STARTING SOMETHING

Easy Starting Under Adverse Conditions

To "start something"—be it a Ford, or a hot time, in this the winter of our discontent—is often more easily said than done. Of course, if there is a long hill, extending downward from the door of one's garage, there is no need to worry about starting—all one has to do is to get into the Ford and coast down hill, using the inertia of the car to "crank her over"—when the high-speed gear is engaged.

In hilly districts, foxy drivers stop their Fords with the car's nose down hill. Then, when starting time comes—five minutes or five hours later—it is easy to let the inertia of the car crank the engine. This stunt is worth remembering—even if you can't stop exactly in front of your best girl's house.

When starting down hill, hold the clutch pedal out, and do not engage the high-speed gear until the car has attained some speed, so that the weight of the moving car will "break loose" the oil of the stiff Ford engine, and start the engine in motion.

Be sure that the headlights are turned off, and the carburetor adjusted for a very rich mixture, before starting to coast.

USING JERK START.

On very slight down grades—only enough to get the car up to a speed of three or four miles an hour, with the clutch pedal in neutral, one can often start the engine by jamming the clutch pedal suddenly and forcefully into forward, into low gear; thus giving the engine a few quick turns, before the resistance of the engine stops the car.

By using the low gear and spinning the engine fast, a much hotter spark and greater suction in the carburetor is secured—thus greatly increasing the chances of starting the engine; as compared with the languid, half-hesitating cranking of the combination of high-gear and low engine speed.

Of course, when this low-speed starting stunt is tried, one must be ready to disengage the clutch. in a snappy manner, as soon as the engine begins to fire. Otherwise, the car will probably stall the engine, and there will be severe jerking and strains, on both car and engine—due to the irregular firing of the engine when starting.

DON'T START IN REVERSE.

Don't try to start the engine by using the reverse gear, when backing down a hill. It is practically impossible to do this because, when in reverse gear, the engine makes so many turns, for each turn of the rear wheels, and there is so darn much friction in the reverse gear, that the only result of trying the stunt is to lock and slide the rear wheels, causing terrific strains on the tires and wheels, and the rear axle system. It may result in shearing off the keys, or breaking one of the axle gears or axle shafts. Turn the car around, when you wish to start by coasting the car.

We will admit that cars, other than the Ford, can start the engine by using the reverse gear, when backing down hill. But, cars other than the Ford, have sliding gear transmissions, in which there is much less reverse gear friction than in the planetary transmission of the Ford. We've tried this enough to make certain that theory and practice agree, that it should never be done. We wouldn't even do it on another fellow's car!

When one "has a gang along," and they are of the useful sex, then it sometimes pays to have one or more men shove the car along the road, while the driver holds the clutch pedal in neutral, until the car has attained a speed of a couple of miles an hour.

Then the driver should "suddenly and forcefully" jam in the low speed pedal, to spin the engine before the car comes to a dead stop. Decisive action is necessary—and he who hesitates is stuck! The quick spinning of the engine, accomplished in this manner, will often effect a start, when no amount of persistent hand cranking will do any good.

In starting the motor, in really cold weather, spinning the motor will often effect a start when no amount of slow, pull-ups of the starting crank are of any value. When the motor is spun, the magneto generates a hotter spark, which is better able to fire the lean, cold mixture in the cylinders. Also, when the engine is cranked rapidly, there is better suction in the cylinders, and this draws the air and gasoline through the carburetor faster, and secures better vaporization.

BEWARE BACK KICKS.

Of course, when spinning the motor, one in more apt to be injured by a back-kick, than when merely pulling up on the starting crank. To avoid injury from this source, there are two small, but vital, little hints. One is to spin the motor with the elbow bent. The straight arm stunt is all right for football, but it is all wrong for cranking a Ford.

If one cranks the engine with the arm straight, and a back fire occurs, there is nothing to bend or flex, and the direct jerk is

very apt to break a wrist or arm, or dislocate the collar-bone.

However, with the elbow bent—then a back-fire merely bends the elbow more, and jerks the handle out of the crankee's hand.

If one isn't strong enough to spin the engine — without straight-arming—then one should not attempt to spin it at all.

Several years ago, before electric starters were in use on any cars, the writer used to wrestle with big, six-cylinder cars—and some of them had a nasty habit of back firing. A few cracks on the shin—by the swift flying handle of the starting crank—soon convinced the writer that there was nothing to be gained by standing too close to the radiator when cranking.

By standing far enough away from the radiator—so that a back fire can swing the starting crank handle completely around, without striking the driver—is another "Safety First" precaution that takes much of the danger out of the hand cranking of the Ford engine.

Another way, of reducing the dangers of a back kick, is not to open the throttle too wide. It stands to reason that, if the throttle is only open a few notches, any backfire which occurs, will only be a slow, weak, half-hearted little kick; that is not nearly so apt to injure the driver as the big, mule-sized kick that sometimes occurs when the throttle is wide open.

Strange as it may seem, the timid cranker is the one most apt to be hurt. There is something rather feminine about the Ford engine (besides its sometimes contrariness) that seems to make the engine feel a contempt for the too-gentle cranker, and the engine kicks accordingly.

But, when the masterful, cave-man cranker firmly grasps the starting crank, and gives the crank a whirl—while the engine may make a few half-hearted attempts at a kick—it is more apt to start right off.

There are good mechanical reasons for this. The faster the engine is turning, the less apt it is to back-fire. When the engine is running fast, the spark control lever can be carried away down on the quadrant, at a position that would cause knocking and backfiring at very low speeds.

When the engine is cranked rapidly, the inertia, of the weight of the fly-wheel, tends to carry the engine on and past dead center, in spite of any small back kicks which may occur. At slow cranking speeds, the fly wheel has but little inertia to carry it over dead center, and the back firing explosion has a chance to reverse the direction of rotation of the engine, and get in its dirty work.

These points, in regard to cranking the Ford engine, are emphasized because cranking is so much more difficult in winter, and so much more dangerous—because, in one's anxiety to start the engine, one is so apt to start with wide open throttle, advanced spark, etc.

SPARK LEVER SETTING.

In connection with the use of batteries, we have been informed by our readers, and have checked this up with our own experiences, that a spark setting that is perfectly all right —for use with the Ford magneto—may be entirely too darn far advanced for use with the batteries. This may seem strange, when we consider that the same timer, coils, and other parts are used.

If you have been accustomed to placing the spark lever down about 5 to 7 notches, when starting on the Ford magneto, then push the spark control lever all the way up—to full retard—when starting on the batteries.

If you have found it necessary to retard the spark lever all the way up, when starting on the Ford magneto; then it may be necessary to bend the commutator pull rod, in order to retard the spark more, for safer starting.

When starting on batteries, it is usually better and safer to start by pulling up on the starting crank for, when batteries are used, just as good a spark is secured at slowest cranking speeds, and it is not necessary to spin the motor to get a good spark.

The reason why the engine is so apt to kick on the batteries, even when safely spun on the magneto, lies partly in the fact that the magneto does not given enough spark to fire the charge, unless the engine is being turned so rapidly that it has enough inertia to carry it over dead center, in spite of a half-hearted back fire. Also, there seems to be a certain amount of lag, in the alternating current supplied by the Ford magneto, as compared with the direct current, supplied by the dry batteries.

HOT IGNITION FOR COLD WEATHER.

The colder the weather, the hotter the electric spark that is necessary to ignite and fire the cold, lean mixture of half-vaporized fuel and air.

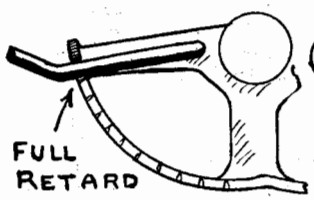
A thin, stringy spark may be so chilled by the gasoline vapor that it may fail to ignite the spark; while a shorter, hot spark—which has power and punch behind it may detonate and fire the charge.

There are two divisions, in easier starting. One is a good fuel mixture while the other is good ignition. They may be compared to the two fists of a boxer—and it is a sure thing that the boxer will be a better fighter if he "has a punch in both hands."

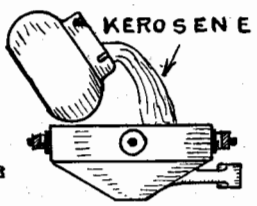
It is sadly true, and truly sad, that when we most need the good, hot spark; this same luscious spark is most difficult to obtain. The Ford magneto requires a fairly high cranking speed, before the magneto will generate enough current to supply the hot, fat spark.

But, when the motor is cold and stiff with congealed oil, then it is about all the driver can do to crank it at all—to say nothing about cranking the engine at a good rate of speed. At below zero temperatures, the writer's Armstrong starter has been sometimes only able to budge the engine, at a very low rate of speed.

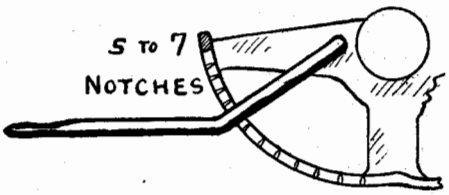
This stiffness, of the Ford engine when cold, is largely due to the peculiar planetary transmission used in the Ford car, as there is no doubt that the cold Ford engine is far harder and stiffer to crank than other engines of the same size.



Battery Start.



Cleans Timer.



Magneto Start.

Some of the friction of the cold engine is due to the fact that the cold oil gums the pistons to the cylinder walls. As an experiment, the writer has removed the spark plugs of a stiff, cold Ford engine, and squirted kerosene onto the pistons, to cut the congealed oil that was gumming the pistons to the cylinder walls. Did it do much good? It did not! The difference was hardly noticeable.

TRANSMISSION OIL DRAG.

When the Ford engine is cranked, the slow speed drum, and the reverse drum spin around inside of their brake bands. Undoubtedly, when the oil is cold and stiff, there is quite a little drag, between the drums and the brake bands. But, the worst is yet to come-

Now the villain appears! Hist!

In the high-speed clutch, there are 25 discs or plates, in very close and intimate contact with each otehr. When the high-speed clutch is released, by the pulling back of the emergency brake lever, the clutch finger ends, which squeezes the discs of the high-speed clutch together, release a distance of less than ¼ of an inch.

Now there are about 25 points of contact, between the discs of the high-speed clutch. And this poor, little ¼ inch is divided up into these 25 spaces, giving a separation, between adjacent discs of the high-speed clutch, of less than .01 inch.

Now one-hundredth of an inch is not a whole lot of space. And this is easily filled by cold, congealed, glue-like oil; which tends to gum the discs of the high-speed clutch together and creates a tremendous drag.

The remedy, in part, is to use a thin, lighter grade of oil in winter than in summer. But, even more important, is to use a high quality, high grade oil. which has a low freezing point; and flows freely at zero—as the expression hath it.

A winter oil has the further advantage of preventing much engine wear in cold weather. If the oil congeals and freezes, it stands to reason that it will not flow to the bearings, until the engine has been warmed up.

Now, it may take some little time for a stone-cold crankcase to warm up to normal temperature in wintry weather, and, if the pistons and cylinder walls are allowed to run without lubrication, until the oil in the crank case gets ready to move around, serious damage to cylinder walls and engine bearings may occur—simply due to the use of poor oil.

JACK UP WHEEL.

The fact that much of the drag in the Ford motor is due to friction and incomplete releasing of the discs of the high-speed clutch, is conclusively proven by the quite generally used stunt of jacking up one of the rear wheels of the Ford car, for easier cranking in cold weather.

Of course, this method is a darn nuisance—but Ford engines have to be started—somehow or other. One of the rear wheels should be securely jacked, so that the wheel just clear the ground, as the vibration, due to the running engine and wheel, sometimes drops the car off the jack. Of course, when there are chains on the tires, it is necessary to jack up the wheel, so that the chains will not catch on the ground and throw the car forward against the driver.

When using this method, it is better to only jack up one rear wheel for, while more complete elimination of friction is secured by lifting both rear wheels—still the rear end of the car is so wabbly and unsteady—when both wheels are jacked up, that jacking up one wheel only, is the most practical method. Also, only one jack is usually available.

The differential gears allow the jacked up wheel to spin, while the other wheel remains at rest upon the ground. If the grease in the rear axle housings is not too heavy, this will not cause undue friction.

Before attempting to start the engine by this method, the front wheels should be **securely blocked**, by about 4 inch by 4 inch blocks. There is sometimes so much friction and vibration when starting that the car will sometimes climb over a mere brick—especially if the brick is only placed in front of the other rear wheel.

And, if the car drops down off the jack. while the rear wheel is spinning, and the high-speed clutch is in gear, this may start the car forward, and run over the driver.

When it comes to getting run over, it is better to get run over by some one else's car—and then one can sue for damages.

Of course, the emergency brake lever is shoved forward, when the car is cranked. But. Fordwise drivers do not place the emergency brake lever **quite** all the way forward. If the emergency brake lever is just pulled back a couple of notches, from the **extreme** forward position, this partially releases the high-speed clutch.

The advantage of this is that. when the

engine starts with a jerk, as it usually does, the slipping of the partially released clutch, reduces the jerks and strains on both engine and transmission and rear axle parts. Also, in case the car should slip off the jack, and start forward, the partially released clutch makes it easier for the crankee to stop the car, by putting his shoulder firmly against the radiator.

When using this "jacked-up wheel method," it is better not to have the spark advanced too far, as a retarded spark tends to lessen the jerks and strains due to the uneven firing of the motor when it is starting.

Aside from using a light, free-flowing oil in cold weather, it seems to the writer that the engine cranks more easily if the oil level is not kept too high. With a high oil level, the cold congealed oil seems to gum up both transmission bands and crank case more, and seems to make the engine harder to start. This is a debatable point—we merely mentioned it—because experience at the handle of an ice cream freezer, has taught most of us the tiresomeness of churning a lot of stiff stuff.

BRAKE LEVER FORWARD.

Another stunt, with which the writer has had but little success—is to leave the emergency brake lever forward, when the car is left in the garage for the night.

According to theory, the squeezed clutch plates keep out the oil. Then, by pulling back the emergency brake lever, just when one is ready to crank the engine, there will be no oil between the clutch plates, to cause drag, and the engine can be cranked readily.

However, it seems that, without oil, the clutch plates still have about as much friction and drag, as when they are glued together with congealed oil. So this method does not work as well, on the Ford car, as it does on paper. But it is an easy method to try.

In using this method, there is a slight risk—very slight in cold weather—that the engine will fire the first shot out of the box, and the car start forward and injure the person cranking the car. Supposing that the car is cranked without the emergency brake lever having been pulled back.

TIMER LUBRICATION.

Scientists say that "dirt, is merely matter out of place." In cold weather, owners of Ford cars are apt to say that "oil, in the Ford timer, is —ll, or worse!" And it surely does make starting hard.

The wide, flat surface, between the timer roller an dthe raceway, becomes covered with cold, congealed oil. This oil, being a perfect insulator, holds the roller out of contact with the metal segment and so no current passes through the contact, and there is no spark at the plugs.

This trouble can be determined by one person listening, at the coil box, while another person cranks the engine.

If the switch is turned "on" and still the coils fail to buzz, the trouble is very likely due to oil in the timer. In this case, the only remedy is to loosen the screw of the clamp spring holding the timer in place, and remove the cotter pin from the commutator pull rod, and then take off the timer.

If the Ford is one of those provided with oil side and tail lamps, a little kerosene oil, from one of these lamps, will make it much easier to clean the timer. At any rate, the raceway, or surface on which the roller runs, should be wiped perfectly clean and dry.

A drop or two of oil on the pin, or axle, on which the roller runs, is all right. But, for cold weather use, it is better not to put any oil on the outer surface of the roller at all.

While the recommendation is usually made that the winter oiling of the timer consist of a mixture of cylinder oil, thinned with 25 per cent kerosene—we believe that, for really cold climates, a 50-50 mixture, of kerosene and cylinder oil, is better.

For lubricating the timer, very thin, light oils, such as sewing machine oil, Three-in-One oil, and castor oil, are sometimes recommended.

Other drivers believe that the best solution of the trouble is not to oil the timer at all, during the cold weather months, when hard-starting is naturally to be expected. They believe that the extra wear, due to the lack of lubrication of the timer roller, is more than repaid for by the easier starting, several times a day.

As a matter of fact, the commutator usually receives some oil, which leaks through from the front end bearing of the camshaft, in spite of the oil retaining washers. Also, the oil breather of the crank case is near by, and this sprays the outside of the timer with oil—some of which gradually works its way inside.

Commutator oiling trouble may cause very hard starting, yet not appreciably affect the running of the warmed-up engine. This is due to the fact that when the engine is running at normal speed, the effect of the centrifugal force of the weight of the roller and the roller arm, slings the roller outward, into more forceful contact with the commutator segments, and insures better contact.

Also, after the engine has been running for a short time, the roller wipes off most of the gummed oil, and the heat and friction thins the oil, so that better contact is made. A good timer is an important help to easier starting.

SPARK PLUG SETTING.

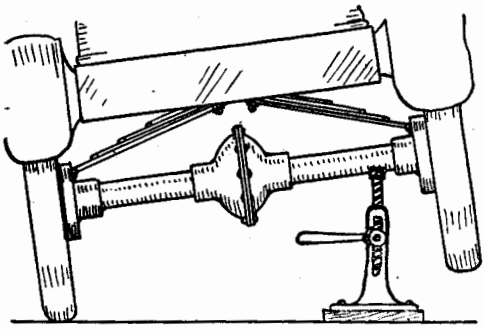
The condition of the spark plugs sometimes makes starting more difficult. If the points of the spark plugs are too far apart. it stands to reason that the Ford engine will have to be cranked fairly fast, before the magneto can generate enough current to jump the wide gap. For easier starting, it is often of considerable help to have the spark plug points rather close together.

The trouble with having the spark plug points too close together is that they are then more apt to become fouled with oil on down grades, and then cause misfiring. Also, too short a gap produces such a short spark, that it does not fire the charge so well.

As 1-32 inch is the standard gap, this can

be made a wee bit less—care being taken to see that the gap is not greater than this, on any of the plugs. This spark plug gap always tends to become greater with use—due to the burning away of the metal of the spark plug points.

Clean spark plug insulators may help easier starting a little. If the insulators are covered with soot and carbon—which carry the current—then the weak current available at cranking speeds is apt to leak through the carbon, and escape. This means that the spark does not jump the gap between the points, and fire the charge in the cylinders as it should.



Jack Up Wheel.

Remove, take apart and clean the spark plugs, and then carefully set the spark plug points to 1-32 inch, or a little less.

COIL UNIT ADJUSTMENT.

When there is so little current available, from the Ford magneto, at slow cranking speeds, we must make the most of it by careful adjustment of the coil unit points. Coil point adjustment has an important influence on easier starting in cold weather.

Whenever possible, the coil units should be tested and adjusted on a coil unit testing machine, with which many Ford Agencies and Service Stations are equipped. As one of these machines costs $50.00, it is not to be considered as available equipment for the individual car owner. The testing and adjusting of coil units is usually done free of charge, the Service Station making a profit on the sale of the new coil points, which are quite often required.

Inspection of the coil unit points shows that only the top half of the points is of Tungsten metal. When this much has been burned away, it is impossible to get a satisfactory adjustment on the remaining points. For this reason, it is quite often true that it is necessary to replace the points. Good coil points will repay their cost in an easier starting and smoother and more powerful running engine.

While standard practice, for summer use, is to adjust the coil unit vibrators to take from 1.4 to 1.6 amperes of current, this means that the engine has to be cranked faster, for the magneto to deliver this much current, than it does if the coil units are so set that they will start to buzz when the ammeter, on the coil unit testing machine, shows about 1 to 1.2 amperes.

At the same time, it takes great care and very careful adjusting to get the coil units to give a good spark at one ampere. Even if the coil units do take as much as 1.2 to 1.4 amperes, this may be considered as very good.

There is some reason to believe that, when adjusted to consume from 1.4 to 1.6 amperes, there is a hotter spark at the plugs. This would tend to make for better running of the engine, after it has once been started.

The vital point is that none of the coil units should take more than about 1.5 amperes, to ensure easy starting and good running in cold weather.

If one does not have a coil unit tester, then the coil points should be filed clean, smooth and true, so that they make good broad contact, over their entire surface, with each other.

The points should separate about 1-32 inch, when the blade is pulled down against the core of the coil. And the tension of the vibrator spring should be enough to give a clear, steady buzz—yet light enough to allow the weak current, from the Ford magneto at slow cranking speeds, to start the vibrators buzzing easily.

TURN HEAD LIGHTS OFF.

While, under favorable conditions, the Ford engine can be started with the head lights turned on, still, for cold weather starting, one should invariably switch off the head lights, spot lights, hand warmers, and other current consuming devices, before attempting to start the engine.

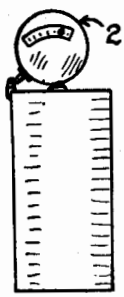
After the engine has started and is running smoothly, at a fair rate of speed, these current consuming devices can be again switched on, without stopping the motor. This makes a big difference in the ease with which a Ford engine can be started on the magneto in cold weather.

MAGNETO STARTING.

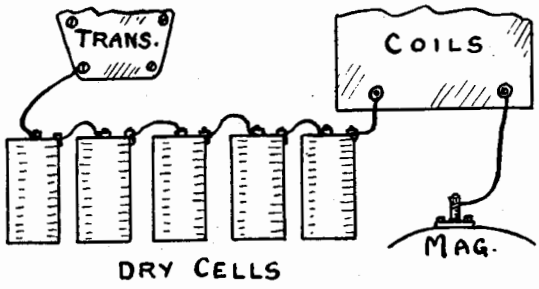
While the 1917 and later Ford engines, which are fitted with the ¾ inch magnetos, are suppose dto give a better spark at cranking speeds, it is the writer's opinion that the chief advantage of the later type magneto, is in its ability to carry the load of the Ford head lights without trouble. Easy starting can be obtained with the old-style Ford magneto, provided, of course, that the magneto is in good condition.

If the rear main bearing of the Ford engine is so worn that it permits end play of the crank shaft, this will tend to allow a greater distance between the magnets and the cores of the magnet coil assembly, when the high-speed clutch is disengaged by pulling back on the emergency brake lever. (By the way, this may be one of the reasons for the success of the method of starting the Ford engine with one wheel jacked up, as then the high-speed clutch is engaged.)

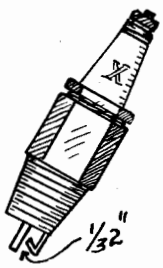
The closer the magnets revolve to the cores of the magneto coil assembly, the stronger the current of the Ford magneto will be. Other causes, of a weak Ford magneto, which would tend to cause hard starting, are weak,



Test Dry Cells



Battery Connection



Spark Plugs.

or partially demagnetized magnets, or short-circuits in the windings of the magneto coil assembly, or dirt under the contact point of the magneto. The strength of the magneto can be tested with a volt-meter, or by the brilliancy of the head lights.

Any broken wires, or poor contact, in the magneto-to-coil wire, or in the switch on the coil box, or even in the contacts between the coil box and the coil units, may tend to make starting more difficult.

One of our readers told us that the trouble, with hard starting on his car, had been due to the coil box holding the coil units so loosely that the units had sagged forward, towards the switch side of the coil box, and were making poor contact with the springs in the back of the coil box. This was remedied by placing a piece of card board between the coil units and the switch side of the coil box, so as to wedge the units firmly back against the contact springs.

One of the whimsicalities of the Ford engine, is that it will often start much better on an advanced spark, than it will on a retarded spark. For this reason, the spark lever should be advanced as much as may be, without causing the motor to back fire and kick.

This position varies, on different Ford cars, according to the adjustment of the commutator pull rod, and the amount of "play" or "back lash" in the joints and connections of the spark control operating mechanism.

Only trial and experiment can determine the best starting position for the spark lever, on each individual Ford car. Roughly, we should guesstimate this at about 5 notches for the spark lever, when the commutator pull rod has been correctly adjusted.

The reason why the motor starts better on an advanced spark, is that then the spark occurs at the top of the stroke of the piston, when the compression is greatest, and when the weak mixture is most apt to fire. Also, with the advanced spark, the explosion develops more power, and so the engine is more apt to keep going, until another "shot" occurs.

BATTERY STARTING.

If the car is fitted with a storage battery, for an electric starting and lighting system, or with a storage battery for electric lights, one should connect this battery to the "battery" post of the coil box, and use this battery current as an aid to easier starting.

A 6-volt storage battery gives just the right current for use with the Ford magneto, and is convenient for electric lamps, which save the driver the trouble of wading around in the snow and fussing with oil lamps—which seldom stay lit—in bad weather.

If the electric starting and lighting system is of the 12-volt type, then the connection, to the battery post of the coil box, should be made to the middle of the storage battery, so that a current of just 6 volts will be sent to the coil box. Using the full 12 volts to the coil box would cause severe sparking and burning of the contact points and would be apt to break down the coil units.

DRY CELLS FOR STARTING.

The use of 5 or 6 dry cells, for starting, is a recommended practice, and ensure sa good, hot spark, no matter how slowly the engine is cranked. Four or 5 dry cells will buzz the coil units, when the batteries are new and strong, and the car is under a warm shop or store room. But, one must not forget that cold slows down chemical activity, and the dry battery, being a chemical device for producing electricity—does not generate as much current at low temperatures. Also the batteries weaken with age.

In order to have a really adequate current for starting, under all conditions, at least 5, and preferably 6, good dry cells should be used. These dry cells should be connected in series; that is. zinc to carbon. zinc to carbon, and so on, throughout the est.

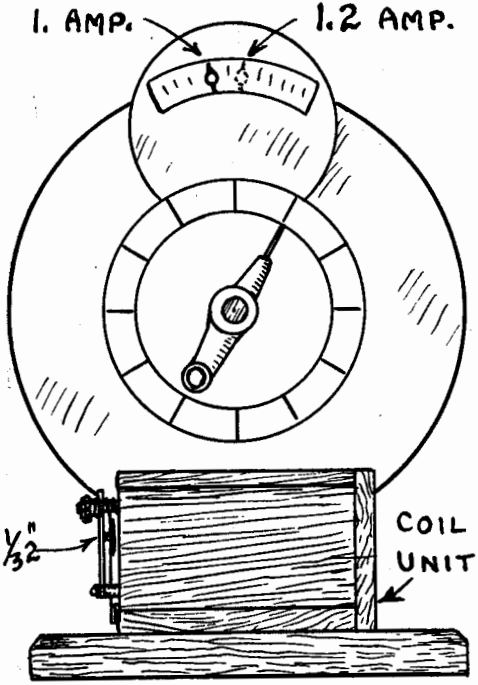
One terminal (it does not matter which one) of the set of dry cells, should be connected to the battery post of the coil box, and the switch turned to the battery side, when one wishes to start the engine.

The other wire, from the batteries, should be "grounded" on the chassis frame. This means that the wire should be in good metallic contact with some part of the steel chassis frame or engine. One of the screws, holding the transmission cover door in place, offers a convenient location for the attachment of the "ground" wire. Rust and oil are insulators, and will prevent good, metallic contact being made.

The battery post of the coil box. is on the side nearest to the carburetor, and is the binding post to which the magneto-to-coil wire is **not connected.** If the battery wire is connected to the same post as the wire from the magneto, then the battery current will flow through the Ford magneto, and

may ruin it. Also, this would run down the batteries.

As soon as the engine has started, switch right over to the magneto side and save the dry cells **for starting only.**



Adjust Coil Units.

The dry cells will not last long, if they are used for running on. But, if used only for starting, the dry cells will last about a year. The beginning of winter is the best time to install the dry cells—for then they will be new and strong, when most needed. During the touring season, the batteries will form a convenient stand-by, and may enable you to reach your destination, even if the Ford magneto should fail, while crossing the mountains.

A set of dry cells, or a storage battery in the car, is often of great help in locating engine or ignition troubles, especially if the driver does not have anyone else to crank the engine, while he is testing to locate the trouble.

If the motor starts to mis-fire, after the car has been driven a short distance—glance at the coil box switch, and see if you haven't forgotten to turn the switch over to the magneto side, after having started the engine. The battery becomes weaker, under steady driving and is very apt to mis-fire.

There are two varieties of dry cells in general use. One type is made for door bells, and other light work. This type usually shows from 18 to 20 amperes, when tested with an ammeter. They supposed to last for several years. But they hardly give enough current for easy starting in automobile use.

Then, there is the regular, automobile type of dry cell, which gives, when new and fresh, from 25 to 30 amperes. when tested with an ammeter. It is a good plan to test every battery purchased, as one or two weak cells wil cut down the power of the entire battery —just as a chain is no stronger than its weakest link. so no set of batters is stronger than the weakest cell.

And it is usually better not to buy dry cells that do not show 25 amperes or more. These batteries should last for about a year. if used for starting and emergency and stand-by use only.