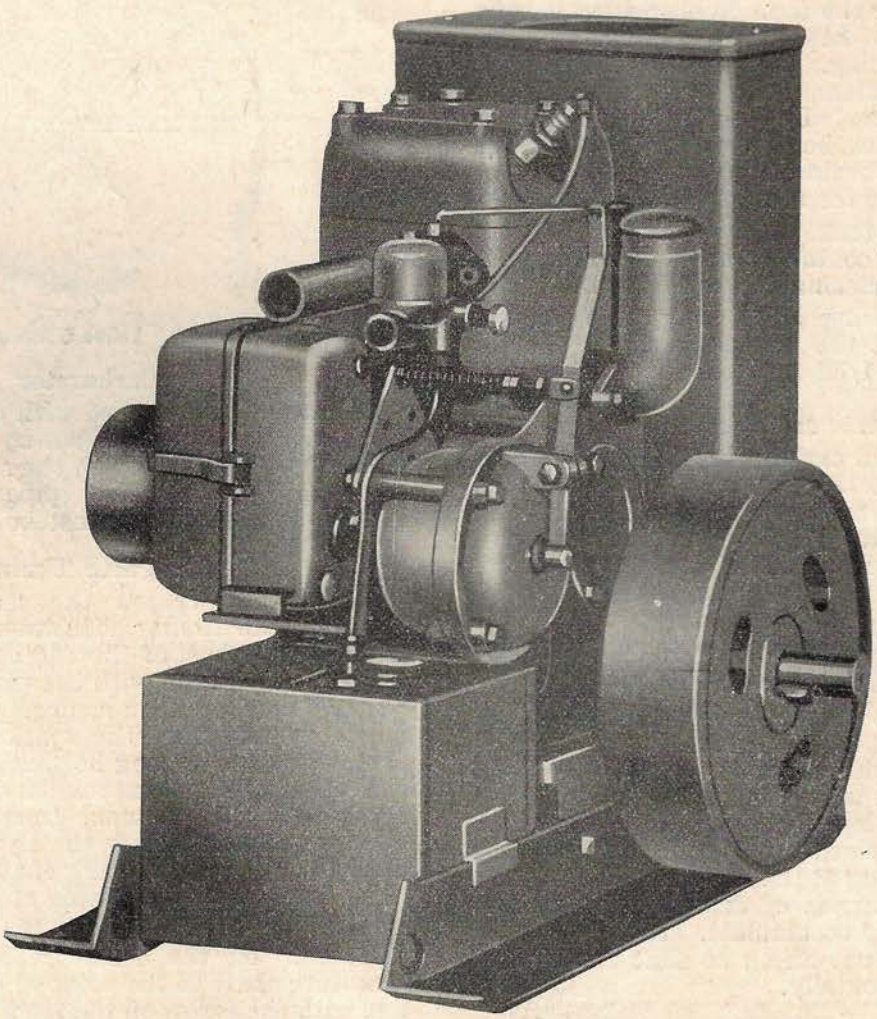
Operating Instructions and Parts List

for

Model AG Engine



NOVO ENGINE CO.

Clarence E. Bement, Vice-Pres. & Gen. Mgr.

LANSING — MICHIGAN

U. S. A.

New York Office 243 Graybar Bldg.

Chicago Office 558 Washington Blvd.

Parts List No. 831 AG Engine

Before Starting Engine

1. Use a good grade of gas engine oil. For summer a medium heavy S. A. E. viscosity No. 30 and for winter a light medium S. A. E. viscosity No. 20. The oil capacity is one quart. Pull out breather cap and pour oil through breather tube. To check oil level, open test cock directly below water hopper, the correct oil level is reached when the oil starts to run out. Always keep oil at this level. The lower plug is for draining the oil. It should be renewed every fifty working hours.

2. Fill hopper with clean water, within 1 inch from the top. Do not allow water to get lower than 4 inches from the top. Replenish as it boils away. Steaming of hopper is sometimes misconstrued as overheating. This is the nature of a hopper cooling system, boiling is normal when engine is operating. During freezing weather when engine is not being operated, the water should always be drained. A pipe plug is provided in the hopper for this purpose.

3. Fill gasoline tank, capacity one U. S. gallon. Be sure that the container used for filling the tank is absolutely clean and free from dirt.

4. Before screwing spark plug into engine make certain that the gap between the points is not more than 1/32 inch or the thickness of a thin dime.

5. Attach magneto cable to spark plug.

6. To start, open carburetor needle valve one-half turn, place starting crank in position. Place left hand over carburetor air intake and crank engine to the right. When engine starts remove hand from carburetor. After engine warms up, it is necessary to adjust needle valve to a position where it will operate smoothly.

7. To stop, push in "Stop" switch on magneto.

Installing the Engine

If the engine is placed inside a building, the exhaust gases should be conducted outside. Use as short and straight an exhaust pipe as possible. If the exhaust pipe is over four feet long it should be enlarged one size, if 10 feet, two sizes, etc. If the exhaust is piped up through the roof, use a valve or a pipe plug at the bottom of the vertical section for the purpose of draining the pipe of any water that may accumulate. To prevent rain entering the pipe use an ell so that the muffler will screw in horizontally.

Governor

The engine is set at 1200 RPM crank shaft speed which gives a speed of 600 RPM on power takeoff shaft.

To change the speed, loosen lock nut on governor adjusting rod. To increase engine speed, increase tension of governor spring and to decrease engine speed, decrease tension of governor spring.

Valve Clearance

.012-in. clearance should be maintained between tappet and valve stem at all time.

Valve Timing

If the timing gears have been removed, it is not difficult to retime the valves. Both gears are marked on the side next to the connecting rod. There are two punch marks on the cam gear and one on the engine pinion. The mark on the engine pinion must come between the two marks on the cam gear. This is important. If gears have been properly meshed the valve timing will be as before.

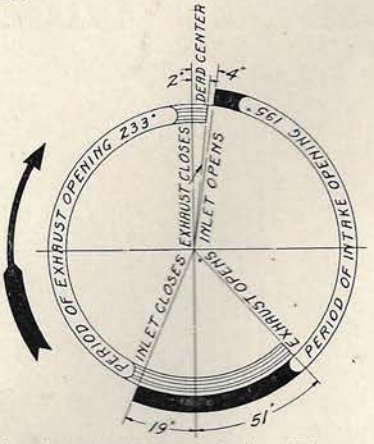


Fig. A2762 Valve Timing Diagram

Carburetor

The engine is equipped with a suction type carburetor. The fuel is drawn up to the carburetor from the gasoline tank on the suction stroke. To accomplish this, all fuel pipe connections and gaskets in carburetor must be tight.

Magneto Timing

If for any reason the magneto has been removed, the timing adjustment is very simple. Turn the flywheel of the engine in running direction to the position with the piston at upper dead center on compression stroke. This can be determined by removing the spark plug and holding thumb over spark plug hole, revolving flywheel at the same time. Compression is noted from the pressure against thumb, from within. At this point continue to turn the flywheel over slowly until the keyway in crank shaft is at lower position. This places the piston at upper dead center.

Next, note large mark on the serrated magneto drive hub on the armature shaft, revolve the armature shaft to the point where this mark is in line with the arrow on the front magneto housing. At this point hold the armature shaft in this position, slip the drive coupling over the magneto drive hub and place the magneto on bracket, at the same time slipping drive coupling on the governor shaft. Align coupling and screw cap screws into magneto, tighten firmly. Check coupling for alignment, drive coupling should slide back and forth at any position coupling may be turned.

It is always well after timing magneto to recheck it to make certain that directions have been followed correctly.

Regrinding Valves

The seats on the valves must always be kept in good condition to prevent the engine from losing its compression. Should the engine turn too easily while being cranked, it is evident that compression is being lost. Leaky valves can be easily detected by cranking engine over slowly at the same time listening for a leak past the exhaust valve at the muffler, and a leak past the inlet valves at the carburetor air intake.

To grind valves, remove cylinder head, magneto, fuel tank and valve cover. Then remove U washer from valve stems, this will relieve spring tension and the valves can then be easily taken out. Mark the valves before removing so that they will be placed back in the proper port.

Scrape all carbon off of inside of combustion chamber in cylinder head, top of cylinder, valves and exhaust valve port, taking care not to score valve seats with scraper.

Apply a small amount of grinding compound to the valve face, place a light spring over the valve stem and insert the valve in the proper port. Do not use too coarse a grinding compound. Grind in the valve with an oscillating motion, allowing the spring to raise the valve off the seat at short intervals. This will permit the grinding compound to flow back and cover the surface made bare by the oscillating motion. The amount of grinding is determined by the condition of the valves. Care should be taken not to permit valve grinding compound to get into valve stem guides. It is not necessary to obtain a seat the entire width of the valve face. If a good seat 1/16-in. wide continues clear around the valve it is sufficient.

After grinding, the valves, valve seats in cylinder and valve guides should be cleaned with gasoline. To test valves, with a soft lead pencil draw several marks across the valve face ¼-in. apart around the valve. Replace the valve in its port, rotate it and then remove it. If the seating has been correctly done, all the lines will have been broken.

Be sure after assembling valves into cylinder that there is a valve clearance of .012-in. It is also a good plan to have a new cylinder head gasket on hand in case the gasket is damaged when removing the cylinder head.

To Remove Cam Shaft

Remove pulley or gear from power takeoff end of cam shaft. Follow direction "To Remove Crank Shaft." Then remove magneto, governor, valve cover, valve tappet assembly and cam shaft bearing retainers. The cam gear and bearing is pressed on the cam shaft and it is necessary to use a gear puller when removing same from crank case.

When reassembling parts, the cam gear should be supported on the back side when driving cam shaft into gear. Be sure to check bearings when completed, refer to "Adjustments of Bearings."

Adjustment of Bearings

The crank shaft and cam shaft bearings are Timken taper roller bearings. Should end play develop, this can be detected by taking hold of flywheel or cam shaft and pushing same back and forth. If loose a chuck will be noticed.

To adjust, remove covers held in place by cap screws on the back side of the engine and take out as many shims as necessary. Care should be exercised not to get bearings too tight. They should turn freely after adjustment has been completed.

The connecting rod has a babbitted bearing. To adjust, remove subbase and flywheel, then connecting rod cap. On a small flat board one foot square attach a sheet of fine emery cloth. Place machined surface of cap squarely on emery cloth pushing same back and forth once or twice. Then reassemble cap to rod, tighten nuts firmly. On one side of cap and rod there is a small lug for the purpose of marking, the two lugs must line up when cap is assembled to connecting rod.

If bearing is still loose, repeat operation. Do not adjust too tight, bearing should be free enough to permit cranking.

To Remove Piston and Connecting Rod

Disconnect fuel feed pipe at lower end, remove flywheel, front bearing retainer and cylinder from sub-base. Remove both counterweights on crankshaft. Counterweights should be marked so that they will be reassembled to their respective positions.

Place throw of crankshaft at lower dead center and remove connecting rod cap and bolts. Turn crankshaft one quarter of a turn or until throw of crankshaft is in a horizontal position. Pull out piston and connecting rod from cylinder until piston rests on throw of crank shaft. Then turn the crank shaft a little at a time to a position until piston can be removed.

When reassembling parts be sure that the oil dip on connecting rod is in its original position. It is a good plan to mark the connecting rod and crank shaft before disassembling.

To Remove Crank Shaft

Disconnect fuel feed pipe at lower end. Remove flywheel, both crank shaft bearing retainers and cylinder from sub-base. Place throw of crank shaft at lower dead center and remove connecting rod cap and bolts. Push piston and connecting rod into cylinder just far enough so that it does not interfere with the crankshaft. Then remove rear counterweight on crankshaft. With a hammer and a brass rod (about ¾-in. diameter) place rod against the end of crank shaft at flywheel end, tapping gently until bearing cup on opposite end is driven out. Then with a small punch drive out the other cup from the inside of crank case. The crank shaft can then be taken out.

After the crank shaft has been removed, it is easy to understand how to reassemble parts. Care should be taken to properly adjust bearings and to retime the valves. Refer to instruction under "Valve Timing" and "Adjustment of Bearings."

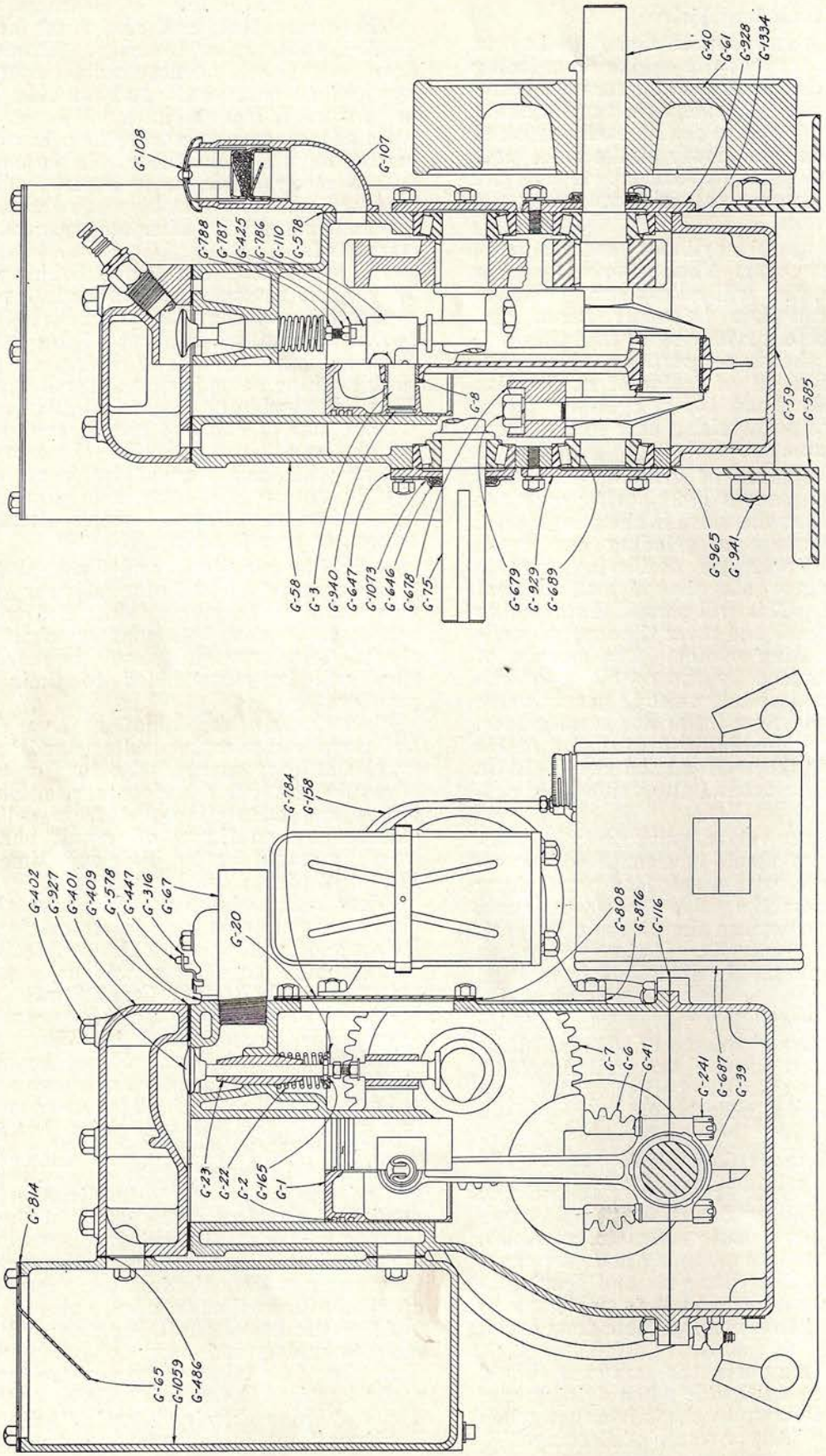


FIG. D179—SECTIONAL VIEW MODEL AG ENGINE

PARTS LIST FOR AG ENGINE

This list supersedes all others of previous date. Prices are F.O.B. Lansing, Mich., and are subject to change without notice. Give symbol and name of part when ordering.

Part No.	NAME OF PART	No. Used	Symbol	Price
*G1A	Piston NNU1 assembled with parts NNU2, NNU2D and NNU3	1	100NNU	4.35
G1	Piston only	1	NNU1	2.75
G2	Piston ring, plain	2	NNU2	.25
G2D	Piston ring, oil regulating	1	NNU2D	.30
G3	Piston pin	1	NNU3	.60
G6	Engine pinion on crankshaft	1	AG6	4.75
G7	Cam gear	1	AG7	6.75
G8	Connecting rod bushing	1	UF8	.20
G20	Valve stem collar	2	UF20	.10
G22	Valve spring	2	AG22	.10
G23	Valve stem guide	2	AG23	.35
G26	Needle valve with head parts AG26 and AG27A	1	T4369	.60
G38	Spring for carburetor needle valve	1	AG38	.05
G39	Connecting rod assembled, parts UF8, UF39, UF41 and UF241	1	T3227	6.50
G40	Crank shaft only	1	AG40	9.00
G41	Connecting rod bolt	2	UF41	.25
G58	Cylinder AG58 with parts AG23	1	101AG	18.50
G58A	Cylinder AG58 with parts NNU1, NNU2, NNU2D, NNU3, UF20, AG22, AG23, UF165 and AG927	1	101AGA	25.00
G59	Sub-base for engine	1	AG59	7.00
G61	Flywheel, 10″ diameter	1	AG61A	8.50
G65	Hopper cover for cast iron hopper—obsolete	1	AG65	.90
G65A	Hopper cover for steel hopper	1	AG65A	.35
G67	Muffler	1	T3867	.50
G71	Starting crank, parts AG71 and AG86	1	T4420	1.00
G71A	Starting crank—hook type for cranking on cam shaft	1	T4469	1.00
G74	Governor shaft	1	SU74E	1.75
G75	Cam shaft	1	AG75	9.00
G95	Air pipe for carburetor	1	AG95	1.25
G98	Paper gasket for carburetor air pipe	1	AG98	.03
G107	Breather tube	1	AG107A	1.25
G108	Breather cap	1	AG108	.30
G110	Bracket for valve tappet	1	AG110	.85
G116	Gasket for sub-base	1	AG116	.07
G120	Magneto bracket	1	SU120M	.75
G158	3/16″x9½″ long fuel feed pipe	1	AG158	.15
G165	U washer for valve stem	2	UF165	.03
G241	Nut for connecting rod bolt	2	UF241	.15
G316	Butterfly valve shaft lever	1	AG316A	.15
G317	Butterfly valve shaft	1	AG317A	.25
G318	Butterfly valve	1	AG318	.10
G401	Cylinder head	1	AG401	7.00
G402	⅜″x3″ cylinder head cap screw	6	AG402	.12
G409	Cylinder head gasket	1	AG409	.25
G421	Bearing for governor shaft AG421A with part SU507	1	114AG	2.00
G425	Washer for valve tappet and carburetor needle valve	3	UF425	.01
G435	Governor pinion	1	AG435	3.00
G439	Governor weight	2	SU439	.65
G443	Governor housing SU443 with part SU507A	1	115SU	5.50
G445	Governor lever assembly, parts AG445A and AG1342	1	T4383	.90
G446	Governor lever stud	1	AG446	.10
G447	Governor rod	1	AG447A	.25
G486	Gasket for hopper to cylinder	2	AG486	.05
G489	Butterfly valve housing	1	AG489	1.10
G507	Bushing for governor shaft, short	1	SU507A	.35
G507A	Bushing for governor shaft, long	1	SU507	.40
G578	Gasket for carburetor and breather tube	2	SU578A	.05
G585	Base angle	2	AG585A	1.50
G646	Felt washer	2	AG646	.05
G647	Retainer for rear cam shaft bearing	1	AG647	1.00
G678	Counterweight for crank shaft	2	UF678	.75
G679	½″x2″ special cap screw for counterweight to crankshaft	2	AG679	.15
G687	Fuel tank	1	AG687B	4.00
G689	No. 14117-14274 Timken roller bearing for crank shaft and cam shaft, for parts of bearing refer to part No. G994 and G995	4	AG689	3.25
G715	Throttle lever pin	1	RF715	.30
G737	Magneto drive hub	1	SU737C	.75
G784	Cover for valve tappet	1	AG784	.50
G786	Valve tappet	1	SU786	.90
G787	Nut for valve tappet adjusting screw	2	UF787	.02

*PARTS NOT ILLUSTRATED.

Always Give Model and Serial Number of Engine and Outfit When Ordering Repairs

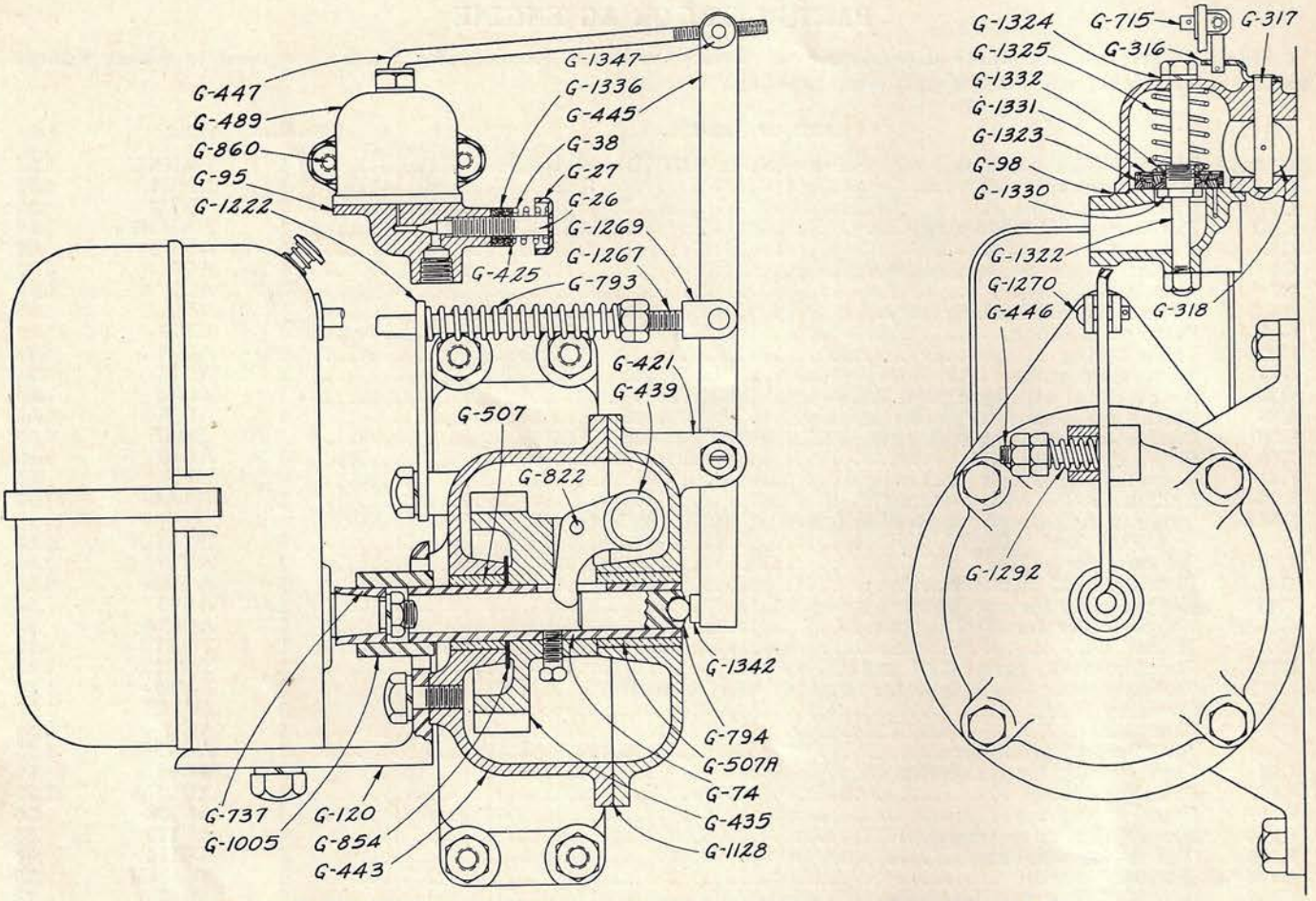


Fig. C598 Sectional View Carburetor, Magneto and Governor Assembly AG Engine

PARTS LIST FOR AG ENGINE—Continued

Part No.	NAME OF PART	No. Used	Symbol	Price
G788	Valve tappet adjusting screw	2	UF788	.15
G793	Governor spring	1	RU793	.10
G794	Governor plunger with steel ball X1109	1	AG794	.35
G808	Gasket for valve tappet cover	1	AG808	.05
G814	Cork gasket for cast iron hopper	1	AG814	.10
G814A	Cork gasket for steel hopper	1	AG814A	.10
G822	3/16"x7/8" pin for governor weight	2	RF822	.05
G854	Fiber washer for governor shaft	1	RF854	.10
G860	1/4"x15/16" stud for carburetor and breather tube to cylinder	4	AG860	.10
G876	Thick gasket for governor housing to cylinder	3	SU876	.05
G876A	Thin gasket for governor housing to cylinder	5	SU876A	.05
G927	Valve, inlet and exhaust	2	AG927	.50
G928	Bearing retainer for front main bearing	1	AG928	1.25
G929	Bearing retainer for rear main bearing and front cam shaft bearing	2	AG929	.90
G940	Snap ring for piston	2	UF940	.10
G941	1/2"x1 1/2" stud for base angles	4	AG941	.15
G965	Gasket for bearing retainer	8	AG965	.04
G994	No. 14274 cup for cam shaft and crank shaft roller bearing	4	AG994	.85
G995	No. 14117 cone and rollers for camshaft and crank shaft roller bearing	4	AG995	2.40
G1005	Magneto drive coupling	1	SU1005C	1.50
G1059	Cast iron hopper, obsolete	1	AG1059	8.00
G1059A	Steel hopper with cover	1	AG1059A	4.00
G1073	Outer felt washer retainer	2	AG1073	.25
G1128	Gasket for governor shaft bearing	3	SU1128	.05
G1222	Bracket for governor spring rod	1	SU1222	.25
G1267	Rod for governor spring	1	SU1267A	.10
G1269	Yoke for governor lever	1	SU1269	.35
G1270	Pin for governor spring rod yoke	1	SU1270	.10
G1292	Spring for governor lever stud	1	SU1292	.05
*G1318	Washer for cylinder head cap screws	6	AG1318	.01

*PARTS NOT ILLUSTRATED.

Always Give Model and Serial Number of Engine and Outfit When Ordering Repairs

PARTS LIST FOR AG ENGINE—Continued

Part No.	NAME OF PART	No. Used	Symbol	Price
G1322	¼"x2 15/16" cap screw for carburetor	1	AG1322	.15
G1323	Carburetor valve disc	1	AG1323	.10
G1324	Copper asbestos washer for carburetor cap screw	1	AG1324	.03
G1325	Spring for valve disc	1	AG1325	.05
G1330	Bushing for valve disc	1	AG1330	.15
G1331	Washer for valve disc	1	AG1331	.05
G1332	Nut for valve disc	1	AG1332	.08
G1334	Gasket for front main bearing retainer	1	AG1334	.05
G1335	5/16"x5/8" set screw for pulley key	1	AG1335	.05
G1336	Felt washer for carburetor needle valve	1	AG1336	.02
G1342	Plug for governor lever	1	AG1342	.20
*G1343	Tie rod for fuel tank	1	AG1343	.15
G1347	Washer for governor lever pin	1	AG1347	.01

ASSEMBLIES AND MISCELLANEOUS PARTS

G95A	Carburetor assembly with parts T4369, AG38, AG95, AG98, AG316A, AG317A, AG318, AG489, AG1322, AG1323, AG1324, AG1325, AG1330, AG1331, AG1332, AG1336, X267, X365, X667 and X1034	1	T4381	5.00
	Governor assembly with parts SU74E, AG421A, AG435, SU439, SU443, T4383, AG446, SU507, SU507A, RU793, AG794, RF822, RF854, SU1128, SU1222, SU1270, SU1292, T4264, X267, X301, X365, X412, X413, X434, X461 and X969	1	117AG	17.50
	Carburetor valve disc assembly parts AG1323, AG1330, AG1331 and AG1332	1	T4446	.45
	Governor spring rod assembly, parts SU1267A, SU1269 and X365	1	T4264	.65
	Valve tappet assembly, parts AG110, UF425, SU786, UF787 and UF788	1	T4426	3.40
G67	Muffler	1	T3867	.50
G71	Starting crank, parts AG71 and AG86	1	T4420	1.00
G71A	Starting crank, hook type for cranking on cam shaft	1	T4469	1.00
G1335	5/16"x5/8" set screw for pulley	1	AG1335	.05
	5/16"x5/16"x2" key for pulley	1		.10
X1072	Model S Bosch magneto with cable	1	X1072	14.00
A2691	Magneto coupling nut	1	A2691	.10

STANDARD PURCHASED MATERIAL

X8	¼" test cock for sub-base	1	X8	.45
X41	¼" pipe plug for sub-base	1	X41	.04
X262	3/32"x¾" cotter pin for connecting rod	2	X262	.01
X267	1/16"x½" cotter pin for parts AG318, AG447, SU1270, RF715, 1 used on each part	4	X267	.01
X301	¼"x½" set screw for governor pinion	1	X301	.02
X365	¼" hex nut for parts: 1 used on AG1322, 4 on AG860, 2 on T4264 and 2 on SU446	9	X365	.02
X371	4½" hex nut for base angle to sub-base	4	X371	.04
X412	¼" lock washer for governor lever stud	2	X412	.01
X413	5/16" lock washer	30	X413	.01
X414	⅜" lock washer for cylinder to sub-base	4	X414	.01
X416	½" lock washer for base angle to cylinder and counterweight cap screw	6	X416	.02
X432	5/16"x5/8" hex head cap screw for parts: 3 used on AG120 to governor and 4 used on governor to cylinder	7	X432	.04
X433	5/16"x¾" hex head cap screw for hopper to cylinder	4	X433	.04
X434	5/16"x⅞" hex head cap screw for parts: 3 used on AG647, AG928, AG929, 4 on 114AG to 115SU	12	X434	.04
X440	5/16"x1½" hex head cap screw for valve tappet bracket to cylinder	1	X440	.05
X448	⅜"x⅞" hex head cap screw for cylinder to sub-base	4	X448	.04
X461	5/16"x½" hex head cap screw for parts: 6 used on AG65, 2 on AG784 and 2 on SU1222	10	X461	.04
X667	¼" rivet washer for carburetor needle valve	1	X667	.01
X808	5/16"x5/16"x2¼" gib head key for flywheel	1	X808	.15
X968	No. C Woodruff key for crankshaft pinion and cam gear	2	X968	.05
X969	No. 6 Woodruff key for governor shaft to pinion	1	X969	.02
X1034	Dole U3 Connector, ⅛" pipe thread, 3/16" outside diameter	1	X1034	.15
X1109	5/16" steel ball for governor plunger	1	X1109	.02
X1210	3/16"x1" dowel pin for valve tappet bracket to cylinder	1	X1210	.03

*PARTS NOT ILLUSTRATED.

TROUBLE CHART

ENGINE HARD TO START:
- Carburetor needle valve closed
- Fuel tank empty
- Fuel pipe clogged
- Valve tappets improperly adjusted
- Valves leaking, warped or gummed
- Water in gasoline
- Air leak in fuel pipe
- Improper fuel mixture

IGNITION TROUBLE:
- Spark plug fouled, broken or cracked
- Points on spark plug too far apart or too close (1/32-in. correct)
- Ignition system water soaked
- Improper timing
- Wire from magneto off or loose

POOR COMPRESSION AND LOSS OF POWER:
- Valves not seating
- Valves warped or gummed
- Piston ring sticking, broken or worn
- Broken or loose spark plug
- Cylinder head gasket leaking
- Worn piston and cylinder
- Valve tappet set too close
- Valve tappet sticking
- Scored cylinder
- Oil too thin to seal pistons
- Governor sticking

ENGINE MISSES OR STOPS:
- Dirt in fuel line
- Spark plug cracked or fouled
- Points on spark plug adjusted too far apart or too close (1/32-in. correct)
- Defective wiring
- Cylinder head gasket leaking
- Valves warped
- Valves or tappets sticking
- Valve tappets set too close
- Fuel tank empty
- Governor sticking

ENGINE OVERHEATS:
- Water low in hopper or dirty
- Spark set too late
- Improper fuel mixture
- Improper valve timing
- Valves leak
- Faulty lubrication
- Poor quality oil

ENGINE KNOCKS:
- Spark set too early
- Engine overheats or overloaded
- Lack of oil
- Carbon accumulation in cylinder
- Engine loose on frame or foundation
- Piston pin or connecting rod bearing loose
- Worn piston and cylinder
- Loose flywheel
- End play in crank shaft

ENGINE USES TOO MUCH FUEL:
- Spark set too late
- Valves leak
- Fuel mixture too rich

EXCESSIVE SMOKE:
- Blue smoke, too much oil in crank case
- Oil of incorrect body
- Black smoke, carburetor needle valve open too far

EXPLOSION IN MUFFLER:
- Irregular or weak spark
- Exhaust valve holds open or broken valve spring
- Exhaust valve warped

EXPLOSION IN CARBURETOR:
- Fuel mixture too lean
- Intake valve sticking or broken valve spring
- Intake valve warped
- Intake valve tappet set too close

STANDARD WARRANTY

Every part of our manufacture is guaranteed against defect in either material or workmanship for a period of one year. We agree to replace free of charge any part of our manufacture sold hereunder providing the part or parts claimed defective are returned to the factory, transportation charges prepaid, within one year from original date of purchase of the engine or outfit, and upon receipt and examination we find the condition of the part or parts substantiates customer's claim of defect. When defective parts are replaced free of charge it is agreed that the manufacturer is in no way liable for expenditures covering labor or otherwise that may be incurred in the replacement of the defective parts. Claimant agrees to furnish the manufacturer with such evidence or information that may be required from time to time when handling claims.

Claims for defective parts not of our manufacture must be made to their respective makers insofar as they are fully warranted by their manufacturers.

All claims must be made within 3 days after receipt of goods.

Printed in U. S. A.