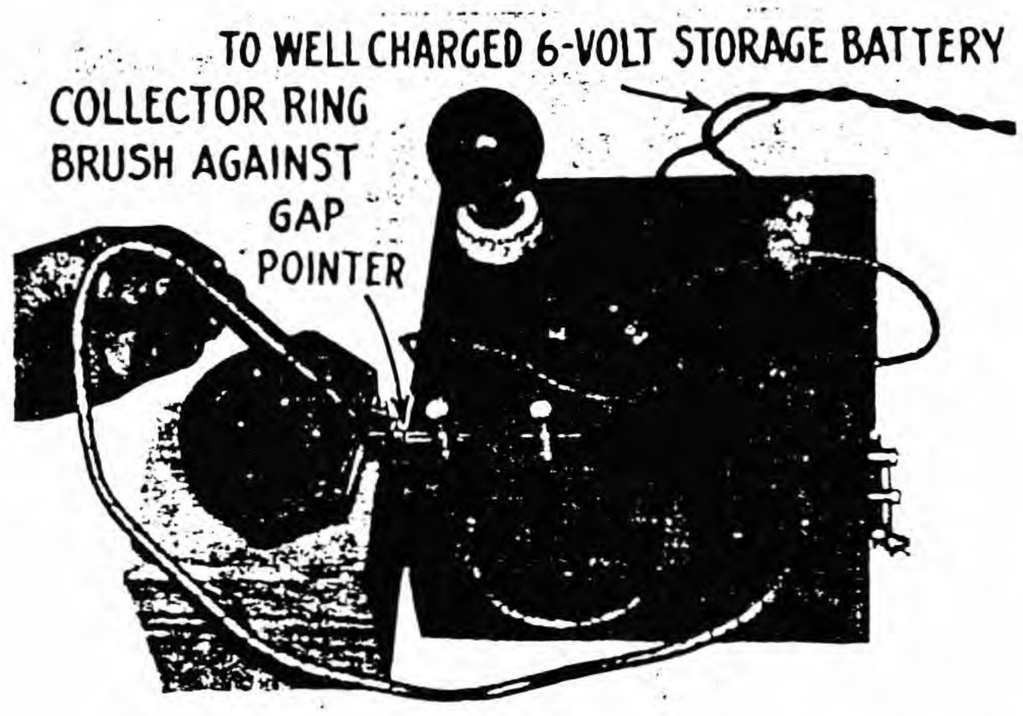
Clean the magneto thoroughly before removing any parts. Remove breaker cover. Inspect short circuiting spring for wear. If the breaker cover no longer short-circuits the magneto when moved to the fully retarded position, it will be necessary to replace the spring. Inspect breaker cover packing and replace if not in good condition.

Breaker point gap should be maintained at .013" at all times. If points are pitted or a ledge of point metal (see Illust. 6) is present, they require dressing; use a sharp magneto point file and dress only to the polishing point. Points should be true to each other to permit perfect contact. Install new breaker points if old ones are badly burned down. Finish by adjusting points to .013" gap clearance, as follows: With rubbing block set on high position of cam, loosen the fixed breaker point lock nut and adjust breaker point to get proper gap setting; then tighten lock nut.

Examination of Distributor

Take off the distributor block after removing two screws and nuts holding it in place. Test the distributor block for cracks, using the high tension circuit in the test set.

Have test set connected as shown in Illust. 61, with collector ring brush against blunt end of gap pointer. Snap on switch and work high tension pointer over surface of distributor block, observing for spark which would indicate a cracked block.



ILLUST. 61--TESTING DISTRIBUTOR BLOCK FOR CRACKS, USING HIGH TENSION CIRCUIT OF TEST SET.

Examine for stuck brushes and make sure they are the E4A brushes (brush is distinguished by groove down one side). If bakelite is burned around the brush holder it usually indicates the brush has been sticking. Stretching the brush spring is not good practice. It is advisible to replace with a new spring and brush. Inspect the felt around the distributor and replace if not in good condition. Good sealing will prolong the life of the brushes, as well as the distributor disc.

Clean the distributor disc with a soft rubber eraser and examine the brush track. The spark spot on the insert should be near the leading edge of the insert. A late spark will cause a spark near the trailing edge of the insert. It results either from incorrect timing of the distributor gears or from running with retarded spark for long periods of time. A worn distributor gear shaft bushing will also result in disc and brush wear. If disc is worn below the edge of the disc insert, it is advisable to replace the disc. This can be done by taking out three screws. Be sure to replace the disc in the same relation to the gear as the one removed from the timing mark or the gear cannot be used in timing the distributor to the armature.

Examination of Ground Brush

Remove the ground brush holder. Clean it and see that the ground brush is free in the holder. Examine the brush track through the ground brush hole in the housing. Track should be clean to make a good contact with brush. Replace the ground brush holder.

Safety Gap

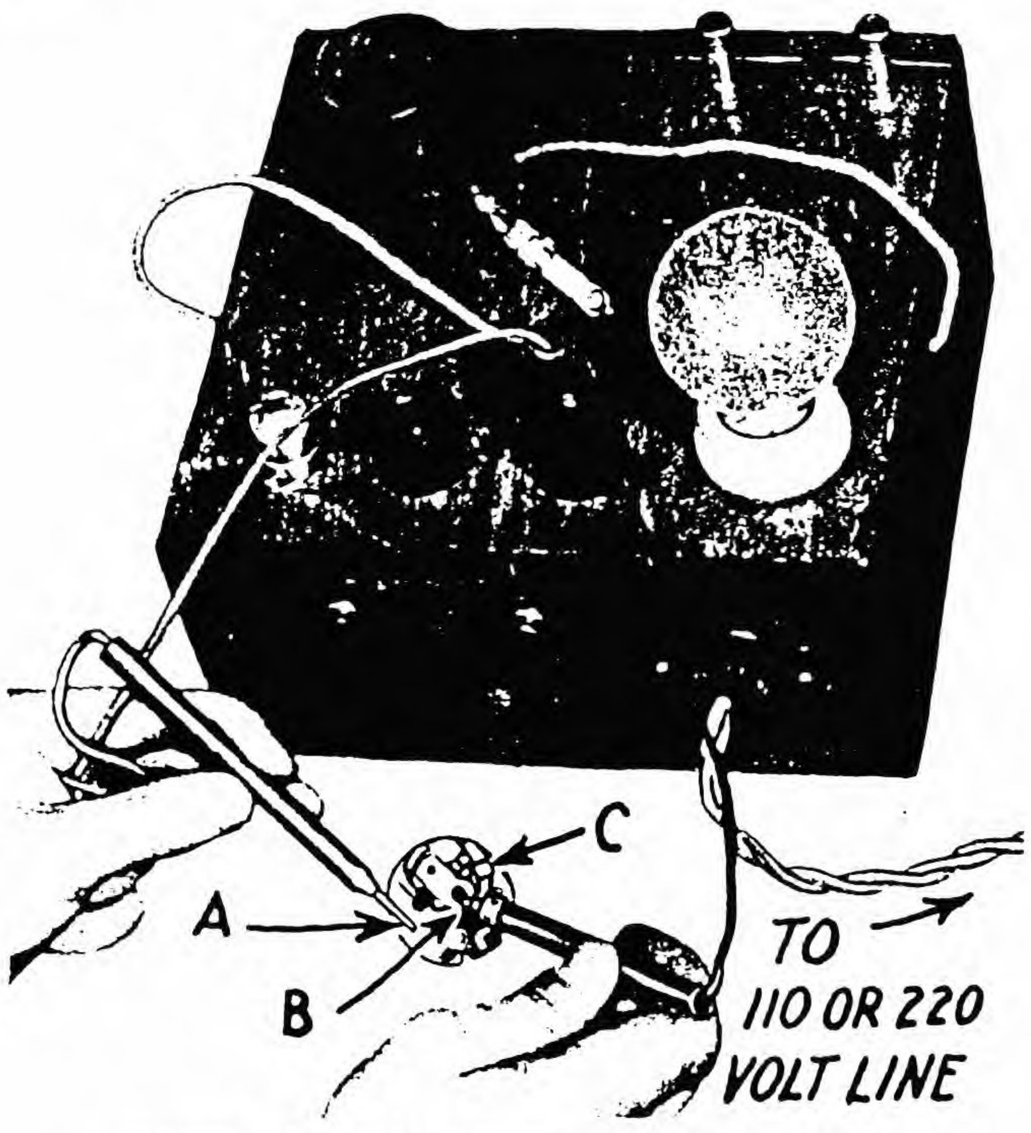
If the breaker and distributor are both found in good condition, carry the examination further. Leave the distributor block off, advance the spark, disengage the magneto starter pawl, then turn the armature briskly by hand. A spark should jump regularly across the safety gap.

Examination for Safety Gap Sparking

We will assume the spark is still unsatisfactory, intermittent and weak. The examination must proceed still further. Take out four screws holding name plate and remove magnet. Recharge magnet as explained under the heading "Magnet" on Page 33. Replace the magnet on the magneto. Magnet can be assembled on magneto either way as the direction of current through the breaker points is reversed with each succeeding break.

Again turn the armature briskly by hand and observe if a spark jumps regularly across the safety gap. If spark does not jump safety gap it will be necessary to remove the magnet; place a soft iron keeper across the poles, and follow the dismantling and testing procedure that follows.

Remove breaker cover and turn out breaker screw which holds breaker in place. Remove breaker assembly. Breaker assembly may be tight on shaft and can be loosened by manipulation of breaker screw in breaker assembly.



ILLUST. 62--TESTING BREAKER ASSEMBLY OF E4A MAGNETO FOR GROUND.

Test breaker assembly for ground as shown in illustration. A dry piece of wood "C" placed between the stationary point support and the breaker arm will hold the points open. Place test point "A" on breaker carrier, and test point "B" on stationary point support as shown. Test lamp should not light when making test.

Magnet

The E4A magneto magnet can be removed after taking out four screws holding name plate and magneto band. Magnet can be charged using the spool type magnetizer SE-858 and following the same procedure as explained on Page 20 for charging the F-4 and F-6 magneto magnets. Original factory polarity of the magnet should be maintained, when recharging magnet on magnetizer. See Illust. 30 for inserting magnet in spools correctly. E4A magnet can be assembled on the magneto either way; the direction of current through the breaker points is reversed with each succeeding break.

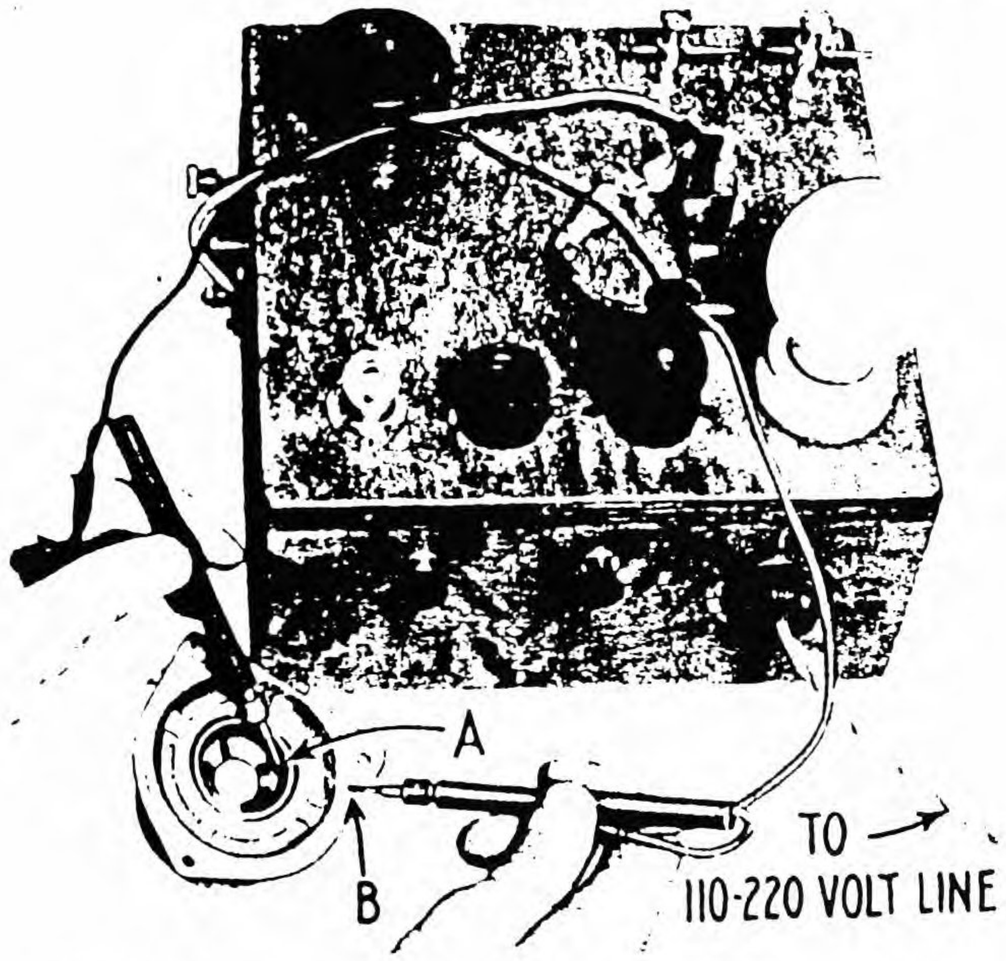
Removing Armature

Remove impulse starter coupling. Screw out safety spark gap screw. Remove ground brush holder and brush. Pry off distributor gear shaft cover and remove distributor gear shaft snap ring and lock washer. Remove magneto end plate and breaker housing, complete. Distributor gear assembly, together with the armature, can then be removed from the magneto frame.

Testing Bearing Race Insulation

Test outer bearing race insulation of both front and rear bearings, using either 6-volt test circuit or 110-220 volt test circuit of electrical test set as shown in Illust. 63. Frequently dust and dirt are a very good conductor of electricity; therefore it is essential that the space around the bearing race be thoroughly cleaned before making test. Hold one test point on outer bearing race and other test point on housing. (See "A" and "B" in illustration.) If test shows shorted condition using 110-220 circuit it is advisable to recheck, using 6-volt circuit. If test shows shorted condition using 6-volt circuit, it is necessary to remove race and install new insulation.

Magneto bearing race puller tool SE-1020 and magneto bearing replacer tool



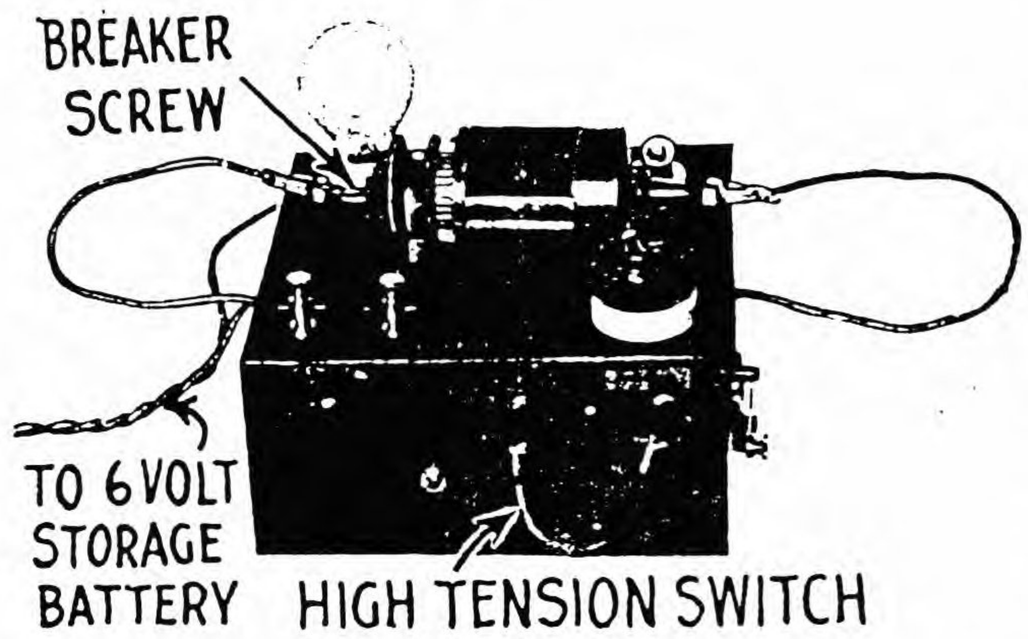
ILLUST. 63--TESTING BEARING INSULATION IN END PLATE AND BREAKER HOUSING OF E4A MAGNETO.

SE-1021 should be used for removing and replacing bearing outer race (see Page 23). Insulation must be of even thickness around bearing race and free of wrinkles. Cut excessive insulation around bearing race after race is assembled in place, and test with electrical test set. A shorted condition will destroy the lubricant in the bearings.

Testing E4A Magneto Coil

Have vibrator switch "off" and high tension switch connected to "armature" terminal. Insert breaker screw into armature so that screw is centrally located, is not bent, or screwed in too tightly. Set armature on test box, pushing its collector ring all the way down into collector ring holder. Clip winding test ends to ends of armature as shown.

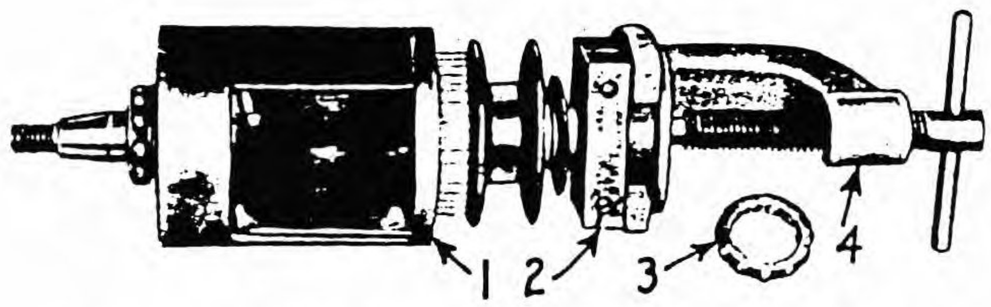
Snap on vibrator switch. Spark should jump 5/16" spark gap continuously, except possibly for occasional skip due to



ILLUST. 64--TESTING E4A ARMATURE WINDINGS USING ELECTRICAL TEST SET.

vibrator. Spark should not jump from armature windings to core. No sparking should occur at collector ring lead-out. If there is sparking here, collector ring should be removed with use of puller SE-839, as shown in Illusts. 65 and 66.

Removing E4A Armature Parts



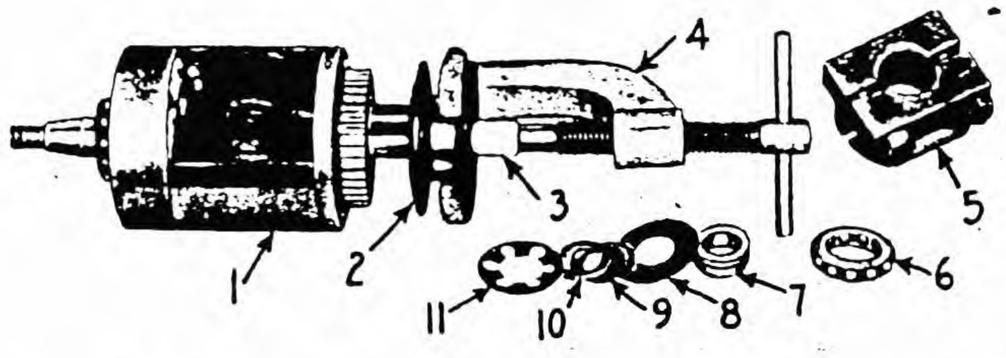
ILLUST. 65--PULLER SE-839 REMOVING BEARING INNER RACE FROM BREAKER END OF E4A MAGNETO ARMATURE.
1--E4A ARMATURE. 2--ARMATURE BEARING RACE ADAPTER SE-834-4.
3--BEARING RETAINER WITH BALLS.
4--BEARING PULLER WITH SCREW

Bearing retainer with balls is readily pried off inner race with screw driver. Inner race is removed as shown in Illust. 65. Collector ring is removed as shown in Illust. 66. Parts are shown in order in which removed.

Assemble new ring and repeat coil test as explained with Illust. 64. A

CAUTION: Armatures with high resistance primary windings tend to reduce current flowing in circuit and to unbalance vibrator operation. As a consequence, they give a somewhat then and sometimes slightly skippy spark across a 5/16" spark gap. The E4A "C" winding, identified by a "CW" on the winding insulation, is of this type.

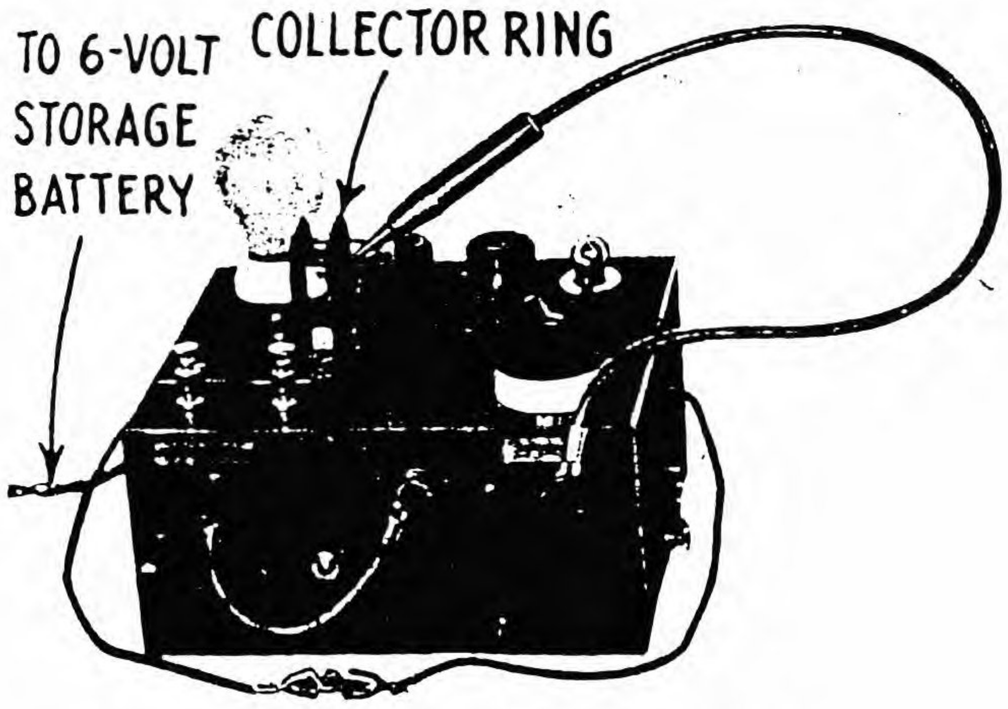
The E4A "C" winding generally gives best spark across test gap with vibrator point adjustment screwed well down. A steadier spark will be had if the armature primary lead-out wire is unsoldered from the condenser terminal. Never condemn a "C" winding on this test because it does not give as intense a spark, as for instance an "A" or "B" winding. When the "C" winding is assembled in a magneto, where it generates its own electrical energy, it develops just as satisfactory a spark as the other windings.



ILLUST. 66--PULLER SE-839 REMOVING E4A MAGNETO COLLECTOR RING. ARMATURE. 1--E4A ARMATURE. 2--COLLECTOR RING. 3--SCREW EXTENSION. 4--BEARING PULLER WITH SCREW. 5--BEARING RACE ADAPTER. 6--BEARING RETAINER WITH BALLS. 7--INNER BEARING RACE. 8--OIL FLINGER. 9--SHIMS. 10--OIL FLINGER SPACER. 11--COLLECTOR RING LOCK WASHER.

strong sulphur-like odor pervades around a defective winding. This odor also exists at the spark gap; therefore, the source must be carefully distinguished.

Testing E4A Collector Ring.

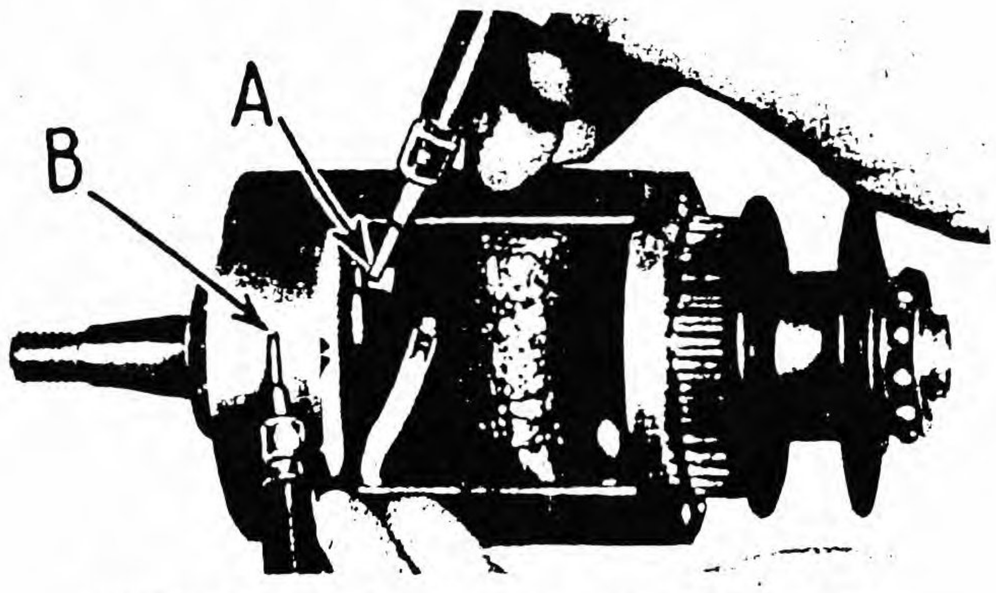


ILLUST. 67--TESTING COLLECTOR RING FOR CRACKS IN INSULATION.

Place collector ring in collector ring holder on test set. Snap switch "on" and move high tension test point over both side faces and in hole of collector ring. Spark should continue to jump gap points and should not jump through insulation.

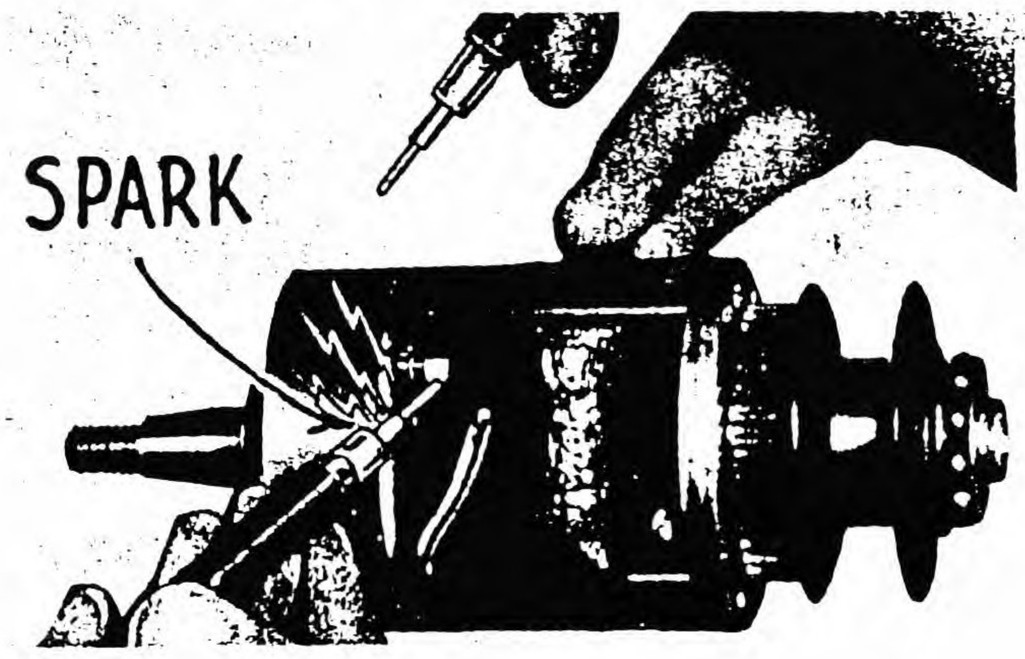
Testing E4A Condenser

Condenser failure on the E4A magneto is rare and testing is usually not required. It is advisable to install a new condenser E4A 608 if there is any doubt as to the successful operation of the old condenser. To test condenser for short circuit and for open circuit it is necessary to unsolder the primary lead-out wire from the insulated condenser terminal. (Place a piece of heat insulating material between soldered connection and coil to protect coil from heat of soldering iron.) Test condenser as shown in Illusts. 68 and 69.



ILLUST. 68--TESTING CONDENSER FOR SHORT CIRCUIT.

Text condenser for short circuit by using only 110-volt test circuit of electric test set. (See Illust. 24.) Hold the test point on insulated condenser terminal "A" and other on grounded face of armature "B". Test lamp should not light. If it does, replace condenser.



ILLUST. 69--DISCHARGING CONDENSER.

Charge condenser as shown in Illust. 68 by holding one test point on insulated condenser "A" and other on grounded face "B". Remove test point to ground face and pivot other test point on condenser terminal to a position where a spark will occur between the side of the test point and a grounded edge as shown in Illust. 69.

With 110 or 220 volts D.C. current a snappy flash should occur every time. With A.C. current a flash may not occur every time; hence the test should be repeated a number of times before condemning condenser. If flash is weak or if no flash occurs after many attempts to charge and discharge condenser, it is necessary to replace it with a new one.

Replacing Condenser

Unsolder both wire connections at condenser terminals. Take out four armature driving end plate screws. Mark

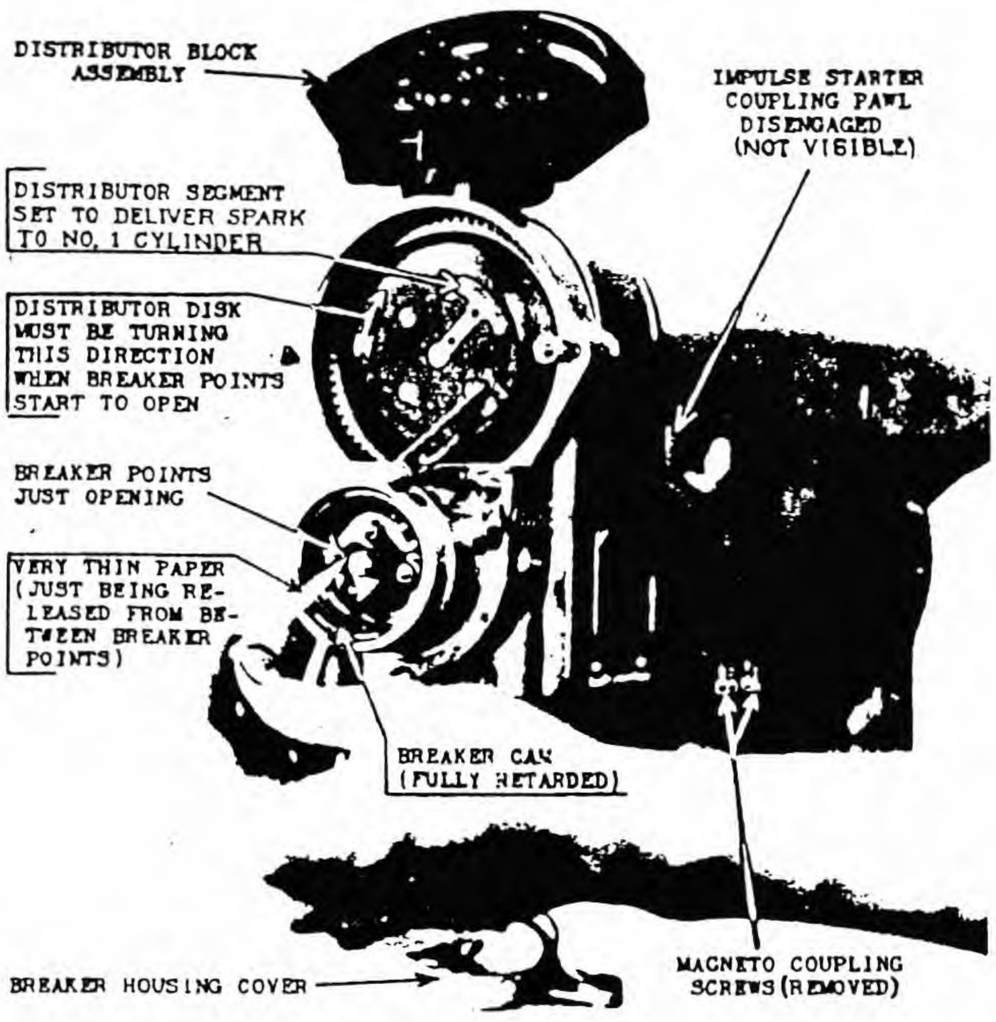
armature driving end plate and center core so they can be reassembled in same relation to each other. Take off armature driving end plate and remove two condenser screws and condenser. Assemble condenser and armature by reversing the foregoing dismantling procedure. Make certain to lock end plate screws with a center punch after screws are drawn up in place and securely solder both wire connections.

Assembling the E4A Armature in Magneto Frame

Magneto armature should be assembled in frame with just enough shims between oil flinger and end plate on driving end of armature to allow no perceptible end play. An accurate test is to assemble the armature in place with the bearings free of grease and oil and the bearing felt removed, then test for end play. Adjustment is made by removing or adding shims.

Distributor is correctly timed when punch-marked tooth in distributor gear lines up with mark on collector ring flange.

Timing Magneto To Engine



ILLUST. 70--TIMING MAGNETO TO ENGINE.

Fully retard spark by raising breaker housing cover. Then remove breaker housing cover by pulling it straight back. Test for .013" point opening. Remove distributor block. Line up magneto assembly on magneto bracket and insert four cap screws. Remove two magneto coupling screws. Crank engine until No. 1 piston is on firing dead center position. Then rotate the impulse starter coupling as shown in illustration (impulse starter coupling pawl must be disengaged), so that distributor disk moves in direction indicated. Stop rotating the instant breaker points start to open and distributor segment is in position shown delivering a spark to No. 1 cylinder. Insert two magneto coupling screws, taking great care not to disturb setting of magneto.

Reassemble distributor block assembly and put on the breaker housing cover. On magnetos equipped with "BX" or "BH" type impulse starter couplings, engage the pawl. Replace the cover on E4A type coupling. Then crank engine slowly, stopping the instant coupling trips. The trip should occur when the engine is on dead center or from dead center to 8° after dead center. If the trip occurs within these limits, the magneto is ready for service. If trip does not occur within these limits, recheck timing; also check impulse starter coupling.

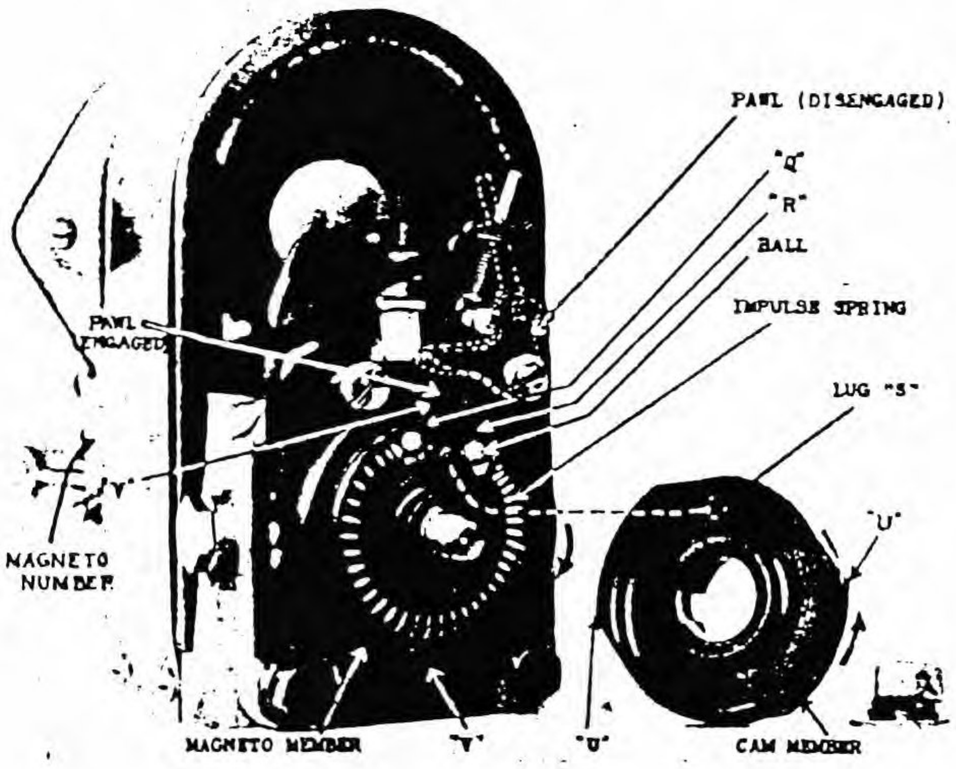
Model "BX" and "BH" Impulse Couplings

International E4A magnetos can be equipped with any one of three types of impulse couplings. The International E4A type covered on pages 26 to 30 of this Manual; the Model "BX" impulse coupling, and the Model "BH" impulse coupling which are both covered in the following pages. The Model "BX" and "BH" impulse couplings serve the same purpose as the International "F" type automatic impulse coupling. It is necessary to manually engage the pawl on the Model "BX" or "BH" impulse coupling if it has been disengaged.

How the Model "BX" and "BH" Impulse Couplings Work

Illustration shows a Model "BX" impulse coupling. The magneto member is keyed to the armature driving end. The cam member is locked to the "magneto and governor shaft" and is always driven steadily at engine speed. Lug "S" fits between the two balls, which are held apart by the knobs "Q" and "R". The pawl, when engaged, catches successively in notches "V" as shown, holding the magneto member and armature from turning until peak "U" of the steadily rotating cam member lifts the pawl out of "V". In the meantime the impulse spring has been compressed by lug "S" through a little more than one-fifth revolution. Therefore, when the pawl is tripped, this

MODEL "BX" AND "BH" IMPULSE COUPLINGS



ILLUST. 71--MODEL "BX" IMPULSE COUPLING PARTIALLY DISMANTLED. THE MODEL "BH" COUPLING IS SIMILAR, THE PRINCIPAL DIFFERENCE BEING THAT ITS MAGNETO MEMBER ASSEMBLY IS MADE UP AS SHOWN IN ILLUST. 75.

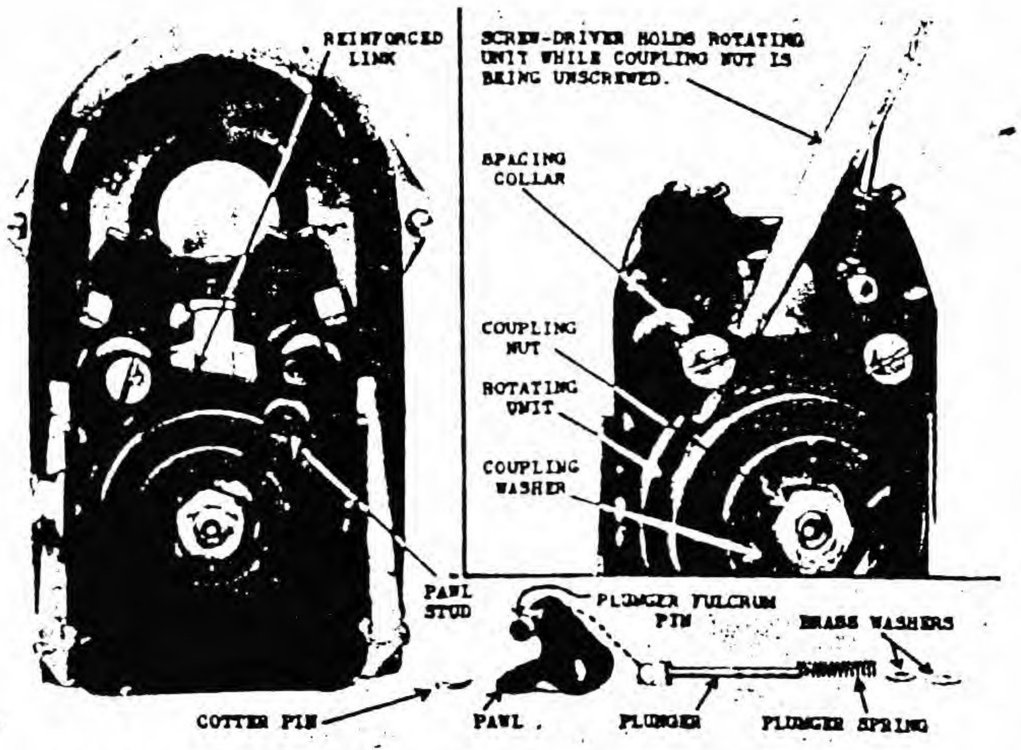
spring expands behind the ball held by knob "Q", hurling the magneto member and armature rapidly forward. There being two notches "V", this action occurs twice during each revolution.

Leverage exerted by the plunger spring holds the pawl in engaged position until the engine's speed exceeds 140 to 240 R.P.M. Then the impact of peak "U" is sufficient to throw the pawl back into disengaged position, where it remains until manually re-engaged.

The Model "BH" coupling operates similar to the Model "BX" except that instead of the balls, it has a cushion-spring (Illust. 75). One end of this spring bears against a lug in the magneto member. The other end makes contact with lug "S", Illust. 71, which fits between the cushion spring and the compression spring, Illust. 75.

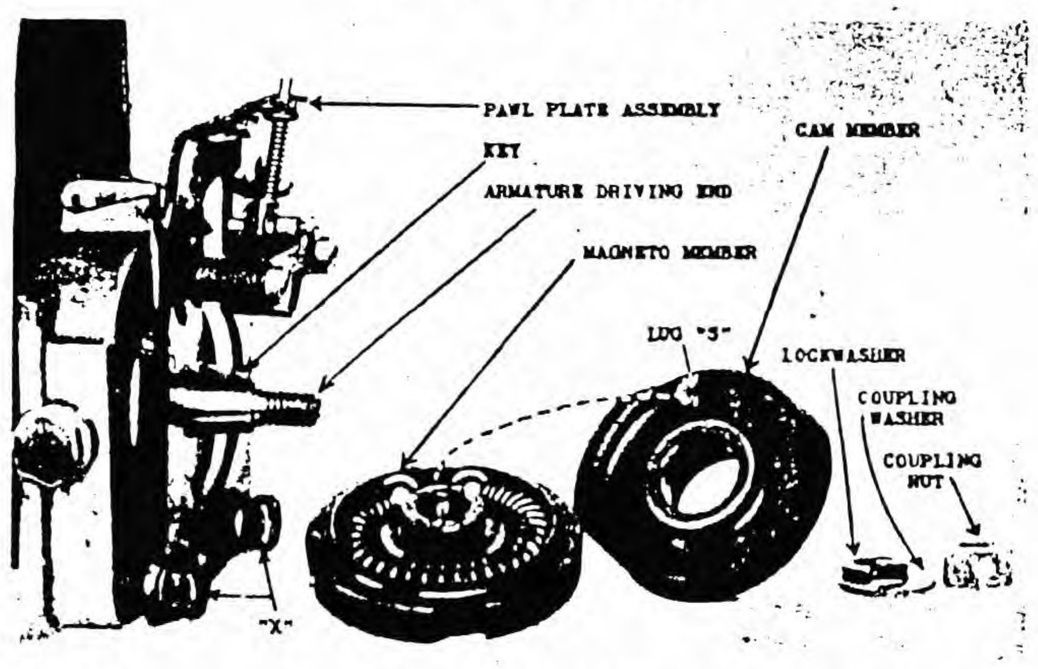
Adjusting Pawl for Throw-Out Speed

The pawl stud (Illust. 72), pawl, plunger, plunger spring, spacing collar and reinforced link, can be removed with the magneto assembly on the tractor. Engine speed at which the pawl will be thrown out of engagement is adjusted by varying the tension of the plunger spring. This is done by means of brass washers. Adding washers raises the throw-out speed; removing washers decreases it. Throw-out speed should be from 140 to 240 R.P.M. Parts should be clean and lubricated with machine oil. Pawl must work freely on its stud, and the plunger and its fulcrum pin must be free.



ILLUST. 72--MODEL "BX" IMPULSE STARTER COUPLING PAWL ASSEMBLY DISMANTLED. INSERT SHOWS ONE WAY OF HOLDING ROTATING UNIT FROM TURNING WHILE UNSCREWING THE COUPLING NUT.

Removing and Dismantling Impulse Starter Coupling

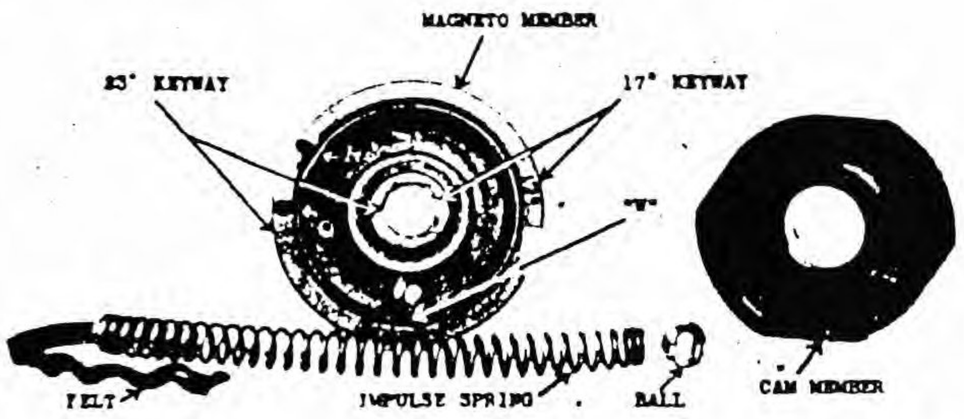


ILLUST. 73--MODEL "BX" IMPULSE STARTER COUPLING PARTS. CONSTRUCTION OF THE MODEL "BH" COUPLING IS SOMEWHAT SIMILAR ALTHOUGH MOST OF ITS PARTS ARE NOT INTERCHANGEABLE WITH MODEL "BX" PARTS.

Hold rotating unit from turning as shown in Illust. 72. Remove coupling nut Illust. 73, lockwasher, coupling washer, and rotating unit. If a screw driver is used to pry off the rotating unit, extreme care must be exercised to avoid crushing the magneto frame. The pawl plate assembly can be removed next by taking out the two cap screws "X", Illust. 73. Pry apart magneto member and cam member, Illust. 73. Impulse spring can be pried out by inserting a screw driver between the spring and one of the balls. Balls can be rolled out only at notch "W", Illust. 74.

Compression spring, Illust. 75, in Model "BH" impulse couplings can be pried out with a screw driver. The cushion spring snaps securely in place and does not as a rule need to be removed. Clean and inspect parts.

Reassembling Rotating Unit



ILLUST. 74--MODEL "BX" IMPULSE STARTER COUPLING ROTATING UNIT DISMANTLED. THE 23° KEYWAY IS USED WHEN MAGNETO IS EQUIPPED WITH 35° BREAKER CAM (SEE ILLUST. 76); THE 17° KEYWAY IS USED WHEN THE MAGNETO IS EQUIPPED WITH 42° BREAKER CAM.

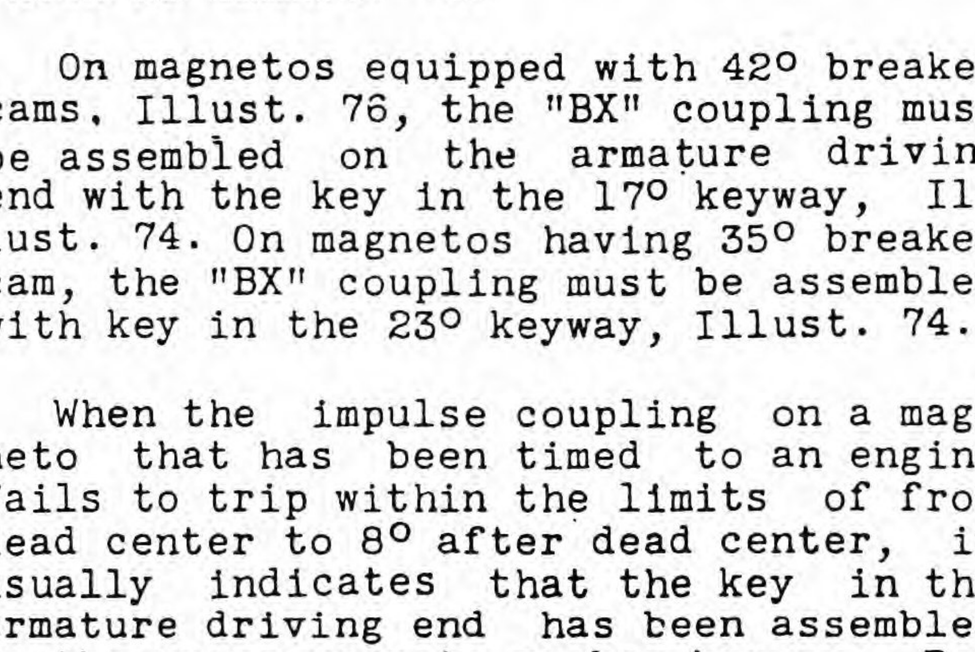
Model "BX" Rotating Unit:

Insert balls at "W", Illust. 74, and roll them into position. Be sure that knobs "Q" and "R" engage balls an ample amount; if balls slip past knobs, magneto will be thrown out of time. Assemble felt into impulse spring, press ends of spring into place against balls, after which middle portion of spring can readily be pressed into position. Pack spring with vaseline, or with a grease that will not become hard and gummy in cold weather. Snap cam member into place, and turn it clockwise on magneto member to test operation of spring.

Model "BH" Rotating Unit:

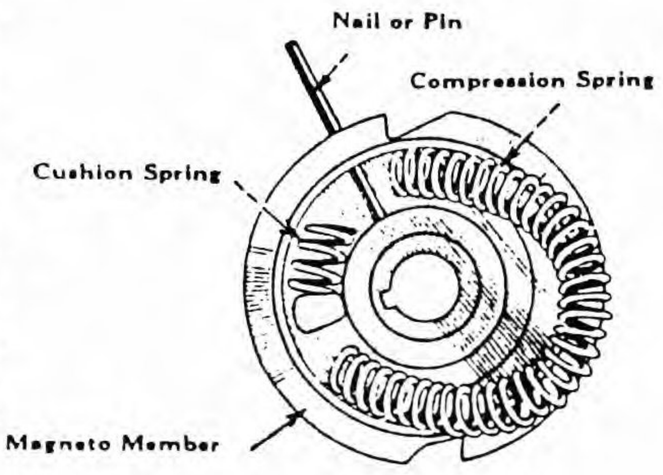
Insert a pin or nail as shown in Illust. 75. Press ends of compression spring into place against lug and nail, respectively, and then press rest of spring into position. If cushion has been removed, see that it is assembled on the same side of the lug as shown in Illust. 75. Pack spring with vaseline, or with a grease that will not become hard and gummy in cold weather. Snap cam member (which is similar to the cam member shown in Illust. 73) into place, with lug "S" between the cushion spring and the nail. Remove nail. Turn cam member clockwise on magneto member to test operation of spring.

The 42° cam was used in all International Type E4A magnetos up to 60401 in magnetos 66001 to 76384, and in magnetos 325000 to 331000. The 35° cam was used in magnetos 60401 to 66001, 76384 to 325000, in magnetos above 330999. International Type E4A magnetos have been equipped with two types of breaker cams, namely, a 35° cam and a 42° cam (Illust. 76). The degrees signify range of spark advance, which is limited by the cam ring stop pin. This pin fits into the 11/16" slot of the 35° cam, and into the 25/32" slot of the 42° cam. In identifying a cam, be sure that the slot measured is on the opposite side of the cam from the grooves, Illust. 76.



ILLUST. 76--E4A MAGNETO 35° AND 42° BREAKER CAM.

ILLUST. 75--MAGNETO MEMBER ASSEMBLY OF MODEL "BH" IMPULSE STARTER COUPLING. THE NAIL OR PIN IS INSERTED WHILE ROTATING UNIT IS BEING ASSEMBLED TO LEAVE SPACE BETWEEN THE COMPRESSION AND CUSHION SPRINGS SO THAT LUG "S" (ILLUST. 73) OF THE CAM MEMBER CAN BE SNAPPED INTO PLACE. NAIL OR PIN IS THEN REMOVED.



Reassembling Impulse Coupling onto Magneto

The Model "BH" coupling is used only on magnetos having 42° breaker cams. The Model "BX" coupling is used with either cam, its magneto member being furnished with two keyways identified as shown in Illust. 74.

On magnetos equipped with 42° breaker cams, Illust. 76, the "BX" coupling must be assembled on the armature driving end with the key in the 17° keyway, Illust. 74. On magnetos having 35° breaker cam, the "BX" coupling must be assembled with key in the 23° keyway, Illust. 74.

When the impulse coupling on a magneto that has been timed to an engine fails to trip within the limits of from dead center to 8° after dead center, it usually indicates that the key in the armature driving end has been assembled in the wrong magneto member keyway. Before removing the magneto assembly, however, recheck the setting of the magneto breaker points and the timing of the magneto to the engine. Check also the pawl assembly, Illusts. 71 and 72, and make sure that the pawl plate is assembled "square" with the magneto frame. If the impulse spring is broken, or if one of the balls slips past knobs "Q" or "R", Illust. 74, magneto cannot be timed correctly. Make sure this does not happen.