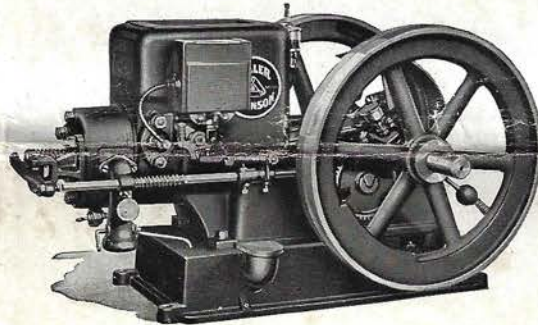


FROM
S. J. THINGSTEAD
2513 East Johnson Street
Madison 4, Wisconsin

Operating Instructions and Spare Parts List

FULLER & JOHNSON

3½ H. P. Model "NC" Gasoline Engines



To enable us to fill your orders for repairs promptly and correctly, it is absolutely necessary for us to have the following information:

Give engine number and horsepower found on name plate.
Give symbol number and name of part.
Give name of railroad or express station, if different from your post office address.
State how to ship, whether by mail, express or freight.
Write your name and address plainly.

Read and Remember

A1. Each Fuller & Johnson engine is carefully built, thoroughly tested and rigidly inspected, and the engine leaves our factory in first class running condition. Therefore, you should leave the adjustments as they are set at the factory. Read the instructions and be sure that you understand the operation of each part. FOLLOW THE DIRECTIONS.

Foundation and Location

B1. For the best results the engine should always stand as level as possible. Keep the engine free from dirt.

Before Starting

C1. Study the information given in the illustrations, and in reading the instructions, where a reference is given, be sure to refer in every case to the illustration. If at the same time you will examine the part on the engine it will help you to become familiar with your engine.

C2. Clean Valves.—When you are familiar with the parts proceed as follows: Clean the admission and exhaust valve stems by squirting some gasoline or kerosene on the stems. This will clean the valve stem of any grease or dirt. Then push the valves in and out to be sure they work freely. Then oil them with gas engine lubricating oil.

C3. Lubrication.—Examine the grease cups on the main bearings and see that there is plenty of

grease in cups. Then give each cup an extra turn to force the grease into the bearings.

C4. Attach the lubricator to the oil feed pipe. Fill the lubricator with special **gas engine oil**. Put the small lever on oil cup to vertical position and by means of the knurled nut adjust the oiler to drop 12 to 20 drops of oil per minute. To increase the flow, turn the knurled nut to the left. To decrease the flow turn the nut to the right. To flush the oiler turn the lever to an angle of 45 degrees. In cold weather the cylinder oil should be diluted with enough kerosene to make the oil flow freely. To stop flow put the lever in horizontal position. Use oil freely, especially when engine is new. If too much is used there will be grey-white smoke in the exhaust.

C5. Water Cooling Hopper.—Next fill the hopper half full of clean water. Warm water aids in starting in cold weather. Keep the hopper tank and water passages clean of any sediment or dirt. Never allow the water to freeze in the hopper. It is easier to drain the hopper than to repair the damage that may be caused by freezing.

C6. Fuel Tank.—Fill the fuel tank with gasoline. Be sure that the fuel used is not some low grade gasoline that has been exposed to the air for some time. Best results are obtained if **fresh** gasoline is used.

S. J. THINGSTEAD
2513 East Johnson Street
Madison 4, Wisconsin

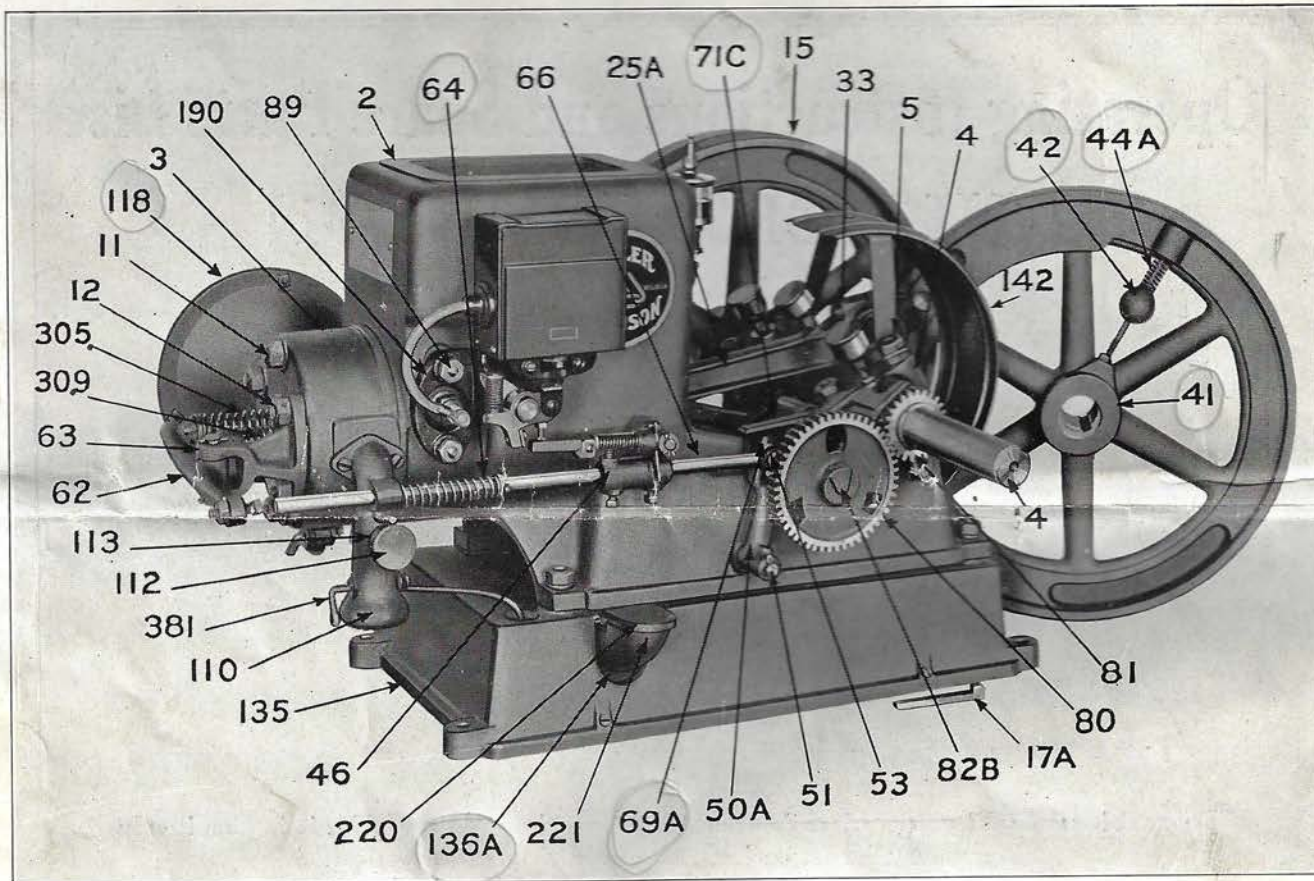


Fig. 1—3 1/2 H. P. Model "NC" Engine showing parts

To Start and Operate Engine

D1. First.—Tighten grease cups, including that on connecting rod, and set feed on cylinder sight feed oil cup.

D2. Second.—Open throttle to starting mark "S".

D3. Third.—Close damper by putting handle in horizontal position.

D4. Fourth.—Attach starting crank on governor side of engine, and give engine a few quick turns. As soon as the engine starts, open damper and adjust throttle to running position "R" or where it gives best results. As load increases close throttle more.

To Stop Engine

D5. Close throttle. Shut off oiler.

Drain hopper in cold weather. A sufficient amount of calcium chloride will prevent water in hopper from freezing. Write us for instructions.

To increase speed loosen the lock nut on governor rod and turn governor weight so as to increase tension on governor spring. To reduce speed turn governor weight so as to loosen tension on governor spring. Always be sure lock nut is tight after adjustment.

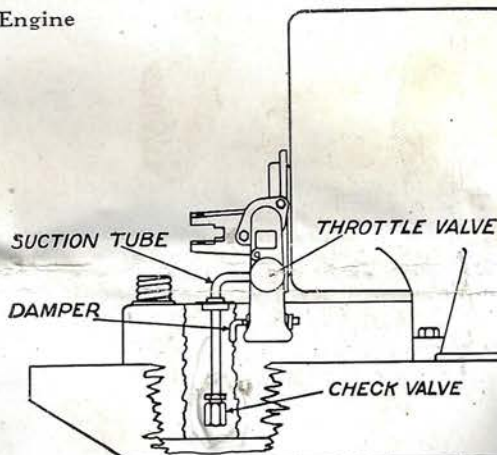


Fig. 2

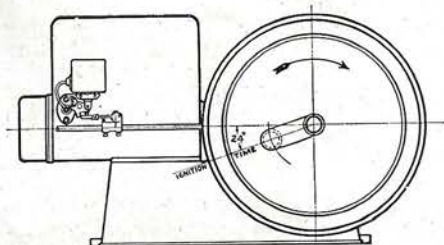


Fig. 3 Showing Ignition Setting

Suggestions for Good Operation

E1. Ignition Setting.—The engine gives the best results when the ignition is set correctly. On 3 1/2 H.P. Model "NC" engines, when equipped with magneto, the ignition should take place when the crank pin is about 24 degrees below the inner horizontal center, the piston moving forward on the compression stroke (before center). When the crank pin is in this position the word "snap" stamped on the face of the flywheel will be at the center of the exhaust rod (See Fig. 3), the piston moving in on the compression

INSTRUCTIONS COVERING THE INSTALLATION OF THE TYPE EK WICO MAGNETO

To Make Installation

There are three things to be considered in making the installation.

First, the mounting of the parts.

Second, the adjustment of the trip finger latch-off.

Third, the setting of the timing.

First take off the exhaust valve lever bracket and put on the bracket No. 190 (Fig. 10) carrying the magneto. Then after cleaning off the push rod, slip the trip carrier No. 46 (Fig. 10) down along the exhaust rod and replace the exhaust valve bracket.

Separate the armature No. 100 (Fig. No. 8) from the poles of the magnet No. 107 (Fig. No. 8) and insert a nail or wire about $\frac{3}{32}$ " diameter between armature and each pole. Then turn the flywheel of the engine until the push rod goes clear back toward the flywheel. The cam roller will then be on the lowest point on the cam. Then slide the carrier No. 46 along the push rod until the point of the latch No. 404 (Fig. 8) is about $\frac{1}{4}$ " past the head of the adjusting screw No. 419 (Fig. 8) with the lever No. 403 pointing downward as shown.

Then adjust the screw No. 419 so the point of the latch hooks up on to the latch block No. 5 about $\frac{1}{8}$ " and when the flywheel is turned in the direction of rotation, the inner end of the latch rod No. 404 hits bottom on No. 403 just as the latch slips off No. 5. Then remove the nail or gauge and test for ignition setting.

As a final check, the trip should occur just as the throw of the crank is about 22° below the horizontal center (just before piston reaches head end), the piston moving forward on the compression stroke. At this point, the word SPARK stamped on the face of the flywheel is even with the exhaust push rod. If the magneto trips before or after the word SPARK comes even with the exhaust push rod (when piston is moving forward on the compression stroke), slide the carrier forward or back to obtain proper timing.

Brief Instructions for the Care of Wico Type EK Magneto

These instructions state briefly how to take care of the Type EK Magneto, and state how to remedy all probable troubles.

If unusual circumstances arise, reference should be made to the Type EK Instruction Book, which gives more complete information about the Type EK Magneto.

J1. Oiling.—Oil magneto every working day with the same oil that is used in the engine cylinder. Special oil is not required. There is little danger from excessive oiling.

J2. Cleaning.—A magneto used constantly in the open will in time become caked with dirt and grease. This condition will cause no decrease of spark strength. If, however, the working parts are kept clean, the life of the magneto will be prolonged. Occasionally, remove the front cover of the magneto and also the moving parts and clean around the breaker points with a clean rag and a small hardwood stick. Keep points of contact between the armature and the cores clean by wiping with a clean rag.

J3. Magnets.—Do not remove the magnets. It is unlikely the magnets will ever need re-charging unless they are removed from the machine.

J4. Trouble Hunting.—If ignition trouble is suspected, disconnect spark wire from plug and observe spark between wire and engine frame by holding end of wire about $\frac{1}{8}$ " from frame while cranking engine. If good spark is produced trouble may be caused by dirty spark plug. If no spark is produced when magneto is operated, the trouble can be located by proceeding as follows: see that the armature (100) returns and makes a firm contact with the cores (107) after being tripped off. Failure to make firm contact indicates friction of moving parts caused by lack of oil. Remove any dirt from between armature and face of cores. Turn the flywheel over slowly and see that when the armature (100) is tripped it snaps quickly away from the cores (107). Failure to do this indicates binding or friction or a broken drive spring (186). Check up the "latch-off" of the trip finger in drive, and if wrong, make it right. (See below.) The latch should slip off the rocker arm just after the armature has opened $\frac{3}{32}$ " to $\frac{1}{4}$ ". If necessary to adjust, proceed as follows: trip the armature (100) from its contact with the cores (107) and insert a strip of metal $\frac{3}{32}$ " 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 latch block (5) on the rocker arm (406), and the adjusting screw (419) should be bearing on the top side of the latch, (See Figure 8), so that the least further movement of the push rod will cause the latch to slip off the latch block. If the latch does not engage the latch block when the armature is set as above, the adjusting screw should be screwed in until the latch just engages. If the latch engages the latch block too much (more than $\frac{3}{32}$ "), unscrew the adjusting screw to give the proper engagement. Loosen the lock nut on the adjusting screw (419) before attempting to change adjustment and be sure to set it up tight after the adjustment has been made. Before attempting to start the engine, remove the metal strip that you placed between the armature and the cores.

Moving Parts.—All moving parts can be withdrawn from the magneto by lifting the armature (100) from its magnetic contact with the cores (107). This operation does not weaken the magnets. When replacing the armature make sure that the felt oil pad slips over the guide rod.

Removal of Covers.—The covers of the magneto are held in place by the band which is fastened by four screws, two at each end of the magneto. The removal of these screws allows the band to be lifted and the covers to be removed.

If, after carrying out the instructions given above the engine does not start and run properly, the magneto should be sent to the service station of the Wico Electric Company at Tulsa, Oklahoma, or to the works of the Wico Electric Company at Springfield, Mass.

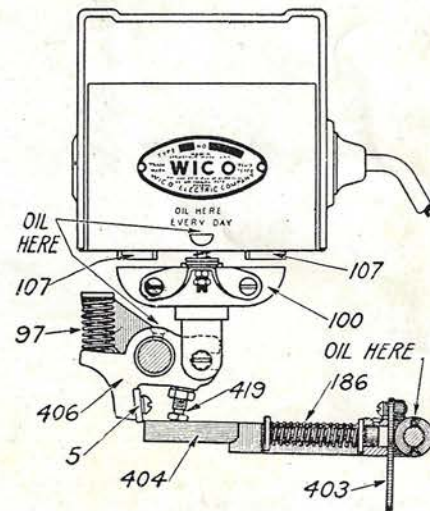


Fig. 8

Price List of Parts for Fuller & Johnson 3½ H. P. Model "NC" Gasoline Engine.

NOTE: To fill your order correctly we must have your engine number.

Description	Symbol	Price	Description	Symbol	Price
Cylinder and base with caps and studs.	X3NC2	85.00	Detent swivel.	G11N71C	1.50
Cylinder head only, each.	X4NB3	8.00	Detent pin.	1NC72	1.20
Cylinder head complete with valves and springs.	G4NB3	12.00	Detent spring.	11N74A	.75
Main bearing cap, R. H.	3NC4	1.50	Timing gear.	2NB80	2.50
Main bearing cap, L. H.	3NC4A	1.50	Timing pinion.	3NB81	2.00
Main bearing studs.	2N5	1.20	Timing gear shaft with oil cup.	G11N82B	1.85
Main bearing shims—thick (8 per set for both bearings), per set.	3NC6	.40	Timing gear shaft oil cup.	11N83A	1.25
Main bearing shims—thin (20 per set for both bearings), per set.	3NC6A	.70	Timing pinion key.	11N87	.10
Skid.	13N10B	1.00	Ignitor body on magneto bracket studs.	2N89	1.12
Cylinder head studs—short.	2N11	.15	Vaporizer with index pin.	XG3NB110A	3.00
Cylinder head studs—long.	13N12	.15	Vaporizer complete with throttle valve and damper.	G3NB110A	1.00
Crankshaft.	3NC14	12.00	Throttle valve complete with knob.	G4NB112	.75
Flywheel.	3NC15	12.00	Throttle valve spring.	J113	.15
Flywheel key.	2N17A	.30	Index pin.	J114	.05
Cylinder head gasket.	4NB20	.70	Muffler complete.	G4N118	2.00
Connecting rod shims (per pair).	2V24A	.60	Check valve body J129 complete with J127 check valve weight.	XGJ129	1.60
Connecting rod complete with bushings.	GG13N25A	7.50	Sub-base.	13N135	1.00
Connecting rod bushing (crank end).	G3NC26	.90	Fuel tank for sub-base.	G13N136A	1.75
Connecting rod bushing (piston end).	X13N28A	1.25	Straps for sub-base tank, each.	13N137	.15
Piston pin set screw.	3N32	.15	Crank shield complete.	G13N142	1.60
Connecting rod bolts, each.	13N33	.50	Starting crank.	G13N153	2.00
Piston pin.	3N36	1.35	Magneto bracket (Wico).	11N190	2.00
Piston only with ring pins and oil tube.	X3NC35	3.50	Wico magneto with bracket 190, stud 11N48 and spark plug ready to attach to engine (includes trip finger but no carrier).	G11N190	14.75
Piston complete with rings.	G3NC35	7.50	Wico magneto complete with bracket, 11N48 stud, plug, trip finger and carrier ready to attach to engine.	G11N190-46	16.00
Piston rings (3 to set) each.	4NB37	.50	Filler flange cover (sub-base).	11N220	.15
Piston pin oil tube.	3NB40	.70	Filler flange (sub-base).	11N221	.75
Governor eccentric.	11N41	.65	Exhaust valve.	4NB302	1.25
Governor weight.	13N42	.40	Exhaust valve nut.	2N304	.25
Governor group — eccentric and weight with rod.	G13N42	1.00	Exhaust valve spring.	2N305	1.20
Governor weight spring.	11N44A	.10	Admission valve with nuts and washers.	G4NB308	1.35
Push rod carrier with stud 11N47 and set screws, less trip finger.	G11N46	1.25	Admission valve spring.	4NB309	.80
Trip finger stud.	11N47	.70	Damper.	4NB380	.60
Rocker arm stud.	11N48	.20	Damper handle.	4NB381	.60
Cam rocker only.	11N50A	1.25	Damper spring.	H382	1.45
Cam rocker, complete with cam roller, pin and detent stop.	GG11N50A	3.00	Suction tube complete for sub-base engine.	XG3NB399	1.25
Cam rocker pin.	11N51	.25	Ignitor or magneto bracket gasket.	2N440	.70
Cam roller pin.	11N53	.30	Vaporizer gasket.	3NB442	1.20
Cam roller.	2NB54	.50	0 x ¼ grease cups (main bearings).		1.20
Exhaust lever.	13N62	.85	Sight feed cylinder oiler.		1.50
Exhaust lever bracket.	13N63	1.10	¾—18 spark plug.		1.50
Push rod spring.	13N64	.55	¾—18 spark plug wrench.		1.50
Exhaust lever pin.	2N65	.35	Steel ratchet grease cup (connecting rod).		1.20
Push rod only.	3NC66	1.10			
Push rod complete with carrier.	G3NC66	3.50			
G11N46 and cam rocker assembly.	Wico	3.50			
GG11N50A.	11N69A	.75			
Detent stop.					

stroke. Examine the ignition setting frequently. Keeping the ignition set properly will save fuel.

E2. Keep the engine as free from dirt as possible.

E3. Adjust the throttle so that the least amount of fuel will be used, and at the same time the engine will maintain its normal speed.

E4. Drain the hopper in cold weather.

Valve Setting

F1. Exhaust Valve.—The burnt gases and refuse from the lubricating oil are forced out through the exhaust valve. Therefore, it is necessary to use good gas engine lubricating oil and keep the fuel throttle set properly. The least accumulation of anything that interferes with the perfect seating of the valve will cause a leak. To determine if the exhaust valve seats properly, turn the flywheel around in the direction the engine runs until the piston moves forward on the compression stroke. If valve seats properly there will be no leaking or hissing noise at the exhaust. Should the valve leak, first be sure the valve stem is clean. Squirt some gasoline on the stem and push the valve in and out, in order that it will work freely in the valve guide. If the valve still leaks, start the engine and while the engine is running take a pair of pliers and rotate the valve on the seat. Then take a block of wood and tap on the end of the exhaust valve lever right next to the exhaust valve stem. By doing this you will find that the tapping will lift the valve from the seat at the time of the explosion and the force of the explosion will blow any accumulation off the valve seat, thus allowing the valve to seat properly. Should this fail it will be necessary to remove the cylinder head, clean and regrind the valve.

F2. Exhaust Valve Setting.—For the best results the exhaust valve should begin to open when the crank pin is 38° above the outer horizontal center, the piston moving out on the power stroke, and should close when the crank pin is 10° above the inner horizontal center, the piston starting to move outward on the suction stroke, that is, the exhaust valve remains open while the crank pin passes through an arc of approximately 228 degrees (See Fig. 4).

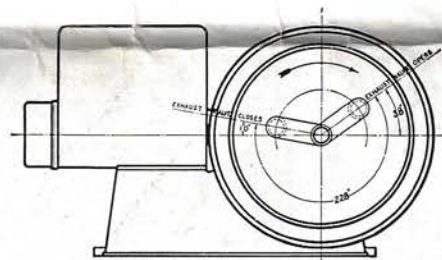


Fig. 4 Showing Valve Setting.

Governor

G1. The governor on the 3½ H. P. Model NC Engine is the hit and miss type, that is the number of explosions is in proportion to the load on the engine. The accompanying drawings (Figures 5 and 6) show the action of the governor.

G2. When the engine is running, centrifugal force causes the governor weight (G) to move outward. When the proper set speed is reached, the extreme outward movement of the governor weight (G) brings the face of the governor eccentric collar (E) in contact with end of the detent finger (A) and forces it upward. As (A) is pivoted at (B) then point (P) is forced into the detent catch (C). With the governor weight (G) in this position (see Figure 5), the exhaust push rod is held forward keeping the exhaust valve open. With the exhaust valve open, no suction is produced by the movement of the piston, therefore, no charge is drawn into the cylinder. With a load on the engine, the speed will quickly lower slightly and the governor spring (S) will push the governor weight (G) nearer the shaft (see Figure 6). With governor weight in this position, the coil detent spring will raise point (P) out of the catch and then allow the roller to follow the cam (see Figure 6) allowing the exhaust valve to close and a charge to be drawn into the cylinder. The power from this explosion tends to increase the speed causing the governor weight (G) to move outward and again force the detent point (P) into the catch (C), (Figure 5). When the engine is heavily loaded it may require several successive explosions to bring the engine up to the set-speed.

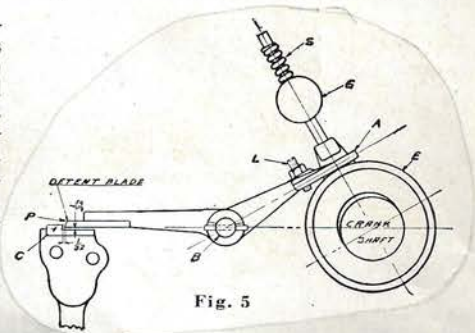


Fig. 5

G3. If at any time it is necessary to check the adjustments of the governor, proceed as follows:

Turn the flywheel until the detent catch (C) moves toward the head of the engine in position as shown in Figure 5. At this position the point (P) of detent finger can be pushed into catch (C). There should be a clearance of one thirty-second of an inch between the point of the detent (P) and the edge of the catch (C). If the clearance is less, grind point (P) to give proper clearance. Be sure to grind detent point at proper angle. Next take hold of governor weight (G) and pull it outward toward rim of flywheel, this will force detent finger point (P) into catch (C). With governor weight pulled out, there should be a clearance of one-thirty-second of an inch between the lower face of the detent blade or point and the face of the detent catch.

If the clearance is greater, it will be necessary to bend the end (A) down slightly, or if less, bend (A) up slightly.

G4. On 3½ H. P. Model NC Engines, turn flywheel until detent (C) is in position as shown in Figure 6. Then place a piece of cardboard

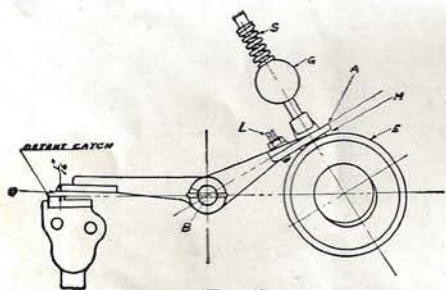


Fig. 6

or thin sheet metal in opening "O." Then adjust the detent screw "L" so that the point touches firmly on the main bearing cap. Be sure to tighten lock nut securely. With detent in this position, there should be a slight clearance at "M."

Check Valve

HI. To maintain a constant gasoline level in the vaporizer, a check valve is placed at the lower end of the stand pipe in the fuel tank. With the throttle properly set, if the engine sucks several times before the explosion occurs, and if when the damper is closed the first suction or charge explodes, and there is no black smoke in the exhaust, this condition indicates that the check valve is leaking, caused possibly by dirt on the valve seat.

To clean the check valve, unscrew the union in the fuel line just below the vaporizer, turn the feed pipe one-quarter turn out in front of the engine and remove the pipe. Unscrew the valve cage at the bottom of the pipe and the valve can be easily removed. After cleaning, replace the check valve in the cage with the slotted end UP and then fill the valve cage with gasoline to test for leakage. If the valve still leaks it will be necessary to regrind the valve or replace with a new one. In reassembling, be sure the valve cage is screwed tightly to the stand-pipe.

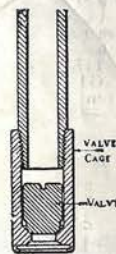


Fig. 7
Check Valve

Parts For Wico Type "EK" Magneto

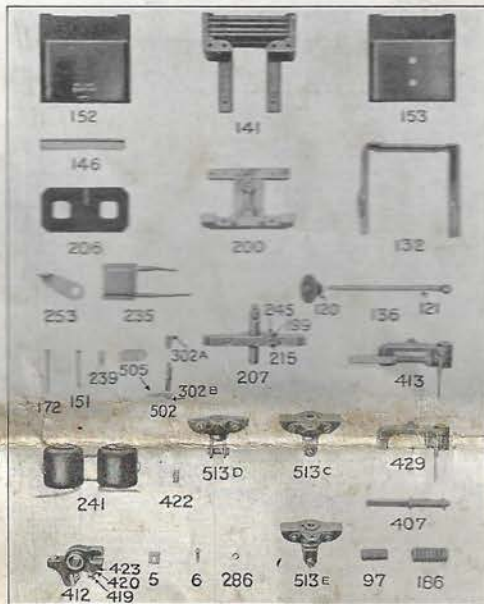


Fig. 9



Fig. 10

Description	Symbol	Price	Description	Symbol	Price
Latch block	5	.30	Coil Gasket	206	1.25
Latch block screw	6	.02	Deck Half Group	207	1.25
Terminal Contact Spring	38	.07	Ground Connection Screw Lock Washer	215	1.00
Push Rod Bracket with set screws and trip-finger stud (47), (less trip finger)	G-46	1.25	Condenser	235	1.00
Rocker Arm Stud	48	.20	Coil Wedge	239	1.00
Lead Wire Terminal not furnished (order 121)	65	.20	Coil Group	241	1.00
Armature Return Spring	*97	.20	Ground Lead Clamp Washer	245	1.00
Coil Group R. H.	103	3.00	Return Spring Support	253	1.00
Coil Group L. H.	104	3.00	Latch Block Screw Lock Washer	286	1.00
Terminal Block Group	120	3.00	Breaker Point Nut	302A	1.00
Lead Wire Group (6" wire)	†121	3.00	Breaker Point Nut	302B	1.00
Side Band Group	132	3.00	Latch Group	407	1.00
High Tension Terminal Group	†136	3.00	Rocker Arm Group	412	1.00
Magnet Group	141	4.00	Trip Finger Group	413	1.00
Cross Arm	146	1.00	Latch Off Screw	419	1.00
Deck Screw	151	.05	Latch Off Screw Nut	420	1.00
Front Cover	152	.75	Trip Finger Support Spring	422	1.00
Back Cover	153	.75	Latch Off Screw Lock Washer	423	1.00
Pole Yoke Screw	172	.25	Trip Finger Frame Group	429	1.00
Drive Spring not furnished (order 407 or 413)	*186	1.00	Breaker Point Set	502	2.00
Magneto Bracket	190	1.50	Breaker Point Lubricating Felts	505	1.00
Wico Magneto Complete with Bracket, Rocker Arm Stud (48) and Spark Plug, ready to attach to engine (includes trip finger, but no carrier)	G-190	17.75	Set of Coil Connecting Wires	511	1.00
Spark Plug (3/8" - 18 thread, long)		1.75	Armature Group	513C	1.00
Ground Connection Screw, Side Band Screw	199	1.00			
Assembly Plate	200	1.75			

*Orders for drive and return springs or armature group cannot be filled unless model and horse-power of engine on which they are to be used is specified.
 †Orders for lead wire group or terminal group cannot be filled unless length of lead wire required is specified.

Be sure to specify Type "EK"

FULLER & JOHNSON MFG. CO.

Engine Specialists
ESTABLISHED 1840

MADISON, WIS., U. S. A.