

# INSTRUCTION BOOK and List of Parts

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*Model - JK - Economy*  
*Enclosed Kerosene and Gasoline Engine*  
*1½ to 2 H. P.*

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Help Us—So We Can Serve  
You Promptly

When ordering repairs always give us the following information so we can be sure of sending you the correct parts:

The Horse Power.

Engine Number

The Model

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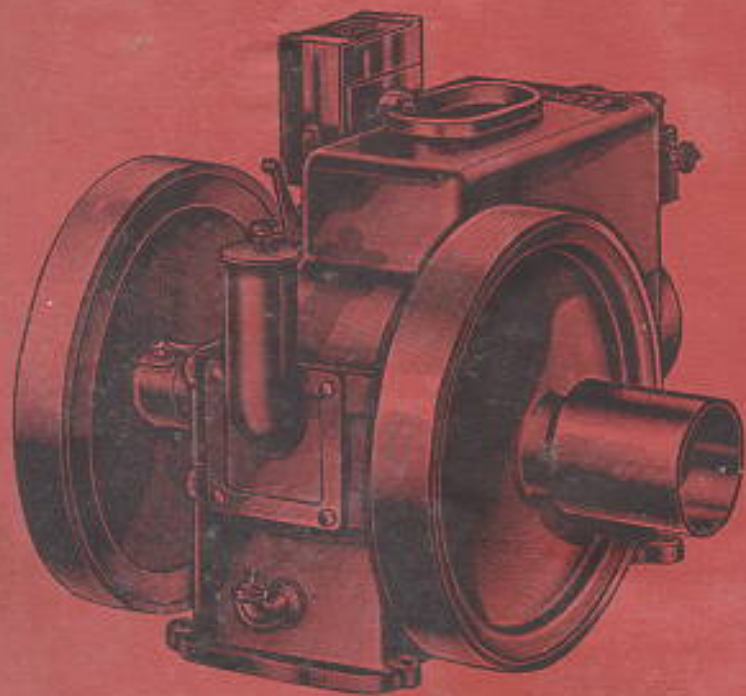
as sample. Pick out the part in the  
5-16, then refer to its number in the  
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the information as requested above, we  
before we can send the parts you

Screw  
magnet

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**Sears, Roebuck and Co.**  
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## The Improved $1\frac{1}{2}$ -2 H. P.

*Enclosed Economy Model JF  
Gasoline & Kerosene Engine*

## UNCRATING AND EXAMINATION

When you receive your Economy Model JK Engine, remove crate and take packages containing small parts from the water hopper. Examine engine closely to see that all bolts and nuts are tight and that engine has not been damaged or tampered with in transit. The hopper should contain the following small parts:

One starting crank  
One spark plug

One instruction book  
One can lubricating oil

In case any loss or damage is observed, notify your railroad agent within twenty-four hours. Ask him to make a notation of loss or damage on your freight bill. If the agent will not do this, request him to inspect the damage and furnish you with a copy of his loss or damage report; then send this copy of report, together with your paid freight bill, to us and we will take care of it and replace damaged or lost parts free of cost to you.

## LOCATION OF ENGINE

If possible, set engine so as to allow ample space on all sides to permit easy access to every part. Engine should be securely fastened to the floor by means of bolts or lag screws to prevent vibration and to obtain the full power of the drive pulley.

If engine is to be run on the ground, bolt on 2x4 skids, drive stakes of sufficient size and length into the ground and secure engine from movement by bolting to these stakes.

## EXHAUST GAS

When engine is installed in a building or enclosed space, the exhaust gas should be piped to the outside, as this gas, if allowed to accumulate, is poisonous. For this purpose, remove the muffler and use an iron pipe as short as possible, avoiding bends and elbows unless absolutely necessary, as these cause back pressure and loss of power.

If exhaust pipe is more than 15 feet long it should be of a larger size than the outlet pipe from the engine. The muffler furnished with the engine can be screwed to the outside end of the pipe. However, unless the noise of the explosions is annoying, it is better to leave the muffler off. As exhaust pipe may become very hot, care must be taken not to bring it into contact with wood or other inflammable material. A vertical exhaust pipe should be provided with a cap to keep the rain out or it should be equipped with a small drain at the lowest part so water will not enter the engine.

## TO CONNECT IGNITION

Screw spark plug firmly into position in cylinder head and attach magneto cable to terminal at outer end.

## ENGINE MUST BE STARTED WITH GASOLINE

Economy Model JK Engines operate equally well with gasoline or kerosene as fuel. However, kerosene will not vaporize to form an explosive mixture at ordinary temperatures, and it is necessary to use a small quantity of gasoline to start and warm up the engine before switching over to kerosene. Proceed as explained on next page.

## OILING INSTRUCTIONS

All mechanical parts requiring lubrication are operated in bath of oil in crank case. To fill crank case with proper amount of oil, remove drain plug No. JY-6150 from oil drain elbow No. JKY-496, then remove breather valve assembly and pour oil in through top of breather pipe until the oil comes up to a level even with the top of oil drain elbow when engine sits level. Then replace and tighten breather valve assembly and oil drain plug. NEVER ALLOW ENGINE TO OPERATE WITH OIL BELOW ONE-QUARTER OF AN INCH FROM THE HIGH LEVEL IN OIL DRAIN ELBOW AND NEVER OPERATE ENGINE WITH EXCESSIVE AMOUNT OF OIL. TOO LITTLE OIL CAUSES EXCESSIVE WEAR OF PARTS AND TOO MUCH OIL CAUSES EXCESSIVE CARBON DEPOSITS.

Be sure to drain oil from crank case and refill with fresh oil after every fifty running hours. Flush crank case occasionally with clean oil (never gasoline or kerosene) to remove any possible sediment and impurities. Engine operates best with following grades of oil:

- No. 20 S. A. E. medium oil in temperatures of 15- or colder.
- No. 30 S. A. E. heavy oil in temperatures from 15- to 50- above zero.
- No. 40 S. A. E. extra heavy oil in temperatures of 50- or above.

## TO START THE ENGINE

First: Fill the engine hopper with just enough clean water to cover the center casting which encloses the piston. The hopper should be completely filled with water after engine is started and warmed up. Use clean, soft or rain water if it can be readily obtained. In cold weather the engine will start easier if warm water is put into the hopper.

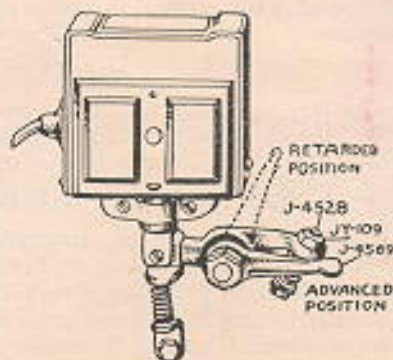
Second: Follow oiling instructions carefully as explained on page (above).

Third: Fill the fuel tank with gasoline or kerosene and see that gasoline and kerosene fuel valves on carburetor are closed.

Fourth: If gasoline only is used as fuel, turn on the fuel valve No. J-20750 (page 16) on the right side of carburetor one full turn. If kerosene is used in fuel tank, fill the reservoir on left side of carburetor with gasoline. Leave kerosene fuel valve No. J-20750 on right side of carburetor tightly closed and open gasoline fuel valve No. J-20749 (page 16) on left side one full turn.

Fifth: Lift up magneto spark control lever No. J-4569 as far as it will go for starting position (see figure at right). This retards the spark and prevents the engine from kicking back when you crank it.

Sixth: Apply the starting crank to end of crankshaft. Hold intake valve in the cylinder head open with the left hand. Spin the flywheel rapidly five or six times, then release intake valve, but continue to crank engine and, as soon as you release intake valve, place your hand over the air damper inlet on the carburetor so as to partly close the air intake until the engine starts.



Seventh: As soon as the engine starts firing, push the spark control lever No. J-4569 down to a horizontal position if full rated horse-power is expected as indicated in illustration on page 2. NEVER ALLOW SPARK LEVER TO BE PUSHED BELOW A HORIZONTAL POSITION, PARALLEL TO BASE AND SEE THAT THE NUTS No. JY-994 ARE ALWAYS JUST TIGHT ENOUGH SO SPARK CONTROL LEVER REMAINS IN POSITION PLACED.

Eighth: About the time the gasoline placed in the carburetor is consumed, the engine has become warm enough to run on kerosene. Then turn on the kerosene by opening kerosene fuel valve No. J-20750 about one full turn, closing the gasoline valve No. J-20749 and adjusting the kerosene fuel valve to the point where the engine runs best.

## TO STOP THE ENGINE

Stop engine by pressing on stop button on magneto, holding it down until the engine comes to a full stop, or closing fuel valve No. J-20750. In freezing weather be sure and drain the water from the water reservoir by removing drain plug in cylinder head. Turn flywheel by hand until exhaust valve is closed to prevent rusting of cylinder walls or valve seats.

## IMPORTANT GENERAL INSTRUCTIONS

Never make repairs inside of engine crank case before disconnecting magneto terminal wire from spark plug or removing spark plug as this will prevent accidental starting of engine.

Never replace fuel filler pipe plate or fuel tank plate on base without applying Permatex gasket cement on both sides of gaskets and on threads of cap screws to prevent fuel leakage from fuel reservoir in base. Then pull all cap screws up evenly.

Always remove piston and connecting rod through cylinder head and of engine and replace in same manner.

Never operate engine without breather pipe plate valve properly installed.

Never start engine without retarding spark lever as explained on page 2. Always fill fuel tank before starting engine as it is never advisable to add fuel while engine is running.

## FUEL VALVE REGULATION

When starting the engine, particularly in cold weather, it is usually necessary to open the fuel valve more than is required for efficient running after the engine is heated. When engine is thoroughly heated, regulate the valve to supply just enough fuel so that engine fires regularly. Too much fuel is indicated by a smoky exhaust. Too little fuel is shown by popping back through the air intake in the carburetor. Should you flood the engine with fuel, it will lose power and stop. In this case, force the surplus fuel in the cylinder through exhaust valve by grasping rim of flywheel and turning engine backward.

## IF WATER BOILS IN ENGINE HOPPER

The hotter the water in the hopper gets the better the engine runs because the fuel vaporizes more readily and makes a better explosive mixture, giving you more power for less fuel. The water circulates around the cylinder and cylinder head and carries off the excess heat in the form of steam. Keep the cylinder properly lubricated and the hopper full of water and there will be no danger of the engine overheating.

## CARE OF WATER SYSTEM

If water seems to boil away too fast, or the engine gets very hot, it will be well to check timing of spark (see page 6). Be sure, also, that the spark retard lever No. J-4569 is pushed down after starting and that the engine is not being flooded with too much fuel. In freezing weather, drain the hopper when the day's work is done by removing plug located in cylinder head for, if the the water is allowed to freeze, the cylinder casting or cylinder head will very likely be cracked or broken.

**Non-Freezing Solution:** A non-freezing mixture can be made by mixing calcium chloride with water in the proportion of about three pounds of calcium chloride to each gallon of water.

**Removing Lime Deposit:** Should a deposit of lime form in the hopper and water passages it may cause the engine to overheat. To remove this deposit make a solution of seven parts of rain water and one part of muriatic acid. Fill the hopper to the top with this solution and allow it to stand for 24 to 36 hours and then drain off. In mixing this solution pour the acid in the water slowly and stir water constantly while doing so. Never pour water into the acid.

**WARNING:** Do not pour cold water on a hot cylinder that has run dry as this may cause it to crack. Stop the engine immediately and allow it to cool off before refilling hopper.

## COLD WEATHER STARTING

All gasoline and kerosene engines are harder to start when cold as the gasoline does not vaporize readily. You can help to overcome this by filling hopper with warm water. If engine is very cold, pour water in slowly as the sudden change may crack the cylinder. Open the gasoline fuel valve further than you generally do and be sure to close the air damper with the hand when starting or if engine shows signs of stopping, until it starts to fire regularly.

Work the intake valve in and out before starting, as this will remove any frost that may have collected on the valve stem and allow it to work easily.

Prime engine with high-test gasoline by pushing open the air intake valve on front of carburetor with the end of oil can spout and squirt in gasoline. After engine starts, regulate fuel valve, cutting down the fuel supply to the lowest point where it will fire regularly without popping back into the carburetor.

## FUEL TROUBLE

Make certain that there is plenty of fuel in the tank. See that the fuel flows from the tank to the carburetor. If not, the fuel pipe, check valve or fuel valve may be clogged with dirt. If this seems to be the case, remove and clean all connections carefully. If you find fuel valve or connections dirty, remove the drain plug and strain the fuel from tank through a chamois skin which will take out dirt and water.

If your fuel contains water strain it through a chamois skin to remove the water, as it makes the engine hard to start and causes a loss of power. In straining gasoline through chamois skin, ground the chamois skin on a metal object such as the rim of a galvanized iron pail setting on the ground, or otherwise the gasoline may easily be ignited by a spark of a static electricity in passing through the chamois.

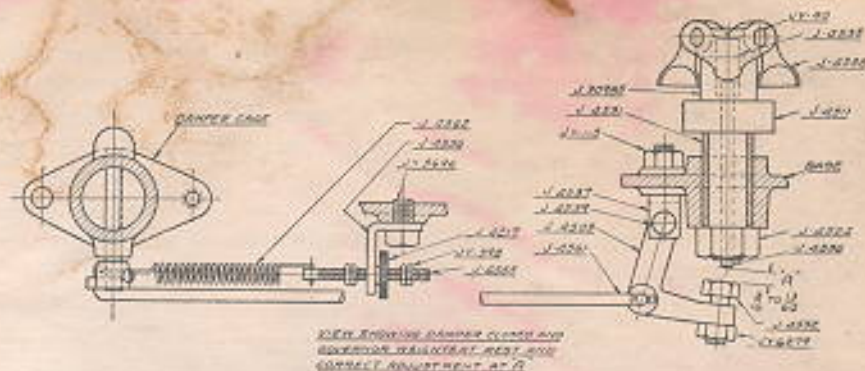


Fig. A

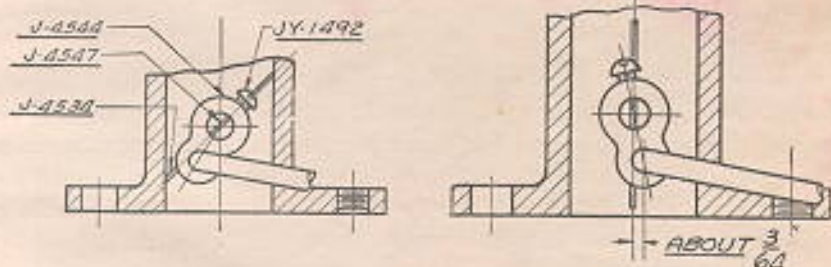


Fig. B

## POSITION OF THE BUTTERFLY VALVE

The butterfly valve in the carburetor damper cage controls the speed of your engine through the action of the governor on the throttle rod. Across the end of the butterfly valve shaft there is a slot which is parallel with the butterfly valve. When this slot is perpendicular and at right angles to the engine base, the butterfly valve is in the same position and wide open. When this butterfly valve is wide open, the butterfly valve lever No. J-4544 should be about three sixty-fourths of an inch off center line to the right as shown in accompanying illustration.

Now move the butterfly valve lever to the left as far as it will go which completely closes the butterfly valve as shown in the illustration "B". When the butterfly valve is completely closed in this position the adjusting screw No. J-4552 in the governor arm No. J-4503 should be three sixteenths to thirteen sixty-fourths of an inch away from end of governor spindle rod when governor spindle rod is pushed in as far as it will go. This adjustment can easily be made by placing an object that is three-sixteenths of an inch thick between the end of the governor spindle rod and the governor arm adjusting screw, as indicated by letter "A" in the illustration "A," when the butterfly valve is completely closed.

After this adjustment has been made, the governor arm adjusting screw should rest against the governor spindle rod when the butterfly valve is wide open.

## TESTING THE SPARK

An irregular spark or no spark at all is often caused by a dirty, worn or faulty spark plug. Carbon deposits on the spark points are usually the result of too much fuel or too much lubricating oil. Remove the plug, take it apart and clean all parts thoroughly with gasoline and wipe dry. Scrape firing points with a thin knife blade until they are bright. These points should be about as far apart as the thickness of a well worn dime, or one thirty-second of an inch. If engine is in daily use, replace spark plug with a new one about once a year or when points are pitted.

To test spark, first see that the contact surfaces of the armature No. 513 of the magneto are clean and that the magneto end of the lead wire has a good contact. Remove the lead wire from spark plug which should be screwed into position in engine and, holding it about one-eighth of an inch from the terminal on plug, turn engine over once or twice until the magneto trips. If a good bright spark jumps the gap you will know that your trouble is not caused by the magneto.

Now remove the plug, attach the lead wire to the plug terminal and hold the metal side of the plug against the plug opening in cylinder and trip magneto as before. If a good hot spark jumps the gap between the points the trouble is not in the plug. If there is no spark between points the porcelain may be cracked or points badly burned and a new plug will be required. See page 12 for additional instructions.

## SPARK TIMING

Place spark control lever No. J-4569 in retard position as shown in illustration on page 2. Now turn fly wheel in direction that engine is cranked until the word "spark" as stamped on rim of flywheel is in perfect alignment with a straight edge held against end of hopper as shown in accompanying illustration. At this point the magneto should have just tripped. If magneto trips before the flywheel reaches this position the spark is too early and may be retarded by loosening lock nut No. JY-109 and turning adjusting screw No. J-4528 to left until by trial the spark occurs at the correct position. If spark occurs too late, then turn spark adjusting screw No. J-4528 to the right until the spark occurs at the correct position. Be sure and tighten lock nut No. JY-109 securely after completing adjustment.

## SPEED REGULATION

Our engine is set to run at 775 R.P.M. under load, which is the most efficient speed to provide the greatest power with the lowest fuel consumption. This speed can be reduced to 400 R.P.M. by turning thumb nut No. J-4217 so tension on governor spring No. J-4562 is decreased. Do not change lock nuts No. JY-398 as these are set at factory to give maximum and minimum speeds. Spark may be retarded when operating the engine at slow speed of approximately 400 R.P.M. but spark must be advanced to horizontal position if maximum horse power and most efficient operation is desired. See illustration "A" on page 5.



## VALVE TIMING

If engine is hard to start or shows a loss of power, the trouble may be due to improper timing of the exhaust valve because of incorrect adjustment of the No. J-4545 adjusting screw in the push rod.

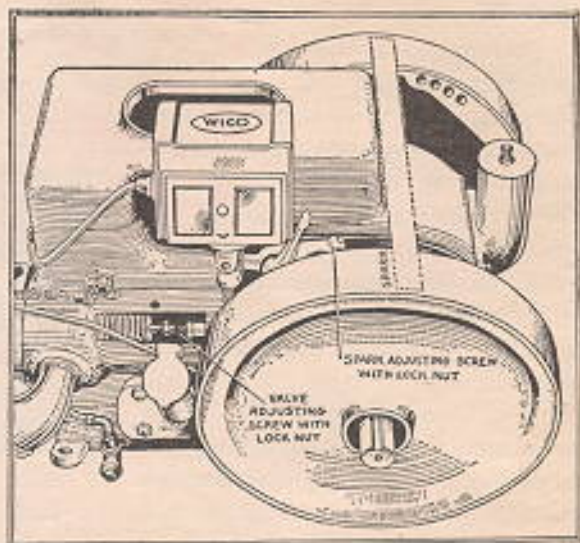
This being a four-cycle engine, four distinct movements of the piston are necessary to complete the cycle. On the first, or suction stroke, the piston travels from the extreme inner to the extreme outer position.

On the second, or compression stroke, the piston returns to the inner position. During this stroke both valves remain closed.

On the third or power stroke, the force of the explosion in the cylinder again drives the piston to the outer position. Before the piston reaches the extreme outer position the exhaust valve is opened by means of a cam and push rod.

On the fourth, or exhaust stroke, the piston returns to its inner position. The exhaust valve should remain open until the crankshaft has passed the inner center about five degrees.

This adjustment is controlled by the No. J-4545 adjusting screw in the push rod. The exhaust valve should close about one-half inch before the word "spark" on rim of flywheel has reached a position of alignment with crank end of hopper as shown in illustration on page 7. This may be accomplished by push rod adjusting screw No. J-4545 in exhaust valve push rod No. J-4527. Be sure and tighten lock nut No. JY6279 on push rod adjusting screw after completing exhaust valve adjusting. There should be about one sixty-fourth of an inch clearance between end of exhaust valve stem and head of adjustment screw when valve is closed and timed correctly.



## ADJUSTING PUSH ROD RETAINING SCREW

Push rod retaining screw No. JY-6281 in the base is for the purpose of preventing push rod from revolving. In installing the push rod, adjust this retaining screw so push rod only turns one sixty-fourth of an inch when lock nut is tightened down on screw.

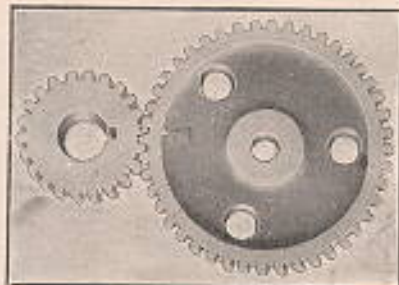
## TO INSTALL EXHAUST VALVE SPRING

Remove cylinder head and exhaust valve cover plate. Compress exhaust valve spring and remove valve spring retaining pin and cup washer. Pull out exhaust valve and replace old spring with new spring. Then compress new spring with cup washer in place so retaining pin can be installed.

## TIMING THE CAM GEAR

If necessary to remove the cam gear or put on a new one, it must be replaced in a certain position. The cam on the gear controls the timing of the spark and the opening and closing of the exhaust valve, so efficient operation of the engine is very dependent on the proper installation of this gear.

To remove old cam gear, take off breather plate and disconnect connecting rod from crank shaft and drop connecting rod end in bottom of crank case. Next remove both fly wheels and crank shaft bearing plate No. J-4516. Now turn crank shaft so exhaust valve is completely closed. Then retain magneto push rod No. J-4522 in place by tying securely with a piece of string to magneto trip lever. Next remove cam gear shaft nut and drive out cam gear shaft with soft nosed driving pin so as not to injure threads on end of cam shaft. When cam shaft is driven out sufficiently far, old cam gear can be removed through front opening. When replacing with new cam gear, see that punched marked tooth that is immediately opposite keyway on crank shaft pinion meshes between the two teeth indicated by arrow on cam gear when placed on cam gear shaft, as in accompanying illustration. Then drive in cam gear shaft and put on cam gear retaining nut and replace other parts in proper order.



This cam gear installation can be greatly simplified by using a mirror to locate the proper meshing of the cam gear with crank pinion. In using this plan, it is only necessary to take off cylinder head, remove piston and connecting rod through cylinder head, to prevent interference of connecting rod when taking off old cam gear. Next remove governor spindle as explained on page 11. Then cam gear can be removed through breather plate opening after taking off cam shaft nut and retaining washer and new gear properly installed in same manner by locating proper meshing with crank shaft pinion with aid of mirror. This method eliminates the necessity of taking off fly wheels and bearing plate.

**BE VERY CAREFUL WHEN PUTTING ON CAM GEAR TO SEE THAT PROPER MESHING IS OBTAINED WITH CRANK PINION AS ONE TOOTH OUT OF THE WAY WILL MAKE A DECIDED DIFFERENCE WITH THE WAY YOUR ENGINE OPERATES.**

**CAUTION:** Never put your hand inside of crankcase until you have removed the magneto lead wire from the spark plug.

## TO GRIND VALVES

If the flywheels turn too easily against compression it shows a loss of power through leakage. If exhaust valve is timed correctly, see that both inlet and exhaust valves are seating properly. If intake valve leaks, it can often be corrected by pulling out on end of valve stem with a pair of pliers and at the same time turning valve so valve head rubs on seat. If this does not increase compression, remove the cylinder head, take off valve spring and remove one or both valves to be ground. Wash valve and valve seat in gasoline; make a paste of fine emery dust and oil, or use prepared valve grinding compound (which can be obtained at almost any store). Smear this mixture on valve and valve seat. Put valve in place, use a forked tool in an ordinary brace and push valve towards seat and turn from left to right for a minute or two and then lift valve and turn it about half way around and repeat until valve and seat show a smooth, even surface all the way around.

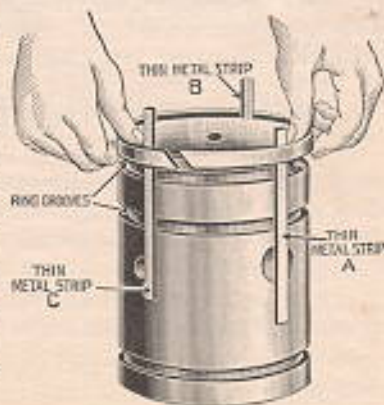
Wash both valve and seat clean with gasoline. In replacing, put heavy spring on exhaust valve and light spring on intake valve; also remove carbon from end of piston and cylinder head. In replacing cylinder head tighten the head stud nuts alternately, being careful not to tighten one more than the other. After engine is warmed up retighten these nuts.

## PISTON AND RINGS

Each piston is fitted with three rings that spring out and press against the walls of the cylinder to prevent the compressed gas from escaping. The piston rings must fit free in the grooves in piston. Too much or a low grade of lubricating oil or fuel will, in time cause a carbon deposit to form around the rings binding them in the grooves so that they cannot act freely. To prevent this loss of power, piston must be removed and rings and grooves cleaned. Proceed as follows:

Disconnect wire from magneto to spark plug. Take off cylinder head and after disconnecting connecting rod cap through breather plate opening, remove piston and connecting rod through cylinder head end. If you find piston rings gummed or held tight in the grooves they must be removed and cleaned.

To remove rings take three thin metal strips (old hack saw blades will do) and slip under center ring. Start the first strip at the joint and force it all the way around until it is in position shown by "A". Then slip the second strip to "B" and the third strip to "C", which will raise ring out of grooves so that it can be slipped off. Repeat the operation with the top ring next and then the bottom ring bringing it up from the bottom of piston. Before replacing piston in cylinder, oil the rings and surface of the piston thoroughly.



## CYLINDER HEAD

If gasket for cylinder head should blow out or become broken when removing cylinder head, before replacing with a new gasket scrape the cylinder and head to a smooth, clean surface, removing all particles of old gasket. After putting on new gasket, push cylinder head in close to cylinder and screw nuts on by hand as far as they will go. Then, with a wrench, turn each nut one after another about one-half turn at a time until all are tight. Do not screw one nut down tight and then go to the next as this will make an uneven joint and the packing will not hold. After engine has run ten minutes and heated up, go over all nuts and tighten them again.

**IMPORTANT:** If you use sheet asbestos packing, be sure to cut out packing for all opening so water can circulate through cylinder head and around valves or they will overheat and be ruined.

## BEARINGS

Watch all bearings closely. They should run freely but without excess play or looseness. Loose bearings rack the engine and will soon break something. A tight bearing will heat up and bind or melt.

The main bearings and crank shaft end of connecting rod are equipped with special anti-friction, die-cast bearings which fit perfectly in machined seats. Piston end of connecting rod has a bronze bushing which, when worn can be driven out to be replaced by a new one.

The main bearings on the crankshaft are carefully fitted before leaving the factory and should last indefinitely if given proper lubrication as explained under Oiling Instructions. Should these bearings need replacement, first remove breather plate and disconnect connecting rod from crankshaft, then remove flywheels (see below) and after taking off bearing plate No. J-4516 pull out crankshaft. Drive out old bearing from base or bearing plate. Drive or press in new bearing, being careful to line up lug on bearing with the slot in the base or bearing plate. If face or bore of bearing has been marred when installing, smooth up with scraper or fine file. It is usually advisable to replace both main bearings at the same time.

The connecting rod bearing in crank shaft end is die cast in two halves and fitted with shims or liners to take up wear. When necessary, bearing cap can be removed and wear taken up by eliminating enough shims to fit bearing snugly. Be sure that bearing does not bind after you have taken out shims or installed and adjusted new bearing. If flywheels turn freely the bearing is not too tight. Be sure and tighten nuts on bearing cap bolts and lock with cotter pin when replacing connecting rod cap.

## REMOVING AND REPLACING FLYWHEELS

Loosen set screw on inside hub of flywheel which should permit flywheel to be removed. If wheel is tight on shaft do not attempt to drive off wheel with hammer as this may injure bearing or other parts, but use wheel puller to remove (a wheel puller is standard equipment in any garage or repair station.)

When replacing flywheel, place it in proper position on shaft, drive in key and then tighten down set screw.

Be sure to have one-eighth of an inch clearance between hub of flywheel and end of bearing housing when key is driven in.

## TO TAKE OFF GOVERNOR BALLS, SPINDLE OR PINION

Take off governor spindle nut No. J-4524 on outside of base. Remove breather plate and entire governor assembly can all be removed through breather plate opening.

When replacing new cotter pins on governor weights when necessary, the correct size of these cotter pins should be  $\frac{3}{16}$  inch by  $1\frac{1}{4}$  inches as quoted in our parts price list. If these pins are too long they will strike other parts of the engine and possibly cause damage.

## TO FIGURE PULLEY SIZES

Our Economy Model JK engine develops an excess over its rated horsepower at normal speed, as marked on the brass name-plate on top of the water hopper. Obtain the proper speed in the driven machinery by use of pulleys of the proper size, rather than attempt to make any considerable change from the normal engine speed.

The speed of the engine and the diameter of the pulley furnished with it being known, obtain the size of pulley to be used on driven machine as follows: Multiply the rated speed of engine by the diameter of engine pulley and then divide the result by the rated speed of the machine to be driven.

To figure the correct size pulley for your engine, when size of pulley and speed of machine to be driven are known, multiply the speed of driven machine by the diameter of its pulley and divide by the rated engine speed. The result will be the diameter of the engine pulley.

We can also supply standard iron pulleys for Economy Model JK Engine in sizes other than regularly furnished. If interested, write for price on the size required, stating horse-power and number of your engine as given on nameplate.

## DAMAGE THROUGH FREEZING

In freezing weather, take no chance. Remove drain plug in cylinder head and drain water jacket and hopper when the day's work is finished. If you fail to do this and the water cooling system freezes, a cracked or broken cylinder, cylinder head or water jacket is almost certain to be the result, necessitating costly repairs and loss of the use of engine until repairs are made.

You can, in some cases, have the water jacket or cylinder head welded at your local garage, but a cracked cylinder is usually a total loss.

If crack is in water jacket and is a small one, it can often be repaired by either of the following methods:

Close crack on the outside with putty or tallow, being careful not to force the material into the crack. Make a solution of one pound sal ammoniac to a gallon of water. Fill the hopper high enough to cover the crack with this solution. Now run engine for five minutes to heat jacket. Stop the engine and refill with the solution and repeat. Do this three or four times and, if crack is not too wide, it will be permanently closed up.

The other method for wider cracks is by the use of iron cement or Smooth-on No. 1 which can be purchased in most hardware stores. Scrape each side of the crack down with the broken end of an old flat file to form a sort of gutter or funnel and scrape off the paint for about  $\frac{1}{4}$  of an inch each side of the crack. Mix the cement according to directions and, with a putty knife or common steel case knife, force the cement into the crack until it is filled. Smooth off surface and let set for about a day before using the engine.

## CARE OF WICO MAGNETO IGNITION SYSTEM

Oil the Wico Magneto every day you use the engine by squirting a few drops of oil in the oil cup marked "Oil Daily." The armature, No. 513, must make a perfect contact with cores projecting from bottom of magneto. Keep these surfaces perfectly clean and free from straw, sand, ice, leaves or anything which will prevent a perfect contact.

After considerable use an oily deposit may gather inside the breaker point tube, around the upper contact. To clean this off, remove the two screws holding magneto to engine frame. Lift it off and separate armature. Next remove the two screws No. 199 at each end of magneto at bottom, and take off cover band and front cover. Clean away oily deposit around upper contact with a clean rag and slim hardwood stick. When replacing armature, be sure that the oil pad No. 505 slips over the guide rod. Do not remove magnets, as this is never necessary and instantly destroys their magnetism.

## IGNITION TROUBLE

If you do not get a spark or the spark is weak, start to look for the cause at the spark plug. If firing points are carbonized, take plug apart and clean with kerosene or gasoline. Examine porcelain and, if cracked, replace it or buy a new plug. See that the points are clean and adjust them so that a well worn dime will just slip between them. Examine the lead wire and look for breaks or loose connections. Test spark from magneto by holding lead wire terminal about  $\frac{1}{8}$  of an inch from metal engine frame when cranking engine. If a spark is produced, the trouble is in the spark plug. If there is no spark, proceed as follows:

See that armature No. 513 returns and makes a firm contact with cores after being tripped off. Failure to do this indicates a weakened or broken return spring No. J-4600, or friction of moving parts caused by lack of oil. Remove any dirt from armature or face of cores. Turn the flywheel over slowly and see that when armature No. 513 is tripped it snaps quickly away from the cores. Failure to do this indicates binding or friction or a broken magnetic trip spring No. J-4560.

See that all electrical connections are tight and also remove front cover from magneto and, with a small piece of hardwood or wire, remove any dirt from contact surface Nos. 301 and 223 and insulating washer No. 168.

## ADJUSTMENT OF BREAKER POINTS

The breaker point contacts are perfectly adjusted at the factory and no readjustment will be required except when installing new contacts, at which time proceed as follows:

The breaker point contact Nos. 301 and 223 should just touch when the armature No. 513 is seven sixty-fourths of an inch from the cores. To adjust, trip the armature from its contact with the cores, and insert a strip of metal seven sixty-fourths of an inch thick between the armature No. 513 and the face of the cores. Loosen the nuts No. 302 on the breaker point stem, and turn the upper nut until the contact No. 223 just touches the contact No. 301. Then set up the lower nut tight against the upper nut. As soon as adjustment has been made, be sure to remove the strip that you placed between the armature and cores.

## REPLACING BREAKER POINTS

The best results will be obtained if both contacts are renewed whenever one of them fails. If either contact fails it may leave the other in such uneven shape as to spoil a new contact.

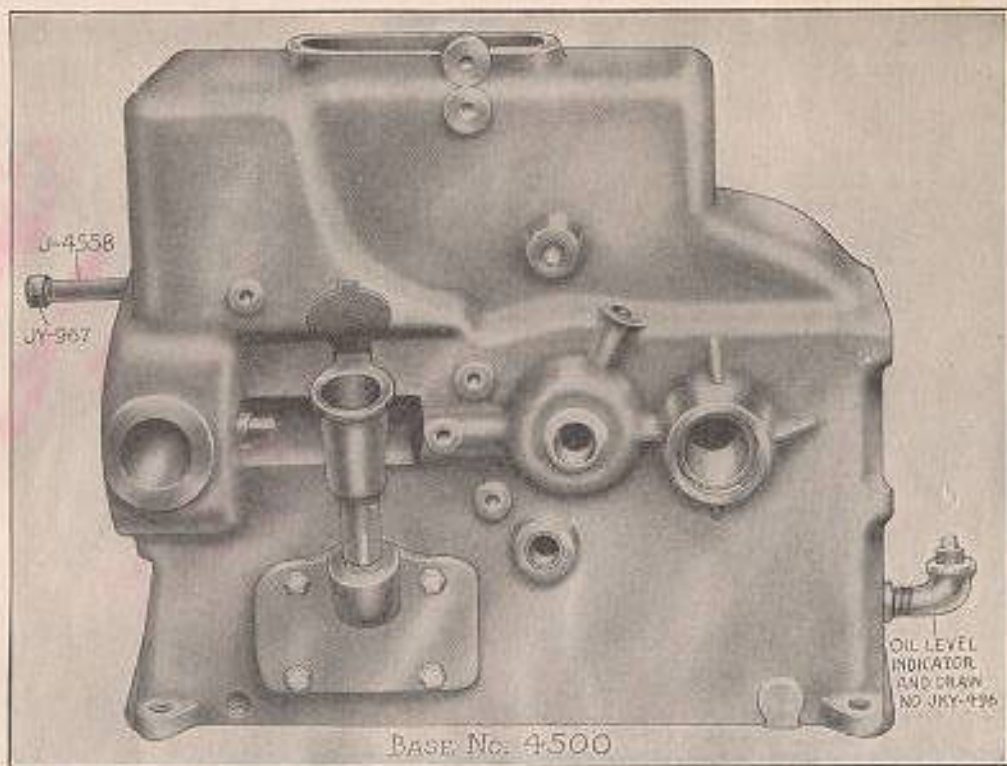
To replace the moving contact No. 223: Withdraw the moving parts and remove the old contact and its spring No. 38 from the breaker point plate by unscrewing the two nuts No. 302. Substitute the new moving contact, being careful to replace the felt washers No. 505.

Replace the nuts and the lock washers between them. After replacing the moving parts, adjust the breaker point contacts as explained under "Adjustment of Breaker Points" as above.

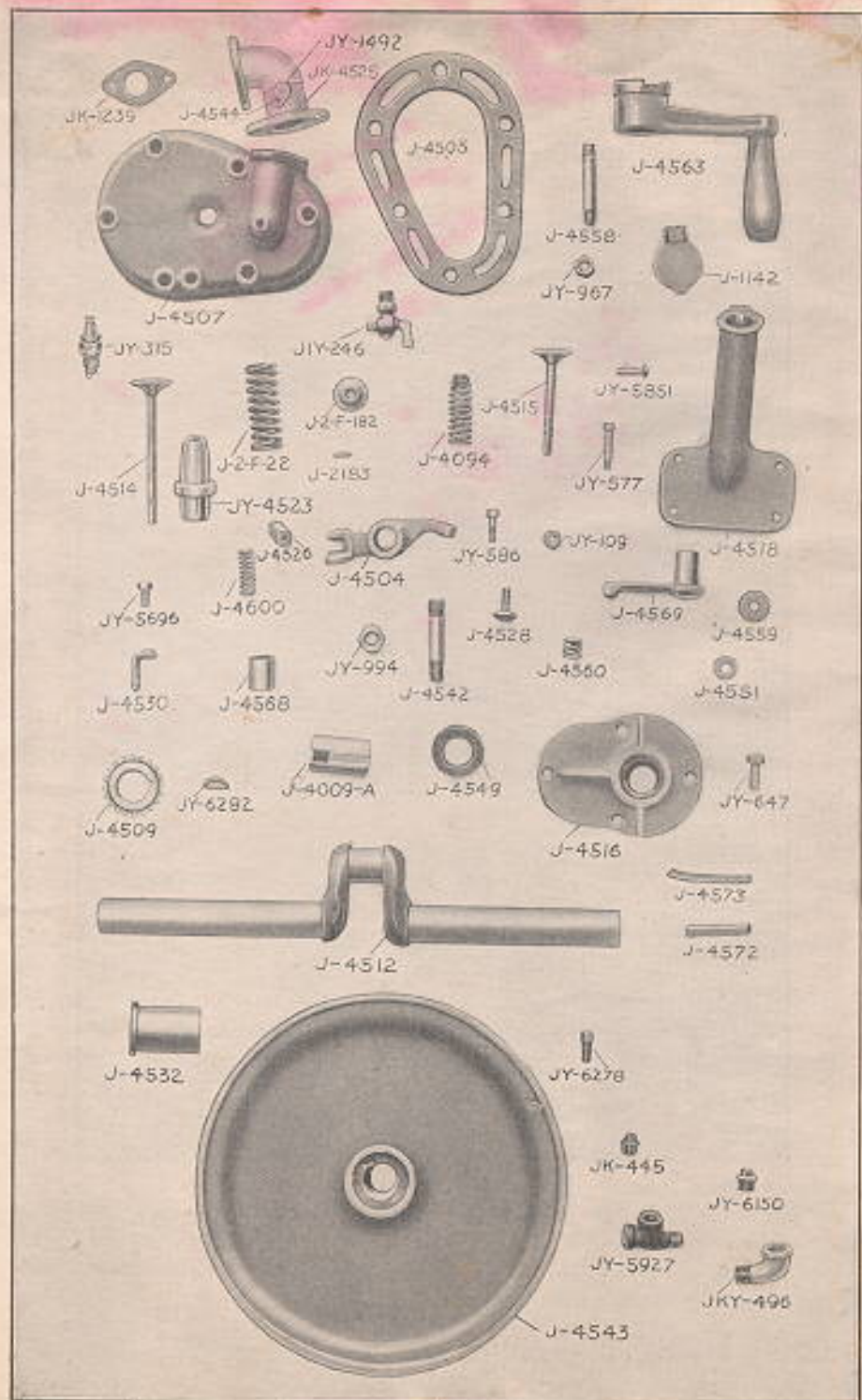
To replace fixed contact No. 301: Remove the front cover and the spring support No. 253 and withdraw the moving parts. Disconnect condenser lead (S) and primary lead No. 217 from breaker point tube No. 158. Remove all nuts and washers from shank of the contact No. 301 and push contact down and out of tube. There are two insulating washers Nos. 168 and 184 inside of tube and these should be removed also.

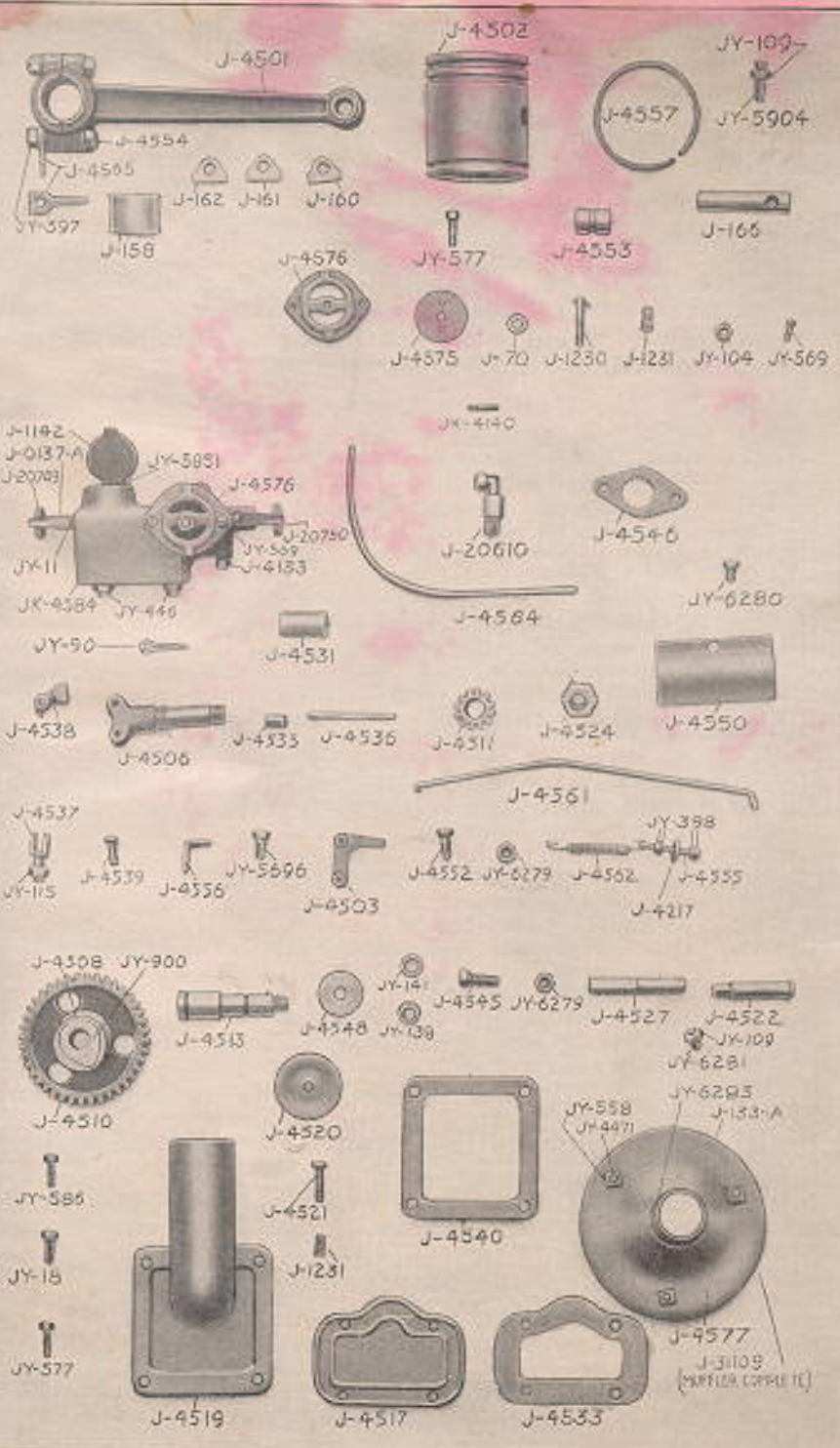
New insulating washer Nos. 168 and 184 and new nuts will be supplied with each new fixed contact, and these should always be used in replacements.

Place insulating washers on new contact and insert in tube, replace outside insulating washer, cover it with the large brass washer and lock washer and screw the nut up tight. Replace the two washers Nos. 240 and 238 and the nut (N). Insert the two leads and set the nut up tight. After replacing the moving parts, see that the contacts are in proper adjustment (see "Adjustment of Breaker Points.")









Price List of Parts for Economy Model JK Enclosed Throttling Governor  
Engine in the 1½-2 H.-P. Size

In ordering be sure to give the following information:

Name and Number of Part,

Horse-Power,

Engine Number.

The Model, which is the letter shown after the horse-power on the name plate.

For illustrations of parts see pages 14 to 16. Part number in the left hand column indicates the number of the illustrations.

Parts marked (\*) will be shipped by freight PREPAID. All other parts are shipped by PREPAID parcel post.

Parts No.	Description	Price
23-HJY-11	Needle Valve Spring Screw	\$0.05
23-HJY-18	Breather Plate Cap Screw	.05
23-HJ-2-F-22	Exhaust Valve Spring	.15
23-HJY-90	Governor Weight Cotter Pin (3/16x1 1/2 inches)	.05
23-HJY-104	Air Damper Locknut	.05
23-HJY-109	Adjusting Locknut	.05
23-HJY-115	Governor Arm Clevis Locknut	.05
23-HJ-133-A	Muffler Body Cap	.60
23-HJY-138	Cam Shaft Locknut	.05
23-HJ-158	Connecting Rod Bearing (two halves)	Per set .98
23-HJ-160	Connecting Rod Shim, thick	.08
23-HJ-161	Connecting Rod Shim, medium	.02
23-HJ-162	Connecting Rod Shim, thin	.02
23-HJ-166	Piston Pin	.53
23-HJ-2-F-182	Exhaust Valve Spring Cup Washer	.05
23-HJY-315	Spark Plug (1/2 inch)	Not Furnished
23-HJY-397	Connecting Rod Bolt Nuts	.06
23-HJY-398	Speed Regulator Hex Nut	.05
23-HJK-445	Fuel Tee Pipe Plug	.05
23-HJY-446	Kerosene Carburetor Pipe Plug	.05
23-HJY-558	Square Nut for muffler	.05
23-HJY-569	Air Damper Machine Screw	.05
23-HJY-577	Cap Screw for filler pipe plate, fuel tank plate and carburetor damper cage	.05
23-HJY-586	Magneto Cap Screw	.05
23-HJY-647	Bearing Plate Cap Screw	.05
23-HJY-900	Woodruff Key in cam gear	.05
23-HJY-967	Cylinder Head Studnut	.05
23-HJY-994	Magneto Rocker Studnut	.05
23-HJ-0137-A	Needle Valve Spring	.08
23-HJ-1142	Lid for carburetor or filler pipe	.10
23-HJ-1230	Carburetor Air Check Stem	.15
23-HJ-1231	Breather Valve Check Spring	.15
23-HJK-1239	Carburetor Gasket	.15
23-HJY-1492	Butterfly Valve Lever Set Screw	.05
23-HJ-2183	Exhaust Valve Stem Pin	.03
23-HJ-4009-A	Crankshaft Keyway Guard	.15
23-HJ-4094	Intake Valve Spring	.15
23-HJ-4133	Fuel Pipe Connection	.30
23-HJK-4140	Damper Cage Stud	.08
23-HJ-4217	Speed Adjusting Nut	.11
23-HJY-4471	Square Head Machine Bolt for muffler	.05
23-HJ-4500	*Base	18.00
23-HJ-4501	Connecting Rod	3.50

Price List of Parts for Economy Model NK Enclosed Throttling Governor Engine in the 1½-2 H.P. Size

In ordering be sure to give the following information:

Name and Number of Part.

Horse-Power.

Engine Number.

The Model, which is the letter shown after the horse-power on the name plate.

For illustrations of parts see pages 14 to 16. Part number in the left hand column indicates the number of the illustrations.

Parts marked (\*) will be shipped by freight, PREPAID. All other parts are shipped by PREPAID parcel post.

Parts No.	Description	Price
23-HJ-4502	Piston.....	\$3.00
23-HJ-4503	Governor Arm.....	.50
23-HJ-4504	Magneto Trip Lever.....	.80
23-HJ-4505	Cylinder Head Gasket.....	.50
23-HJ-4506	Governor Spindle.....	1.25
23-HJ-4507	Cylinder Head.....	4.80
23-HJ-4508	Cam.....	3.30
23-HJ-4509	Crankshaft Pinion.....	1.00
23-HJ-4510	Cam Gear.....	1.60
23-HJ-4511	Governor Pinion.....	.45
23-HJ-4512	Crankshaft.....	6.30
23-HJ-4513	Cam Shaft.....	.70
23-HJ-4514	Exhaust Valve.....	.45
23-HJ-4515	Intake Valve.....	.45
23-HJ-4516	Bearing Plate.....	2.45
23-HJ-4517	Fuel Tank Cover Plate.....	.60
23-HJ-4518	Filler Pipe with Plate.....	1.05
23-HJ-4519	Breather Pipe with Plate.....	1.40
23-HJ-4520	Breather Valve Disc.....	.10
23-HJ-4521	Breather Valve Cap Screw.....	.15
23-HJ-4522	Magneto Trip Push Rod.....	.40
23-HJ-4523	Exhaust Valve Stem Guide.....	.45
23-HJ-4524	Governor Spindle Nut.....	.10
23-HJK-4525	Butterfly Valve Cage.....	.85
23-HJ-4526	Trip Lever Trunnion Block.....	.15
23-HJ-4527	Exhaust Valve Push Rod.....	.60
23-HJ-4528	Magneto Trip Adjusting Screw.....	.15
23-HJ-4530	Magneto Return Spring Support.....	.10
23-HJ-4531	Governor Spindle Bushing.....	.35
23-HJ-4532	Main Bearings.....	1.65
23-HJ-4533	Fuel Tank Cover Plate Gasket.....	.30
23-HJ-4535	Governor Spindle Rod (Short).....	.10
23-HJ-4536	Governor Spindle Rod (Long).....	.15
23-HJ-4537	Governor Arm Fulcrum Clevis.....	.30
23-HJ-4538	Governor Weight.....	.15
23-HJ-4539	Governor Arm Fulcrum Clevis Pin.....	.05
23-HJ-4540	Breather Pipe Plate Gasket.....	.35
23-HJ-4542	Magneto Trip Lever Stud.....	.45
23-HJ-4543	*Flywheel.....	8.00
23-HJK-4544	Butterfly Valve Lever.....	.20
23-HJ-4545	Exhaust Valve Push Rod Adjusting Screw.....	.10
23-HJ-4546	Damper Cage Gasket.....	.15

Price List of Parts for Economy Model JK Enclosed Throttling Governor  
Engine in the 1½-2 H.-P. Size

In ordering be sure to give the following information:

Name and Number of Part.

Horse-Power.

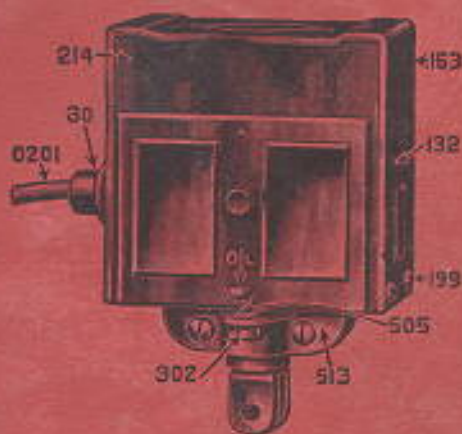
Engine Number.

The Model, which is the letter shown after the horse-power on the name plate.

For illustrations of parts see pages 14 to 16. Part number in the left hand column indicates the number of the illustrations.

Parts marked (\*) will be shipped by freight, PREPAID. All other parts are shipped by PREPAID parcel post.

Parts No.	Description	Price
23-HJ-4548	Cam Retaining Washer.....	<b>\$0.05</b>
23-HJ-4549	Crankshaft Felt Washer.....	.05
23-HJ-4550	Exhaust Valve Cover Plate.....	.15
23-HJ-4551	Magneto Trip Spring Washer.....	.05
23-HJ-4552	Governor Arm Adjusting Screw.....	.15
23-HJ-4553	Connecting Rod Bushing.....	.45
23-HJ-4554	Connecting Rod Bolt.....	.18
23-HJ-4555	Speed Adjusting Screw.....	.05
23-HJ-4556	Speed Adjusting Bracket.....	.10
23-HJ-4557	Piston Rings.....	.40
23-HJ-4558	Cylinder Head Stud.....	.25
23-HJ-4559	Magneto Pad Washer.....	.05
23-HJ-4560	Magneto Trip Spring.....	.15
23-HJ-4561	Throttle Rod.....	.20
23-HJ-4562	Speed Adjusting Spring.....	.15
23-HJ-4563	Oil Splasher Finger.....	.08
23-HJ-4568	Magneto Trip Lever Bushing.....	.20
23-HJ-4569	Spark Control Lever.....	.60
23-HJ-4572	Flywheel Key (pulley side).....	.12
23-HJ-4573	Flywheel Key (magneto side).....	.12
23-HJ-4574	Magneto Terminal Wire.....	.65
23-HJ-4575	Air Check Disc.....	.05
23-HJ-4576	Carburetor Air Check Flange.....	.45
23-HJ-4577	Muffler Body.....	.95
23-HJK-4584	Carburetor Body.....	<b>3.00</b>
23-HJ-4600	Armature Return Spring.....	.40
23-HJY-5696	Cap Screw for magneto return spring bracket and speed adjusting bracket.....	.05
23-HJ-5851	Carburetor Lid Pin.....	.03
23-HJY-5904	Piston Pin Set Screw.....	.05
23-HJY-6150	Oil Filler Plug.....	.05
23-HJY-6278	Flywheel Set Screw.....	.10
23-HJY-6279	Exhaust Valve Adjusting Screw Locknut.....	.05
23-HJY-6280	Exhaust Valve Cover Cap Screw.....	.05
23-HJY-6281	Exhaust Push Rod Set Screw.....	.10
23-HJY-6282	Crank Pinion Woodruff Key.....	.05
23-HJ-6283	Muffler Nipple.....	.20
23-HJ-20610	Check Ball Valve, Complete.....	.60
23-HJK-20749	Gasoline Needle Valve.....	.30
23-HJ-20750	Kerosene Needle Valve.....	.30
23-HJ-31109	Muffler Assembly Complete.....	<b>1.88</b>



**Price List of Parts for Model EK Wico High Tension Magneto Used on  
Model JK Enclosed 1 1/2-2 H.P. Size**

**In ordering be sure to give the following information:**

Name and Number of Part

Horse-Power.

Engine Number.

The Model, which is the letter shown after the horse-power on the name plate.

For location of parts see illustrations above. Part number in the left hand column indicates the number on the illustrations.

**All magneto parts are shipped by parcel post, postage paid by us.**

Parts No.	Description	Price
23-30	Terminal Ins. Block	<b>\$0.30</b>
23X38	Terminal Contact Spring	.20
23X132	Side Band	<b>1.00</b>
23X153	Back Cover	.35
23X199	Ground Connection and Side Band Screw	.05
23X214	Front Cover	.50
23X302A	Breaker Point Nut	.05
23X302B	Breaker Point Nut	.05
23X302	Breaker Points (set of two with washers)	<b>2.00</b>
23X305	Breaker Point Lubricating Felts (set of two)	.10
23X513	Armature	<b>1.75</b>
23X0201	Lead Wire with Terminal and Intensifier	<b>.80</b>

*Read Your Instruction  
Book Carefully —  
Know Your Engine  
Thoroughly*

**Proper Care and Proper  
Oiling Will Add Years  
to the Life and Service  
of Your Engine**

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