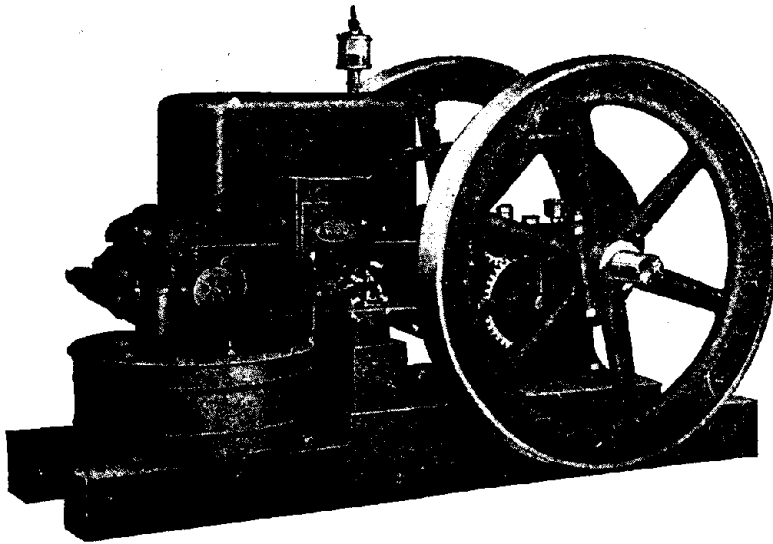


ENGINE
INSTRUCTION BOOK
No. 20



**To Operate Successfully Apply the
Information Given Herein**

I M P O R T A N T

THIS instruction book is given you as we know if you will follow its simple rules, you can operate the engine successfully. If you fail to heed the advice, the loss is ours as well as yours.

We have not included in the price of the engine sold you, any selling or demonstrating expense. Neither did we include any charge for future expert services, traveling or hotel expenses but have given you a good engine with this eliminated. These instructions should enable you to be your own expert at all times and thereby save time and expense.

After thirty-eight years of successful engine building with a plant representing an investment of nearly a million dollars, with all kinds of suitable machinery, fixtures and instruments, with hundreds of trained and skilled mechanics, the manufacturers are building perfect engines and for that reason, are entitled to your consideration.

Our throttling governor engines give unfailing service and satisfaction. They are built with that end in view and we ask you at the start to pay but little if any, heed to so-called experts who, with perhaps no previous knowledge of our engines or but little of other gasoline engines, may presume to advise you that this, that or the other thing is wrong. We are asking you to operate this engine upon instructions that are based on thirty-eight years of experience in the manufacture of gasoline engines.

PRINCIPLE OF A 4-CYCLE INTERNAL COMBUSTION ENGINE.

This is a 4-cycle, throttling governor, suction feed type of engine, equipped with high tension ignition.

The first outward stroke draws in a properly mixed charge through the carburetor; the return stroke compresses and fires it; the next outward stroke delivers the full explosion power and on its return stroke exhausts the burned gases. The governor controls the amount of fuel and air admitted during each suction stroke, which varies with the load applied to the engine.

Installation.

When Engine Is Received carefully uncrate and clean it, avoiding damage. See that all bolts and nuts are tight. Cylinder stud nuts, and engine to skid or foundation bolts, should be examined, and kept tight.

Fly Wheels Shipped Separate on 15 and 25 H.P. Engine. Put them on shaft as marked, spreading hub with a cold chisel in center of split—turn wheel to correct position to slip over key in key-way and remove chisel. Tighten clamp bolt.

If Not On a Foundation—If engine is to be run on the ground, it should be secured from movement by stakes of sufficient size, driven into the ground and bolted or nailed to engine skids.

If Located On a Foundation: If engine is 10-h.p. or larger it should be placed on a foundation built according to plans shown on page 13 of this book. Leave working space around engine.

If Located in a Building: Select or provide a heavy floor and bolt engine skids securely to same if 7-h.p. or less in size. If larger, build a foundation as per table, or a support equally as strong.

Exhaust Connections: If engine is installed inside a building, the exhaust silencer cap should be removed and the exhaust pipe line carried OUTSIDE, where a Special Silencer can be furnished at small extra expense.

Beware of Poisonous Exhaust Gases: Use no more elbows than necessary and increase size of pipe from engine out to the exhaust discharge to at least one size larger pipe. If pipe is carried through a roof, a drain should be placed at the LOWEST POINT of the exhaust line to remove water which accumulates in the pipe.

Preparation.

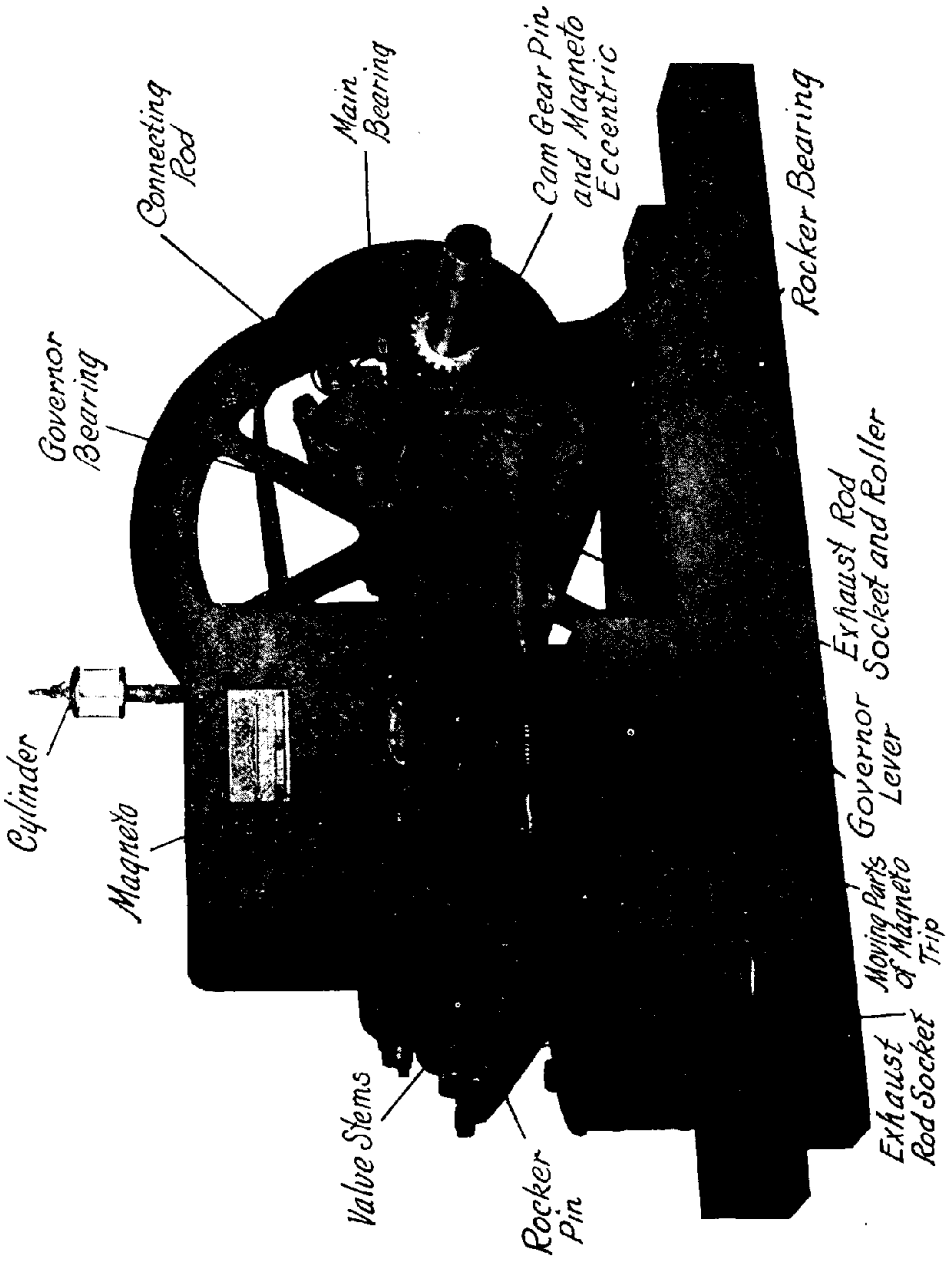
See That Moving Parts Work Freely: After engine is cleaned, see that all moving parts work freely and are not gummed with paint.

All engines are carefully tested before shipment but paint sometimes dries on

joints after standing and it is safer to try all parts and see that they work freely.

Use coal oil on joints that are gummed with paint. Screw sight-feed lubricator on cylinder oil pipe.

USE GOOD GRADE GASOLINE ENGINE OIL IN PLACES MARKED EXCEPT WHERE GREASE CUPS ARE PROVIDED FOR USE OF CUP GREASE.



Oiling and Rate of Speed: Before trying to start engine, fill grease cups on main bearings, connecting rod and governor bearings and screw down two turns. Give these one turn daily. Use same hard grease you use in your auto bearings. Fill cylinder lubricator with a good grade of gas engine oil (steam cylinder oil will not do) and set feed about as follows: 10 drops per minute on 2 and 3-h.p.; 15 on 5 and 7-h.p.; 20 on the 10 and 15-h.p., and 25 on the 25-h.p.

After the engine has been in use for several weeks, gradually reduce the oil one-half as the engine becomes worn in. With a hand oil can, oil the cam gear pin bearing, the magneto pin and guides, governor weight pin and center pin, the valve rocker pins roller, and rod sockets, and the valve stem guides. Keep them well oiled. In cold weather, oil the piston as it projects from the cylinder until oil begins to flow from the lubricator.

Put one drop of light machine oil in magneto breaker bearing for each 20 hours' running. Do not use too much oil on the magneto, as this fouls it and causes weak sparks. See oil chart and follow it carefully.

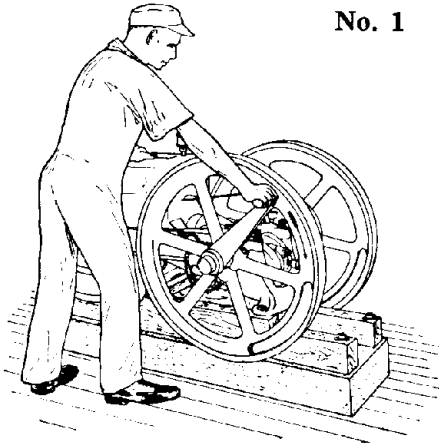
Fill Fuel Tank: Fill fuel tank with gasoline, kerosene or distillate. If the engine is to be operated on kerosene or distillate, fill the carburetor cup with gasoline to start the engine to warm it up for proper operation on kerosene and distillate.

Fill Cooling Water Hopper: Put water in hopper, only enough to cover the cylinder top, especially if it is to run on kerosene and distillate. In cold weather the engine will start easier if warm water is first put in the hopper. After starting, fill hopper nearly full.

Spark Plug: Screw in spark plug and attach high tension cable or wire to it. See that firing points are the proper distance apart. See page 9.

STARTING ENGINE WITH CRANK, USING GASOLINE

No. 1



First—Move spark timing lever under magneto toward cylinder head or move battery timer on 2-h.p. size up.

Second—Hold inlet valve open and turn wheels over until magneto trips or coil buzzes with switch on and piston is clear in.

Third—Open fuel tank valve $\frac{1}{2}$ to 1 turn, close other fuel valve and prime with gasoline squirt can 1, 2 or 3 shots in priming hole.

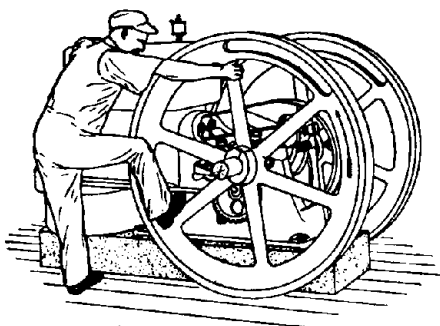
Fourth—Attach starting crank and turn over rapidly.

Fifth—After engine starts, push magneto timer lever toward crank or push battery timer down and turn on lubricator.

Sixth—Turn fuel valve to point where engine neither smokes at exhaust, nor pops at carburetor. This will be usually with notch in fuel valve wheel up. If gasoline squirt can is not available, hold left hand over carburetor opening while cranking until starting charge is sucked from tank.

If the Engine Does Not Start: If engine does not start first time, hold inlet valve open with left hand and turn engine backwards, observing if excess fuel is blown back through carburetor. If this occurs, the engine is FLOODED.

If so, shut off the fuel valve and crank engine over a few times, thus blowing out the excess fuel. If engine does not start now, without priming, then reprime and go through the starting operations, being careful not to FLOOD engine again.



No. 2

To Start 10, 15, 25-H.P. by Back Kick Method.

First—Push timing lever under magneto toward cylinder head.

Second—Hold inlet valve open, turn wheels over until magneto snaps and piston is clear in.

Third—Open fuel tank valve $\frac{3}{4}$ to $1\frac{1}{2}$ turns, close other fuel valve and prime with gasoline squirt can 2 or 3 shots in priming hole, or spark plug hole.

Fourth—Turn engine over quickly until piston is clear out and crank pin is below outer center about 30 degrees.

Fifth—Place right foot on the spoke of fly wheel nearest cylinder head and grasp the upper spoke which is forward of center of crank and throw fly wheels quickly back, forcing piston back into cylinder until magneto snaps and charge is ignited. After starting, set magneto for early spark by moving timer lever forward toward crank, then turn on lubricator and adjust fuel valve same as on smaller engines.

If engine does not start first time, hold inlet valve open with left hand and turn engine fly-wheels backward and observe if fuel is blown back through the carburetor valve plate. If this occurs, the engine has too much fuel—or is flooded. If so, shut off needle valve and holding the inlet valve open, turn the fly-wheel over backwards several times, thus forcing the excess fuel out.

Now open needle valve to running position and turn engine to starting position with piston out, and then revolve fly-wheels as before noted to cause first explosion.

If engine does not start now, reprime and go through the starting operation again, being careful not to flood the engine the second time.

A warm engine only requires a small priming charge for starting. Open needle valve only to running position—i. e., with notch up—and draw only a small priming charge in.

After a few trials the exact amount can be determined so that engine should always start at first trial.

Priming Through Priming Cup.

A small priming hole may be seen just in front of butterfly shaft bearing on top of carburetor and engine may be primed with a squirt can for starting in place of putting left hand over carburetor air opening.

Use one charge for 2-h.p. engines and more in proportion on larger sizes. Prime with squirt can when piston is clear at the position for regular starting described.

To Start When Using Kerosene or Distillate.

Fill large fuel tank with kerosene or distillate and carburetor chamber with gasoline.

Have only enough cooling water in hopper to barely cover cylinder barrel.

Shut off kerosene or distillate valve (right hand one) tightly, and open gasoline starting valve (left hand one) about $\frac{1}{2}$ turn. Prime in the same manner as the gasoline operated engine.

Start engine and run until the fuel in the carburetor chamber is nearly gone. Then open (right hand) kerosene or distillate valve, while closing the (left hand) gasoline valve, in the same manner, thus changing from one fuel to the other. In extremely cold climates it may be necessary to refill the carburetor chamber before engine is hot enough to operate properly on kerosene or distillate.

Remember—the engine must be hot to properly change the kerosene or distillate to an explosive gas.

After engine is operating properly on kerosene or distillate, the water hopper should be almost filled with water. Put in more water as it boils away.

Engines 10-h.p. and larger are equipped with water injection valve. This valve should be opened slightly if engine thumps or pounds under heavy load. Don't feed too much water as it will diminish power. Close water valve shortly before shutting down to dry out the firing chamber. Never leave it open after stopping.

To Stop Engine.

To stop engine, close fuel valve. Then shut off cylinder lubricator and in freezing weather drain the cylinder. Leave engine at rest with the exhaust valve CLOSED, to avoid rust on valve, or seat, and on cylinder walls.

Gas Engines

Engines to be used for manufactured or natural gas are equipped with adjustable fuel check and throttle valve in place of standard liquid fuel valve and tank. The compression is also higher for engines using gas and this is taken care of by special piston.

The special gas valve furnished with gas engines is adjustable for different pressures as it has been found that pressure will vary in different localities. If the pressure is extremely high a reducing valve should be used, but the ordinary pressure is so low that the valve furnished with engine will take care of it.

This variation of pressures makes it necessary for each user to adjust the spring tension on gas check valve. This tension should be just enough to hold check valve to its seat against the pressure of the gas but not so much that the suction of the engine will not open it for the admission of gas fuel.

The throttle valve on top of this valve is for the adjustment of the opening of the check and should be set for proper amount of fuel. This also depends on

the local conditions and must be done by the operator.

It is advisable to place a shut-off cock in the line between the meter and the engine fuel check valve so that the regular fuel check adjustment need not be disturbed when shutting down.

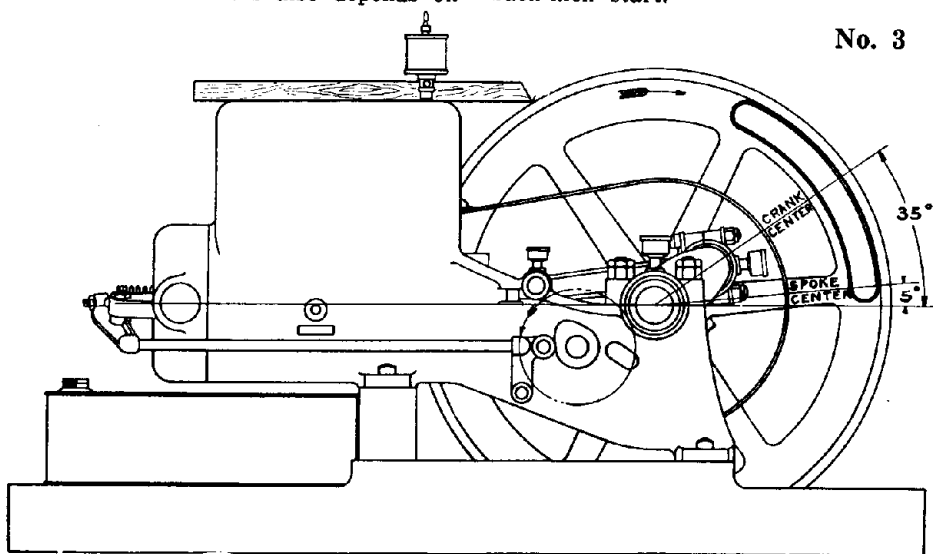
Gas engines are primed and started on gasoline the same as a standard liquid fuel engine, and all other procedure in starting is the same.

In stopping, shut off gas at cock, shut off lubricator feed and throw out battery switch if using batteries.

Use pipe sufficiently large from the meter to the shut-off cock and engine.

Description of Engine Parts and Manner of Adjustment.

In this throttling governor engine the amount of explosive mixture admitted to the engine is controlled through the carburetor butterfly valve by a gear-driven throttling governor of the fly-ball type. The mixture is drawn into the cylinder through the inlet valve located in the cylinder head. The exhaust valve in the cylinder head is operated by a cam from the timing gear, and the ignition is also timed from this same gear. On battery equipped engines, the battery timer blade comes in contact with the exhaust cam at the proper time for both the regular running spark, and the retarded starting spark. The magneto is tripped from an eccentric in the same gear, furnishing a spark for both the forward, or regular running, and the back-kick start.



No. 3

Carburetor.

The fuel is drawn up from the main tank by suction through the carburetor, regulated automatically by the compensating air valve at the mouth of the carburetor. This air valve is fitted with a spring which must not be stretched, or changed, as it is fitted by careful test for all conditions of the operation of this engine. See that this valve fits flat against its seat and works freely, as paint sometimes gums here.



No. 4

The fuel pipe to the tank is provided with a screened check valve which holds the fuel up to the nozzle. Keep this screen clear and keep water from the fuel tank. If engine backfires and misses when there is plenty of fuel turned on, and in the tank, the cause may be due to leaky check valve or a clogged screen. Be sure the check seats properly. Otherwise rub it in with a screw driver.

The gasoline chamber in the carburetor is used only in starting and warming up the engine when the main tank is filled with kerosene or distillate. Keep the valve controlling the feed from this pocket closed at all times except when starting for kerosene or distillate. In starting cold engine on gasoline, keep the kerosene valve closed until engine is sufficiently warm to vaporize the kerosene properly.

Inlet Valve.

The inlet valve located in the cylinder head should work freely and seat properly. Oil stem occasionally. If a leak develops in the valve it will be easily noted when the engine is turned backwards against compression, by the sound of escaping air, or, by fuel being blown out of the carburetor valve plate on the priming-cup hole.

Exhaust Valve.

Exhaust valve, located in the cylinder head, is opened by rocker arm operated from cam on timing gear. This valve opens at approximately 35 degrees from the end of the power stroke, and closes when crank is about 5 degrees above inner center on exhaust stroke. Fly-wheel rim is marked for these points. See cuts 3 and 5.

This opening is controlled partly by the screw in valve end of rocker arm on the cylinder head.

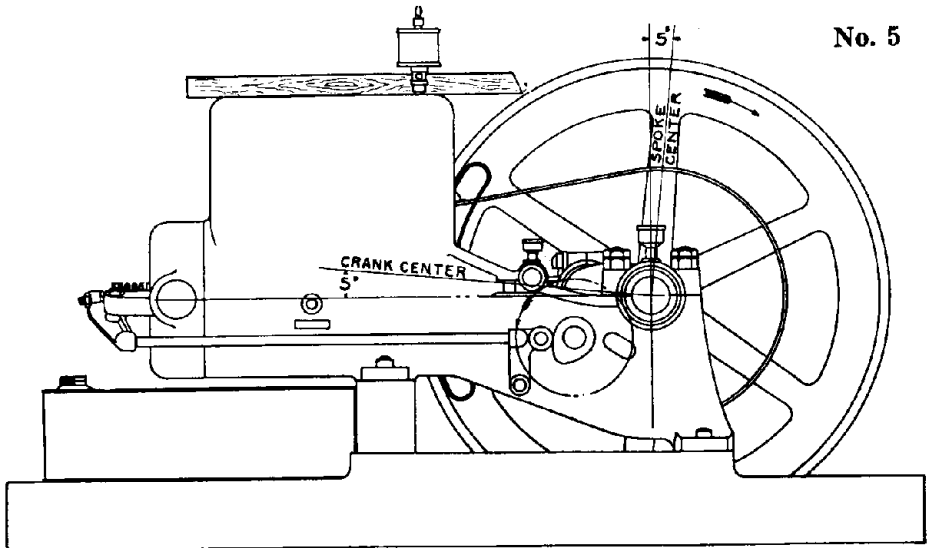
This screw should be adjusted only to correct wear, and not screwed in so tightly that valve cannot open and close at above points.

A mixture of powdered graphite and oil is recommended for oiling the valve stems.

Grinding Valves.

If the fly-wheel should turn over too easily against compression it is evident that some leak is taking place.

Examine both the inlet and the exhaust valves. If either leaks, seat it and with a pair of pliers, rub it on its seat and if necessary, grind it in.



GRINDING VALVES Con.

To do this, remove the cylinder head, and grind the valves to a good seat with fine emery, or ground powdered glass and oil. Clean both valves and head carefully and replace, being sure that head gasket is tight.

Clean off gasket surface on both cylinder and head before replacing gasket, and tighten cylinder head stud nuts carefully before and after engine is run.

Tighten these stud nuts several times after runs when engine is first received, as studs expand with heat, and this will take the stretch out. The common cause of blown gaskets is not keeping cylinder head stud nuts tight during the first few weeks of operation.

Piston.

A new engine may leak compression for a short time but will soon wear itself in. If a leakage occurs thereafter around piston, when engine is turned over against compression, first see that enough lubricating oil is being supplied, to properly lubricate the piston and rings. If leaks still occur, remove the piston, and clean thoroughly, taking off the rings by slipping three strips of sheet metal, about $\frac{1}{2}$ " wide, under the rings, at equally distant points, when the rings may be slipped off. Clean with gasoline, kerosene or hot lye solution, and replace in same position.

Piston Pin.

The hardened and ground piston pin has a bearing in both sides of the piston, and is clamped and kept from turning, or moving end-wise in the rod, by the connecting rod clamp screw. This screw is provided with a lock washer under its head to prevent its working loose; but must always be kept tight.

To remove the piston pin, place an open end or socket wrench on the clamp screw head, and take the screw out ENTIRELY, as it passes through a groove milled in one side of the piston pin.

The piston pin may then be tapped out with a wood punch. In replacing the pin, be sure to have the groove come in line with the clamp screw in the rod, otherwise the clamp screw cannot be replaced.


In putting the pin and rod in place in the piston, be sure and have the oil grooves come UP, and the joints of the piston rings come DOWN.

This will insure proper lubrication of the pin and also of the whole piston.

Timing Gears.

The large timing-gear running on pin on the side of the base has a hardened cam cast as a part of the gear, which opens and closes the exhaust valve in proper time, as noted under exhaust valve heading. This cam also times the battery ignition when the engine is so equipped.

This gear carries the magneto rod eccentric which properly times the magneto spark for both the regular running, and starting on magneto equipped engines. Keep this gear well oiled on its bearing. If necessary to remove this gear, or the crank shaft, for any purpose, be sure and replace the gears in their proper relation to each other. For correct timing of the exhaust valve and ignition, set as follows:

The large gear has two consecutive teeth marked thus, 00, while the crank gear has one tooth marked with an 0. When properly placed the single marked tooth of the crank gear should come between the two marked teeth of the cam gear, thus 000 

Throttling Governor.

This fly-ball type of governor is gear driven through the large gear on the side of the engine base. The governor weights through centrifugal force operate the carburetor butterfly-valve by means of a link. See that every part of the governor is kept well oiled and that it works freely. When butterfly-valve is closed, the governor weights should still lack a little space of being fully out. Keep cotter pins in the governor-weight pins, and the butterfly link ends.

Speeder.

A speed regulator is located on the top of carburetor and is easily accessible. When speeder thumb nut is unscrewed as far as it will go, the engine slows down to its minimum speed. When screwed up the engine is running about 15 to 20 per cent above normal speed. Power is in proportion to engine speed.

Ignition.

All sizes of engines except 2-h.p. are equipped with Wico High Tension Magneto only. The 2-h.p. can be furnished with either battery or Wico Magneto.

The timing of the spark is adjustable

for early or regular running spark and for retarded or starting spark.

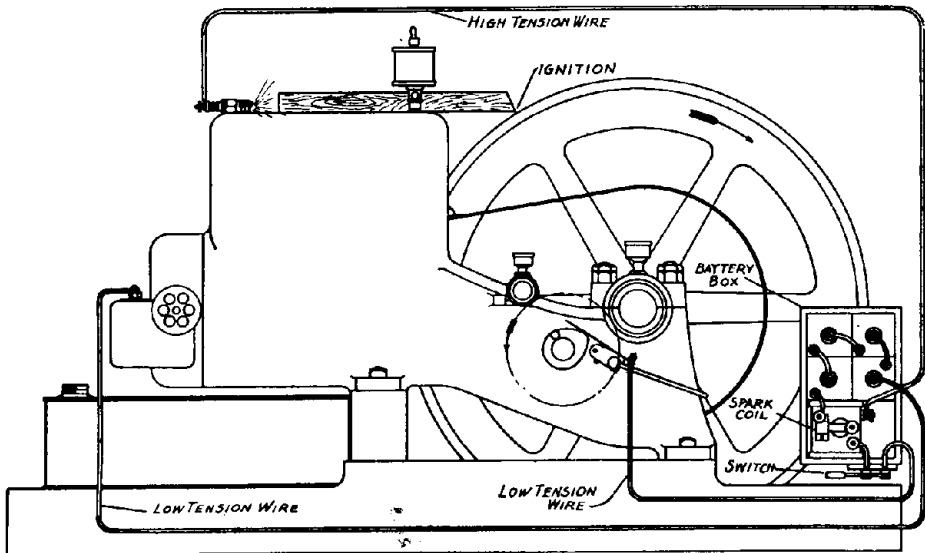
The 2 to 7-h.p. sizes are started with a hand-crank and the 10, 15 and 25-h.p. sizes by the back-kick method.

Battery.

On the 2-h.p. engines equipped with battery, the spark is supplied through vibrator type spark-coil, properly connected to standard dry cells, according to diagram shown below. The battery timer is supplied with early or running and retarded or starting spark device. Spark is early with lever DOWN, and retarded with lever UP.

Coil should buzz, when engine is turned over to its regular ignition position, when switch is on. This position is indicated

by word "IGNITION" on fly-wheel rim, level with top of hopper. If coil does NOT buzz WHEN BATTERY IS ALL RIGHT, clean the contacts of the vibrator with a fine file or with emery cloth. Keep coil and batteries covered as a protection against rain or dirt. Guarantee DOES NOT COVER BATTERIES, which we do not make. Never use more or less than four batteries.



No. 6

MAGNETO.

The Wico Magneto is mounted on bracket on side of the hopper. It should be kept tight by nut on the holding stud. Magneto is snapped by a trip lever operated by a rod and eccentric on the cam gear.

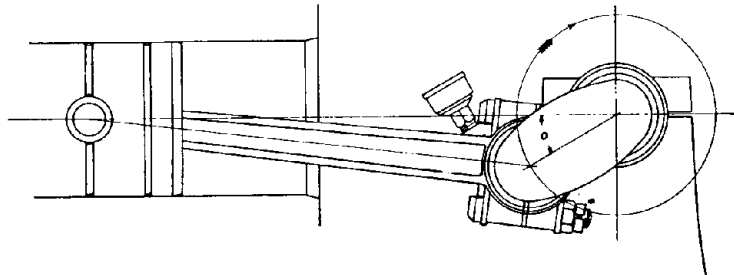
Adjustment for wear and timing of magneto spark is made by screwing in or unscrewing this rod to make spark later or earlier. Be sure and lock the holding nut on the rod after adjustment is made.

The magneto spark should take place when the mark on fly-wheel rim is in line with top of hopper. The wheel rim is marked with the word "IGNITION."

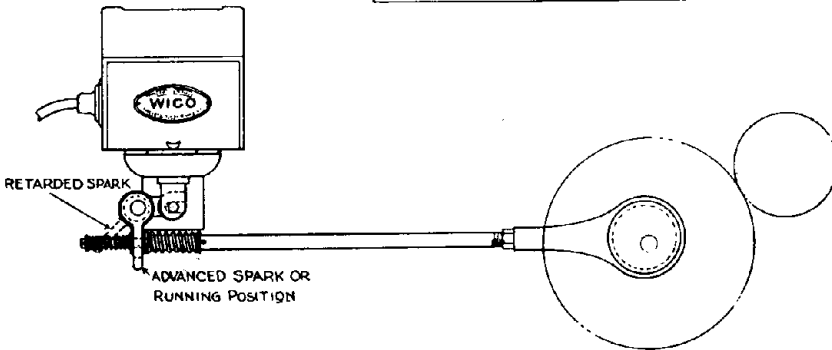
In starting engine by the back-kick method, the spark takes place when crank is slightly back of vertical position, toward cylinder, when revolved backwards.

Keep magneto operating mechanism well oiled.

The spark timing on the chart below applies to both the battery and magneto, but the word "IGNITION" stamped on the flywheel rim, is the guide for the proper point. Place a straight-edged stick on top of the hopper, and bring the lower edge out to the fly-wheel rim. Turn the fly-wheels forward until the word "IGNITION" is in line with this straight edge, and see that magneto trips, or spark coil buzzes, at that point.



HORSE POWER	2	3	5	7	10	15	25
DEGREES BELOW	45	43	40	35	32	28	25



No. 7

Spark Plug.

The points of the spark plug should be set not over 1/32 of an inch apart, or about the thickness of a worn dime. Keep the spark plug clean both inside and outside the cylinder.

A foul spark plug will not start the engine and a dirty plug on the outside will sometimes cause engine to miss, and be hard to start, especially if the weather is damp.

General Care of Engine.

The engine is fitted with high grade babbitt, in main crank bearings, and the connecting rod crank end, which, with proper care, should last a long time. These babbitted bearings are poured and not cast separately. The bearing caps are provided with thin paper shims for proper adjustment. A loose bearing soon pounds out, and is the main cause of broken crank shafts. Loose bearings allow deflection enough to crystallize and break a shaft if neglected too long. Keep bearings adjusted so that the nuts are down tight on the cap, and shaft is not loose in bearing. Remove some of the paper shims when necessary. To locate looseness in main bearings, lift up under fly-wheel rims, with a bar, and see if shaft lifts in bearings. To locate looseness in crank pin connecting-rod bearing, turn engine backward and forward, placing thumb on connecting rod bearing at crank cheek. Looseness can be detected. Adjust with shim washers and be sure to replace cotters in slots of castle-nuts. Keep piston pin tight in connecting-rod inner end. Use socket, or open end wrench, to keep this tight.

Fly-Wheels.

Fly-wheels have clamped hubs to hold them firmly on crank shafts. To remove wheel, take out clamp bolt, and drive a wedge, or chisel, in split, in the CENTER of hub, then slip wheel off over key.

Cooling Water.

Water in hopper should never be allowed to fall below the level of the cylinder top wall when operating, as cylinder will get too hot. It is expected that the water will boil away, as the engine is operated under load, and it should therefore be replaced as it evaporates. While the engine jacket may not be broken when water is allowed to freeze, it is not advisable to take the chance, and the hopper should be drained, when engine is not in use, during cold weather, unless a non-freezing solution is mixed with the water.

Non-Freezing Solution.

A non-freezing mixture of calcium chloride and water, which will not freeze solid in zero weather, is made by using three parts of calcium chloride to one part of water.

SPEED AND PULLEY RULES.

The catalog speed of your engine is the one at which its horse-power is rated, although our engines will develop more than rated horse-power at rated speed. If speeded up with speeder nut they will develop considerably more than their rated horse-power. If speeded much below their rated speed it is to be expected that they will not develop rated horse-power.

To obtain the correct size of pulley on your engine, when the size of pulley and speed of machine to be driven are known: Multiply speed of your machine by the diameter of its pulley, and divide by rated engine speed. The result will be the diameter of the engine pulley.

Similarly, the size of pulley necessary to be used on a driven machine is obtained by multiplying the rated speed of the engine, by the diameter of the standard pulley furnished, and divide that by the rated speed of the machine to be driven.

For example: The rated speed of 5-h.p. Throttling Governor WITTE Engine is 450 r.p.m., and its standard pulley diameter is 8 inches. If you have a ma-

chine which must be operated at a speed of 750 r.p.m., the pulley to be used on

such a machine will be $\frac{450 \times 8}{750} = 4.8''$

diameter, in which case a 5" diameter pulley should be used, and the engine speeded up to 469 r.p.m. to obtain approximately correct speed of the machine.

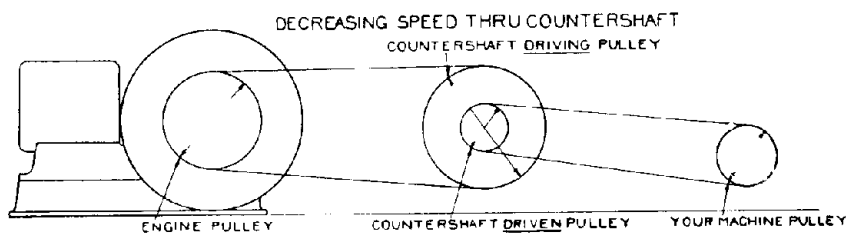
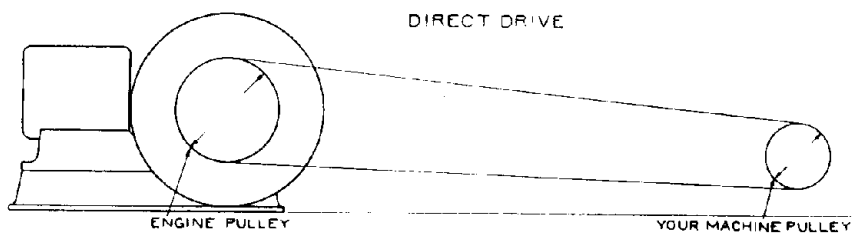
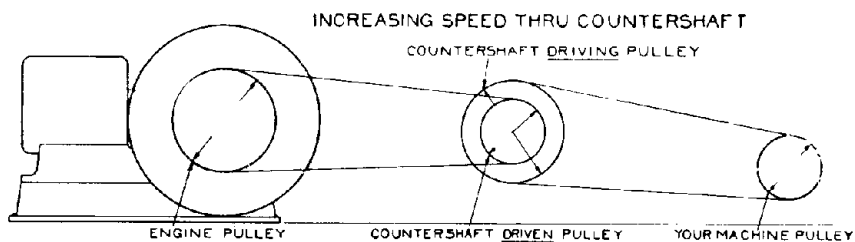
If driving your machine from a line shaft, first figure the speed of the line shaft, from your machine speed and pulley, and then figure the line shaft, or engine pulley, from that, in a similar manner. The cut shows various drives, and illustrates the foregoing explanation.

Do not speed your machinery too high—give the engine a little the advantage. If the engine labors too hard and does not pull the load right, reduce the size of the engine pulley, or increase the size of the driven pulley.

The use of clutch pulley is suggested on the engine shaft, in place of shifting belt with tight and loose pulleys. Beware of projecting set screws, or keys, on your line shaft, or machine, which might catch loose clothing and cause serious accident.

ENGINE SPEEDS

Rated H.P.	Rated R.P.M.	Low Speed	High
2	600	500	710
3	530	425	635
5	450	360	540
7	400	320	480
10	390	315	465
15	315	255	380
25	300	240	360

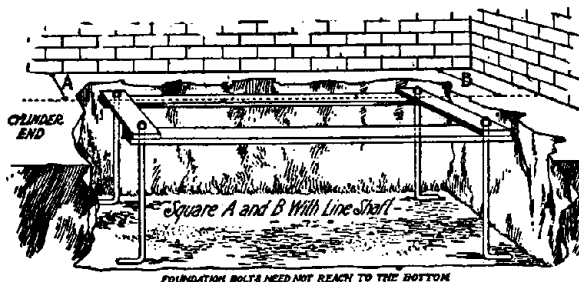


No. 8

FOUNDATIONS.

When putting in foundations for the 10, 15 and 25-h.p. engines, excavate hole as per foundation drawing of those sizes. If a foundation is desired under smaller engines, it should be finished a little

above floor level so wheels will clear safely. On the larger engines no skids are furnished, and a foundation sub-base is necessary as shown.



No. 9

Make a template of 1x4 timber, and drill it to correspond with engine bolt holes. Suspend this over hole. See illustration. Line up holes with your machinery level, and adjust bolts to proper heights above the engine's foot line, then lay the foundation. The upper 18 inches of the bolts, should be loose, setting in pipes, or wooden tubes, to allow them to be shifted slightly if necessary. After engine is placed on foundation, fill up around these bolts with slush cement.

Use plenty of slush cement, and finally finish the top smooth and level.

When the engine is set on its foundation, slush cement should be poured under the casting feet, from inside of engine base, to insure a firm foundation for the casting. The lower the foundation of the engine, the more rigid the entire power plant will be, and in every case must the foundation FIT TIGHT TO MOTHER EARTH.

FOUNDATION MIXTURE.

To make 10 cubic feet of concrete foundation requires:

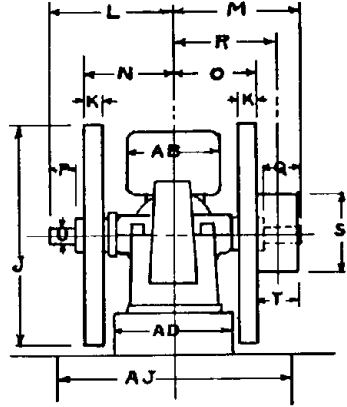
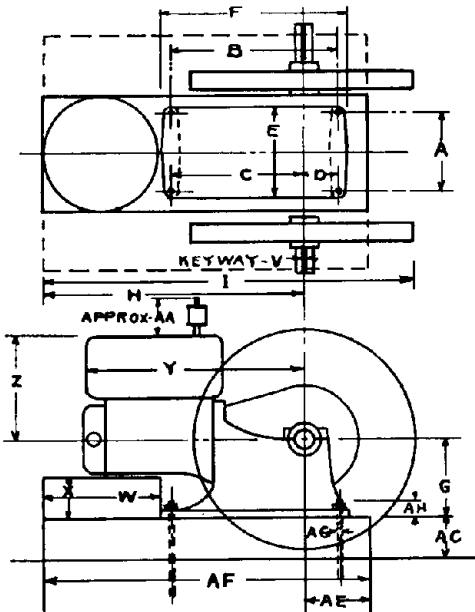
Cement.....	2 Bags.
Sand	4 $\frac{1}{4}$ Cubic Feet.
Stone	9 $\frac{1}{2}$ Cubic Feet.

Let foundation set 6 days before placing engine. Line holes with engine bolts per table. In cementing bolts to foundation, use equal parts of cement and water, and let set a week before starting engine.

Size of measures for sand: Use box 2x2 $\frac{1}{2}$ x11 inches deep. For stone or gravel use box 2x5x11 $\frac{1}{2}$ inches deep.

GENERAL DIMENSIONS

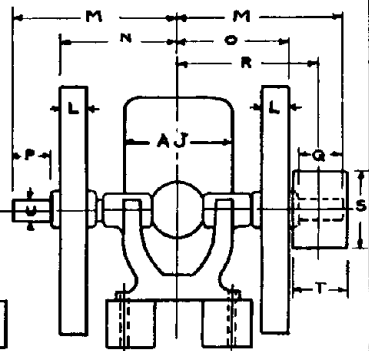
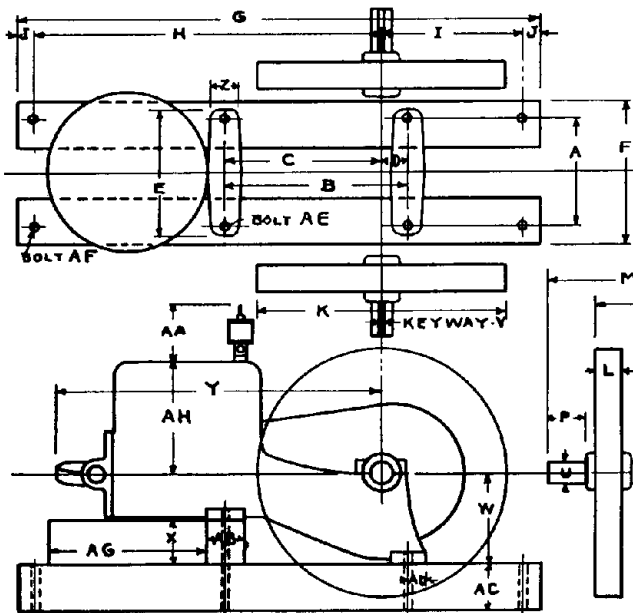
No. 10



HP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AJ
10	12	2 3/8	20 1/2	5 1/4	14	20 1/2	12	40	57	34	2 3/8	18 1/2	19 1/2	13 1/2	12 1/2	4	5 3/8	16	12	6 1/2	2 1/2	5	18	6 1/2	30 1/2	16 1/2	6	14	6 1/2	18	10	50	5	2	36
15	16	3 1/4	25	6 1/4	18	34	16	50	71	42	3 1/4	23	23	16 1/2	10 1/2	5 3/8	16 3/8	12	16	8 1/2	2 1/2	3	23	9	41	21	6	17	6 1/2	21	12	62	3	24	48
25	17	39	32	7	20	43	18	58	84	52	3 1/2	26	27	18 1/2	17 1/2	5 3/8	17 1/2	20	10 1/2	9 1/2	3 1/2	8	24	10	53 1/2	24	6	24	10	25	19	72	1	23 1/2	54

GENERAL DIMENSIONS

No. 11

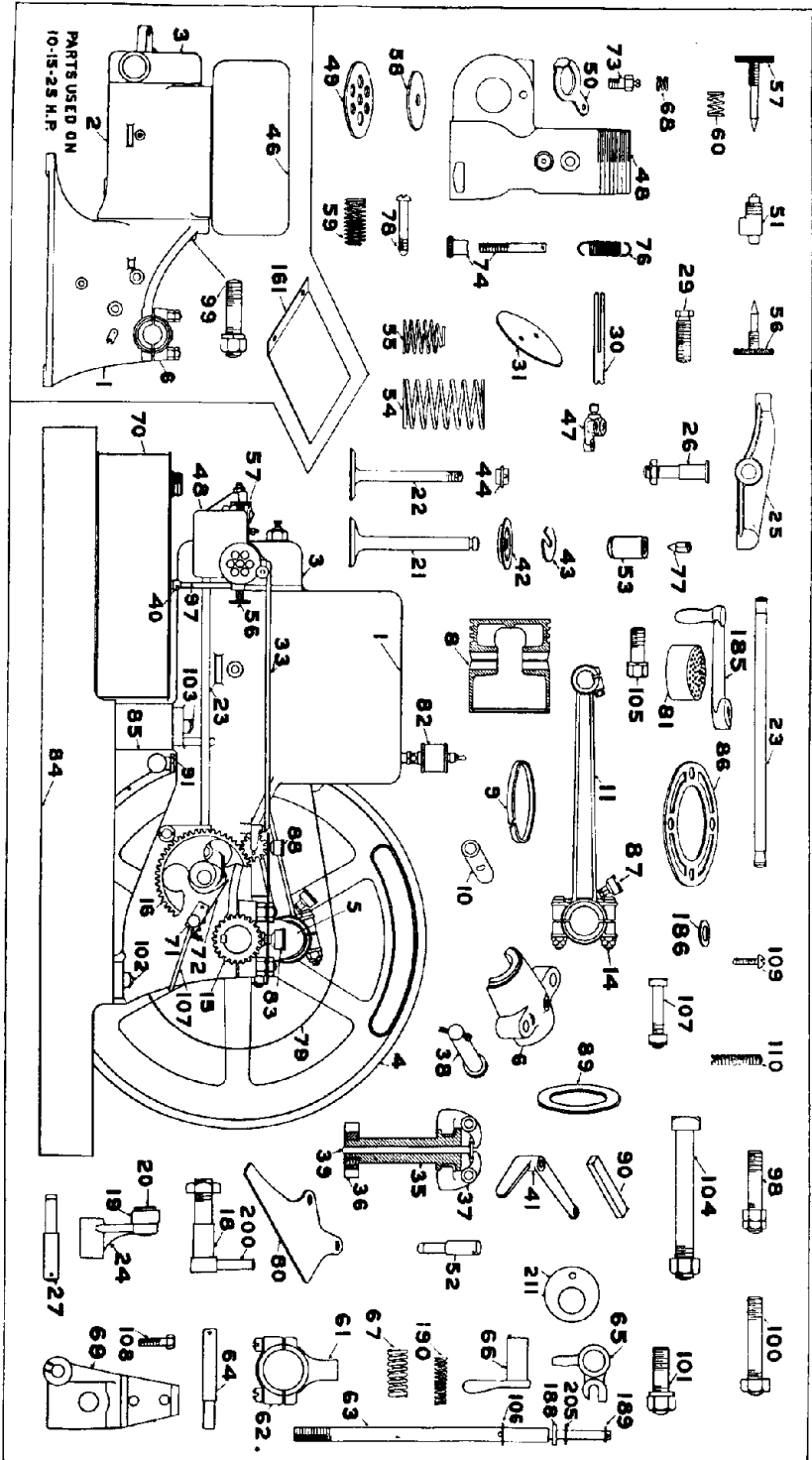


HP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AJ
2	7 1/2	1 1/2	10 1/2	1 1/2	8 1/2	9	36	25	9	1	16	17 1/2	10 1/2	8	7 1/2	2 1/2	3	5	3 1/2	1 1/2	3	6 1/2	5 1/2	21 1/2	2	5 1/2	2 1/2	2 1/2	1 1/2	1 1/2	1 1/2	11 1/2	7 1/2		
3	8 1/2	1 3/4	12 1/2	1 3/4	9 1/2	11	40	27 1/2	10 1/2	1 1/2	19	20	12 1/2	9 1/2	8 1/2	2 3/4	3 1/2	10 1/2	6	1 1/2	3 1/2	7	3 1/2	25	2	5 1/2	2 1/2	3 1/2	1 1/2	1 1/2	1 1/2	13 1/2	8 1/2	8 1/2	
5	10	1 3/4	15 1/2	1 3/4	11 1/2	13 1/2	45	28 1/2	14 1/2	1 1/2	24	24 1/2	14 1/2	10 1/2	9 1/2	3 1/2	4 1/2	11 1/2	8	1 1/2	3 1/2	7 1/2	3 1/2	28 1/2	2 1/2	5 1/2	3 1/2	1 1/2	1 1/2	1 1/2	14 1/2	10	10 1/2		
7	11 1/2	1 3/4	17 1/2	1 3/4	13 1/2	15 1/2	54	34 1/2	14 1/2	1 1/2	28	28 1/2	16 1/2	11 1/2	10 1/2	3 1/2	4 1/2	12 1/2	10	1 1/2	3 1/2	8 1/2	3 1/2	32 1/2	2 1/2	5 1/2	3 1/2	1 1/2	1 1/2	1 1/2	16 1/2	12	11 1/2		

INDEX TO CHART.

Always call for parts wanted by the number shown and the name following it. All items preceded by * are NOT illustrated on opposite page. If your price list of these parts becomes misplaced, notify us and a new one will be mailed immediately.

- | | |
|---|---|
| <ul style="list-style-type: none"> 1 Cylinder and base 2, 3, 5, 7-h.p. 1A Base only 10, 15, 25-h.p. 2 Cylinder only 10, 15, 25-h.p. 3 Cylinder head 4 Fly wheels 5 Crank shaft 6 Main bearing caps *7 Main bearing shims 8 Piston 9 Piston rings 10 Piston pin 11 Connecting rod—complete 12 Connecting rod cap *13 Connecting rod shims 14 Connecting rod bolt 15 Crank shaft gear 16 Cam and eccentric gear WICO *17 Pulley 18 Cam gear pin WICO 19 Exhaust roller 20 Exhaust roller pin 21 Exhaust valve 22 Inlet valve 23 Exhaust push rod 24 Exhaust roller rocker 25 Exhaust valve rocker 26 Exhaust valve rocker pin 27 Exhaust roller rocker pin 29 Exhaust valve adjusting screw 30 Butterfly shaft 31 Butterfly valve *32 Butterfly valve staple 33 Governor link *34 Roller rocker pin washer 35 Governor hub with gear 37 Governor weights 38 Governor weight pins 39 Governor center pin 40 Fuel pipe splash collar 41 Governor lever 42 Exhaust spring washer 43 Exhaust washer plate 44 Inlet valve spring nut 46 Extension hopper 10, 15, 25-h.p. 47 Butterfly lever 48 Carburetor body 49 Carburetor valve plate 50 Carburetor cover 51 Kerosene valve body 52 Governor lever pin 53 Kerosene fuel check body 54 Exhaust valve spring 55 Inlet valve spring 56 Kerosene needle valve 57 Gasoline needle valve 58 Carburetor air valve 59 Carburetor valve spring 60 Needle valve and magneto timer spring 61 Magneto eccentric strap 62 Magneto eccentric strap cap 63 Magneto rod WICO 64 Magneto timing bushing pin 65 Magneto trip arm WICO 66 Magneto timing bushing WICO 67 Magneto bumper spring WICO | <ul style="list-style-type: none"> 68 Carburetor cover spring 69 Magneto bracket WICO 70 Fuel tank 71 Battery timer block 72 Battery timer blade complete 73 Carburetor cover screw 74 Speeder stem and nut 76 Speeder spring 77 Fuel check valve 78 Carburetor air valve screw 79 Crank oil guard 80 Gear guard 81 Muffler cap 82 Cylinder lubricator complete 83 Main bearing grease cup 84 Engine skids 2, 3, 5, 7-h.p. 85 Cylinder foot 2, 3, 5, 7-h.p. 86 Gasket for cylinder head 87 Connecting rod grease cup 89 Bearing washer 90 Fly wheel key-pulley side 90A Fly wheel key governor side *91 Cylinder drain bushing *94 Spark plug ½" stand *95 Exhaust pipe nipple *96 Cylinder lubricator nipple 97 Fuel pipe nipple 98 Main bearing studs 99 Cylinder base studs 10, 15, 25-h.p. 100 Cylinder head studs 101 Magneto bracket stud 102 Engine to skid bolts—forward 103 Engine to skid bolts—rear 104 Fly wheel clamp bolts 105 Piston pin clamp bolt with washer 106 Magneto rod bump spring washer WICO 107 Battery timer pin and handle 108 Magneto cap screws WICO *109 Battery timer blade screw *110 Battery timer adjusting screw *136 Gas valve body *137 Gas valve *138 Gas valve spring nut *140 Hopper gasket 10, 15, 25-h.p. *142 Gas valve adjusting lock nut *143 Gas valve throttle *144 Gas valve spring *160 Lubricator pipe clip, 25-h.p. 161 Hopper splash plate 10, 15, 25-h.p. 185 Starter crank 2, 3, 5, 7-h.p. 186 Cylinder head stud gasket *187 Governor drag spring 10, 15, 25-h.p. 188 Magneto bump washer WICO 189 Magneto outer buffer spring washer 190 Magneto buffer spring WICO 200 Cam gear oiler nipple 202 Eccentric strap cap screws 10, 15, 25-h.p. WICO *204 Cylinder cover plate replaces hopper 10, 15, 25-h.p. 205 Magneto inner buffer spring washer WICO 211 Eccentric plates 2, 8, 5, 7-h.p. *212 Gear pin oiler elbow 10, 15, 25-h.p. *214 Eccentric plate dowel pin |
|---|---|



Be sure to give name, number and horse-power of engine, and whether stationary, portable or saw rig.

No. 12

LOG AND TREE SAW INSTRUCTIONS

On Following Pages

LOG AND TREE SAW INSTRUCTIONS.

Carefully remove crate from outfit, taking out extra parts from small box in corner of crate, and unwrap saw blade.

Tighten up all bolts, especially those passing through wood skids, as timbers shrink, and loose bolts and shifting parts result if these are not kept tight.

Clean off all parts of engine and saw rig, and see that they are not damaged.

Attach saw blade to outer, or finished side of saw casting, using bolts or cap screws furnished, using a lock washer between the saw blade and the nut.

Hold saw mechanism up when not sawing, by means of the wood hold-up bar bolted to saw side of skids.

STARTING ENGINE.

Read instructions for starting and operating this engine carefully before attempting to do any work with the outfit. Follow them carefully, and familiarize yourself with all the details of operation.

If your engine does not run properly, look over the trouble chart, and find the cause and remedy of your particular difficulty.

PREPARING TO SAW.

In using outfit as a log, or cross-cut saw, bring it to position desired, and with saw blade in line with the location of the cut to be made. More and better work can be done if log is first cleared of small branches and twigs, and cuts marked off with axe. This helps to start saw straight, and lets the teeth of saw directly into the wood.

When outfit is in position on the log, drive log spurs well into the wood, about center line of log.

Unwind log hook chain with windlass, and drive hook well into the log below the skid handles, in position shown by cut. Wind up chain tightly, holding windlass ratchet wheel with its pawl. When ready to begin cut, raise the saw mechanism by handle, and fold the hold-up piece back alongside of the skid. Then lower the saw down on the log. Be sure that saw clutch is thrown out.

CUTTING THE LOG.

Start engine according to regular instructions, and when running up to speed, and fairly well warmed up, with throttle properly adjusted, push saw clutch lever in, starting the saw gradually, preferably from a position with the saw blade clear out at farthest point of stroke and drawing back on first stroke. Push clutch in tight, so that clutch dogs drop into groove in clutch sliding cone. This

prevents clutch disengaging during operation. Saw runs approximately 200 strokes per minute, the speed recommended by saw makers. This speed may be varied by speed regulator on engine.

When cut is finished, throw out clutch lever and move to next cut. The clutch is designed so that it should slip when saw blade pinches. Clutch should be adjusted only tight enough to carry the

load, adjustment being made by the two nuts on the take-up stud in the end of crank shaft. It should be only tight enough to compress the spring nearly flat with still a little compression left in. The spring is located between the clutch adjusting nuts and the large clutch washer.

Keep clutch parts well oiled so that it will release instantly when lever is thrown out. Particular attention should be paid to the oiling of the shaft on which the clutch dogs work so that sufficient oil will work down into the friction part of the clutch, keeping it from getting dry and rough. Also, keep all moving parts of the saw mechanism well oiled.

ADJUSTABLE WHEELS.

If a long log is to be cut in several pieces, the truck wheels may be changed from side to end spindles, making it

easier to move outfit along log for next cut.

TREE SAW PARTS.

Tree saw parts consist of special pitman, saw lever, and saw casting with pins, spring tension windlass parts, and housing for saw lever bearing and windlass shafts clamped between skids. A

saw-supporting guide and skid rest is bolted under handle end of skids, as shown, on which to rest end of outfit, and to attach to the tree to be felled.

OPERATING TREE SAW.

Remove saw blade from regular log saw casting, wood pitman from gear and saw lever. Fold up log saw mechanism out of way, holding up with regular wood bar. Place tree saw lever on its shaft which projects down between the two skids on log saw, with the hub up, holding same on with washer and large cotter pin furnished. Don't omit washer as weight rests on this part. Now place long pipe pitman rod with upper end on gear pin, lower end on tree saw lever pin, putting washers and cotters in place.

Attach saw to upper, or finished side of saw casting, with teeth out and pull saw blade back, resting on top of skid rest block. Pass log hook chain around the sheave, on block between skids, place the hook in the dust groove of saw, winding up the windlass to hold saw against the skid.

Hook the tension spring into the saw casting spring-link and the tension windlass chain, drawing it fairly tight, and the outfit is ready for work.

In placing saw in position to fell a tree, locate it on side opposite the direction in which you wish to fell the tree, with skid block resting firmly on the ground, and tree spur, located on skid block, imbedded well into the tree trunk, pointing toward center of tree as near as possible, but with rig in such a posi-

tion that saw casting will not strike tree trunk, or roots, when at its outer point of stroke. Unwind log chain windlass, and drive its hook well into trunk of tree below line of saw cut. Tighten chain with windlass. This forces log hook, and tree spur, well into tree trunk, as shown.

When saw blade is brought back near skid, and resting on the block guide, the spring may be tightened a little, if not already so, resting teeth of saw against tree trunk.

Start engine, and throw in clutch. After which tighten up the spring tension by its windlass, and follow up the tension as saw enters its cut, and makes progress.

It is well during the cut, or before starting it, to notch tree on opposite side, below the saw cut, to help throw it clear from stump as it falls.

After cut is started, and blade has entered far enough, drive wedges in cut, behind saw, to force tree over, following up as fast as it yields. When tree begins to fall, release the spring tension, and throw out clutch on engine.

After tree falls, draw back saw blade and secure with log hook, winding up chain to hold it back against the skid, with some tension on spring windlass, after which outfit is ready to move to next tree.

INSTRUCTIONS FOR PLACING CLUTCH PULLEY.

In putting pulley on, in place of sawing outfit, proceed as follows:

Lift up saw side of rig, and block up under axle on that side, after which remove truck wheel if necessary. Remove saw pitman, large gear and sawing attachment parts, and unscrew clutch adjusting nuts from their stud. Now remove clutch parts, including the small

clutch gear. Slip pulley on shaft, with clutch ring against cone cup in place of the small clutch gear.

Replace clutch parts in exactly the same position they were in before, screw on nuts on the adjusting stud, making proper adjustment to have pulley carry belt load when clutch is thrown in.

CARE OF SAW.

The saw should be kept sharp, and with proper set for the kind of wood being cut, so as to clear the blade well. The raker teeth should also be in proper length relative to the cutting teeth.

Setting: Set cutting teeth of log saw blade alternately right and left. Give saw about $\frac{3}{64}$ -inch set on both sides of raker teeth, but give each cutting tooth the same amount of set. If teeth are not uniformly set, it causes saw to bend and heat.

Give enough set to have blade clear, but not too much, as this would mean a wider cut, hence using more power causing saw to pull hard.

Do not attempt to set teeth in cold weather until blade is warmed and no frost is in it, as this would cause teeth to snap off. Give saw very little set for hard woods, but use more for soft, stringy, fibrous, spongy wood, or very green timber.

Filing: Keep teeth well sharpened, using a mill file. Have bevel down to $\frac{1}{8}$

the length of the tooth. Do not take too heavy a cut in filing, as this might cause the teeth to over-heat and crumble on points when used. Never file square corners in the gullets, as no saw is guaranteed if it cracks due to square, or sharp corners in gullets. See that the lengths of cutting teeth are all the same. Have raker teeth $\frac{3}{64}$ of an inch shorter than cutting teeth for hard woods and as much as $\frac{1}{8}$ " for very soft woods.

Don't roll the file in sharpening, nor round the cutting or raker teeth, but leave very keen pointed teeth.

Gumming: Keep gullets rounded with round file so saw dust can get out freely and not pack.

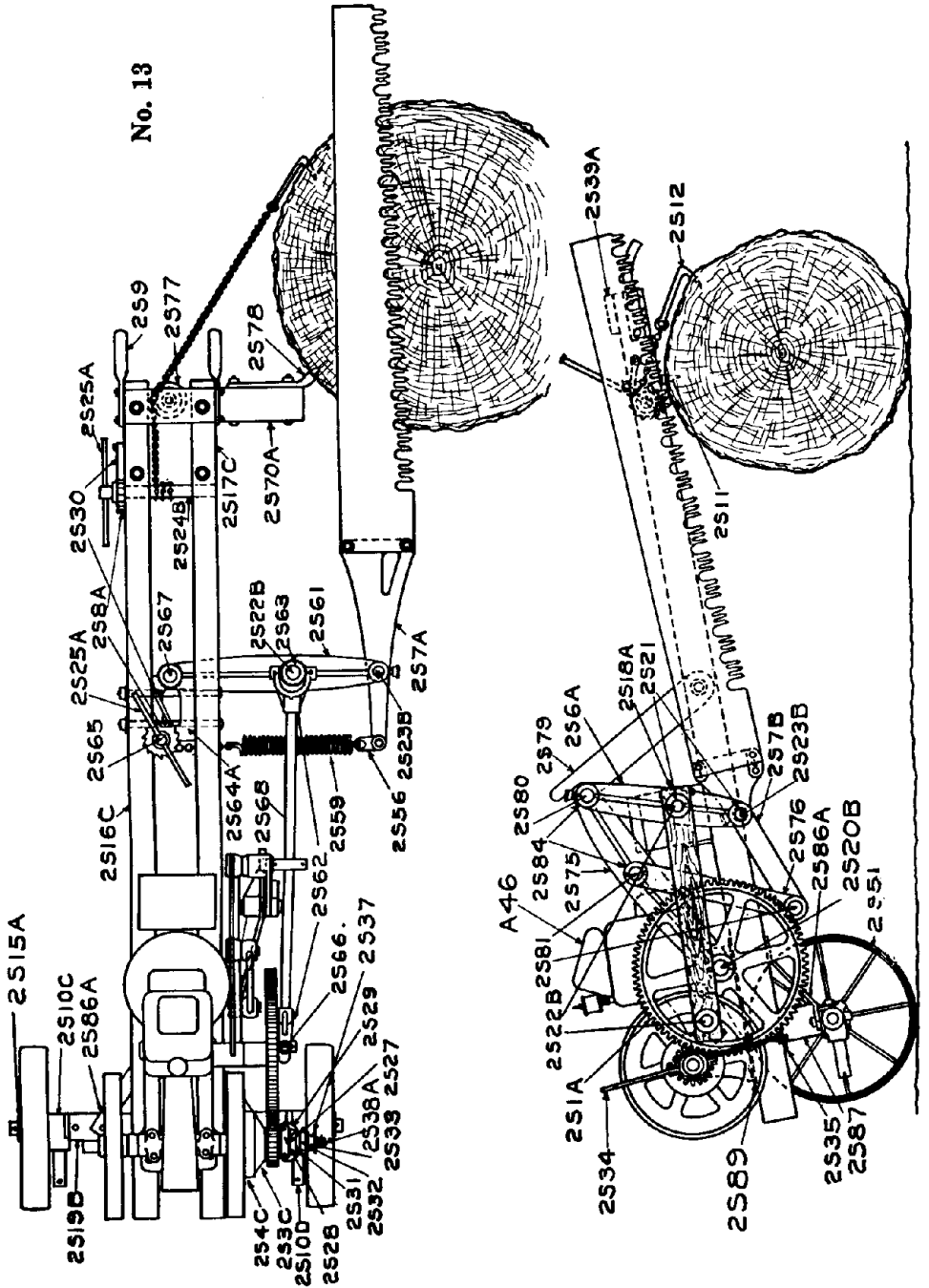
It is a good plan to take paper impressions of teeth when saw is first received, and when necessary to gum, see that the teeth get the same pitch as original. Never use an emery wheel to gum out gullets, unless you know how, as a saw may be badly injured if heated too hot by grinding.

OPERATING SAW.

If saw blade is used in freezing weather, be sure the frost is first drawn from it* by warming, otherwise the teeth may

break off. Keep all bolts tight on rig, and use plenty of oil on all wearing parts.

No. 13



INDEX TO CHART.

LOG AND TREE SAW PARTS.

Always call for parts wanted by the symbol number shown and name following it.

Items preceded by * are not numbered on opposite page.

If your price list of these parts becomes misplaced, notify us and a new one will be mailed immediately.

2S1A	Large gear	2S37	Clutch take-up washer
2S3C	Pinion and clutch cone	2S38A	Clutch stud
2S4C	Clutch cone cup	2S39A	Frame cross bar
2S6A	Log saw lever	2S59	Tree saw spring
2S7A	Tree saw casting	2S61	Tree saw lever
2S7B	Log saw casting	2S62	Tree saw pitman fork end
2S8A	Windlass ratchet wheel	2S63	Tree saw fork end collar
2S9	Truck handles	2S64A	Tree saw shaft housing
2S10C	Wheel trunnion right hand	2S65	Tree saw spring shaft
2S10D	Wheel trunnion left hand	2S66	Tree saw pitman fork pins
2S11	Log spur bolts	2S67	Tree saw lever fulcrum shaft
2S12	Log hook	2S68	Tree saw pitman rod
2S15A	Truck wheel washers	2S70A	Tree saw skid block
2S16C	Right hand skid	2S75	Log saw lever fulcrum bar
2S17C	Left hand skid	2S76	Log saw parallel link
2S18A	Pitman rod log saw	2S77	Tree saw chain sheave
2S19B	Axle angle	2S78	Tree saw spur
2S20B	Gear shaft	2S79	Fulcrum bar hold up piece
2S21	Gear shaft and pitman washers	2S80	Saw lever fulcrum pin
2S22B	Pitman pins	2S81	Parallel link pins
2S23B	Saw casting pins	*2S82	Tree saw lever shaft pin
2S24B	Windlass shaft	*2S83	Tree saw pitman fork rivets
2S25A	Windlass bar	2S84	Log saw lever link pin washer
2S27	Crank clutch washer	*2S85A	Clutch pulley
2S28	Clutch dog yoke	2S86A	Axle braces
2S29	Clutch dog	2S87	Axle block
2S30	Windlass pawl	2S89	Engine foot strap
2S31	Clutch sliding cone	*A85A	Engine foot
2S32	Sliding cone yoke		Saw blade 5-ft.
2S33	Clutch sleeve		Log hook chain
2S34	Clutch lever		Tree saw spring chain
2S35	Clutch lever fulcrum		Grease cup No. 0 used on saw
*2S36	Clutch dog pins		levers, saw casting and gear

YOUR ENGINE TROUBLES AND THEIR REMEDIES.

Trouble	POSSIBLE CAUSE		REMEDY	See Page No.	
Engine will not start.	Instructions not read or followed.		Read carefully and follow in order given.		
	No fuel in tank.		Fill fuel tank.	3	
	Water in fuel tank.		Strain fuel through fine gauze or chamois.	6	
	Water in cylinder.	Head gasket broken or not tight.	Renew gasket if necessary. and see that it is tight.	7	
	Poor compression.	Valve leaks.	Grind to good seat.	7	
		Piston.	Clean and oil.	7	
		Gasket leaks.	Renew or tighten head nuts.	7	
	Not primed properly.		Follow priming instructions carefully.	3 & 4	
	Too much fuel; engine flooded.		Close needle valve, hold inlet valve open and turn engine over to blow out excess fuel.	3 & 4	
	Engine too cold.		Put warm water in hopper.	3	
	Poor spark or no spark.		Dirty spark plug.	Remove and clean.	9
			Spark plug points too far apart.	Adjust points to a distance of thickness of a worn dime.	9
			Broken plug porcelain.	Put in new plug or renew old porcelain. Keep spare plug handy.	9
			Spark plug wire grounded.	Trace wire through from battery or magneto to spark plug and see that no spark jumps from it.	8
			Coil does not buzz.	Clean vibrator points and adjust to buzz loudly.	8
		Weak batteries.	Test with ammeter and renew.	8	
		Poor battery connections.	Clean connectors and tighten well at all points.	8	
		Timer blade makes poor contact.	Clean paint or rust from cam nose.	8	
	Magneto.	Trip magneto by turning engine over and observe if spark is good. See that magneto tripping parts work freely and that the break is quick	9		

Trouble	POSSIBLE CAUSE		REMEDY	See Page No.	
Engine misses after being started.	Ignition.	Loose battery connections.	Go over all connections; clean and tighten.	8	
		Dirty spark plug.	Remove; clean porcelain and adjust points.	9	
		Magneto lags.	Keep magneto clean and properly oiled.	9	
	Fuel.	Throttle set improperly.	Set throttle close enough to stop all black smoke from exhaust but not so lean that engine backfires in carburetor.	3 & 4	
		Dirt in fuel check valve in tank.	Clean tank and check valve and strain all fuel.	6	
Engine runs irregularly.	Governor parts bind.		Clean with kerosene and see that they work freely.	1 & 7	
	Fuel check valve in tank leaks.		Remove clean and see that it seats and does not leak.	6	
Engine runs away.	Governor parts not adjusted properly.		Adjust butterfly valve and governor travel so that valve will close just before governor weights are clear out.	7	
Engine knocks.	Fuel.	Throttle set too lean.	Open fuel valve very slightly.	3 & 4	
		If on kerosene, water is not turned on.	Adjust carefully until knock is decreased as much as possible. Be sure water pipe is free and water is being fed.	4	
	Ignition.	Too early spark.	Adjust time of spark according to table on ignition chart.	8 & 9	
	Carbon.		Clean carbon from piston and combustion chamber.	7	
	Loose bearings or connecting rod.		Adjust by removing shims and tighten down on caps.	10	
	Cam to exhaust roller.		Adjust for proper exhaust valve timing per chart.	5 & 6	
	Loose fly wheels.		Tighten hub clamp bolts.	10	
	Mud or scale in jackets.		Flush out mud or dirt and clean out scale.	10	
	Engine does not carry load.	Improper mixture.		Adjust fuel throttle.	3 & 4
		Late spark.		Set spark per ignition chart.	8 & 9
Carbon in engine.		Clean out carbon.	7		
Exhaust valve setting wrong.		Set according to valve timing chart.	5 & 6		
Governor butterfly valve setting incorrect.		Have valve fully open when governor weights are clear in and closed just before weights are clear out.	7		

Trouble	POSSIBLE CAUSE		REMEDY	See Page No.
Engine does not carry load. Con.	Poor compression.		Clean piston and rings and use good oil.	7
	Back pressure in exhaust pipe line.		Increase size of pipe from engine out and use less bends.	1
	Wrong pulley size to allow engine to run up to speed.		Figure your pulley sizes on engine and machine to let engine run a little above normal speed.	10 & 11
Engine uses too much fuel.	Fuel throttle too far open.		Adjust so that no black smoke is observed at exhaust.	3 & 4
	Late ignition.		Time spark properly.	8 & 9
	Exhaust valve setting wrong.		Set according to chart.	5 & 6
	Poor compression.		Clean and oil piston and rings.	6
	Restricted exhaust pipe.		Increase size of pipe and use fewer bends.	1
Engine over-heats.	Mixture too rich.		Adjust fuel throttle properly	3 & 4
	Late spark.		Time spark properly, and do not try to run on retarded spark.	8 & 9
	Poor spark.	Battery.	Clean and adjust contact points on spark coil. New batteries if necessary.	8
		Magneto.	See that magneto gives a good hot spark.	9
	Weak exhaust spring.		Put washer under spring until a new spring can be procured.	6
	Low level of cooling water.		Do not let water level fall below cylinder top.	10
	Carbon in engine.		Clean out carbon.	7
	Mud or scale in jacket.		Flush out mud or dirt and remove scale.	10
Carbon forms.	Too much fuel.		Adjust fuel throttle.	3 & 4
	Too much lubricating oil being fed.		Adjust cylinder oiler to feed the minimum amount for proper lubrication.	3
	Engine too cold to operate properly on kerosene.		See that the engine is hot enough to operate on kerosene before trying to run on that fuel.	4

Trouble	POSSIBLE CAUSE	REMEDY	See Page No.	
Engine smokes.	Mixture too rich.	Adjust throttle properly.	3 & 4	
	Too much lubricating oil being fed.	Adjust oil feed properly.	3	
	Lost compression.	Piston blowing.	Clean and oil piston and rings.	7
		Valves leak.	Grind to perfect seat.	7
Weak exhaust valve spring.		Replace with new spring.	6	
Cylinder oiler does not feed properly.	Lubricator passage stopped up.	Clean lubricator and use clean oil.	3	
	Oil too heavy in cold weather.	In starting in cold weather, use hand oil can on piston until engine becomes warm enough to cause oil to flow.	3	
Won't run on kerosene.	Engine not hot enough to vaporize fuel properly.	Use only enough cooling water in jacket to cover cylinder top. After engine is operating on kerosene fill up hopper slowly.	4	
Won't run on Distillate	Too low a gravity and too heavy to be drawn up through our nozzle or check valve	Use thinner grade, about the consistency of kerosene, or dilute with kerosene Note: The term Distillate is used for several low grades of fuel, some not adapted for four-cycle engines	4	

THINGS TO REMEMBER

Engine must be solidly placed and firmly secured

Follow directions for oiling.

See that your pulley sizes, on engine and machine to be operated, are of correct proportion.

Keep plenty of water in hopper and fuel in tank. It takes gasoline to start and heat up engine for kerosene operation. Engine must be warm enough to vaporize kerosene properly.

For short runs use gasoline.

Keep your spark plug clean and points adjusted.

Keep your engine timed properly. See valve and ignition timing chart and marks on fly-wheel rim.

If you run on retarded spark, or set the regular spark later than at point indicated on fly-wheel rim, you will over-heat your engine—burn your valves and valve stems—get less horse-power and cut down the life of your engine materially.

Feeding too much fuel produces the same difficulties. Set your fuel feed so engine neither smokes at exhaust nor pops back in carburetor.

See that your fuel is clean. It is advisable to strain it.

Dirt under check valve will cause trouble. See that it seats properly.

Keep all bolts and nuts tight on your engine.

Finally, don't allow anyone to tinker with your engine.

Study your instruction book and be your own expert.

We will not replace parts deliberately ruined by neglect to follow our printed instructions.