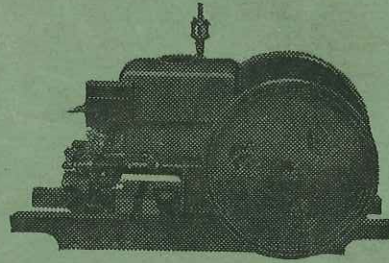


INSTRUCTION BOOK AND REPAIR LIST

MODEL XK AND XI
HERCULES ENGINES



Keep This Booklet for Future Use

**Every Hercules Engine is Carefully Tested
and Inspected to Insure Our
Customers 100% Service**

The life of your engine depends on the
attention you give it. Please take advantage
of the instructions we give you in this book.



Hercules Products, Inc.

Evansville, Indiana, U. S. A.

5000-2-29

WWW.HerculesEngines.com

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HELP US TO HELP YOU!

READ THESE INSTRUCTIONS CAREFULLY BEFORE ORDERING ANY REPAIR PARTS

The following information which you will find stamped on the name plate must be given in your orders for repair parts before we can fill them:

The number and quantity of parts wanted.

The engine number.

The horse power.

The letter appearing after horse power of engines.

If you fail to give us this information it will be necessary to delay your order and write you for same, therefore, to avoid annoying delays, see that the information requested above is given on every order for repair parts.

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 on the drive pulley. This can be done by boring holes in the wood skids or by the use of metal stirrups to be hooked over the skids and securely fastened to the floor.

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

EXHAUST GASSES

When engine is installed in a building or enclosed space, the exhaust gas should be piped to the outside as these gasses if allowed to accumulate are 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 a small drain at the lowest part so water will not enter the engine.

OIL ENGINE WELL BEFORE STARTING

Your engine is new and all parts are tightly fitted. A liberal oiling of every moving part is necessary before starting. Do not depend upon grease cups and sight feed oiler alone for this first oiling but take your oil squirt can and oil each moving part. Move the working parts with your hand or by turning flywheel. See that each part moves freely and is plentifully supplied with oil. Turn the flywheels until the piston comes out of the cylinder as far as it will and squirt oil on the polished surface of the piston and piston pin inside, spreading it all the way around with the fingers. Plenty of oil and grease in the working parts during the first few weeks that you use your engine may add years to its life. Unscrew the grease cups and fill them with the sample grease we furnish; then screw down until grease is forced out at the end of bearings. Turn the flywheels around two or three times to work the grease over the entire bearings surface. After forcing plenty of grease into the bearings it is a good plan to again remove the grease cups and refill them before starting the engine. Oil

the valves and valve stems and make sure that they work freely. Also squirt some lubricating oil into the pipe into which the automatic sight feed oiler is screwed. At the same time turn the flywheels around two or three times to lubricate the piston and cylinder.

REGULATING SIGHT FEED OILER

Screw the automatic sight feed oiler into top of pipe X-14 and fill with a good grade of gas engine or tractor lubricating oil. Adjust oiler to feed ten drops a minute on a full load or five drops a minute on a light load. Raise the lever on top of oiler straight up and adjust flow as follows: To increase the flow of oil, turn adjusting collar under lever to the right. To decrease the flow turn to the left. To shut off oil, turn lever down. In cold weather oil does not flow freely and a change in adjustment will be necessary or it may be necessary to warm the oil to make it flow freely.

TO ADJUST THE No. 63 AUTOMATIC CONNECTING ROD GREASE CUP

(AS USED ON THE 3½, 6 AND 8 H. P. ENGINES)

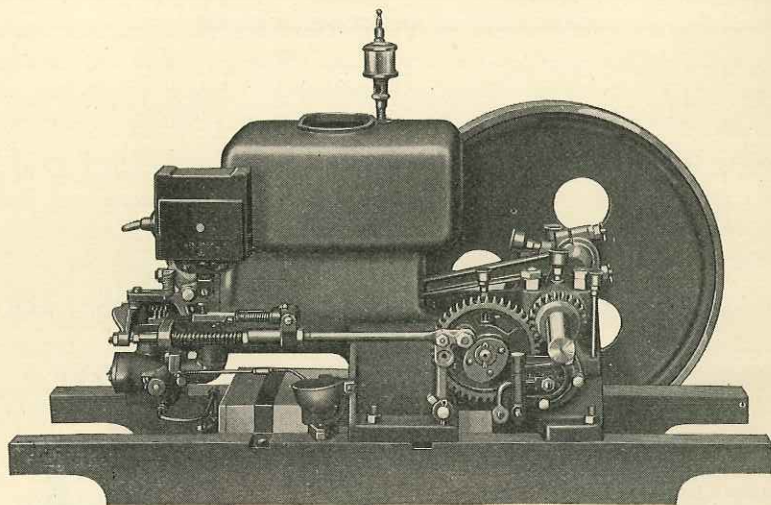
To fill and adjust this cup, screw the lever "A" down as far as it will go. Then unscrew the cup at "B". With a screwdriver turn the screw in the shank "C" to the right until the hole through the bottom of the cup is closed.

Fill the cup with grease. Screw the two parts of the cup together securely and turn the lever "A" to the left until it reaches the position "D". Then take the screwdriver and turn the screw "C" slowly to the left until the grease starts to come out slowly. Then screw the cup in position on the connecting rod. For winter use the adjusting screw should be wide open as the grease is very stiff and will not feed as readily. One filling should be enough for about eight hours' continuous running.



Figure 4

TO PREPARE THE 1¾, 2½ and 3½ H. P.
MODEL XK ENGINES FOR STARTING



Read pages 2 and 3 very carefully.

Screw spark plug firmly into position in the cylinder head and attach magneto cable to terminal at outer end. While Hercules Engines operate equally well with gasoline, kerosene or distillate, they **MUST BE STARTED WITH GASOLINE** since kerosene or distillate will not vaporize as readily as gasoline at ordinary temperatures to form the explosive mixture that is necessary in starting. Of course if the engine is very warm from a previous operation, it might start on kerosene without the aid of the small quantity of gasoline to warm it up.

TO START THE 1¾, 2½ AND 3½ H. P. MODEL XK ENGINE

First: Fill the engine hopper with only enough clean water to cover the center casting which encloses the piston. This 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 engine will start easier if

warm water is put into hopper. The 3½ H. P. engine is equipped with a water valve extending down from the damper cage. See that this is tightly closed.

Second: Fill the fuel tank with gasoline, kerosene or distillate and see that gasoline and kerosene fuel valves are closed.

Third: If gasoline only is used as fuel, turn on the fuel valve No. X-0153 on right side of carburetor one full turn. If kerosene or distillate is used in fuel tank, fill the reservoir on left side of carburetor with gasoline. Leave kerosene fuel valve No. X-0153 on right side of carburetor tightly closed and open gasoline fuel valve No. X-0152 on left side one full turn. (See illustration on page 21.)

Fourth: Turn up top lever on sight feed oiler; lift magneto spark lever No. X-403 (see figure 12 on page 38) up to the starting position. This retards the spark and prevents the engine from kicking back when you crank it.

Fifth: Apply the starting crank to end of crank shaft. 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.

Sixth: As soon as the engine starts firing, push the spark lever No. X-403 down as far as it will go, into running position.

Seventh: About the time the gasoline placed in the carburetor is used up or the engine has become hot enough to run on kerosene or distillate, turn on the kerosene by opening kerosene fuel valve No. X-0153 about one full turn; then close the gasoline valve No. X-0152 and adjust the kerosene 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. Other ways of stopping the engine are to close fuel valve No. X-0153 or to pull magneto cable from spark plug. Shut off cylinder oiler by turning down top lever. In freezing weather drain the cylinder by removing drain plug at base of frame on side. Turn flywheel by hand until exhaust valve is closed to prevent rusting of cylinder walls or valve seat.

TOO LITTLE FUEL ON 1¾, 2½ AND 3½ H. P. ENGINES

If there is a popping sound at the carburetor and engine does not develop its rated horse power the mixture is too lean. Do not try to adjust this by adjusting the carburetor until you have cleaned the fuel pipe No. X-38. You will

find a little valve in the fuel line; be sure that it is working freely. After you have assured yourself that the fuel line is cleared and the engine continues to show signs of lean mixture it will be necessary to adjust the air damper spring by releasing the lock nut and turning the damper stem to the left which will tighten the spring and make the damper disc harder to move, thereby causing more fuel and less air to be drawn into the cylinder at each suction stroke of the piston. Be very careful not to make this adjustment too tight or you will flood the engine and make it necessary to make the adjustment all over again.

Do not try to make adjustments on the air damper spring until you have assured yourself that all other parts of the fuel system are properly adjusted.

If the engine starts and runs good on the gasoline you put in the carburetor to start the engine with and fails to run good when you turn on the kerosene, you will find your trouble somewhere between the carburetor and the fuel tank.

Sometimes a popping noise is caused by poor ignition, valves not seating properly or a leaky cylinder head gasket, which permits the water to leak in the cylinder and mix with the fuel. In this case it will be necessary to replace with a new gasket unless the leak is so slight that after the engine is once started it is not noticeable.

Fuel trouble might also be caused by butterfly adjustment. Read instructions covering this adjustment on page 7 very carefully.

TOO MUCH FUEL ON 1¾, 2½ AND 3½ H. P.

It is a common mistake to flood the cylinder in cranking the engine, which makes it very hard to start. Unless engine is subjected to a low temperature, do not flood the cylinder as engine can be choked down by feeding too much fuel just as easily as by not feeding enough. Of course during extremely cold temperatures the rate of fuel vaporization is much lower and an extra amount is necessary.

If black smoke appears at the exhaust muffler and the exhaust has a muffled sound, the mixture is too rich and you are using too much fuel. If you cannot regulate this with the fuel valve by cutting off some of the fuel it will be necessary to loosen the air intake or damper spring by releasing the lock nut and turning the air damper stem, No. X-1230 to the right. (See illustration on page 24). This is a very sensitive adjustment and the damper stem should be turned but very little at a time until the desired results are obtained.

Fuel trouble might also be caused by butterfly valve adjustment. Read instructions covering this adjustment on page 7 very carefully.

HOW TO ADJUST BUTTERFLY VALVE ON 1¾, 2½ AND 3½ H. P.

Across the face of the butterfly spindle and damper lever No. X-0167 you will find a line. This line is parallel to the butterfly valve and when the butterfly valve is wide open the line should run lengthwise with the damper cage which encloses the butterfly valve. When the line or slot is in this position the adjusting screw No. (X-Y467) should be touching the governor spindle rod so that the action of the governor in pushing the spindle rod against this adjusting screw will close the butterfly valve and thus regulate the speed of the engine.

TO CHANGE THE SPEED ON THE 1¾, 2½ AND 3½ H. P.

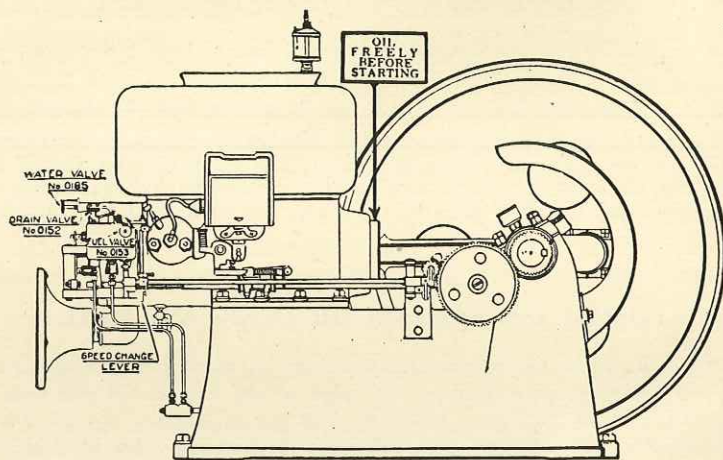
As explained in the preceding instructions on the butterfly valve adjustment, the butterfly valve regulates the speed of the engine. If you wish to reduce the speed of the engine, loosen the lock nut on set-screw No. (X-Y467) and turn screw to the right. This will cause the butterfly valve to close at a lower speed of the engine and governor and result in a fewer number of revolutions per minute.

To increase the speed of the engine, turn the adjusting screw to the left thereby causing a higher speed of the engine and governor to close the butterfly valve through the action of the governor spindle on the adjusting screw.

REGULATING WATER VALVE ON 3½ H. P. ENGINE

The water valve is provided only on the 3½ H. P. engine as it is not required on the smaller sizes. It extends below the damper cage which is located between the carburetor and the engine. (See illustration on Page 21). It is closed by turning to the right and should never be opened when using gasoline as fuel. When kerosene or other low grade fuel is used, a deposit of red hot carbon is likely to form in the cylinder which causes preignition. This preignition causes the engine to pound and the pounding can be overcome by gradually opening the water valve No. X-0165 a notch at a time until the knocking has ceased. Do not use too much water in trying to entirely stop the pounding as a little knock indicates good power and too much water will result in a loss of power. Be sure to close water valve five minutes before you stop engine to prevent rusting the cylinder and valves.

READ GENERAL INSTRUCTIONS ON PAGE 12



TO PREPARE THE 6 AND 8 H. P. MODEL XK ENGINE FOR STARTING

Be sure you have followed very carefully instructions on pages 2 and 3 with regard to thoroughly oiling the engine. See that the spark plug is firmly screwed into the magneto bracket and the cable from the magneto is attached to the terminal of the spark plug.

TO START THE 6 AND 8 H. P. ENGINES

First. Fill the hopper about two-thirds full of water unless you expect to run the engine under a continuous load for some time with no attention and then fill almost to the top to avoid the possibility of the engine becoming dry.

Second. Fill the fuel tank with kerosene.

Third. See that drain valve is closed in carburetor. Then fill carburetor with gasoline for starting. Open the fuel valve No. X-0153 one full turn and after engine is running, adjust this valve to a point where the engine runs best. As fast as the gasoline in the carburetor is consumed, it will be replaced with kerosene from the fuel tank by the fuel plunger pump on the carburetor. By the time the gasoline in the carburetor is entirely consumed, the engine will be warm enough to operate on the kerosene that has replaced the gasoline. When starting the engine cold again, drain the remaining kerosene back into the fuel tank through the drain valve and then repeat as above.

Fourth. Lift magneto spark lever No. 403 (see Figure 13 on page 39) up to starting position. This retards the spark which prevents the engine from kicking and makes it easier to start.

Fifth. Apply the starting crank and hold the intake valve in the cylinder head open with the left hand, spin the flywheel rapidly five or six times, then release intake valve and place your hand over the air port under the carburetor but continue to crank the engine until it starts. By placing your hand over the air intake in the carburetor you choke the air and give the engine a rich mixture of fuel.

Sixth. As soon as the engine starts firing push the spark lever No. 403 down to running position.

TOO LITTLE FUEL ON 6 AND 8 H. P. ENGINES

The kerosene carburetor on these engines is of the pump feed type and the fuel is supplied from the tank to the carburetor by the action of the cam rod on the pump lever.

In case the engine is not getting enough fuel after you have properly regulated the fuel valve, drain carburetor by means of drain valve, remove No. X-0158 pump body, TAKING CARE NOT TO LOSE THE TWO CHECK BALLS, and clean pump body and connections carefully.

Also see that fuel pipe and connections from carburetor to fuel tank are clean and also the strainer nipple No. 40.

Fuel trouble might also be caused by butterfly valve adjustment. Read instructions covering this adjustment very carefully.

HOW TO ADJUST THE BUTTERFLY VALVE ON THE 6 AND 8 H. P.

When the line or slot on the butterfly valve lever No. 170 is horizontal to the ground, the butterfly valve in the damper cage is wide open. When in this position place the speed change lever No. 0157 in low speed and adjust the governor shaft arm No. 0154 tight against the end of the governor spindle rod No. 068 with the aid of the set-screw that locks the governor shaft arm on the governor shaft rod No. 172.

WATER VALVE ON 6 AND 8 H. P. KEROSENE ENGINES

If you are using kerosene for fuel in either of these sizes, there is a water valve provided to eliminate pre-ignition caused by a red hot carbon deposit being formed inside of the combustion chamber. This pre-ignition causes a pounding in the engine which can be overcome by gradually opening the water valve No. X-0137, one notch at a time until the knocking has ceased.

This water valve is located on the cylinder head on the 6 and 8 H. P. engines.

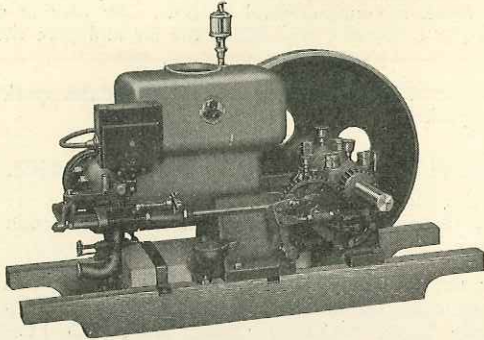
Be careful not to use too much water in trying to entirely stop the pounding as a little knock indicates good power and too much water will result in a loss of power.

Do not fail to close this water valve about five minutes before you stop the engine as this will prevent rusting.

READ GENERAL INSTRUCTIONS ON PAGE 12.

MODEL XI GASOLINE ENGINE INSTRUCTIONS

(1¾, 2½ AND 3½ H. P.)



TO PREPARE ENGINE FOR STARTING

Read over pages 2 and 3 very carefully and be sure that all of the moving parts are thoroughly oiled and working freely.

Fill the water hopper two-thirds full with clean water and fill the fuel tank with gasoline. Screw spark plug firmly into cylinder head and attach magneto terminal wire.

TO START THE 1¾, 2½ AND 3½ H. P. MODEL XI GASOLINE ENGINE

Open the needle valve on the mixer two full turns to the left and turn on the oil by raising the lever on the lubricator so that the oil is dropping properly, as explained on page 3.

Lift magneto spark lever No. 403 as shown on page 38, as this retards the spark and prevents the engine from kicking.

Apply the starter crank and turn the engine to the right rapidly five or six times while you hold the intake valve open with your left hand to release the compression.

After you have gained momentum in turning the fly-wheels over, release your left hand from the intake valve and hold it over the air intake port on the carburetor, so the engine will get a good, rich mixture for starting.

As soon as the engine starts, push the spark lever No. 403 down in running position and adjust the fuel valve No. X-0133 so that the engine is running with the least number of explosions without black smoke appearing at the exhaust or a popping sound in the carburetor.

If engine does not start readily, read instructions on page 12 very carefully and then read the general instructions on pages 13 to 21.

TO STOP THE ENGINE

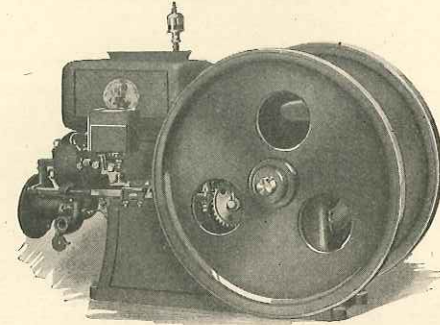
First. Shut off the gasoline by closing the fuel valve.

Second. In cold weather drain the water from the reservoir by opening the drain cock. Be sure to do this, as even a light frost may crack the cylinder or cylinder head by freezing the water.

Third. Turn flywheel until exhaust valve closes. This prevents corroding of valve seats and injury to cylinder.

MODEL XI GASOLINE ENGINE INSTRUCTIONS

(6 AND 8 H. P.)



TO PREPARE ENGINE FOR STARTING

Read over pages 2 and 3 very carefully and be sure that all of the moving parts are thoroughly oiled and working freely.

Fill the water hopper two-thirds full with clean water and fill the fuel tank with gasoline. Screw spark plug firmly into magneto bracket and attach magneto terminal wire.

TO START THE 6 AND 8 H. P. MODEL XI GASOLINE ENGINE

Open the needle valve on mixer two full turns to the left and turn on the oil by raising the lever on the lubricator. Be sure the oil is dropping properly, as explained on page 3.

Lift magneto spark lever No. 403, as shown on page 39. This retards the spark and prevents the engine from kicking.

Close the air damper on the carburetor air intake and then apply the starter crank. Hold the air intake valve open with the left hand and turn the fly-wheels rapidly to the right. After the fly-wheels have gained momentum, release your left hand from the intake valve and continue to crank until the engine starts.

Just as soon as the engine starts, open the air damper so the cylinder will not be flooded, and push down the spark lever No. 403 into running position. Then, close the fuel valve slowly until the point is reached where the engine runs best with the least number of explosions and without black smoke appearing at the exhaust or a popping sound at the air intake on the carburetor.

If engine does not start readily or does not operate properly, read over instructions on page 12 very carefully and then read the general instructions on pages 13 to 21.

TO STOP THE ENGINE

First. Shut off the gasoline by closing the fuel valve.

Second. In cold weather drain the water from the reservoir by opening the drain cock underneath the cylinder, also remove plug from bottom of cylinder head. Be sure to do this, as even a light frost may crack the cylinder or cylinder head by freezing the water.

Third. Turn flywheel until exhaust valve closes. This prevents corroding of valve seats and injury to cylinder.

MODEL XI GASOLINE ENGINE INSTRUCTIONS

HOW TO ADJUST THE GASOLINE FUEL VALVE

The mixing fuel valve or carburetor No. X-35 is of the suction feed type, gasoline being drawn from the tank in the base by the intake or suction stroke of the piston. The air and gasoline are mixed in this valve to form the explosive gas.

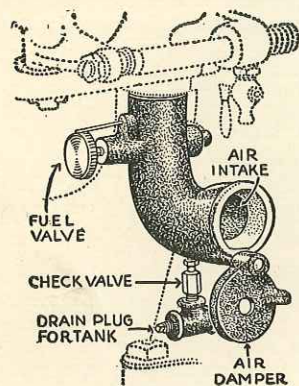


Figure 5

When you start the engine, open the fuel valve, close the air port while cranking, either with your left hand on the $1\frac{3}{4}$, $2\frac{1}{2}$ and $3\frac{1}{2}$ H. P. sizes, or with the air damper on the 6 and 8 H. P. sizes, as this draws a supply of gasoline from the tank and primes the intake valve. It is a common mistake to flood the cylinder in starting the engine, so do not keep the air port closed too long. Open the fuel valve two turns on the $1\frac{3}{4}$ and $2\frac{1}{2}$ H. P. sizes and from one to two turns on the larger sizes. In cold weather you may be required to use more fuel in starting. After the engine is running, open the air damper and close the fuel valve slowly until the point is reached where the engine runs with the least number of explosions without black smoke appearing at the exhaust or a popping sound at the air port of the mixer. Black smoke from the exhaust indicates too much fuel and a popping sound at the carburetor indicates too little fuel.

If it is ever necessary to take the mixing valve and feed pipe off the engine, be very careful not to lose the valve out of the check valve, because if this valve is not in place, your engine will not get any gasoline. To drain gasoline from the fuel tank remove the drain plug.

THE GOVERNOR

The governor controls the speed of the engine and is of the ball type. When the engine runs above its regular speed, the balls on the governor widen their circuit, which presses in on the pin going through the governor spindle. This forces the detent blade in so that it catches behind the block on the cam rod and holds the exhaust valve open, at the same time stopping the spark and cutting off the supply of fuel, until the speed of the engine is reduced to where it should be, then the detent blade flies out again, releasing the cam rod and the engine takes up its regular operations. **When running empty the engine exhausts every eight to ten revolutions of the flywheel.**

HOW TO ADJUST THE DETENT BLADE

When the exhaust valve is wide open and the detent blade is pushed in behind the catch block on the cam rod, there should only be the thickness of a postal card between them. To adjust the detent blade on the $1\frac{3}{4}$, $2\frac{1}{2}$ and $3\frac{1}{2}$ H. P. sizes, move the blade forwards or backwards through the aid of the two adjusting nuts No. X-077. To adjust the blade on the 6 and 8 H. P. sizes, loosen the lock nut No. X-077 and screw the adjusting screw No. X-052 either in or out until you have the blade where it should be. Then, tighten the lock nut No. X-077.

THE DETENT CATCH BLOCK

The catch block on the cam rod is made of tooled steel and should last a long time. If this block should wear so that it does not hold the detent blade and regulate the speed of the engine, it will be necessary to replace this block with a new one. On the 6 and 8 H. P. sizes this block has two sides and may be turned around should one side show signs of excessive wear.

READ OVER THE GENERAL ENGINE INSTRUCTIONS ON PAGES 13 TO 21 VERY CAREFULLY FOR OTHER INFORMATION

GENERAL INSTRUCTIONS

FOR CARE AND OPERATION OF YOUR ENGINE

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.

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 static electricity in passing through the chamois.

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. Oil both valves every time you run the engine.

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 gasoline fuel valve, cutting down the fuel supply to the lowest point where it will fire regularly without popping back into the carburetor.

IGNITION TROUBLE

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 $1/32$ of an inch. If an 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. 100 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 $1/8$ 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.

SPARK REGULATION

When the spark lever No. 403 is in advanced position for running (which is down) the magneto should trip when the word "Spark", which you will find stamped on the rim of the flywheel, is opposite the top of the cam rod.

If the magneto does not trip at the right time, adjust the trip finger No. 407 by moving it backwards or forwards through the adjusting nuts No. X-50 on the cam rod of the $1\frac{3}{4}$, $2\frac{1}{2}$ and $3\frac{1}{2}$ H. P. engines and Y-460 and Y-586 on the 6 and 8 H. P. sizes.

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 14). Be sure, also that the spark retard lever No. X-403 is pulled 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 base opposite magneto side as if 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 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.

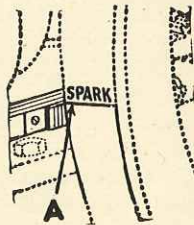
DAMAGE THROUGH FREEZING

In freezing weather, take no chance. Remove drain plug in base opposite magneto side and drain water jacket 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. Let it stand for half an hour; then drain out, saving the solution. Now run engine for five minutes to heat jacket. Stop the engine and refill with 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 sort of a 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.

VALVE TIMING

In some cases where the engine is hard to start or has a loss of power, the trouble can be traced to improper timing of the valves caused by the incorrect adjustment of the No. 06 valve adjusting screw on the valve lever No. 28.

As this is a four cycle engine, we will show you the four distinct parts in the movement of the piston and crankshaft and the timing of the valves.

The first is known as the suction stroke, during which time the piston is traveling from extreme inner to extreme outer position, causing a vacuum which automatically opens the inlet valve and admits a charge of kerosene mixed with air from the carburetor.

In the next or compression stroke, the piston returns from the extreme outer to extreme inner position, compressing the charge which has been drawn into the cylinder. During this stroke both valves remain closed, the spark taking place just before the end of this stroke.

The third, or power stroke, is caused by the force of the explosion in the cylinder driving the piston out again to its outer position. Before the piston reaches the extreme outer position the exhaust valve is opened by means of a cam which pushes out the cam rod and works the valve lever and lifts the valve. The proper time for this valve to start to lift is when the crankshaft is half way between the vertical and horizontal position on the downward part of this stroke.

We now come to the last or exhaust stroke. The exhaust is already open so as piston returns from its outer position it drives the burnt gases out into the exhaust pipe. The exhaust valve remains open until the crankshaft has passed the inner center three degrees or five degrees.

This adjustment is controlled by means of No. 06 adjustment screw (pages 24, 25 and 26) and is easily regulated.

Notice the setting of this valve from time to time, as this may work out of adjustment as the engine is used.

If exhaust valve spring has weakened to such an extent that suction is pulling in exhaust valve, replace with new spring.

It is possible that the No. 06 adjusting screw may not be able to give you the correct exhaust valve timing if the cam gear with cam has not been properly meshed with the crankshaft pinion. See directions below.

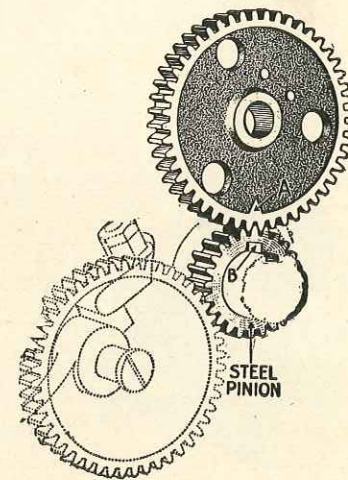
HOW TO PUT ON THE CAM GEAR

If it is ever necessary to take off the cam gear or to put on a new one it must be put on in a certain position as the cam on the gear controls the time of the spark and the opening and closing of the valves, in fact every operation of the engine depends on this cam being set just right.

To put the cam gear on the $1\frac{3}{4}$, $2\frac{1}{2}$ and $3\frac{1}{2}$ H. P. engines, first remove valve lever No. X-28 on cylinder head and lock the cam rod No. X-48 as far back as possible to prevent interference from cam roller when installing new cam gear. Turn flywheel around until the key in the crankshaft is straight up as shown by "B" in the accompanying illustration. Then set the two teeth that are just under the arrow indicator (marked "A" in the accompanying illustration) on the cam gear over the tooth in the crankshaft pinion just above the key marked "B" in the illustration. Then roll the cam gear to the left, keeping it in mesh with the crankshaft pinion until it reaches the position shown by dotted gear in the illustration. Next set the cam gear stud in place and fasten it with set screw. You can then release the cam rod and replace the valve lever No. X-28.

In putting the cam gear on the 6 and 8 H. P. engines it is best installed by rolling it around to the right after it has been properly meshed with the crankshaft pinion by following the same instructions with regard to the arrow indicator and the crank pinion key.

Be very careful in putting on this cam gear for one tooth out of the way will make a decided difference in the way your engine will run.



HOW TO GRIND VALVES

When an inlet or exhaust valve leaks, remove the cylinder head, take off the valve springs, remove the valve you want to grind and wash it and the valve seat in gasoline, then make a paste of fine emery dust and oil. If you cannot get emery dust, use powdered pumice stone with oil. (You can get powdered pumice stone at almost any drug store.) Smear this on the valve and valve seat, put the valve in place and put a nail through the hole in valve stem on the outside of the head, grasp the nail with your fingers and turn from left to right for a minute or so, then lift the valve and turn it about half way around and repeat this until the valve and valve seat show an even surface all the way round.

After the valve is ground in, wash off the emery dust with gasoline and do not get any dirt on the valve seat. In replacing the valves be sure to get the heavy spring on the exhaust valve and the light spring on the inlet valve.

HOW TO ADJUST VALVE LOCK ON 6 AND 8 H. P. ENGINES

The inlet valve "A", as shown in the illustration, is opened by the suction of the piston. For the entire length of the suction stroke gas is being drawn into the cylinder; then when the piston starts to compress the gas this valve closes and is held shut by the valve lock "C", so that no gasoline is wasted.

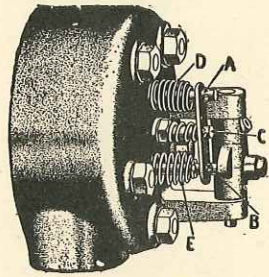


Figure 7

If there is a loss of fuel at the opening of the mixer, loosen the lock nut on the valve lock stud "C" and screw stud out one turn and tighten lock nut. If engine does not get enough fuel loosen lock nut as above and screw stud in one turn and tighten lock nut.

HOW TO PUT ON THE CAM ROD SPRING

The cam rod spring holds the cam rod and roller against the cam on the cam gear. As this spring does a lot of work it may wear out; if it does, buy a new one. (See No. 059 in list of repairs, pages 30 and 33.) To put on a new spring, remove the cylinder head, slip the spring over the end of the cam rod and replace the cylinder head. If necessary to repack cylinder head, see page 19.

HOW TO TAKE OFF A FLYWHEEL

To take off the flywheel, loosen the bolt on the hub and this should permit the flywheel to be removed. However, the wheel may be tight on the shaft

and you may have to drive it off by firmly tapping on the end of a piece of hard wood that has been placed against the hub. A little kerosene poured into the flywheel slot might also help in loosening it from the shaft.

To take off the pulley on the $1\frac{3}{4}$ and $2\frac{1}{2}$ H. P. engines, loosen the set-screw with a screwdriver and drive the pulley off.

HOW TO REPLACE A FLYWHEEL

When replacing flywheel, place wheel in proper position on shaft, tighten the bolts down securely and drive in key.

TO TAKE OFF THE GOVERNOR BALLS, SPINDLE OR PINION

If you find it necessary to take the governor apart, first take off the governor pinion. To do this, first unloosen the small set-screw that locks the governor pinion on the governor spindle, hold the flywheel stationary thus locking the gears, and then turn the governor balls to the right as the pinion is put on with a right hand thread.

PACKING THE CYLINDER HEAD

We use a special graphite asbestos packing between the cylinder and cylinder head to prevent the escape of the compressed gas.

To repack the cylinder head in case the packing should blow out or if you should break the packing when removing the cylinder head, you can use ordinary asbestos packing such as you buy at your hardware store or the kind we furnish under No. 17 on pages 22 and 26. If you use the ordinary asbestos packing, soak it in linseed oil; if you buy our special graphite asbestos packing or gasket, it is all ready to be put on.

Before putting on new packing be sure all particles from the old packing which may have stuck to the cylinder or cylinder head are scraped off and that these parts show a smooth, clean surface. If all the old particles are not cleaned off the new packing will blow out in a short time.

After you have the packing in place push the cylinder head in close to the cylinder and screw on the nuts by hand as far as they will go, then use a wrench and turn each nut, one after the other, about one-half turn at a time. **Do not screw one nut down perfectly tight and then go to the next, as this causes an uneven joint and the packing will not hold.** After the engine has been running for about ten minutes tighten the nuts again and you will have a perfectly tight joint.

CYLINDER HEAD PACKING

If you make a new packing from sheet asbestos you must be sure to cut openings in the packing so the water can circulate from the cylinder, through the cylinder head and around the valves; if you fail to cut these water openings the cylinder head will get too hot and be ruined.

BEARINGS

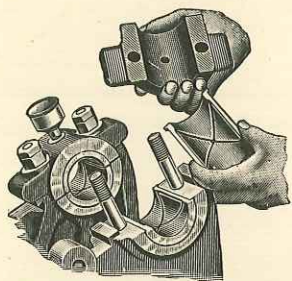


Figure 8-The Main Bearings

Be sure all bearings are kept properly adjusted. An engine should never be run with a bearing that is too loose or too tight. A loose bearing will soon rack your engine and break something, and a tight bearing will heat up and soon melt.

The main bearings and crankshaft end of connecting rod have die cast bearings which fit perfectly into the machined bearings. The piston end of the connecting rod has a cast bushing.

All the bearings can easily be replaced; the bearing in the piston end of the connecting rod can be driven out and a new one driven in.

The crankshaft bearings and the bearing in the crankshaft end of the connecting rod are made of a special die cast babbitt. They are fitted with steel liners so you can take up any wear in the bearings. Remove the bearing cap and take out enough of the steel strips from both sides of the bearing so it fits snug.

After you have removed the steel strips and put the cap back on again, screw down the bolts, but before starting the engine open the exhaust valve and turn the flywheels around by hand to see that they turn freely. If they bind you have taken out too many steel strips and you will have to put enough back until the flywheels turn easily. Watch the grease cups closely and give them a quarter of a turn each time you start the engine. See that all bolts are tight and you will have no trouble with the bearings.

PISTON AND RINGS

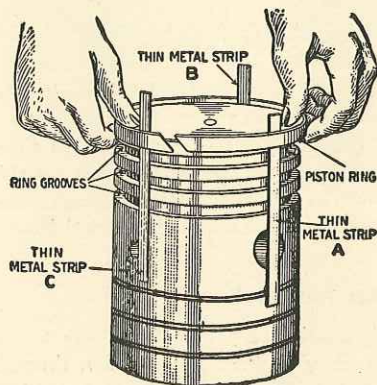


Figure 9

As explained on page 16, what makes the engine run is the combination of air and gas drawn into the cylinder by the suction of the piston, this gas being compressed before it is exploded. To compress this gas it is necessary that the space in the cylinder be gas-tight. The piston is fitted to the cylinder and makes a fairly tight joint, but on account of the expansion of iron when it gets hot, it is necessary to have some other means of keeping the gas from escaping. Each piston is fitted with three rings that spring out and press against the walls of the cylinder, preventing the gas from escaping.

These piston rings hold the compression and must fit free in the grooves of the piston. Feeding a poor

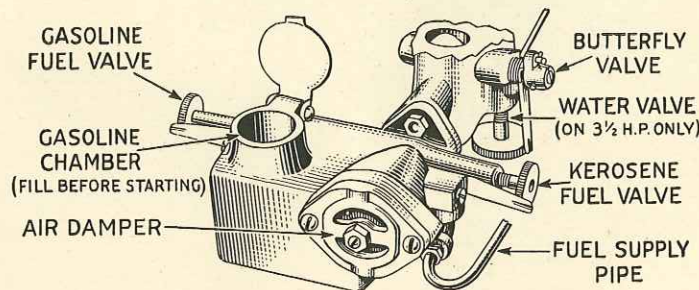
grade of gasoline or lubricating oil, or too much of either, will cause a carbon deposit to form around the rings, which will in time bind them in the grooves, so they cannot spring out against the walls of the cylinder to hold the compression. It is very necessary that you use the proper grade of oil and watch the supply of gasoline, for on this depends the proper running of the engine.

Before removing the piston from the cylinder, be sure the wire is disconnected from the batteries or magneto, take out the connecting rod bolts at the crankshaft end of the connecting rod. Remove the bearing which loosens the connecting rod from the crankshaft. Next, you will have to take off the governor spindle, as instructed on page 19, which gets the spindle and balls out of the way. This is all of the governor that you will have to take off, as the piston will now slip out of the cylinder.

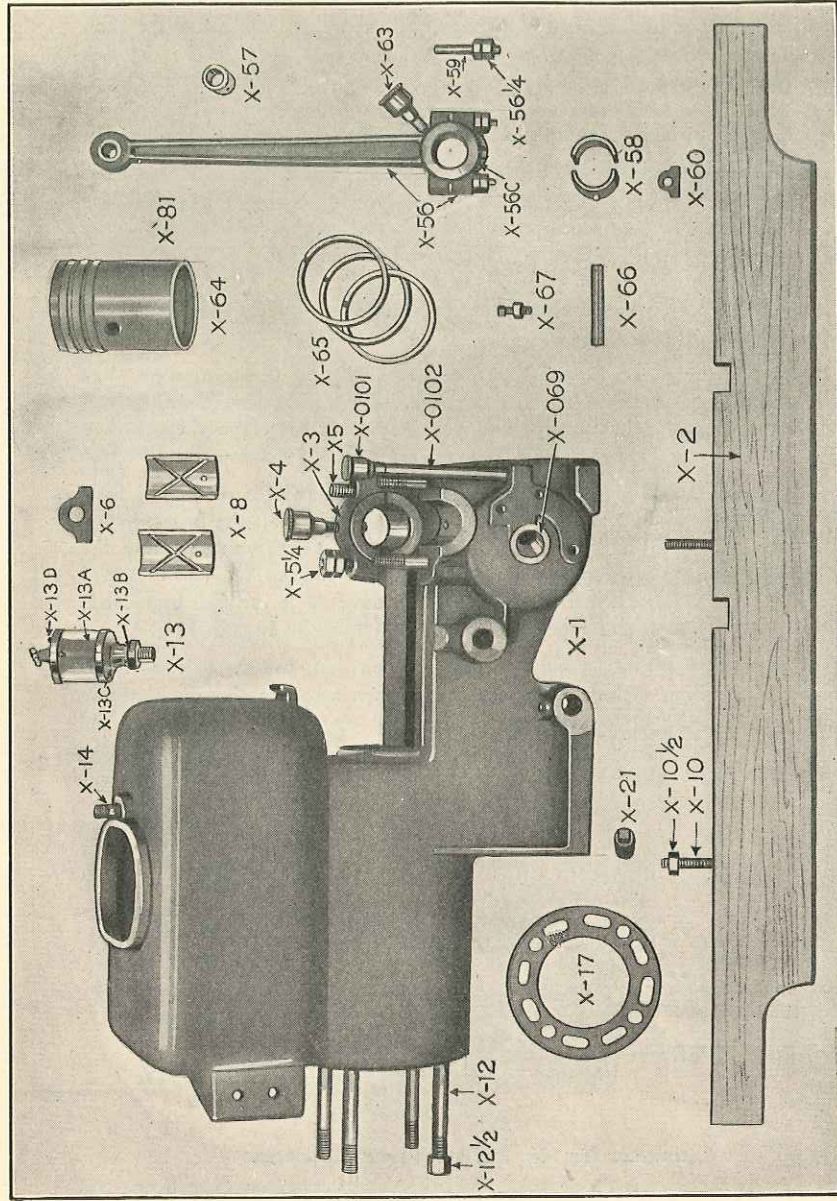
If you find the piston rings are gummed or held tight in the grooves, they must be thoroughly cleaned. To do this you will have to remove the rings and wash them in kerosene or gasoline and you may have to scrape them with a knife.

To remove the rings take three thin metal strips (pieces of an old hack saw blade are fine for this) and slip under the center ring. Start the first strip under the ring at the joint and force it all the way around until you have it at the position shown by "A", Figure 9, then slip the second strip to "B" and the third to "C", which will raise the ring out of the groove so it can be slipped off. Take the top ring next and repeat the operation, then the bottom ring.

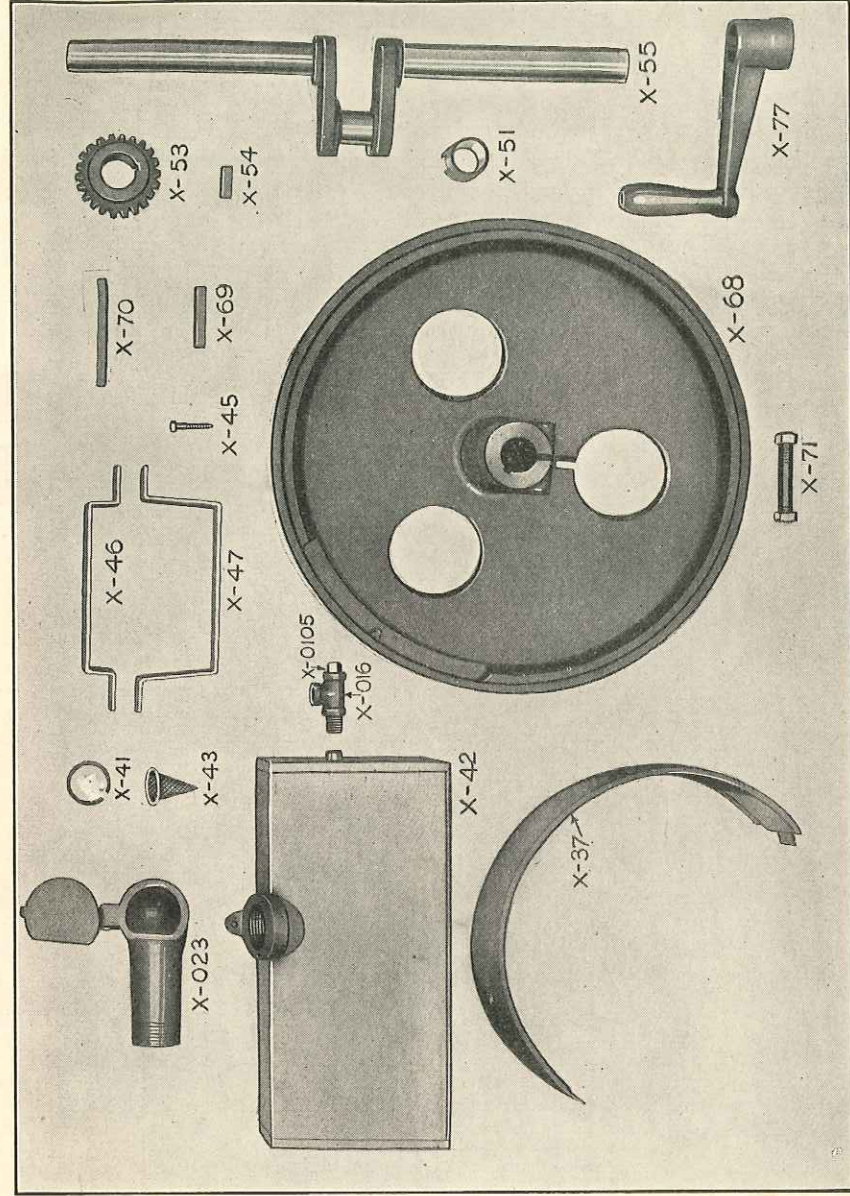
In replacing the rings, put the center ring on first, using the three metal strips as before, then without the three metal strips you can slip the top ring on and then put the bottom ring on, bringing it up from the bottom of the piston. Before putting the piston back in the cylinder, oil the rings and surface of the piston thoroughly.



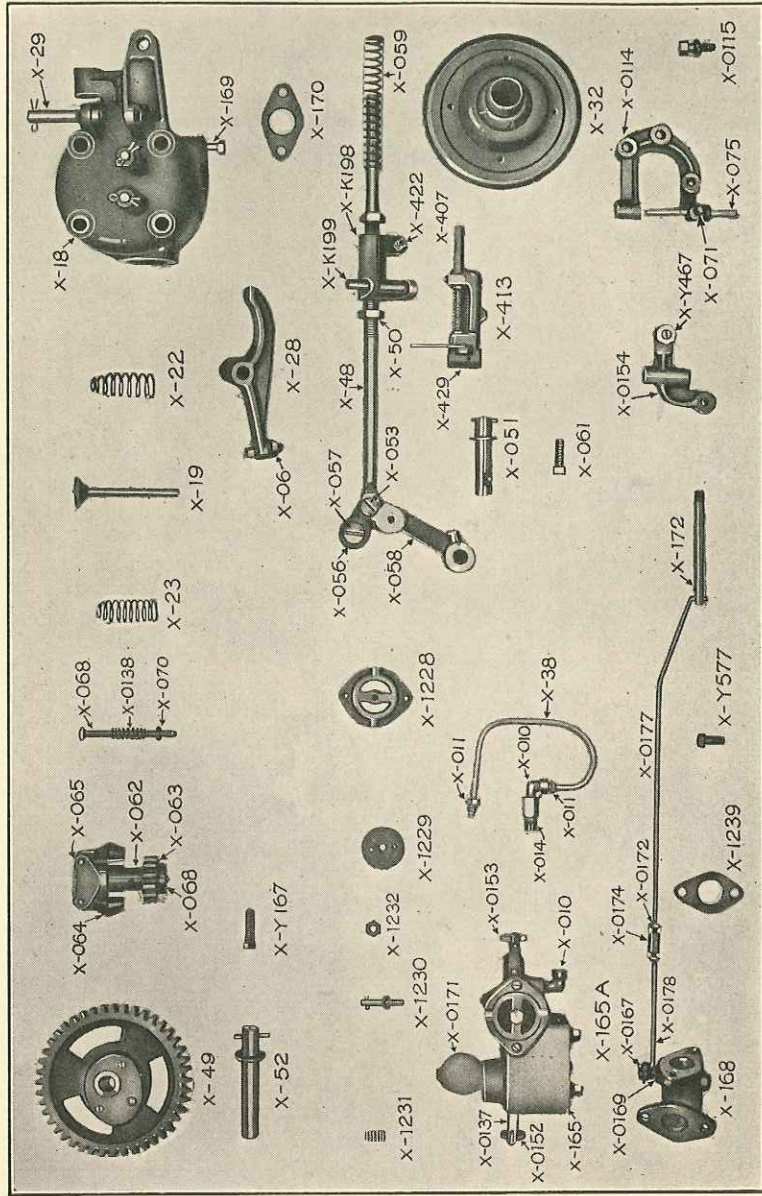
Carburetor for 1 3/4, 2 1/2 and 3 1/2 H. P. Engine



PARTS FOR 1¾, 2½ AND 3½ H. P. MODEL XK OR XI ENGINE
 For Prices See Pages 29, 30, 31
 Parts for 6 and 8 H. P. on Pages 26, 27, 28.



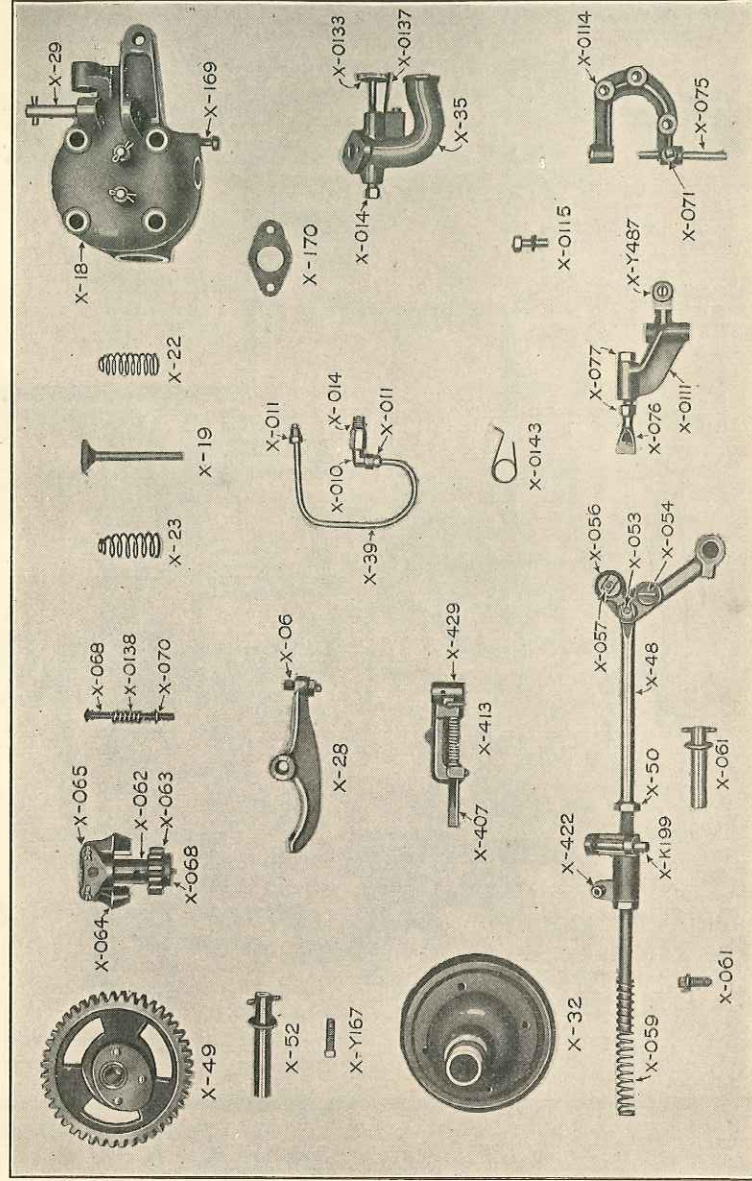
PARTS FOR 1¾, 2½ AND 3½ H. P. MODEL XK OR XI ENGINE
 Prices on Pages 29, 30 and 31.
 Parts for 6 and 8 H. P. on Pages 26, 27, 28.



PARTS FOR 1 3/4, 2 1/2 AND 3 1/2 H. P. MODEL XK ENGINE

Prices on Pages 29, 30 and 31.

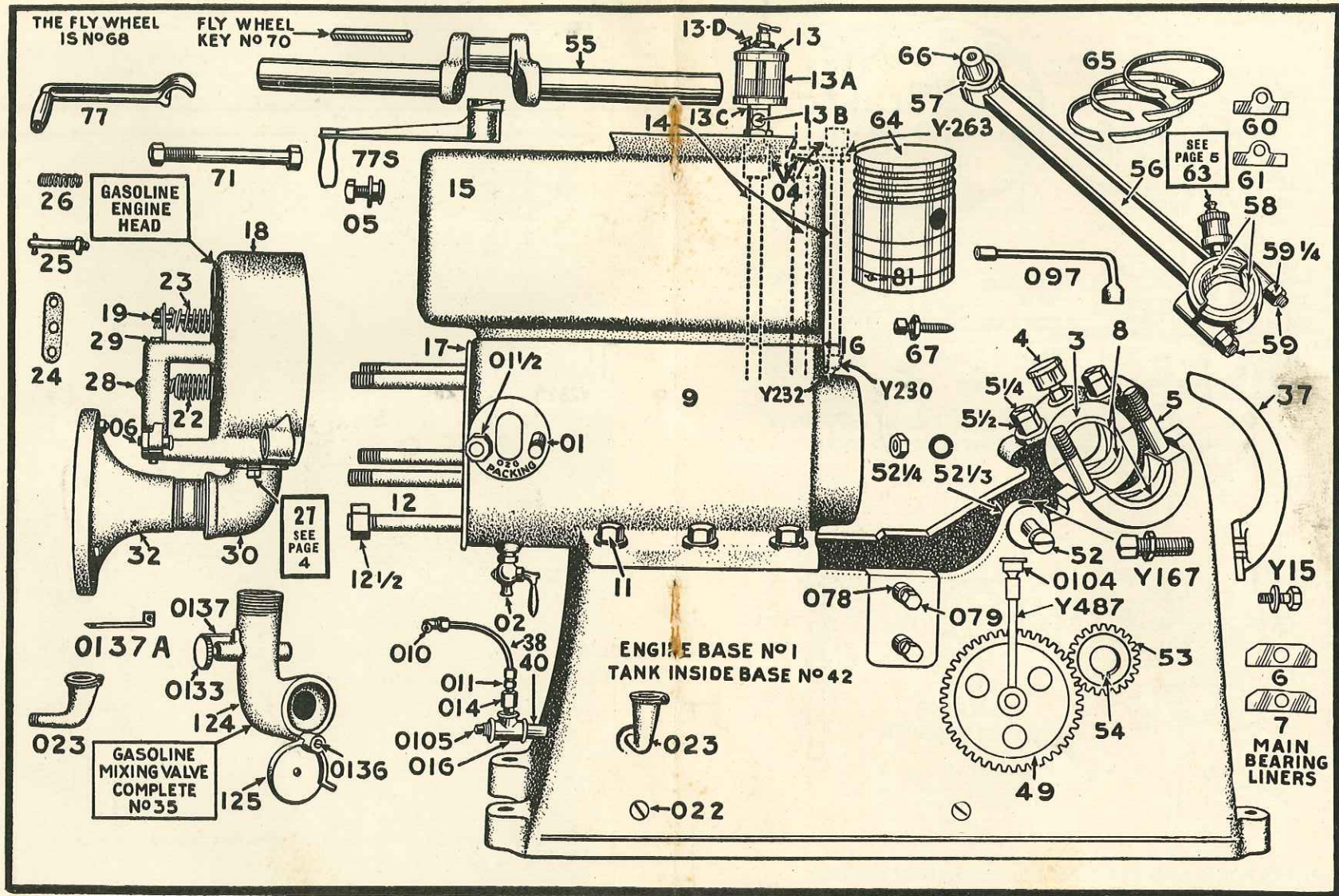
Parts for 6 and 8 H. P. on Pages 26, 27 and 28.



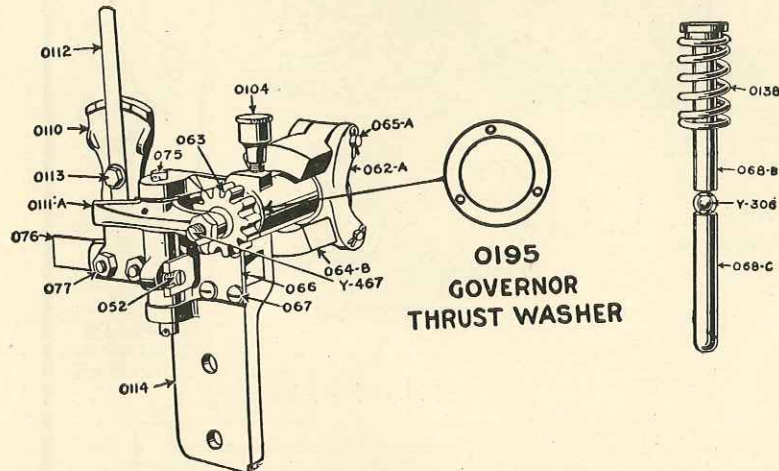
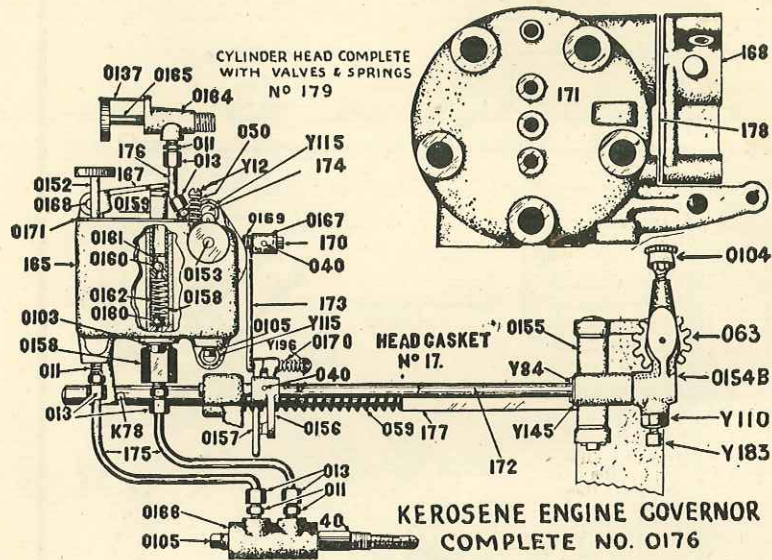
PARTS FOR 1 3/4, 2 1/2 AND 3 1/2 H. P. MODEL XI ENGINE

Prices on Pages 29, 30 and 31.

Parts for 6 and 8 H. P. on Pages 26, 27 and 28.



PARTS FOR 6 AND 8 H. P. MODEL XK AND XI ENGINES
 Prices on Pages 32, 33, 34 and 35. Parts for 1 3/4, 2 1/2 and 3 1/2 H. P. on Pages 22, 23, 24 and 25.



PARTS FOR 6 AND 8 H. P. MODEL XK AND XI ENGINES
 Prices on Pages 32, 33, 34 and 35.
 Parts for 1 3/4, 2 1/2 and 3 1/2 H. P. on Pages 22, 23, 24 and 25.

Price List of Parts for 1 3/4, 2 1/2 and 3 1/2 H. P. Model XK and XI Engines

SUBJECT TO CHANGE WITHOUT NOTICE

When Ordering Parts, Be Sure to Give the Letters, Numbers and Horse Power of Your Engine as Stamped on Name Plate

Part No.	Description	Rating 1 3/4 H. P.	2 1/2 H. P.	3 1/2 H. P.
X-1	*Base (Note—Important. If your engine base has cylinder jacket drain plug on magneto side order X-1B)	\$16.00	\$19.50	\$23.50
X-2	*Wooden Skids (each)	.75	.75	1.40
X-3	Base Cap	.70	.85	1.25
X-4	Main Bearing Grease Cup	.12	.12	.15
X-5	Base Cap Stud and Nut	.30	.35	.35
X-5 1/4	Base Cap Stud Nut	.05	.05	.05
X-6	Bearing Liners thick, per set	.15	.20	.20
X-7	Bearing Liners thin, per set			.23
X-8	Main Bearings (2 halves)	1.20	1.30	1.55
X-12	Cylinder Head Stud and Nut	.35	.35	.45
X-12 1/2	Cylinder Head Stud Nut	.05	.05	.10
X-13	Sight Feed Oiler Complete	1.95	1.95	2.10
X-13A	Large Glass for Oiler	.45	.45	.53
X-13B	Small Glass for Oiler	.30	.30	.30
X-13C	Small Glass Cage	.30	.30	.30
X-13D	Cap for Oiler	.60	.60	.60
X-14	Oiler Pipe	.25	.30	.30
X-17	Cylinder Head Gasket	.50	.55	.60
X-18	Cylinder Head (Note—Important. If your engine has cylinder jacket drain plug on magneto side of base order X-18B)	4.90	6.00	8.25
X-18A	Cylinder Head Complete with Valves and Springs	6.00	7.10	9.85
X-19	Exhaust or Inlet Valve	.40	.40	.65
X-21	Cylinder Drain Plug	.05	.05	.05
X-22	Exhaust Valve Spring (Note—Important. If your Cylinder Head has counter-sunk recess around valve guide for exhaust valve spring order X-22B)	.15	.15	.15
X-23	Inlet Valve Spring	.15	.15	.15
X-28	Valve Lever	.45	.45	.50
X-29	Valve Lever Pin	.12	.12	.15
X-31	Muffler Plate, each	1.00	1.00	1.65
X-32	Muffler Complete	1.88	1.88	2.78
X-35	Gasoline Carburetor Complete	2.75	2.75	2.90
X-37	Oil Guard	.55	.75	.90
X-38	Supply Pipe with Connectors	.52	.52	.60
X-39	Gasoline Fuel Supply Pipe only	.15	.15	.15
X-41	Strainer Ring	.05	.05	.05
X-42	Fuel Tank	2.25	2.55	2.90
X-43	Filler Pipe Strainer	.20	.20	.20
X-45	Cap Screw	.05	.05	.05
X-46	Upper Fuel Tank Support Strap	.20	.20	.20
X-47	Lower Fuel Tank Support Strap	.20	.20	.20
X-48	Cam Rod	.55	.55	.90
X-49	Cam Gear	2.20	2.20	3.40
X-50	Connecting Rod Adjusting Rod for Trip Rod	.05	.05	.05
X-51	Crankshaft Sleeve Cover for Keyway	.15	.15	.15
X-52	Cam Gear Stud Complete	.25	.25	.35
X-53	Crankshaft Pinion	1.00	1.05	1.85
X-54	*Crankshaft Pinion Key	.09	.09	.09
X-55	*Crankshaft	6.00	7.25	9.50
X-56	Connecting Rod and Cap (with bolts and nuts)	4.50	5.60	7.50
X-56A	Connecting Rod Complete with bearings	5.40	6.60	8.55

NOTE: All items marked * will be shipped by express or freight collect. All other items can be shipped by parcel post.

Price List of Parts for 1 $\frac{3}{4}$, 2 $\frac{1}{2}$ and 3 $\frac{1}{2}$ H. P. Model XK and XI Engines

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Part No.	Description	Rating 1 $\frac{3}{4}$ H. P.	2 $\frac{1}{2}$ H. P.	3 $\frac{1}{2}$ H. P.
X-56C	Connecting Rod Cap Only.....	.70		
	Cap not furnished separately on 2 $\frac{1}{2}$ to 3 H. P.			
X-57	Connecting Rod Bushing.....	.45	.60	.80
X-58	Connecting Rod Bearings (2 halves).....	.98	1.10	1.15
X-59	Connecting Rod Bolt.....	.30	.35	.55
X-59 $\frac{1}{4}$	Connecting Rod Nut.....	.06	.06	.06
X-60	Connecting Rod Liners thick, per set.....	.15	.15	.23
X-61	Connecting Rod Liners thin, per set.....	.15	.15	.23
X-63	Connecting Rod Grease Cup.....	.38	.38	.75
X-64	Piston.....	2.90	3.60	4.50
X-65	Piston Rings, each.....	.38	.38	.45
X-66	Piston Pin.....	.53	.60	.75
X-67	Piston Pin Set Screw with Locknut.....	.09	.09	.09
X-68	*Flywheel each with Key.....	5.80	7.55	11.75
X-69	Flywheel Key on Pulley Side.....	.12	.12	.12
X-70	Flywheel Key on Cranking Side.....	.12	.12	.12
X-71	Flywheel Bolt.....	.15	.20	.25
X-77	Starting Crank.....	1.00	1.00	1.50
X-79	Machine Bolt for Pulley.....		.15	
X-81	Piston Oil Tube.....		.30	
X-06	Valve Lever Adjusting Screw with Nut.....	.12	.12	.12
X-010	Angle Connections.....	.30	.30	
X-011	Straight Connection.....		.30	
X-014	Straight Valve Cage and Check Valve.....	.60	.60	.60
X-016	Pipe Tee.....	.20	.20	.20
X-023	Filler Pipe.....	.65	.65	.65
X-051	Rocker Arm Stud Pin with Washer (Note—Important. If your engine has cylinder jacket drain plug on magneto side of base order X-051B)....	.10	.10	.15
X-053	Cam Rod Pin with Nut.....	.25	.25	.25
X-054	Detent Blade Catch Block with Nut.....	.30	.30	.30
X-056	Cam Roller.....	.32	.32	.32
X-057	Cam Roller Pin with Nut.....	.25	.25	.25
X-058	Rocker Arm (Note—Important. If your engine has a cylinder jacket drain plug on magneto side of base order X-058B).....	1.05	1.05	1.05
X-059	Cam Rod Spring.....	.12	.12	.12
X-060	Governor Complete.....	4.50	4.50	4.75
X-061	Rocker Arm Pin Set Screw.....	.05	.05	.05
X-062	Governor Spindle (Note—Important. If your engine has the cylinder jacket drain plug on magneto side of base order X-062B).....	1.25	1.25	1.25
X-063	Governor Pinion (Note—Important. If your engine has the cylinder jacket drain plug on magneto side of base order X-063B).....	.55	.55	.55
X-064	Governor Weight.....	.25	.25	.25
X-065	Governor Weight Pin with Cotter Key.....	.09	.09	.09

NOTE: All items marked * will be shipped by express or freight collect. All other items can be shipped by parcel post.

Price List of Parts for 1 $\frac{3}{4}$, 2 $\frac{1}{2}$ and 3 $\frac{1}{2}$ H. P. Model XK and XI Engines

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Part No.	Description	Rating 1 $\frac{3}{4}$ H. P.	2 $\frac{1}{2}$ H. P.	3 $\frac{1}{2}$ H. P.
X-068	Governor Spindle Rod.....	.20	.20	.20
X-069	Governor Spindle Bushing (Note—Important. If your engine has cylinder jacket drain plug on magneto side order X-069B).....	.40	.40	.40
X-070	Speed Changing Washer.....	.08	.08	.08
X-071	Governor Bracket Lever Pin Set Screw.....	.05	.05	.05
X-075	Governor Bracket Lever Pin.....	.10	.10	.10
X-076	Detent Blade.....	.45	.45	.45
X-077	Detent Blade Adjusting Nut.....	.05	.05	.05
X-0101	Grease Cup.....	.15	.15	.15
X-0102	Governor Spindle Oiler Pipe.....	.15	.15	.15
X-0105	Quarter Inch Drain Plug.....	.05	.05	.05
X-0111	Detent Lever.....	.55	.55	.55
X-0114	Governor Bracket.....	1.25	1.25	1.50
X-0115	Governor Bracket Cap Screw with Lock Washer.....	.10	.10	.10
X-0133	Gasoline Fuel Valve.....	.30	.30	.30
X-0137	Fuel Valve Spring.....	.08	.08	.08
X-0138	Governor Spindle Rod Spring.....	.12	.12	.12
X-0143	Detent Lever Spring.....	.09	.09	.35
X-0152	Fuel Valve (Gasoline).....	.30	.30	.30
X-0153	Fuel Valve (Kerosene).....	.30	.30	.30
X-0154	Governor Control Arm.....	.30	.30	.40
X-0165	Water Valve.....		.30	
X-0167	Damper Lever.....	.12	.12	.12
X-0169	Butterfly Damper Spring.....	.10	.10	.10
X-0171	Carburetor Lid and Pin.....	.10	.10	.10
X-0172	Air Damper Rod Adjusting Nut.....	.05	.05	.05
X-0174	Air Damper Rod Turn Buckle.....	.15	.15	.15
X-0177	Air Damper Rod (Long Section).....	.25	.25	.25
X-0178	Air Damper Rod (Short Section).....	.20	.20	.20
X-1228	Air Damper Plate.....	.45	.45	.45
X-1229	Air Damper Disc.....	.05	.05	.05
X-1230	Air Damper Stem with Washer.....	.15	.15	.15
X-1231	Air Damper Spring.....	.15	.15	.15
X-1232	Air Damper Stem Lock-nut.....	.05	.05	.05
X-1239	Carburetor Gasket.....	.15	.15	.15
X-165	Carburetor Body Only.....	3.00	3.00	3.00
X-165A	Carburetor Complete.....	5.00	5.00	5.00
X-168	Air Damper Cage with Damper and Stem.....	3.00	3.00	3.40
X-169	Air Damper Cage to Cylinder Head Cap Screw (Thin head).....	.08	.08	.08
X-170	Air Damper Cage to Cylinder Head Gasket.....	.15	.15	.25
X-172	Governor Shaft.....	.40	.50	.60
X-K198	Trip Bracket Casting.....	.35	.35	.35
X-K199	Trip Finger Pin.....	.15	.15	.15
X-Y167	Cam Gear Pin Set Screw.....	.05	.05	.05
X-Y467	Governor Control Arm Adjusting Screw with Nut.....	.05	.05	.05
X-Y487	Cam Gear Oiler Pipe.....	.15	.15	.15
X-Y577	Damper Cage to Carburetor Cap Screw.....	.05	.05	.05

NOTE: All items marked * will be shipped by express or freight collect. All other items can be shipped by parcel post.

PRICE LIST OF ENGINE PARTS THAT CAN BE USED ON 6 AND 8
H. P. GASOLINE MODEL XI OR KEROSENE MODEL XK ENGINES

Subject to Change Without Notice

When Ordering Parts, Be Sure to Give the Letters, Number and Horse Power
of Your Engine as Stamped on Name Plate

Part No.	Description	Rating	6 H. P.	8 H. P.
X-1	Base (Stationary)		\$26.65	\$40.75
X-3	Base Cap	1.65		1.90
X-4	Main Bearing Grease Cup	.18		.18
X-5	Base Cap Stud and Nuts	.35		.50
X-6	Bearing Liners, thick, per set	.23		.23
X-7	Bearing Liners, thin, per set	.25		.27
X-8	Main Bearings (two halves)	2.35		3.80
X-9	*Cylinder	17.00		23.25
X-11	Cylinder Cap Screw	.15		.20
X-12	Cylinder Head Stud and Nut	.45		.60
X-13	Sight Feed Oiler, complete	2.10		2.40
X-13A	Large Glass for Oiler	.53		.60
X-13B	Small Glass for Oiler	.30	Give name	.30
X-13C	Small Glass Cage	.30	manufacturer	.30
X-13D	Cap for Oiler	.60	of	.70
X-14	Oiler Pipe	.27	oiler	.30
X-15	*Water Reservoir	9.70		14.55
X-16	Water Reservoir Gasket	.30		.35
X-17	Cylinder Head Gasket	.80		1.13
X-18	*Cylinder Head with Valves and Springs only for Gasoline Model XI Engine only. If wanted for Kerosene Model XK order X-171	12.10		13.75
X-18A	*Cylinder Head, complete with Valves, Springs, Levers, etc., for Gasoline Model XI engine only. If wanted for Kerosene Model XK order X-179	12.95		14.65
X-19	Exhaust or Inlet Valve	.85		1.00
X-22	Exhaust Valve Spring	.15		.23
X-23	Inlet Valve Spring	.15		.25
X-24	Valve Lock Lever	.15		.15
X-25	Valve Lock Stud	.15		.15
X-26	Valve Lock Spring	.12		.14
X-27	Pipe Plug	.05		.05
X-28	Valve Lever	.60		.68
X-29	Valve Lever Pin	.15		.24
X-30	Street Elbow	.90		.90
X-31	Muffler Body with Nipple	2.03		2.33
X-32	Muffler Complete with Nipple	3.38		3.68
X-33	Muffler Cap	1.35		1.35
X-35	Gasoline Mixing Valve, complete	3.15		3.70
X-37	Oil Guard	2.25		2.50
X-38	Supply Pipe and Connectors	.60		.65
X-40	Strainer Nipple	.60		.60
X-42	Fuel Tank	3.55		3.70
X-47	Stationary Tank Binders with Nuts	.30		.30
X-48	Cam Rod	1.60		1.65
X-48A	Cam Rod with Roller and Catch Block	2.10		2.25
X-49	Cam Gear	3.75		5.90
X-52	Cam Gear Stud, complete	1.50		1.75
X-53	Crankshaft Pinion	1.85		2.05
X-54	Crankshaft Pinion Key	.12		.12
X-55	*Crankshaft	14.25		17.00
X-56	Connecting Rod and Cap (with bolts and nuts. Cap not furnished separately)	9.75		11.75
X-56A	Connecting Rod Complete (with bearings)	11.35		13.95
X-56C	Connecting Rod Cap only			
X-57	Connecting Rod Bushing	1.20		1.30
X-58	Connecting Rod Bearing (2 halves)	1.75		2.30
X-59	Connecting Rod Bolt with Cotter Pin and Nut	.55		.75
X-59 1/4	Connecting Rod Nut	.06		.06
X-60	Connecting Rod Liners, thick, per set	.23		.23
X-61	Connecting Rod Liners, thin, per set	.23		.23
X-63	Connecting Rod Grease Cup	.95		1.15

NOTE: All items marked * will be shipped by express or freight. All other items can be shipped by parcel post.

PRICE LIST OF ENGINE PARTS THAT CAN BE USED ON 6 AND 8
H. P. GASOLINE MODEL XI OR KEROSENE MODEL XK ENGINES

Subject to Change Without Notice

When Ordering Parts, Be Sure to Give the Letters, Number and Horse Power
of Your Engine as Stamped on Name Plate

Part No.	Description	Rating	6 H. P.	8 H. P.
X-64	Piston		\$ 5.60	\$ 7.50
X-65	Piston Ring (each)	.60		.68
X-66	Piston Pin	.95		1.25
X-67	Piston Pin Set Screw complete	.09		.15
X-68	*Flywheel (each) with key	19.50		27.75
X-70	Flywheel Key	.15		.15
X-71	Flywheel Bolt	.25		.25
X-77	Starting Crank	1.50		1.60
X-77S	Starter Crank (Socket Type)	1.50		1.60
X-78	Pump Drive Pin	.08		.08
X-79	Machine Bolt for Pulley	.10		.10
X-80	Pulley Stud with Nut			
X-81	Piston Oil Tube	.30		.30
X-84	*Mounting Engine Fuel Tank			7.50
X-89	Mounting Tank Binders			.53
X-124	Mixing Valve Body	1.75		2.20
X-125	Mixing Valve Damper	.21		.26
X-165	Carburetor Body	3.45		3.45
X-165A	Kerosene Carburetor complete	9.00		9.00
X-166	Nozzle Tube	.08		.08
X-167	Pump Lever	.83		.90
X-168	Air Damper Cage, with damper and stem	3.20		3.25
X-171	*Cylinder Head with Valves and Springs only (Kerosene)	12.95		14.60
X-172	Governor Shaft	.45		.53
X-173	Air Damper Rod	.25		.25
X-174	Carburetor Stud	.27		.27
X-175	Fuel or Drain Pipe with Connections	.77		.82
X-176	Water Pipe	.55		.58
X-177	Cam Rod	1.65		1.88
X-178	Air Damper Cage Gasket	.15		.15
X-179	*Kerosene Cylinder Head, complete	13.80		15.50
X-180	Exhaust Valve Spring (Kerosene Engine)	.15		.23
X-184	Intake Valve Spring (Kerosene Engine)	.15		.23
X-01	Igniter Stud and Nut	.20		.20
X-02	Drain Cock	.50		.50
X-04	Oiler Pipe Coupling	.15		.15
X-05	Water Reservoir Bolt	.10		.10
X-06	Valve Lever Adjusting Screw and Nut	.16		.16
X-010	Angle Connection	.30		.30
X-011	Straight Connection	.30		.30
X-014	Straight Valve Cage and Check Valve	.60		.60
X-016	Pipe Tee	.20		.20
X-022	Tank Rod	.23		.23
X-023	Filler Pipe	.57		.57
X-026	Igniter Gasket	.15		.15
X-040	Taper Pin	.05		.05
X-052	Detent Blade Adjusting Screw	.12		.12
X-054	Detent Catch Block	.30		.30
X-055	Catch Block Screw	.08		.08
X-056	Cam Roller	.32		.32
X-057	Cam Roller Pin with Dowel	.15		.15
X-059	Cam Rod Spring	.12		.12
X-060	Governor, complete	8.00		8.00

NOTE: All items marked * will be shipped by express or freight. All other items can be shipped by parcel post.

PRICE LIST OF ENGINE PARTS THAT CAN BE USED ON 6 AND 8
H. P. GASOLINE MODEL XI OR KEROSENE MODEL XK ENGINES

Subject to Change Without Notice

When Ordering Parts, Be Sure to Give the Letters, Number and Horse Power
of Your Engine as Stamped on Name Plate

Part No.	Description	Rating	6 H. P.	8 H. P.
X-062	Governor Spindle		\$ 1.40	\$ 1.40
X-062A	Governor Spindle		1.40	1.40
X-063	Governor Pinion with Set Screw		.55	.55
X-063½	Governor Pinion Set Screw		.05	.05
X-064	Governor Ball		.25	.25
X-064B	Governor Ball		.25	.25
X-065	Governor Weight Pin with Cotter Pin		.12	.12
X-065A	Governor Weight Pin with Cotter Pin		.12	.12
X-066	Governor Bracket Plate		.20	.20
X-067	Bracket Plate Screw		.12	.12
X-068	Governor Spindle Rod		.40	.40
X-068B	Governor Spindle Rod		.25	.25
X-068C	Governor Spindle Rod End		.10	.10
X-070	Speed Changing Washer		.08	.08
X-075	Detent Lever Pin		.12	.12
X-076	Detent Blade		.20	.20
X-077	Detent Locknut, complete		.15	.15
X-078	Governor Bracket Dowels		.09	.09
X-079	Cap Screws		.12	.12
X-097	Igniter Wrench		.30	.35
X-0103	Pipe Plug		.05	.05
X-0104	Governor Shaft Arm Grease Cup		.15	.15
X-0104	Governor Bracket Grease Cup		.15	.15
X-0105	¼ in. Drain Plug		.05	.05
X-0110	Speed Change Body		.45	.45
X-0111	Detent Lever		.38	.38
X-0112	Speed Change Lever		.10	.10
X-0113	Speed Lever Screw		.05	.05
X-0114	Governor Bracket		1.90	1.90
X-0133	Fuel Valve		.30	.30
X-0136	Damper Screw		.05	.05
X-0137	Fuel Valve Spring		.08	.08
X-0137A	Fuel Valve Spring		.08	.08
X-0138	Governor Spindle Spring		.12	.12
X-0142	Detent Spring		.09	.09
X-0152	Drain Valve		.45	.45
X-0153	Fuel Valve, Kerosene Side		.30	.30
X-0153A	Fuel Valve, Gasoline Side		.30	.30
X-0154B	Governor Shaft Arm		.85	.85
X-0155	Governor Shaft Bearing		.40	.40
X-0156	Throttle Lever		.38	.38
X-0157	Speed Changing Lever		.14	.14
X-0158	Pump Body		1.43	1.43
X-0159	Pump Plunger		.67	.67
X-0160	Check Ball		.05	.05
X-0161	Check Ball Retainer Pin		.05	.05
X-0162	Pump Spring		.09	.09
X-0164	Water Valve Seat		.38	.38
X-0165	Water Valve		.30	.30
X-0166	Fuel Valve Tee		.38	.38
X-0167	Damper Lever		.12	.12
X-0168	Pump Lever Pin		.10	.10
X-0169	Butterfly Damper Spring		.08	.08
X-0170	Speed Change Lever Spring		.08	.08
X-0171	Carburetor Lid Flat Type		.05	.05
X-0171A	Carburetor Lid and Pin		.10	.10
X-0175	Pump Complete		2.30	2.30
X-0176	Governor Complete		7.00	7.00
X-0195	Governor Thrust Washer		.15	.15

NOTE: All items marked * will be shipped by express or freight. All other items can be shipped by parcel post.

PRICE LIST OF ENGINE PARTS THAT CAN BE USED ON 6 AND 8
H. P. GASOLINE MODEL XI OR KEROSENE MODEL XK ENGINES

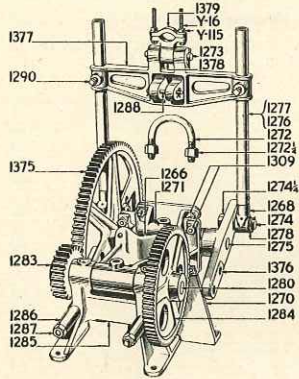
Subject to Change Without Notice

When Ordering Parts, Be Sure to Give the Letters, Number and Horse Power
of Your Engine as Stamped on Name Plate

Part No.	Description	Rating	6 H. P.	8 H. P.
X-Y12	Screw		\$.05	\$.05
X-Y15	Oil Guard Cap Screw with Washer		.10	.10
X-Y80	Cotter Pin		.03	.03
X-Y84	Cotter Pin		.03	.03
X-Y104	Governor Bracket Grease Cup Nipple with Union			
X-Y110	Locknut		.05	.05
X-Y111	Cam Rollers Stud Nut		.05	.05
X-Y115	Nut		.05	.05
X-Y145	Washer		.05	.05
X-Y167	Cam Gear Pin Set Screw, complete			
X-Y183	Governor Shaft Arm Set Screw		.08	.08
X-Y196	Speed Change Lever Pin		.10	.10
X-Y230	Oiler Pipe Elbow		.18	.18
X-Y232	Oiler Pipe (short nipple)		.10	.10
X-Y263	Oil Pipe Support		.10	.10
X-Y306	Steel Ball 3½ to 14		.05	.05
X-Y467	Set Screw with Lock Nut		.05	.05
X-Y487	Cam Gear Oil Pipe with Coupling		.25	.25

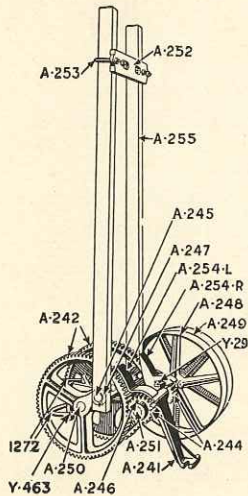
NOTE: All items marked * will be shipped by express or freight. All other items can be shipped by parcel post.

Direct Connected Vertical and Horizontal Pump Jack Parts



Part No.	Name of Part	Price
1266	Pump Gear Bearing and Bracket.....	\$5.20
1268	Pump Rod Head with Pin (state diameter of pump rod).....	.90
1270	*Stand for Horizontal Jack.....	1.40
1271	Pump Gear Bearing.....	1.75
1272	Vertical Pump Clamp.....	.20
1272 1/4	Nut for Clamp.....	.05
1273	Pump Lever Pin and Cotter Pin.....	.10
1274	Pump Rod Stud and Cotter Pin.....	.25
1274 1/4	Nut for No. 1274.....	.10
1275	Large Pump Gear Shaft.....	.75
1276	Horizontal Short Pump Rod.....	1.10
1277	*Vertical Long Pump Rod.....	1.80
1278	Washer for Pump Rod Stud.....	.05
1280	Small Gear Shaft.....	.75
1283	Pinion with Pin.....	3.50
1284	Gear with Pin.....	2.35
1285	*Jack Support to Engine Bracket.....	2.85
1286	Pipe Spacer to Engine.....	.10
1287	Stud with Nut for Engine Bracket.....	.10
1288	Vertical Pump Rod Pin and Cotter Pin.....	.15
1290	Set Screws.....	.05
1309	Bolt for Stand.....	.05
1375	Crank Gear with Pin.....	6.60
1376	Bell Crank with Pin.....	1.65
1377	Crosshead.....	2.45
1378	Pump Handle Clamp.....	.40
1379	Clamp Cap.....	.25
Y16	Cap Screw.....	.10
Y115	Nut.....	.05

Horizontal and Vertical Double Geared Belt Driven Pump Jack Parts



Part No.	Description	Price
A-241	Base.....	\$3.00
A-242	Crank Gear.....	1.90
A-244	Pinion.....	.65
A-248	Pulley (Loose).....	2.00
A-249	Pulley (Tight).....	2.10
A-252	Cross Head.....	.90
A-254-R	Gear Guard (Right).....	.30
A-254-L	Gear Guard (Left).....	.30
A-243	Spacing Collar.....	.10
1382	Stand.....	.80
1383	Pump Handle Clamp.....	.30
1384	Pump Handle Clamp Cap.....	.25
A-250	Crank Gear Shaft.....	.40
A-251	Pinion Shaft.....	.65
A-245	Crank Pin.....	.50
A-246	Pinion Pin.....	.05
A-253	Cross Head Clamp.....	.25
1385	Pump Clamp Pin.....	.10
1272	Pump Clamp.....	.30
A-255	Pump Arm.....	.90
A-247	Crank Pin Washer.....	.05
Y-29	Cap Screw.....	.05
Y-463	Set Screw.....	.05

NOTE—All items marked (*) will be shipped by freight or express. Other items can be shipped via parcel post.

Friction Clutch Pulleys

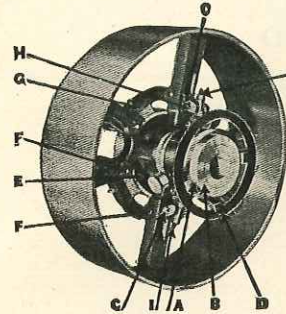


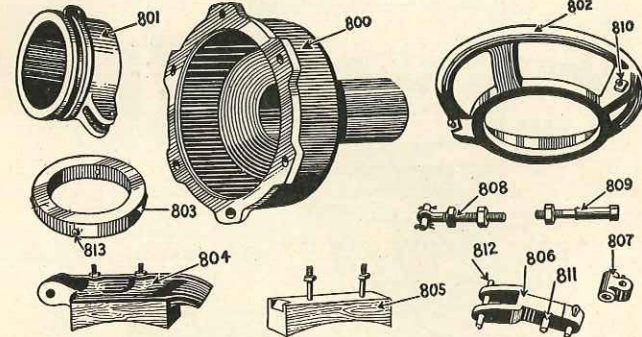
Figure 10

A friction clutch pulley is used in place of the solid pulley, so the engine may be started or stopped without having to throw off the belt, or the machine may be stopped without stopping the engine. This clutch has interchangeable rims, which can be easily removed so by purchasing one of these clutch pulleys with extra rims you will have an outfit that will run nearly every machine your engine can handle.

To change the pulley rims, loosen the four set screws "A" (Figure 10); remove the collar "B". Then take out the bolts "C" and remove the hand wheel and collar "D". Pull out the Friction Spider "E". Take out the cotter keys and drive out pins "F". This will free the friction blocks "G" and the adjusting arms "H". Your pulley is now completely dismantled. To build up the new pulley, take the new rim and simply reverse these operations.

The pulley is very easily adjusted by means of the adjusting bolts "I", but be sure to adjust them evenly so the bearing will be the same on all the blocks.

The pulley will stand still when the hand wheel "D" is pushed in. To start the machine pull the hand wheel "D" out slowly as this throws the load on the pulley gradually and will lengthen the life of your pulley.



Clutch Pulley Parts

Watch carefully to be sure you are giving us the correct diameter and face of pulley rim when ordering parts.

No.	Description	PRICES		PRICES		PRICES	
		For 8x6 F C Pulley Only	For 12 and 16x6 F C Pulley Only	For 12 and 16x6 F C Pulley Only	For all 8-in Face Pulleys		
800	*Friction Spider.....	\$6.50	\$9.85	\$13.20			
801	*Sliding Sleeve.....	3.40	3.90	5.15			
802	*Hand Wheel.....	1.60	1.85	2.25			
803	*Friction Collar.....	1.00	1.30	1.95			
804	*Brake Shoe with Block.....	1.00	1.30	2.00			
805	*Friction Block.....	.30	.40	.50			
806	*Adjusting Arm.....	1.00	1.00	1.30			
807	*Knuckle Joint.....	.60	.60	.60			
808	*Adjusting Eye Bolt.....	.65	.65	.90			
809	*Bolt or Brake Shoe.....	.60	.70	.80			
810	*Bolt or Hand Wheel.....	.10	.10	.10			
811	*Adjusting Arm Pin (short).....	.20	.20	.20			
812	*Adjusting Arm Pin (long).....	.20	.20	.20			
813	*Friction Collar Set Screws.....	.08	.08	.08			

PRICES SUBJECT TO CHANGE WITHOUT NOTICE
Clutch Pulley Rims Only

Size	Price	Size	Price	Size	Price
* 8 x 6.....	\$ 7.00	*16 x 6.....	\$13.00	*24 x 8.....	\$19.00
*12 x 6.....	\$10.50	*20 x 8.....	\$16.50	*28 x 8.....	\$21.75

Note—All Items marked (*) can be shipped by parcel post. All items marked (x) will be shipped by express or freight, collect.

Wico Magneto

With Complete Equipment

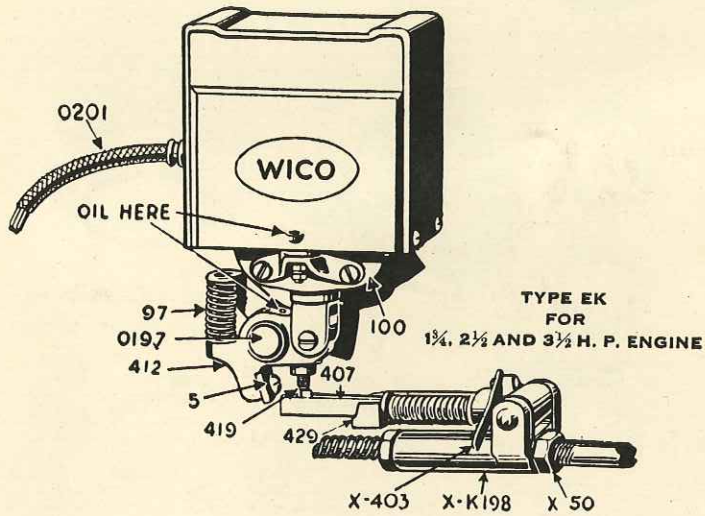


Figure 12

Wico Magneto

With Complete Equipment

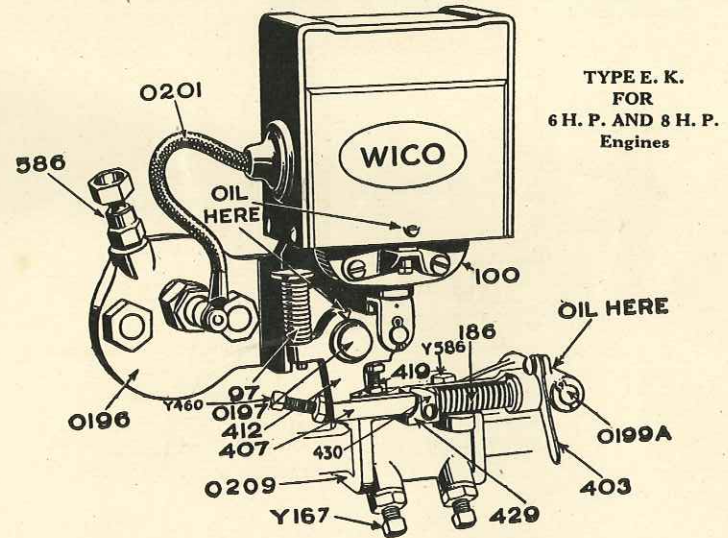


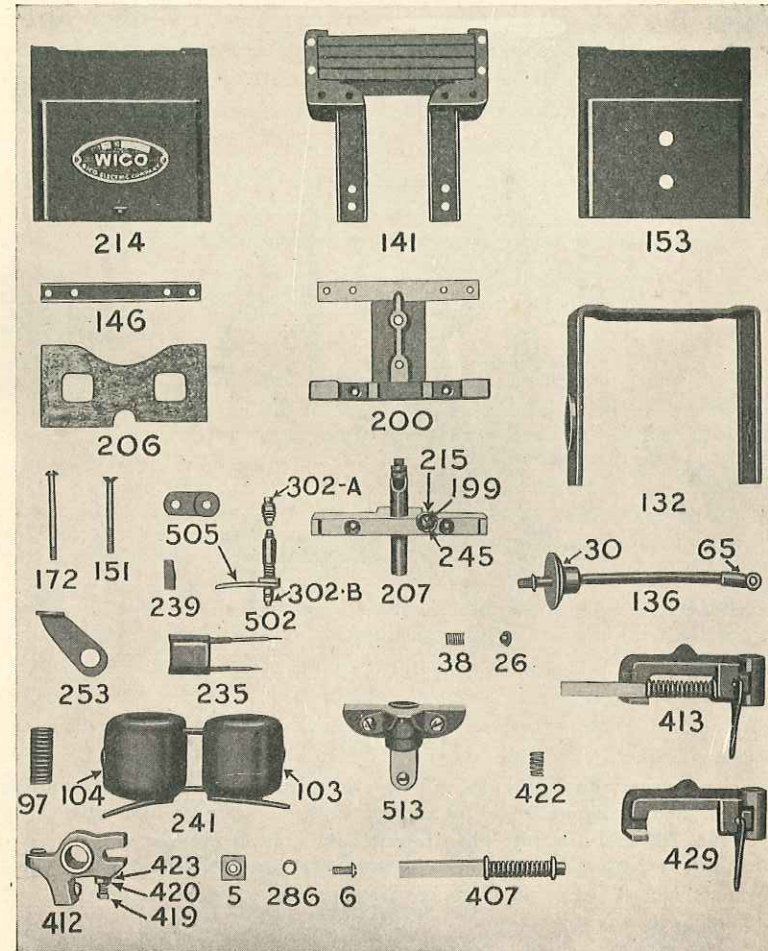
Figure 13

Parts Price List of Wico Type E. K. Magneto as used on 1³/₄ H. P. to 8 H. P. Engines

Part No.	Name	List Price
W5	Latch Block	.35
W6	Latch Block Screw	.05
W26	Spring Clamp Washer	.10
W30	Terminal Ins. Block	.30
W38	Terminal Contact Spring	.20
W65	Lead Wire Terminal	.05
97	Armature Return Spring	.40
103	Coil Group R. H.	3.75
104	Coil Group L. H.	3.75
107	Core Group	1.25
132	Side Band Group	1.00
136	Terminal Group	.80
141	Magnet Group	6.50
146	Cross Arm	.10
151	Deck Screw	.10
153	Back Cover	.35
W172	Pole Yoke Screw	.10
186	Latch Spring	.25
199	Ground Connection Screw Side Band Screw	.05
200	Assembly Plate	1.00
206	Coil Gasket	.10
207	Deck Half Group	1.75
214	Front Cover	.50
215	Ground Connection Screw Lock Washer	.05
235	Condenser	3.00
239	Coil Wedge	.05
241	Coil Group	8.00
245	Ground Lead Clamp Washer	.05
253	Return Spring Support	.10
286	Latch Block Screw Lock Washer	.05
302A	Breaker Point Nut	.05
302B	Breaker Point Nut	.05
403	Spark Lever	.25
407	Latch Group	1.00
412	Rocker Arm Group	1.25
413	Trip Finger Group	1.25
419	Latch-off Screw	.10
420	Latch-off Screw Nut	.05
422	Trip Finger Support Spring	.15
423	Latch-off Screw Lock Washer	.05
429	Trip Finger Frame Group	.75
430	Latch Group Clip	.07
W502	Breaker Point Set	2.00
505	Breaker Point Lubricating Felts	.10
511	Set of Coil Connecting Wires	.20
513	Armature Group	1.75
0201	Lead Wire with Terminal and Intensifier	.80
K196	Magneto Bracket	1.90
0197	Rocker Arm Stud (All Horse Power)	.40
K198A	Trip Bracket Assembly Complete (less No. 413 Assembly)	1.75
K198B	Trip Bracket Casting	.25
K198C	Trip Bracket Assembly Complete	3.00
K199	Trip Finger Pin (1 ¹ / ₂ and 2 H. P. old style)	.15
K199A	Trip Finger Pin (1 ¹ / ₂ and 2 ¹ / ₂ H. P. Adjustable Type)	.15
K209	Trip Bracket Clamp (1 ¹ / ₂ and 2 ¹ / ₂ H. P. Adjustable Type)	.30
Y15	Cap Screw with Washer for Adjustable Trip Bracket Assembly	.10
Y460	Set Screw with Lock Nut	.10
Y466	Set Screw with Lock Nut (1 ¹ / ₂ to 2 ¹ / ₂ H. P.)	.10
.....	EK Wico Magneto Complete with Bracket, Spark Plug and Trip Assembly	18.00
.....	EK Wico Magneto only	14.00

All parts on list above can be shipped by parcel post.

Parts and Numbers for the Wico Type E. K. Magneto as used on 1³/₄ H. P. to 8 H. P. Engines



To avoid delays and mistakes always show number, name of part and type of magneto. For prices see page 40.

Wico Magneto

TYPE E. K.

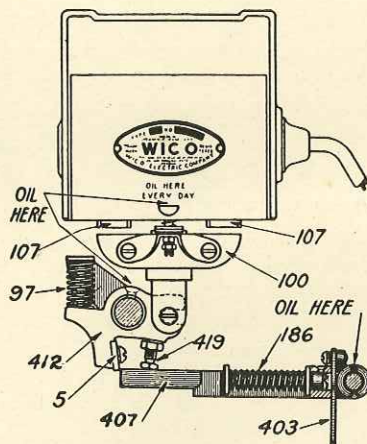


Figure 16

The numbers on Figure 16 will be used in the instructions on adjusting Wico Magnetos. Figure 16 is cut of type E. K. showing position of the trip finger No. 407 and armature No. 100 after the contact between armature No. 100 and the face of the cores No. 107 has been broken, also at the point where trip finger No. 407 trips off of rocker arm No. 412 causing armature No. 100 to return to its original position.

ADJUSTMENTS

Latch-off of Trip Finger

(See Figure 16)

The rocker arm (412) is provided with a screw (419) and locknut for adjusting the "latch-off" of the trip finger. This screw must be set so that the latch (407) will slip off the lip of the rocker arm just after the breaker points have been opened by the downward movement of the armature.

If the screw is screwed OUT too far the breaker points will not open and the magneto will not spark.

If the screw is screwed IN too far the trip finger will drive the armature down too far and possibly break the return spring or the parts that hold it.

This adjustment will be made originally by the engine builder and should not require attention thereafter. It has nothing whatever to do with the time of the spark.

If necessary, the adjustment can be made as follows:

Trip the armature (100) from its contact with the cores (107) and insert a strip of metal 7-64" thick between the armature and the face of the cores. Move the push rod slowly until the latch of the trip finger reaches the rocker arm. The edge of the latch should then just engage the edge of the lip of the rocker arm, and the adjusting screw (419) should be bearing on the top side of the latch, (see Figure 16) so that the least further movement of the push rod will cause the latch to slip off the edge of the rocker arm.

If the latch does not engage the lip of the rocker arm when armature is set as above the adjusting screw should be screwed in until the latch just engages. If the latch engages the lip of the rocker arm too much (more than 1-32") unscrew the adjusting screw to give the proper engagement.

Loosen the locknut on the adjusting screw (419) before attempting to change adjustment and be sure to set it up tight after the adjustment has been made. Remove the metal strip before attempting to start the engine.

Latch and Latch Block Edges

(See Figure 16)

If the edge of the latch (407) becomes worn where it engages latch block (5), a fresh edge can be obtained by clamping the latch in a vise and pulling it out of the trip finger and giving it a quarter turn before replacing it. A fresh edge on the latch block (5) may be obtained by loosening the latch block

screw and giving the latch block a quarter turn before replacing it. The screw is headed over at its outer end and the heading should be filed off before attempting to loosen the screw. Be sure to replace the lock washer and set screw up tight. The latch-off screw (419) should be removed to get at the latch block screw. After the latch block is replaced, the latch-off adjustment should be made as described under "Adjustments", see page 43.

CARE OF WICO 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. 100, must make a perfect contact with cores No. 107. 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 at each end of magneto at bottom, and take off cover band and front covers. Clean away oily deposit around upper contact with a clean rag and slim hardwood stick. When replacing armature, be sure that oil pad No. X-266 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 carboned, 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. X-100 returns and makes a firm contact with cores No. 107 after being tripped off. Failure to do this indicates a weak end spring or broken return spring No. X-97 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. 100 is tripped it snaps quickly away from the cores No. 107. Failure to do this indicates binding or friction or a broken drive spring No. X-186, (see figure 16).

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 surfaces Nos. 301 and 223 and insulating washer No. 168.

INSTRUCTIONS ON HERCULES MODEL X DRAG SAW

Get engine ready for operation as directed on pages 4 or 10.

Mount wheel with stub axle under channel iron with square head of bolts in channel. Place split washers on bolts and fasten with thumb nuts.

Remove two bolts holding eccentric cap and strap No. AX-191 and place over bell crank AX-184. Fasten in position by two bolts with oil pocket up. The split washers are to be placed on bolt next to nut, which should be drawn up tight.

Remove the cotter pin and washer from crosshead No. AX-181 and bell crank No. AX-184, connect these two parts with wood pittman, with oil holes up. Replace washers and cotter pin.

Remove two machine bolts No. AY-75 from cross head No. AX-181 and fasten saw blade with head of bolt resting against blade and split washer between crosshead and nut. Fasten saw blade firmly in position.

Remove bolts from wood skids. Install the two engine base plates No. AX-4184 on the wooden frame and then install engine by bolting through these wooden frames on one side with two carriage bolts No. AY-4775 and through engine base plates on other side with carriage bolts No. AY-4766. Small sprocket pinion No. AX-189 should be keyed on crankshaft of engine.

Put driving chain No. AX-216 over large and small sprocket wheels, being sure that the arrows on the links are on top and are pointing in the same direction that the chain runs. Slide bearing No. AX-186 away from engine until chain is tight and then tighten bolts which should hold bearing No. AX-186 to wood frame pieces.

Next, take a straight edge and lay it against the side of the teeth on the large sprocket No. AX-4155. The other end of the straight edge should be in line with the teeth on small sprocket No. AX-189 to make the chain run right. If the large sprocket does not line up with the small sprocket, move bearing No. AX-186 until it does. Proper lining up of the sprocket and proper tightness of the chain are important factors to the successful operation of your sawing outfit.

Screw grease cup in large sprocket wheel hub.

Remove two nuts and washers from wood skid holding saw rest No. AX-187 and place rest across wood frame pieces. Fasten in position with washers on top of rest and replace the two nuts on each bolt.

DRAG SAW INSTRUCTIONS (Cont. From Page 45)

When you are ready to start sawing, change truck wheels from side to end so you can move the outfit along the log. Clean the log of branches and mark your cuts with an ax. Drive anchor hook No. AX-199 into side of log opposite the engine and tighten up ratchet No. AX-194 on top of wood frame to hold the outfit firmly to the log.

Be sure the clutch is released by pulling out hand wheel of the large sprocket and that the saw is resting on saw rest No. AX-187. Start the engine and when it is running at regular speed, push in the hand wheel on the sprocket clutch. Then lift up the moving saw blade, pull the saw rest back out of the way and lower the blade of the saw to the point where you want to make the cut.

SAW INSTRUCTIONS

Keep your saw filed to a good cutting edge; the rakers should be slightly shorter than the cutting teeth; keep the proper amount of set in the saw to prevent it from binding. If your saw cuts too slowly it may need filing and setting, or the engine may be running too slowly. The amount of timber you will be able to cut depends to a great extent on the condition of your saw so do not attempt to use the outfit unless you have your saw properly filed and set.

GENERAL DIRECTIONS

Keep all moving parts of engine and saw well lubricated; keep grease cups full of grease and all bolts and nuts perfectly tight.

ENGINE FOR OTHER WORK

To use the engine for other work, remove the small sprocket pinion on engine crankshaft and attach a pulley. The engine may also be removed entirely from frame by taking out the bolts which are used in attaching it to the outfit.

INSTRUCTIONS FOR ASSEMBLING BUILT-IN CLUTCH SPROCKET ON 1 $\frac{3}{4}$ H. P. MODEL X DRAG SAW

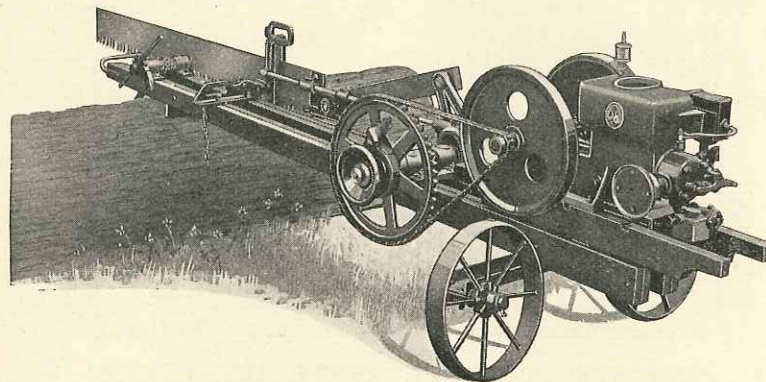
First place clutch drum AX-4156 on sprocket No. AX-4155 and then put on clutch band No. AX-4157 by inserting anchor pin No. AX-4164 and securing with cotter key.

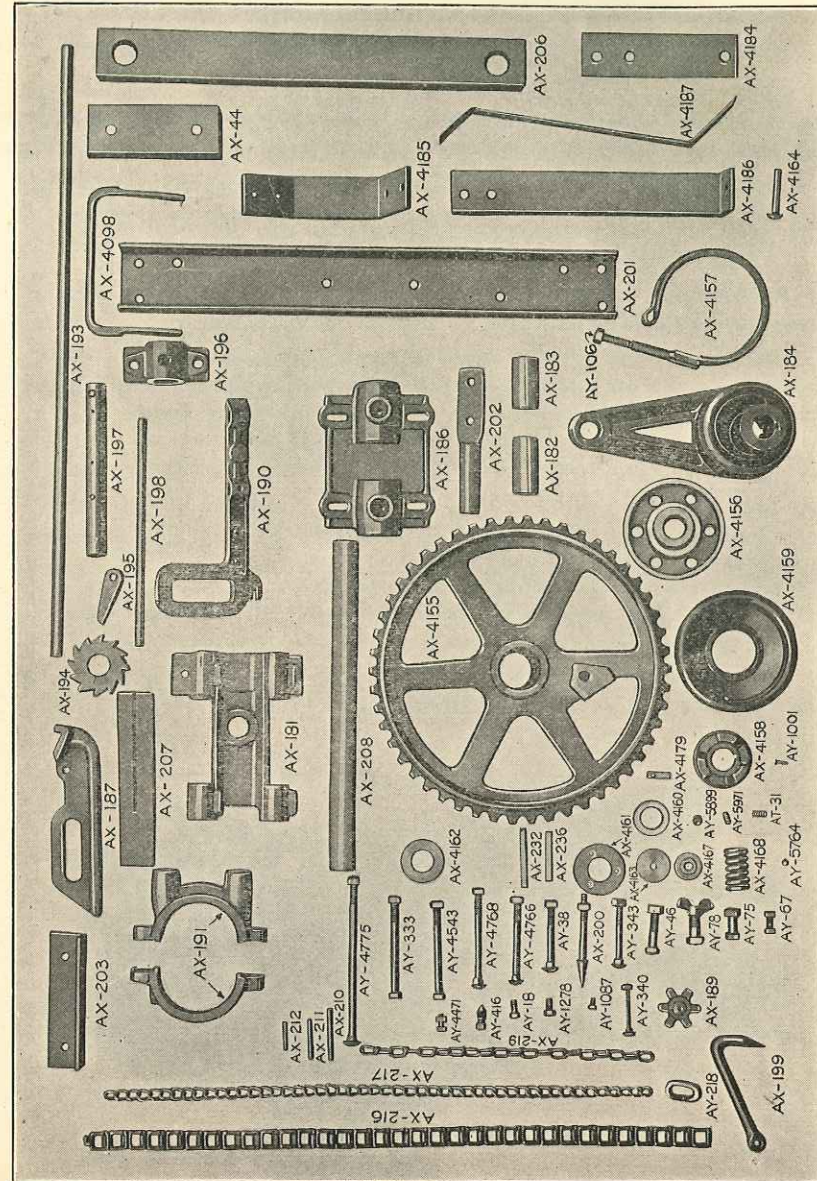
Next put spring No. AX-4168 on clutch band adjusting bolt, follow with washer No. AX-4167 and then screw on nut AY-106. Then place washer No. AX-4162 on drive shaft and then place the sprocket with assembled clutch drum on the drive shaft. Then put collar No. AX-4160 on the drive shaft and screw in set screw No. AY-5899 in the hole in the rim of this collar to hold the sprocket in place on the shaft.

Then put clutch jaw No. AX-4158 on the shaft with key No. AX-4179 and pin No. AY-1001 which extends through hole in this key to the clutch jaw. Next put on hand wheel No. AX-4159 followed by washer AX-4161 which is attached with three set screws No. AY-1087 that screw into the clutch jaw. Then put washer No. AX-4163 on end of shaft with machine screw No. AY-1278 and lock washer.

Now place steel ball No. AY-5764 in the hole in the clutch jaw for this purpose and then insert spring No. AT-31 and set screw No. AY-5971. The purpose of this ball with spring tension is to catch in the counter sunk holes in the drive shaft and keep the clutch jaw engaged or disengaged with the clutch drum.

If the clutch slips while the drag saw is in operation you may adjust it to hold by tightening up on clutch adjusting nut No. AY-106.





REPAIR PARTS LIST FOR HERCULES MODEL X DRAG SAW OUTFIT

All items marked (*) will be shipped by express or freight. Other items can be shipped via parcel post.

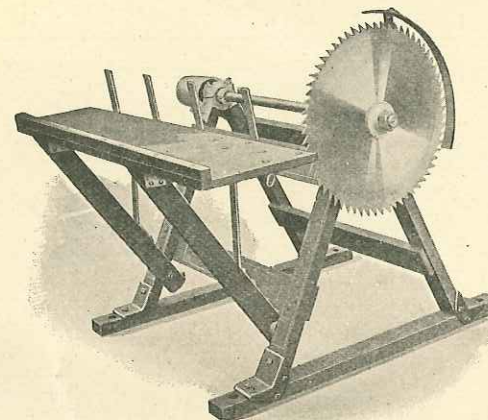
AY-18	Cap Screw (5/16" x 3/4")	.....	\$ .05
AT-31	Ball Spring	.....	.12
AY-38	Carriage Bolt (3/8" x 4")	.....	.07
AX-44	Wood Axle Spacer	.....	.20
AY-46	Machine Bolt, (1 1/2" x 3")	.....	.07
AY-67	Machine Bolt (3/8" x 1")	.....	.05
AY-75	Machine Bolt (1/2" x 1 1/4")	.....	.05
AY-78	Wing Nut Machine Bolt	.....	.05
AY-106	Clutch Band Adjusting Nut	.....	.07
AX-181	*Cross Head	.....	6.55
AX-182	Cross head Pin	.....	.40
AX-183	Crank head Pin	.....	.40
AX-184	*Bell Crank	.....	6.65
AX-186	*Crank Shaft Bearing	.....	5.30
AX-187	Saw Rest	.....	.80
AX-189	Engine Shaft Sprocket	.....	.50
AX-190	Saw Handle	.....	1.10
AX-191	*Eccentric Cap & Strap	.....	5.40
AX-193	Guide Rod	.....	.90
AX-194	Ratchet	.....	.60
AX-195	Ratchet Pawl	.....	.20
AX-196	Ratchet Shaft Bearing	.....	.85
AX-197	Ratchet Shaft	.....	.95
AX-198	Ratchet Handle	.....	.20
AX-199	Anchor Hook	.....	.50
AX-200	Spike Bolt	.....	.15
AX-201	*Axle	.....	2.30
AX-202	Wheel Knuckle	.....	.70
AX-203	Truss Rod Plate	.....	.55
AX-205	Frame Skids (each)	.....	2.50
AX-206	Pitman	.....	.35
AX-207	Saw Guide	.....	.20
AX-208	Crank and Sprocket Shaft	.....	1.50
AX-210	Crank Pin Dowel	.....	.05
AX-211	Ratchet Pin Dowel	.....	.05
AX-212	Guide Rod Pin	.....	.05
AX-216	Driving Chain	.....	3.25
AX-216 1/2	Driving Chain Links (each)	.....	.05
AX-217	Twisted Link Chain	.....	.45
AX-218	Connecting Link	.....	.10
AX-219	Dog Chain	.....	.15
AX-221	*Truck Wheel	.....	4.85
AX-232	Taper Key	.....	.05
AX-236	Straight Key	.....	.05
AY-333	Machine Bolt (7/16" x 6")	.....	.10
AY-340	Carriage Bolt (1 1/4" x 3")	.....	.05
AY-343	Carriage Bolt (7/16" x 4")	.....	.10
AY-416	Set Screw (1/2" x 1")	.....	.05
AY-1001	Flat Head Countersunk Rivet	.....	.03
AY-1087	Flat Head Machine Screw (1/4" x 5/8")	.....	.03

REPAIR PARTS LIST FOR HERCULES MODEL X DRAG SAW OUTFIT

All items marked (*) will be shipped by express or freight. Other items can be shipped via parcel post.

AY-1278	Cap Screw ($\frac{3}{8}$ " x $\frac{3}{4}$ ").....	.05
AX-4098	Drag Saw Handle.....	1.30
AX-4155	*Large Sprocket	7.70
AX-4156	Clutch Drum	2.75
AX-4157	Clutch Band Assembly.....	2.90
AX-4158	Clutch Jaw	1.00
AX-4159	Clutch Hand Wheel.....	.75
AX-4160	Clutch Collar .....	.35
AX-4161	Clutch Hand Wheel Washer.....	.40
AX-4162	Sprocket Thrust Washer.....	.30
AX-4163	Clutch Stop Washer.....	.20
AX-4164	Clutch Band Anchor Pin.....	.15
AX-4167	Clutch Spring Thrust Washer.....	.15
AX-4168	Clutch Spring .....	.35
AX-4179	Clutch Jaw Key.....	.05
AX-4184	Engine Base Plate.....	.55
AX-4185	Chain Guard Bracket.....	1.50
AX-4186	Chain Guard Bracket.....	1.90
AX-4187	Chain Guard Brace.....	.30
AX-4190	Chain and Sprocket Guard complete.....	4.00
AY-4471	Machine Bolt ($\frac{1}{2}$ " x 3").....	.05
AY-4543	Machine Bolt ($\frac{7}{16}$ " x $5\frac{1}{2}$ ").....	.10
AY-4766	Carriage Bolt, ($\frac{7}{16}$ " x 5").....	.10
AY-4768	Carriage Bolt ($\frac{7}{16}$ " x 6").....	.10
AY-4775	Carriage Bolt ($\frac{7}{16}$ " x 10").....	.10
AY-5764	Steel Ball $5/16$ ".....	.05
AY-5899	Headless Cup Point Set Screw ($\frac{1}{4}$ " x $\frac{1}{4}$ ").....	.05
AY-5971	Headless Cup Point Set Screw ($\frac{3}{8}$ " x $\frac{1}{4}$ ").....	.05

No. 15 SAW FRAME



No.		Price
WS1	xShaft with Saw Mandrel.....	\$5.85
WS2	*Collars to fit on Mandrel, per pair.....	1.90
WS3	*Nut to hold collars on Mandrel.....	.35
WS4	*Bearing Support with Cap.....	1.65
WS5	*Bearing Complete	1.60
WS6	*Each half Bearing.....	.75
WS7	xCrown Face Pulley with set screw and key 5 x 7.....	2.75
WS8	xCrown Face Pulley with set screw and key 8 x 8.....	4.30
WS9	xBalance Wheel	8.75
WS4A	*Bearing Cap only.....	.25
WS4A	*Bearing Cap only.....	.25

NOTE—Items marked (*) can be shipped by parcel post. Items marked (x) will be shipped express or freight.