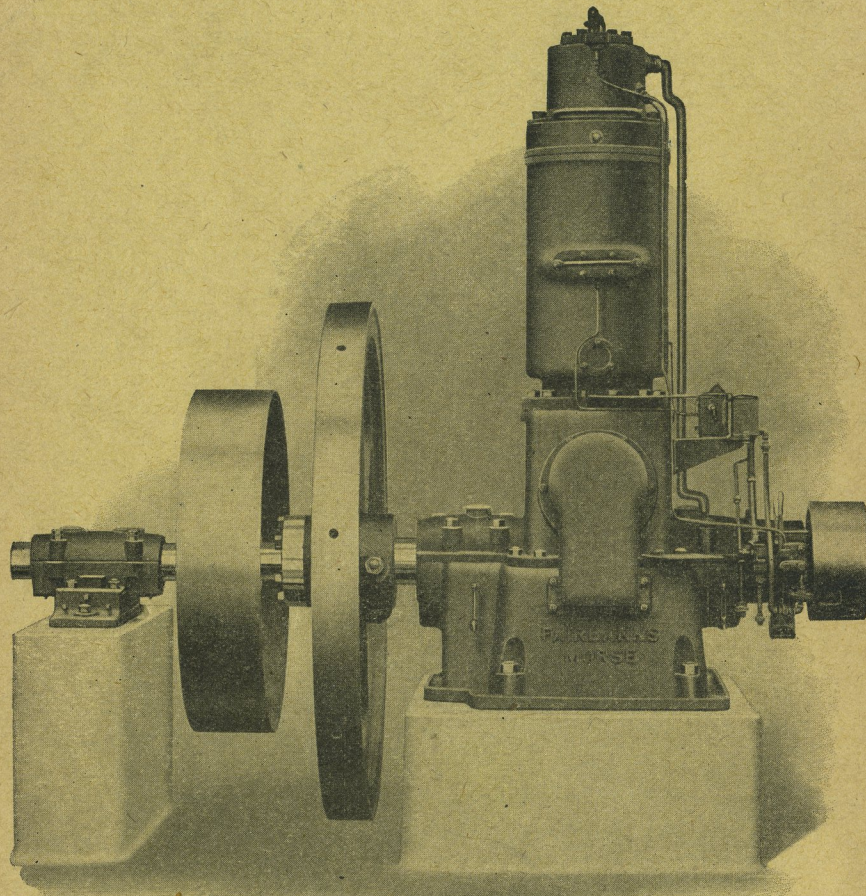


**INSTRUCTIONS No. 2450D**

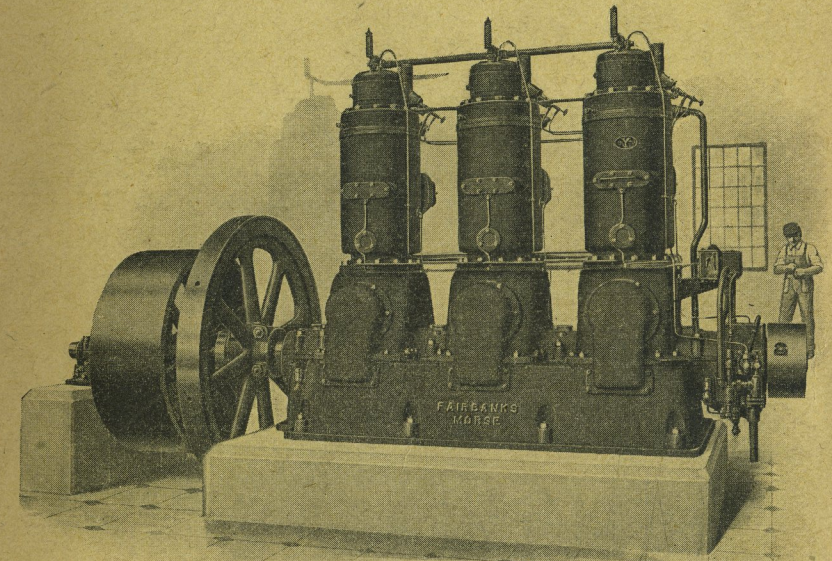
FOR SETTING UP AND OPERATING

**Fairbanks-Morse  
Type "Y" Vertical Oil Engines**

This pamphlet should be carefully read before attempting to do anything with the engine



(3154G)



(3294G)

**FAIRBANKS, MORSE & CO.**

CHICAGO, ILL.

(INCORPORATED)

- |                  |                    |                    |                      |
|------------------|--------------------|--------------------|----------------------|
| Atlanta, Ga.     | Denver, Colo.      | Los Angeles, Cal.  | Portland, Oregon     |
| Baltimore, Md.   | Des Moines, Ia.    | Louisville, Ky.    | Salt Lake City, Utah |
| Boston, Mass.    | Detroit, Mich.     | Milwaukee, Wis.    | San Francisco, Cal.  |
| Buenos Aires     | Indianapolis, Ind. | Minneapolis, Minn. | Seattle, Wash.       |
| Cincinnati, Ohio | Jacksonville, Fla. | New Orleans, La.   | Spokane, Wash.       |
| Cleveland, Ohio  | Kansas City, Mo.   | New York, N.Y.     | St. Louis, Mo.       |
| Dallas, Tex.     | London             | Omaha, Neb.        | St. Paul, Minn.      |

The Canadian Fairbanks-Morse Co., Limited

- |          |                 |           |          |           |          |          |
|----------|-----------------|-----------|----------|-----------|----------|----------|
| Hallifax | St. John, N. B. | Quebec    | Montreal | Ottawa    | Toronto  | Hamilton |
| Windsor  | Winnipeg        | Saskatoon | Calgary  | Vancouver | Victoria |          |



**FAIRBANKS, MORSE & CO.**

(INCORPORATED)

(Copyright, 1917 by Fairbanks Morse & Co.)



**INSTRUCTIONS No. 2450D**  
**For Setting Up and Operating Fairbanks-Morse Type “Y”**  
**Vertical Oil Engines.**

These engines operate on the “two-cycle system” and are designed to use kerosene, distillate, gas oil, fuel oil, and crude oil. The system used differs from that of the ordinary two-cycle gasoline engine in several important particulars.

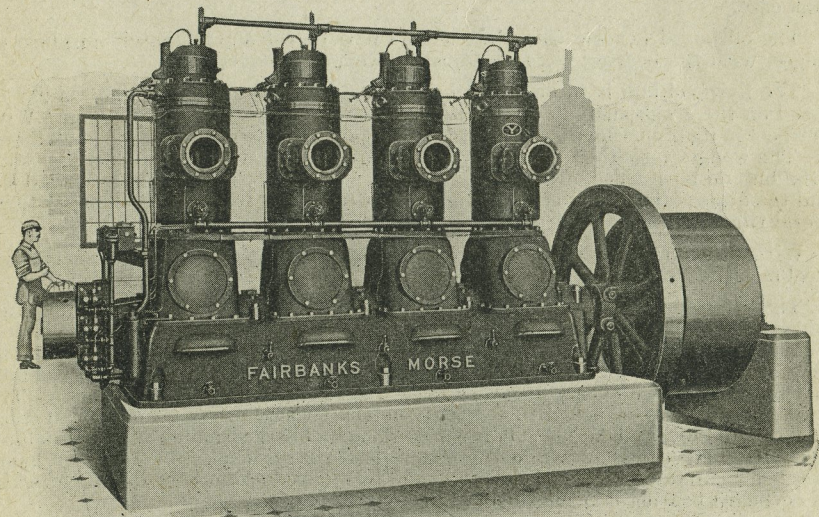
**Two-Stroke Cycle**

**Fuels Used**

The main frame or crank case is closed, and serves as a pump for air. The air enters the crank case through an automatic suction valve, and as the piston moves downward, the air is slightly compressed. Just before the end of this stroke the exhaust ports in the cylinder are uncovered by the piston, allowing the burned gases in the cylinder to escape.

**Cycle of Operation**

**Exhaust**



(3482G)

Inlet ports in the opposite side of the cylinder communicate with the crank case through the air or transfer passage. Shortly after the exhaust ports have opened, the air ports are uncovered by the piston and pure air rushes from the crank case to the cylinder, cleaning the latter of exhaust or burned gases and charging it with fresh air. This air is trapped in the cylinder on the subsequent closing of the air and exhaust ports and as the piston moves upward compression of the air takes place.

**Inlet**

**Compression**

Shortly before the upper dead center is reached, the injection pump forces a fine spray of oil fuel into the combustion chamber in the cylinder head. This vaporizes and mixes with the compressed air in the combustion space. At the dead center, when the compression has reached its maximum, ignition automatically occurs. The resulting pressure drives the piston downward doing useful work. After expansion has occurred the exhaust ports again open, and the cycle of operations is completed.

**Injection**

**Ignition**



**Foundation** The foundation should be prepared in accordance with the drawing furnished with each engine. This drawing gives the location of driving belts, exhaust pipe, and all outside dimensions. A sufficient space of at least two feet should be allowed on all sides for easy access by the attendant.

**Exhaust** The instructions on the foundation drawing furnished with each engine are to be carefully followed with reference to the exhaust piping. If any departure seems necessary the advice of the factory should be obtained.

**Clean Top of Foundation** The air used by the engine is taken from the space below the crank case and above the concrete capstone portion of the foundation. Before the engine is set, the bottom of the crank case and top of the foundation must be clean of dust, chips, dirt, etc. After setting, it is recommended to cover the surface of the foundation, beneath the crank case and inside the lower base, with linseed oil, hot tar, or a thin layer of neat cement mixed with water, to prevent any free particles of dirt or dust being caught up by the air suction. If dirt in the air reaches the cylinder it will cut the working surfaces.

**Dust Prevention**

**Level the Engine** The foundation being prepared, with the bolts firmly embedded and projecting the proper distance, the engine is to be set over them and leveled with wedges. A thin grout of cement and sand should be poured over the top of the foundation, a dam of wet sand around the engine base serving to retain the grout. When the grout is thoroughly set, the nuts on the foundation bolts may be tightened. Extreme care must be taken to keep the engine level on the foundation while this work is in progress. Care must be taken that the grout or cement does not fill up the inside of the lower base and cut off the air passage from back to front under the bottom of the crank case.

**Outboard Bearing** The outboard bearing sole plate should now be set approximately in place on wedges, with the bearing box and adjusting wedges removed.

**Flywheel** The flywheel hub is to be wedged slightly apart, after which it can readily be placed on the crank shaft in the position shown on the foundation drawing. With the wheel in its proper location, the crank shaft should extend through the hub about  $\frac{3}{4}$ ". The wedges may then be removed, but care must be taken that the outer ends of the hub on both sides of the split are even, so that one side does not extend beyond the other. The bolts must be tightened evenly and firmly by going over them several times.

With direct connected units, on account of the generator foundation, the flywheel must be put in place before the engine is lowered onto the foundation.

**Extension Shaft** The extension shaft is fitted to the engine at the factory, adjusted to run true, and marked with reference to the wheel hub. Before re-assembling, every particle of dirt must be removed from the two surfaces which are bolted together. The shaft must be placed on the studs in its proper relation to the wheel hub. The nuts must be drawn down evenly and very firmly, going over them several times. The alignment should be checked to see that the shaft runs true at its outer end when not supported by any bearing. This can be done by observation with a fixed pointer nearly touching the shaft while the engine is being turned over slowly by hand. After being carefully aligned the shaft should be blocked up to carry its weight while the outboard bearing is being set in place.

On the single cylinder engines, the weight of the flywheel and shaft extension may overbalance the governor end of the shaft before the outboard bearing is in place, and actually lift the governor end of the shaft against the main bearing cap. This must be watched and if it occurs the outboard bearing must be set high enough to allow the shaft to bear against the bottom of the governor end main bearing.

**Outboard Bearing** The adjusting wedges and outboard bearing box should now be set in place. With the wedges in the mid-position of vertical adjustment the screws should be tightened only sufficient to hold all parts properly together. This will raise the sole plate to its proper position with relation to the shaft.

A thin grout of cement can then be poured between the sole plate and the foundation. When this grout is thoroughly set, the foundation bolt nuts may be tightened, and the outboard bearing box finally adjusted. In making the horizontal alignment the box should bear slightly against the belt side of the shaft.

**Cooling Water** Multi-cylinder engines are furnished with both inlet and discharge piping complete between the cylinders, and single cylinder engines are furnished with simple connections at both points.

The water supply line is to be connected to the pipe opening at the lower end of the cylinder. Multi-cylinder engines may be connected at either end, as is most convenient.

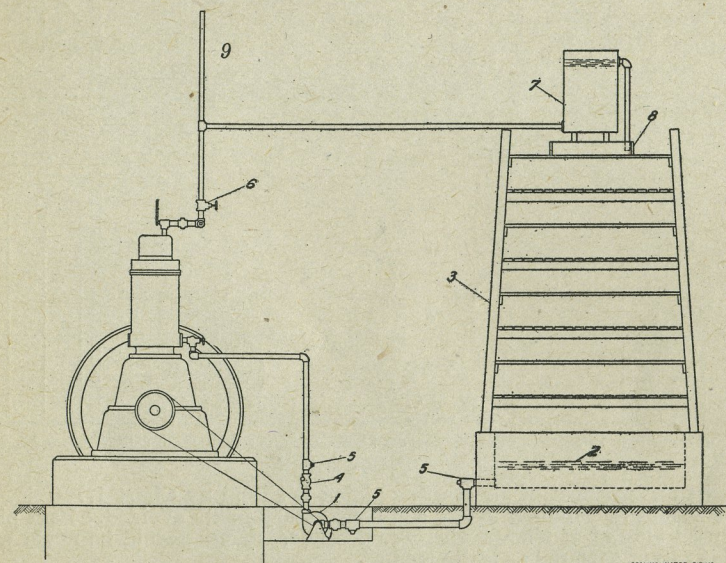


CHART 1786GN1

DRAWING  
SCALE  
MAY 1908  
1786GN1

When a cooling tower is used the necessary connections are as shown on chart 1786GN1. The centrifugal circulating pump 1 must be set below the level of the water in the tank 2 at the base of the cooling tower 3. A Check Valve 4 must be provided in the discharge line from the pump to insure that the system will remain filled with water after shutting down. Tees with plugs at 5 provide for necessary draining in cold weather, and the straightway valve 6 in the overflow line may be used to cut off the water when taking off the cylinder head. The overflow should be carried to the bottom of a tank 7 having a capacity of a barrel or more. This tank will always remain full, and thus prevent the engine from going entirely dry under any circumstances. From a connection at the top of the tank 7 a pipe carries the water to the distributing box 8, and thus over the cooling tower. A riser 9 must be located close to the engine, and carried up, ten feet or more higher than the top of the cooling tower. This is to allow air and steam to escape which might otherwise interfere with proper circulation.

When running water under pressure is used for cooling, it is connected to the pipe at the bottom of the cylinder, as above described.

Regardless of the source or method of cooling water supply or circulation, it is absolutely necessary that all of the water jackets be completely filled before lighting the starting burner or starting the engine. Water coming into the jackets after the parts are heated will surely cause broken cylinder heads and combustion chambers.

The riser near the cylinder must be used in that case also, unless the overflow is carried straight upward and is made of large size piping.

A thermometer is to be screwed into the tee provided for it in the discharge line at each cylinder head. It indicates the temperature of cooling water as it leaves each cylinder head, and its location should not be changed. This thermometer is the principal guide to the regulation of the cooling water supply to each cylinder.

There must be no "traps" or "pockets" in the piping, as they will prevent proper circulation.

Drain cocks or plugs should be provided at all low points. All water should always be drained off after each run of the engine when there is any danger of frost, otherwise a cracked cylinder or pipes may result.

Inlet and  
DischargeCooling  
TowersCooling with  
running waterFill the  
JacketsTher-  
mometer

Traps

Drains



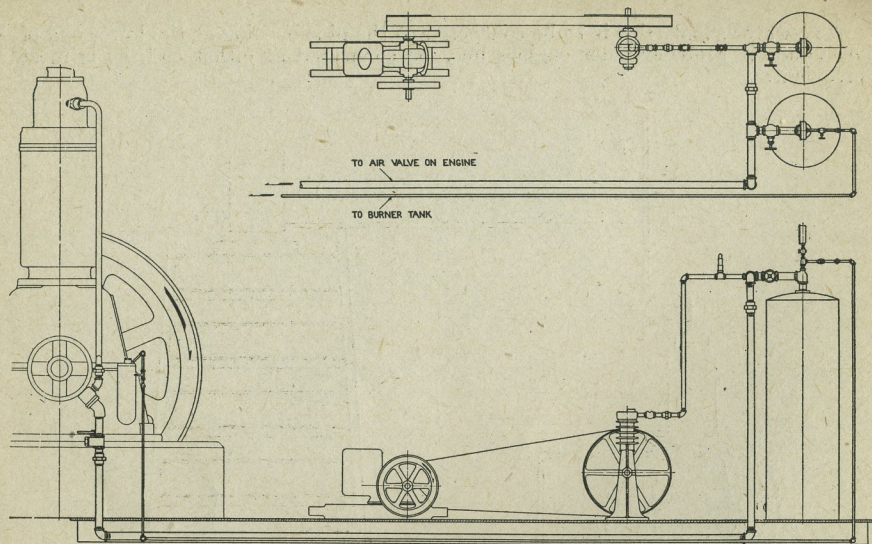


CHART 1770GN

The usual arrangement of air starting piping is shown by Chart 1770GN. All connections should be carefully made, and unnecessary joints avoided. Bent pipes should be used instead of elbows wherever possible. Joints should be made with thick shellac rather than red or white lead.

The air compressor may be set to drive from the main engine. The small engine then need be used only if the air pressure in tanks is lost.

A galvanized steel fuel tank is furnished with each engine, and should be connected as shown on Chart 1771GN. The fuel tank may be located outside of the building in a covered pit as shown, and should be placed in a horizontal position, and lower than the engine so that the fuel will flow toward the tank from the engine. Any amount of fall from six to twenty-four inches will do.

Air for Starting

Fuel Tank Location

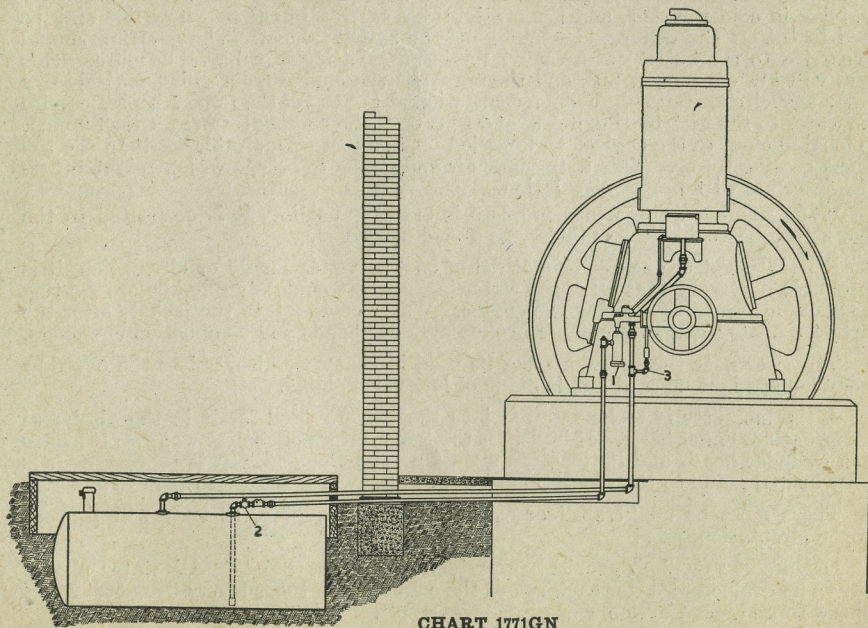


CHART 1771GN

Care should be taken that the cap on the fuel tank filler pipe is not screwed down so far as to cover the vent hole in the side of the filler pipe. If this vent is covered, the air cannot enter the tank and maintain atmospheric pressure on the fuel.

With this tank are furnished the proper connections for outlet and return pipe. The size pipe furnished should be used. In connecting the fuel tank with the engine, care must be taken to wash out every piece of pipe or joint with gasoline or kerosene to remove all scale and loose matter, which, if left in the pipes, would interfere with the proper working of the valves. Extra care must be taken in making tight all water and fuel pipe connections; shellac should be used in the joints of fuel pipes and white lead in the joints of water pipes.

The main fuel strainer is indicated by 1, Chart 1771GN. It should be thoroughly cleaned before starting. After doing this, care should be taken to re-assemble the parts exactly as before. The purpose of the cock 2 in the fuel suction line is to restrict the supply of fuel slightly if the pump should deliver too freely to the reservoir on the engine.

The engine is shipped with a union attached to the lower end of the overflow pipe from the fuel reservoir, and to this union the return pipe is to be connected and carried down to the floor or through the floor as required, and back to the fuel tank, with a gradual descent, to the free return of surplus fuel.

The injection pump drips are connected together under the injection pump, and are connected to the return pipe as shown at 3 on the Chart.

One essential feature of the engine, which for best results must always be in perfect mechanical order, is the injection pump. It is operated by a cam on the crank shaft which gives the plunger a constant stroke, thus displacing a constant amount of fuel at each revolution.

The suction valve of this pump is operated through a push rod by a cam which is driven and controlled by the shaft governor. It may be taken out for cleaning or inspection by removing the plug at the end of the injection pump. The discharge valve is located on top of the pump. When examining these valves, care must be taken that their small springs are not lost, and that all parts are clean when replaced, especially the valve seats. After examination, before the pump is re-assembled, it should be washed out thoroughly with gasoline or kerosene. Care should be taken not to damage the faces of the unions, otherwise they will leak under the pump pressure.

A supply of oil fuel is maintained in the elevated reservoir by the auxiliary fuel pump, as shown on Chart 1771GN. All excess fuel overflows from the reservoir to the storage tank.

The hand lever is used to operate the injection pump when starting.

The injection nozzle is screwed into the center of the combustion chamber against a taper seat.

The nozzle tip screws into the injection nozzle and has one central hole.

The engine is fitted with a combustion chamber held against the face of the cylinder head. Near the injection nozzle there is a movable stem having a spoon on one end and an operating handle and spring on the other end. This is for use in starting only.

The governor is of the shaft type, with two weights, each pivoted at one end. The opposite or free ends are linked to the governor cam. As the engine speed increases the weights shift the cam around the shaft opposite to the direction of shaft rotation. The engine speed may be increased by tightening the governor springs, and decreased by the reverse. Adjustment should be made so that the two springs have equal tension.

To remove a governor spring, proceed as follows: Remove the adjusting screw, then remove the notched plate from the pocket by raising it slightly and giving it a quarter turn. Move the spring so that the cross pin in the weight can be taken out. The spring can then be removed.

The main bearings are of the ring oiling type. The oil reservoir of each of these bearings is to be kept properly filled with lubricating oil, and frequent observation should be made of the height of the oil in the gauge glass at each bearing. The upper and lower limits of oil are indicated by the shields over the glasses, or by broad white bands around them. Oil must always be visible between these limits. The oil should occasionally be drawn from the main bearing reservoirs and replaced with fresh, clean oil.

Vent

Size of Oil Piping  
Clean the Pipes

Fuel Strainer

Overflow Pipe

Injection Pump Drip

Injection Pump

Keep Valves Clean

Union Joints

Fuel Reservoir and Pump

Hand Pump Lever  
Injection Nozzle

Nozzle Tip

Combustion Chamber

Starting Sp

Governor

To Change Speed

To Remove Spring

Main Bearings

Oil Level

Renewing Oil



**Main Bearing Adjustment**  
Adjustment of the main bearings is necessary when excessive play of the shaft can be detected. Vibration of the flywheel when the engine is in operation may also indicate a necessity for main bearing adjustment. This should be made in the following manner: First, remove the bearing cap, then lift off the upper half of the bearing liner, which is a cast-iron shell lined with babbitt metal. After removing this shell, one or more of the thin metal shims between it and the lower shell may be removed from each side of the bearing, after which the top half of the bearing may be replaced and the cap again clamped down securely.

After adjustments have been made and the engine is put into operation, the parts should be watched for a time to note whether the running temperature grows excessive.

**Main Bearing Renewal**  
Any main bearing may be completely removed by first relieving the pressure of the crank shaft by means of a jack under the flywheel or crank shaft, then proceeding as above, and in addition, rolling out the lower half of the bearing liner or shell in the manner which is self-evident on inspection. In the case of a bearing between cylinders, the lower half is in two parts, which must be rolled out one at a time. If the bearings do not roll out readily they may be driven out by light hammer blows, using a wood driver to protect the bearings from being marred by the hammer. New liners which will interchange with those on the engines can be furnished from the factory, or the old ones can be re-babbitted.

**Crank Pin Bearing**  
The crank pin bearing is readily adjustable. After loosening the nuts on the connecting rod bolts about three-quarters of an inch, the metal shims between the halves of the bearing may be removed from their dowels, and then replaced after removing one thin shim, or as many as necessary, from each side. It is not necessary to completely dismantle the rod.

**Renewal**  
In a renewal of the crank pin bearing the new liners should be carefully fitted into the connecting rod and its cap, and the shim faces filed to the general surface. The liners should then be tried on the crank pin by hand to note whether they have sufficient end play (about 1-64") and whether they spot up evenly on the surface. In any case, after new crank pin liners have been fitted to an engine it is well to inspect them after running the engine for five or ten minutes at no load, and again after about a thirty minutes' run at a load. When the nuts are again drawn up, they should be set as tightly as possible. The cotter pins must always be inserted in the holes in the ends of the connecting rod bolts and the ends of the pins spread well apart. There are two holes in the bolts, for the cotter pins, either of which may be used, thus allowing a closer adjustment.

**Piston Pin Removal**  
The piston pin is hollow, of hardened steel ground to exact size. To remove it, turn the piston on end with its closed end down, then remove the headless screw and spring from the piston pin boss and drive or pry out the dowel pin, which can be seen by looking into the hollow piston pin. The piston pin can then be driven out of the piston toward the dowel end, which is larger than the opposite end.

**Bearing and Adjustment**  
The piston pin bearing is of special bronze. In order to adjust it for wear, first remove the piston pin and connecting rod from the piston, then try the piston pin in its bearing in the connecting rod. Loosen the lock nuts on the set screws in the end of the connecting rod, then remove the brass liner from the slot in the bushing, and file this liner down the desired amount, then replace it and tighten the screws evenly and carefully until the bushing grips the liner evenly. Do this by small steps if necessary, so as to secure the desired fit of the pin in the bearing. After this has been done, tighten the lock nuts very firmly, and try the bearing fit again to see that it has not been made too tight.

**Assembling**  
All of the oil grooves should be carefully cleaned and the bearing thoroughly oiled before re-assembling. When replacing the parts see that they are put in their original places, and particularly that the connecting rod has not been turned over in its relation to the piston; also note carefully to replace the piston in the cylinder with the oil collecting plate on the same side as the oil pump connection which supplies it.

**Renewal**  
If it becomes necessary after long service, the piston pin bearing liner may be replaced. The two brass dowels holding the old liner may be drilled out, and new ones used to hold the new liner. The new liner must be adjusted to the piston pin (see "adjustment") and it may be necessary to touch up the wearing surface with a scraper to get a proper and uniform bearing.

The end play of the crank shaft is adjusted by thin shims placed between the air stop ring and a shoulder on the crank shaft. The shims are made in halves to be easily removable, and are located to make all adjustment at one crank or bearing, the other cranks or bearings having slightly greater end-wise clearance.

**Crank Shaft End Play**

If the end play becomes excessive it may be reduced by adding shims, always adding two halves at a time. On engines of more than one cylinder an equal thickness should be added to both points of adjustment, if possible. In making this adjustment always allow at least 1-64" end play, and take especial care that all the other air stop rings have greater clearance than the two taking the end thrust.

**Adjustment**

The engine is provided with a mechanical sight feed oiler forcing oil to the cylinder, piston pin, and crank pin bearings. Care must be taken that the oiler is always feeding properly and that it at all times has a sufficient quantity of clean oil in the reservoir. There are four feeds from the oiler to each cylinder. The one leading to the side of the cylinder nearest the governor is for the piston pin. The other two are for the cylinder. A fourth feed enters the upper base and is for the crank pin. The main bearings are all provided with ring oilers each having a large oil well with sight glass connected outside in which the level of the oil can be seen.

**Lubricating System**

It is advisable to use a lubricating oil that is approved by Fairbanks, Morse & Co.

**Lubricating Oil**

The lubricating oil should be run through a fine mesh wire strainer and it is well to have this soldered into the funnel which is used for filling. The cover of the oiler should always be replaced after filling. The oiler should be drained occasionally and washed out with gasoline or kerosene. This applies also to the main bearing oil wells. The instruction sheet attached to the oiler should be read and carefully followed.

**Cleanliness is an Essential in Lubrication**

No set rules can be given for the proper amount of lubricating oil as conditions vary and different oils have different lubricating values. The following quantities, however, will usually suffice:

**Quantity of Lubricant Needed**

- Piston Pin ..... 10 drops per min.
- Crank Pin ..... 30 drops per min.
- Cylinder, Exhaust Side ..... 40 drops per min.
- Cylinder, Opposite Exhaust Side ..... 50 drops per min.

These amounts are suggested for an engine with standard direction of rotation. If the engine operates counter-clock wise, looking at the governor end, the cylinder may be given 50 drops on the exhaust side, and 40 on the opposite side.

**Opposite Standard Rotation**

Before starting the engine, the oiler should be cranked by hand to make sure the oil pipes are full, otherwise the bearings and cylinder may be damaged before oil reaches them after the engine starts.

**Lubrication in Starting**

In cold weather care must be taken that the oil is not so cold that it will not flow. This can be seen by cranking the oiler by hand and watching the discharge. If the oil is too cold, it must be warmed. Some oils flow at lower temperatures than others.

**Cold Weather Lubrication**

The injection pump case should be partly filled with lubricating oil up to an overflow opening. This is in the side of the case on some engines and in others it is the end of a pipe brought up from below the case to show the proper oil level. If the case is filled too full it will overflow out of the end next the governor.

**Oil in Pump Case**

**STARTING**

These engines are equipped with starting burners using compressed air, as shown on Chart 1811GN2.

Before lighting the burners to start the engine, see that all the water jackets are completely filled. If this is negelected, it will surely result in broken cylinder heads and combustion chambers.

**Compressed Air Starting Burner**



**Burner with Adjustable Hood**

On Chart 1811GN2 the fuel tank is 1, which is to be filled with kerosene, being careful to strain the kerosene to remove any dirt or foreign matter. 2 is a pipe connection to the compressed air storage used for starting the engine. 3 is a stop and waste cock used to shut off the burner. The pipe 4 conducts compressed air to the burner (or to all the burners on multi-cylinder engines), and 5 conducts the kerosene. In the fuel line 5, is a fuel valve 12, which is used to regulate the kerosene supply to the burner.

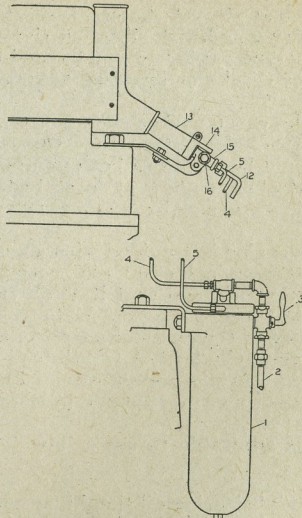


CHART 1811GN2

**Starting the Burner with Adjustable Hood**

Before attempting to start the burner close the fuel valve 12 and the cock 3 at the fuel tank. Then open the  $\frac{1}{4}$ " valve at the large air storage tank, and after it the cock 3 at the kerosene tank. Turn hood 13 so that stop 14 rests against side of body 15 marked "OIL". Open the fuel valve 12 about one turn and hold a lighted match or oil wick torch at the mouth of the burner. The burner should light with a slightly yellow flame. Now turn hood 13 with stop 14 toward side of body marked "AIR" until the flame is clear and has a characteristic roar.

**Adjustment and Cleaning**

If burner is not properly adjusted, or if it is taken apart for cleaning it will be necessary to readjust it. This is done by regulating the location of stop 14 on hood 13. Loosen clamp screw on stop 14 and turn hood 13 onto body 15 as far as it will go without exerting excessive force. Then with the air turned on at cock 3, turn hood 13 out of body 15 just about  $1/12$  turn, to feel strong blast of air out of mouth of hood 13. Then light burner as described before and adjust location of stop 14 on hood 13 until a clear flame is obtained. Make final adjustment when burner is hot. In this location clamp stop 14 securely to hood 13 with stop 14 resting against the side marked "AIR". Turning hood 13 so that stop 14 points to "OIL" will cut down the air and give slightly yellow rich flame which is easy to ignite when burner is cold.

**Air Pressure**

Burner will operate best between pressures of 100 to 150 pounds. Occasionally the burner should be thoroughly cleaned.

**Cleaning**

The screens 16 are easy to remove and should be cleaned frequently to get best results.

**Clean Fuel**

It is essential that the kerosene used with this burner be free from dirt, as improper action of the burner will nearly always be found to be due to its presence. In such a case the burner must be cleaned by removing the nozzle from the torch body, being careful to re-assemble according to the directions just given.

**Turn Flywheel to Starting Position**

With the relief cocks in the cylinder heads open, the flywheel may be turned until the crank (the nearest one to the governor of multi-cylinder engines) is about 10 degrees past the upper center. (The standard direction of rotation is clockwise, looking at the governor end.) The location of the crank in question with reference to some point on the flywheel, such as the keyway or split in the hub, should first be determined by inspection with the upper base cover removed.

**Inspect Fuel Reservoir and Lubricating System**

After the crank is properly set, the relief cocks should be closed. The auxiliary fuel reservoir and the lubricator must be full. The lubrication should be started by turning the hand crank on the lubricator until the pipes are full. The grease cups on the governor weight pins should be filled and given several turns, and the governor link pins given a few drops of oil.

**Starting Spoon**

The operating handle of the starting spoon should be turned until the line and the arrow on the end of the stem points through the center of the injection nozzle. The handle will then lie against the injection pipe.

**Priming Cylinder**

After the combustion chamber and the tube projecting from it have been heated for a few minutes, and the tube is red hot, prime the cylinder (the one nearest the governor on multi-cylinder engines) by giving the injection pump two or three

sharp strokes with the starting lever, and leave the lever latch in the notch farthest from the shaft so that the injection pump may be operated by its cam. Be sure that the injection pump is in proper working order and that fuel was delivered to the injection nozzle when the pump was worked by hand.

Now open the shut-off valve which admits air to the air starting valve cage. With proper air pressure the engine will turn over.

As soon as one or more ignitions have occurred, and the engine has come up to speed, close the air starting valve, and hold the pump plunger back with the starting lever so the pump will not be operated, until the excess of fuel which has been injected for starting has been burned; then gradually allow the plunger to take its normal position with the slide roller engaging the injection cam, and again hook the lever latch in the notch farthest from the shaft.

As soon as the ignitions are regular, the starting burners may be shut off.

Then turn the operating handle about one-half turn from starting position. If the ignitions become irregular, turn it back, as when starting and let the engine operate under these conditions until the combustion chamber is hot enough for regular ignitions, then the handle should be turned one-half turn away.

By means of the sight glass in the tank see that the auxiliary fuel pump is delivering plenty of fuel, and also see that the lubricator is working properly. Also open the covers or lids on each main bearing cap to see that each oiling ring is running properly and not stuck in one position.

As the engine warms up, regulate the supply of cooling water so that the temperature of discharge is maintained at its proper point. This can best be determined by experience, and is the point at which the engine operates most quietly and regularly. The exact temperature will depend upon the fuel being used and the load carried. In general, the engine will operate best at full load with an outlet temperature of about 120° F., and at light load about 160°, but this must be modified by experience under the special conditions of the installation.

When starting an engine of three or four cylinders, it may be found advisable to open the by-pass valves above all of the injection pumps except the one used for priming and starting, thus starting up on only one or two cylinders. This is done to prevent a momentary excess of speed during the short period before the governor gains control of the engine. After getting up to proper speed, however, the needle valves should be closed and all cylinders put into operation.

In starting engines of more than one cylinder, only the cylinder nearest the governor should be primed with fuel. A lever is provided on each pump for the purpose of filling the oil pipes when empty. These levers are also convenient to stop the engine quickly.

**WHEN THE ENGINE IS IN OPERATION**

When carrying any load, the explosions should be perfectly regular. An irregularity may be caused by sticking of the governor, due to neglect of lubrication, or sticking of the check valve in the injection nozzle, due to the use of oil with foreign impurities which have not been properly screened out. Irregularities may also be due to sticking of the injection pump suction valve. A drop of lubricating oil on the valve stem where it projects from the pump body will generally correct this.

In installations where the starting air compressor is driven from the main engine, the compressed air tanks should be pumped up to full pressure immediately after starting the engine. As soon as the tanks are up to pressure, all valves in the air line and at the tanks should be closed tight to prevent leakage. Always before shutting down the engine, care should be taken to see that the tanks are up to pressure for the next start.

The air in the tanks should be kept at a pressure of about 150 pounds per square inch. It should be used carefully, so as to always have plenty in reserve in case the engine must be shut down soon after starting. The engine can be started on lower pressure than 150 pounds, but it will start more readily at that pressure.

Open Air Cock

Hold Inj. Pump Plunger Back

Close Air Cock

Starting Spoon

Inspect Fuel and Lubricator Supplies

Regulate Cooling Water

Starting Three or Four Cylinder Engines

Regular Explosions

Check Valves

Air Compressor

Pressure of Air for Starting



**TO STOP THE ENGINE.**

**Single Cylinder Engines** To stop a single cylinder engine, pull the starting lever toward the crank shaft and lock it there.

**Two, Three and Four Cylinder Engines** If the engine is of more than one cylinder, the injection must be shut off from the remaining cylinders, either by means of the pump handles, or by opening the by-pass valve on each injection pump.

**Turn the Oiler** While the engine is coasting to a stop, turn the crank handle of the oiler a number of revolutions, so that the pistons and cylinders will be nicely bathed in oil for the period the engine is standing idle.

**MISCELLANEOUS INSTRUCTIONS.**

**Scale in Cooling Water** Cooling water which contains mineral matter tends to form scale on water cooling surfaces. This should be looked for and removed if it becomes 1/16" thick or more. A sample of scale may be placed in a warmed solution of 1 part muriatic acid to 10 of water, or in a warmed solution of sulphuric acid of the same proportions. If the sample dissolves in either solution, the jacket spaces may be filled with that and left for some hours, then washed out. This process may be repeated at sufficiently frequent intervals to keep the surfaces clean.

Where wood cooling towers or tanks are used and there is trouble from scale, hydrochloric or sulphuric acid may be put into the water to the extent of about one per cent. Scale on the hot surfaces results in overheating and cracking.

**Ports** Inspection should be made occasionally of the exhaust ports through the hand hole plates on the exhaust nozzle. The piston and rings can be seen through the ports on both sides by removing the cover plates. When using a heavy grade of fuel, it may be necessary to clean the ports of bridging carbon formation from time to time.

**Piston Rings** If a loss of compression is noticed, the piston should be inspected through the ports. It can be removed by taking off the cylinder head and disconnecting the connecting rod bolts at the crank pin end. This gives complete access to all interior parts of the engine. The piston rings should remain free in their grooves. Any accumulation of carbon from the lubricating oil which tends to stick the rings should be washed out with kerosene. If the rings have been allowed to stick fast, the compression and explosion will blow past them, and the combustion will be poor, due to poor compression. If the rings are gummed fast in the grooves, a hot solution of lye and water will assist in freeing them.

**Grinding of Pump Valves** If the pump valves become leaky, they should be ground into their seats, using a fine grade of carborundum paste, flour of glass, or pumice stone, but not with emery, as even the finest grades of this are too coarse.

**Injection Nozzle Valve** The injection nozzle valve consists of a spring loaded steel ball. This ball should be inspected occasionally and removed if it shows corrosion or wear.

**Priming Injection Pump** When the engine is first started up, or if for any reason the injection pump has lost its priming, a simple way to prime it is to open the needle valve on the pump and hold open the suction valve by hand. The fuel injection pipe between the pump and the injection nozzle on any cylinder may be filled by operating the individual pump by hand.

**Drain Jacket and Pipes** After shutting down the engine, allwater jackets and pipes should be drained, if there is danger of freezing weather. It does not pay to take any chances.

**Injection Cam Setting** The injection cam setting is one of importance and is easily made. At the inner end of the cam hub is a notch with beveled edge, which reveals a portion of the crank shaft. On the edge of the notch is a permanent line or center punch mark. This mark lines up with another mark on the crank shaft, placed there at the factory, and is correct for operation on the fuel on which the engine was tested. It may be necessary for the operator to change the cam setting slightly to secure the best results on the particular fuel to be used in each case.

If it is necessary to change the cam setting, do not move the cam more than 1/16" with respect to the mark on the shaft before trying effect of the change.

To set the governor cam, slide it onto the crank shaft up against the air starting cam, with the **leading** high cam point about 35 degrees ahead of the high cam point of the injection cam. The leading high cam point is the point at the beginning of drop between high and low cam surface, and not the point at the end of the rise from low to high cam surface. Wedge the split in the governor hub slightly. Slide the entire governor assembled onto the crank shaft, leaving the governor hub project about 3/4" beyond the end of the shaft. Turn the governor on the crank shaft until the center punch mark on the end of the hub is approximately in line with a similar mark on the end of the crank shaft. Slide the governor cam towards the governor and slip the loose link ends over the pins in the cam, turning the latter slightly on the shaft, if necessary. Then slide the governor and cam further onto the shaft until the governor cam has a slight end motion of about 1/64" between the air starting cam and the inner end of the governor housing hub. Adjust the position of the governor and cam around the shaft to get the setting marks on the governor hub and crank shaft exactly together.

Remove the wedge from the hub, see that the governor cam has 1/64" end motion, then tighten the hub bolt nut securely.

It is absolutely necessary that the links connecting the governor cam to the governor weights be connected properly, and not reversed. The instructions for reassembling must be followed exactly, and attention given to the reference marks on all parts.

See that the governor cam has perfect freedom to move around the shaft, insuring quick response to any change of governor weight position.

The injection pump suction valve push rod adjustment is especially important on multi-cylinder engines. It should be such that each cylinder does its share of the work. If all of the injection pumps and their valves are in proper condition, the cylinders will work evenly if the push rod clearance is the same for each suction valve. The clearance (on low governor cam) should be at least fifteen one-thousandths inch (.015"). A sheet of ordinary writing paper is about four one-thousandths inch thick.

Each push rod is provided with a screw adjustment and lock nut on its end. These adjustments may be checked with the engine in operation by slightly opening the by-pass valve on the injection pump of each cylinder in turn and noting the effect. If one cylinder is doing more than its share of the work, this test will show it, and the push rod for that cylinder may be adjusted a little closer.

The manually operated by-pass needle valve on each of the injection pumps is useful in temporarily slowing down the engine when an electric generator it is driving is to be paralleled or "put on the line" with others on the same switchboard. These by-passes are not intended for use in regulating the running speed of the engine, as that must be taken care of by changing the tension of the governor springs themselves. Whenever the engine is in regular operation these by-passes must be closed, otherwise the governor will not have proper control of the speed, and the engine will not be able to carry its greatest load.

Governor Setting

Governor Links in Place

End Clearance

Tighten Hub Bolt Nuts

Attach Links Properly

Injection Pump Suction Valve Push Rod Adjustment

Check Adjustment when Running

Parallel Operation



**REPAIR PARTS LIST**

FOR

**Fairbanks-Morse Type "Y" Vertical Oil Engines—Style "V"**

When ordering parts, always give the size or horse power, type and shop number of the engine. The number is very important. It is stamped on the cylinder and cylinder head flanges. Do not fail to give it.

Parts may be ordered individually or in groups.

A group number printed in heavy type, followed by the letter "C," such as "5-C Piston," covers all items in that paragraph down to the first horizontal line.

An ordinary repair number printed in light type (such as 5), covers one part only, including any parts which are "always fitted" to it. For example: In Group 5-C, the numbers 6, 178, 4 or 8 cover one part only, but "5" covers the part No. 5 and all parts "always fitted" to it, as indicated by the bracket in front of the part names.

A Group may be ordered, less certain specified parts. For example: "5-C, less No. 8."

Any part without a repair number is listed directly after the numbered part with which it is used.

Upper bases, cylinders, cylinder heads, etc., are numbered 1, 2, 3 and 4, beginning at the governor end of the engine.

Repair Number Arranged Numerically	The group number in heavy type, when shown at the head of a group of parts, includes all items mentioned in that group.	Number Used On				Included in Group Number
		1 Cyl. Eng.	2 Cyl. Eng.	3 Cyl. Eng.	4 Cyl. Eng.	
<b>1</b>	<b>1-C Cylinder</b> .....	1	2	3	4	
	Cylinder, always fitted with head studs, exhaust nozzle studs and core hole cover studs.....	1	2	3	4	
	Core hole covers (951 and 952) core hole cover gaskets (407), core hole cover nut, port cover (851), port cover gasket (418), port cover cap screws, and piston (5-C).....					
	Cylinder head studs.....	8or12	16or24	36	48	
	Cylinder head stud nuts (see 604 for balance of these nuts).....	8or12	16or24	36	48	
	Cylinder exhaust nozzle studs.....	10or12	20or24	36	48	
	Cylinder exhaust nozzle stud nuts.....	10or12	20or24	36	48	
	Cylinder core hole cover studs.....	6	12	18	24	
	Cylinder core hole cover stud nuts.....	6	12	18	24	
	Cylinder core hole cover cap screws, short.....	4	10	16	22	
	Cylinder core hole cover cap screws, long.....	2	2	2	2	
<b>2</b>	<b>2-C Upper base</b> .....	1	2	3	4	<b>14-C</b>
	Upper base, always fitted with cylinder studs, air pipe studs, cover studs, lubricator bracket studs, base plug (304), pipe plugs, headless screw plug, base dowel (409), with nut, crank pin oiler spout (254).....	1	2	3	4	
	Upper base cylinder studs.....	8or12	16or24	36	48	
	Upper base cylinder stud nuts.....	8or12	16or24	36	48	
	Upper base air pipe studs.....	6	12	18	24	
	Upper base air pipe stud nuts.....	6	12	18	24	
	Upper base cover studs.....	6	12	18	24	
	Upper base cover stud nuts.....	6	12	18	24	
	Upper base lubricator studs (on governor end, upper base only).....	4	4	4	4	
	Upper base lubricator stud nuts (on governor end, upper base only).....	4	4	4	4	
	Upper base pipe plug.....	1 or 2	2 or 4	5	7	
	Upper base headless screw plug.....	1	2	3	4	
<b>3-A</b>	<b>Cylinder head</b> , always fitted with combustion chamber studs, starting check valve studs and relief valve bushing.....	1	2	3	4	
	Cylinder head combustion chamber studs.....	6	12	18	24	
	Cylinder head combustion chamber stud nuts.....	6	12	18	24	
	Cylinder head starting check valve studs.....	2	4	6	8	
	Cylinder head starting check valve stud nuts.....	2	4	6	8	
	Cylinder head relief valve bushing.....	1	2	3	4	
<b>4</b>	<b>Piston pin dowel spring screw</b> .....	1	2	3	4	<b>5-C</b>

Before ordering, read instructions above.

Repair Numbers Arranged Numerically	The group number in heavy type, when shown at the head of a group of parts, includes all items mentioned in that group.	Number Used On				Included in Group Number
		1 Cyl. Eng.	2 Cyl. Eng.	3 Cyl. Eng.	4 Cyl. Eng.	
<b>5</b>	<b>5-C Piston</b> .....	1	2	3	4	<b>1-C</b>
	Piston, always fitted with piston ring dowels, piston pin dowel (6), dowel spring (178), and spring screw (4).....	1	2	3	4	
	Piston rings (8), and piston pin (7-C).....					
<b>6</b>	<b>Piston pin dowel</b> .....	1	2	3	4	<b>5-C</b>
<b>7</b>	<b>7-C Piston Pin</b> .....	1	2	3	4	<b>5-C</b>
	Piston pin.....	1	2	3	4	
	Piston pin oil scraper (836), oil scraper spring (837), oil scraper guide (839).....					
<b>8</b>	<b>Piston ring</b> .....	4	8	12	16	<b>5-C</b>
<b>13</b>	<b>13-C Flywheel</b> .....					
	Flywheel, always fitted with hub bolts (401), hub bolt nuts, shaft extension studs.....	1	1	1	1	
	Flywheel key (403).....					
	Flywheel shaft extension studs.....	6	6	6	6	
	Flywheel shaft extension stud nuts.....	6	6	6	6	
<b>14</b>	<b>14-C Lower Base</b> .....	1	1	1	1	
	Lower base, always fitted with upper base studs, upper base stud nuts, bearing cap studs, bearing cap stud nuts, pump case studs, air pipe studs, bearing well drain pipes, bearing well drain plugs, oil catcher drain plugs, upper base (2-C), upper base gasket halves (197), bearing caps (805-C, 806-C and 807-C), oil stops (812, 813 and 814).....	1	1	1	1	
	Lower base upper base studs, short.....	12	28	44	60	
	Lower base upper base studs, long.....	4	4	4	4	
	Lower base upper base stud nuts.....	16	32	48	64	
	Lower base bearing cap studs (end bearing).....	6	6	6	6	
	Lower base bearing cap studs (center bearing).....	2	2	4	6	
	Lower base bearing cap stud nuts.....	6	8	10	12	
	Lower base pump case studs.....	4	4	4	4	
	Lower base pump case stud nuts.....	4	8	12	16	
	Lower base air pipe studs.....	4	8	12	16	
	Lower base air pipe stud nuts.....	2	2	2	2	
	Lower base end bearing drain plugs.....	1	1	1	1	
	Lower base oil catcher drain plugs.....	1	2	3	4	
	Lower base crank case drain pipes.....	1	1	2	3	
	Lower base bearing oil well drain pipes.....	1	2	3	4	
	Lower base crank case drain cock.....	1	2	3	4	
<b>17</b>	<b>Connecting rod piston pin bushing, with dowels</b> .....	1	2	3	4	<b>18-C</b>
	Connecting rod piston pin bushing dowels.....	2	4	6	8	
<b>18</b>	<b>18-C Connecting Rod</b> .....	1	2	3	4	
	Connecting rod, always fitted with cap (20), dowels (181), bolts (32), piston pin bushing (17), shim (22), bushing take-up block (35), set screws with nuts and washers, and shims (44 and 45).....	1	2	3	4	
	Connecting rod crank pin liners (19).....					
	Connecting rod take up block set screws.....	2	4	6	8	
	Connecting rod take up block set screw nuts.....	2	4	6	8	
	Connecting rod take up block set screw washers.....	2	4	6	8	
<b>19</b>	<b>Connecting rod crank pin liner halves (furnished in pairs only)</b> .....	1 pr	2 pr	3 pr	4 pr	<b>18-C</b>
<b>20</b>	<b>Connecting rod cap</b> .....	1	2	3	4	<b>18-C</b>
<b>22</b>	<b>Connecting rod piston pin bushing shim</b> .....	1	2	3	4	<b>18-C</b>
<b>25</b>	<b>25-C Crank Shaft</b> .....	1	1	1	1	
	Crankshaft, always fitted with oiler ring crankshaft studs, air stop ring pins, counter weight dowels (138), counter weight bolts (139) with nuts, and counter weights (26).....	1	1	1	1	
	Crankshaft crank pin oiler ring (253-C), oiler ring gasket (405), oiler ring stud nuts, oiler ring screw, oiler ring lock washers, air stop rings (165), springs (193) and for multiple cylinder engines (165-A-C).....					
	(For 3 and 4 cylinder engines, also air stop ring back lash springs (392), pins (393), clips (394), bolts and nuts are included)					

Before ordering, read instructions on page 12.



Repair Numbers Arranged Numerically	The group number in heavy type, when shown at the head of a group of parts, includes all items mentioned in that group.	Number Used On				Included in Group Number
		1 Cyl. Eng.	2 Cyl. Eng.	3 Cyl. Eng.	4 Cyl. Eng.	
26	Crankshaft oiler ring studs.....	3	6	9	12	25-C
	Crankshaft oiler ring stud nuts.....	3	6	9	12	
	Crankshaft air stop ring pins.....	2	4	6	8	
	Counterweight, always fitted with oiler ring studs.....	2	4	6	8	
	Counterweight oiler ring studs.....	2	4	6	8	
	Counterweight oiler ring stud nuts.....	2	4	6	8	
32	Connecting rod bolts, always fitted with nuts (34) and cotters.....	2	4	6	8	18-C
	Connecting rod bolt cotters.....	2	4	6	8	
33	Cylinders head gasket.....	1	2	3	4	
34	Connecting rod bolt nuts.....	2	4	6	8	18-C
35	Connecting rod take up block.....	1	2	3	4	18-C
44	Connecting rod shims, thick.....	16	32	48	64	18-C
45	Connecting rod shims, thin.....	16	32	48	64	18-C
48	Governor spring weight pin.....	2	2	2	2	501-C
51	Governor spring eyebolt.....	2	2	2	2	256-C
52	Governor spring plug.....	4	4	4	4	256-C
70	Governor adjusting screw plate.....	2	2	2	2	501-C
75	<b>75-C Exhaust Nozzle</b> .....	1	2	3	4	
	Exhaust nozzle.....	1	2	3	4	
	Exhaust nozzle hand hole covers (281), hand hole cover gasket (76), hand hole cover clamp (282).....					
76	Exhaust pot hand hole cover gasket.....	1	1	1	2	225-C
76	Exhaust nozzle hand hole cover gaskets.....	2	4	6	8	75-C
77	Exhaust nozzle cylinder gasket.....	1	2	3	4	
83	<b>83-C Governor Weight Pin</b> .....	2	2	2	2	501-C
	Governor weight pins, always fitted with nuts.....	2	2	2	2	
	Governor weight pins grease cups (265).....					
85	Governor weight pin nut.....	2	2	2	2	256-C
91	Governor spring adjusting screw.....	2	2	2	2	531-C
	Injection pump discharge valve.....	1	2	3	4	533-C
92	Injection pipe pump connection.....	1	2	3	4	421A-C
						422A-C
						423A-C
						424A-C
						424A-C
117	<b>117-C Combustion Chamber</b> .....	1	2	3	4	
	Combustion chamber, always fitted with pipe plugs, starting tube (845) and starting spoon (119-C).....	1	2	3	4	
118	Combustion chamber pipe plugs.....	3	6	9	12	
	Combustion chamber gasket.....	1	2	3	4	
119	<b>119-C Starting Spoon</b> .....	1	2	3	4	117-C
	Starting spoon stem with spoon.....	1	2	3	4	
	Starting handle (121) and spring (122).....					
121	Starting spoon handle, with bolt, nut and lock washer.....	1	2	3	4	117-C
	Starting spoon handle bolt.....	1	2	3	4	
	Starting spoon handle bolt nut.....	1	2	3	4	
	Starting spoon handle lock washer.....	1	2	3	4	
122	Starting stem spring.....	1	2	3	4	117-C
138	Crankshaft counterweight dowels.....	2	4	6	8	25-C
139	Crankshaft counterweight bolts, with nuts.....	2	4	6	8	25-C
	Crankshaft counterweight bolt nuts.....	4	8	12	16	
164	Shaft extension oil throw ring.....	2	2	2	2	460-C
165	Crank case air stop ring (one piece)..... (Only furnished with Group 25-C.)	2	2	2	2	25-C
165A	<b>165A-C Crank Case Air Stop Ring</b> .....	2	4	6	8	25-C
	NOTE: Two-piece ring always furnished for repairs.					
	Crank case air stop ring (two pieces), always fitted with screw (191), dowel (192) and lock wire.....	2	4	6	8	
	Crank case air stop ring spring (193).....					
167	Governor weight pin bushing.....	2	2	2	2	501-C
172	<b>172-C Belt Pulley</b> .....	1	1	1	1	
	Belt pulley, always fitted with hub bolts (404) and nuts.....	1	1	1	1	
	Belt Pulley Key.....					

Before ordering, read instructions on page 12.

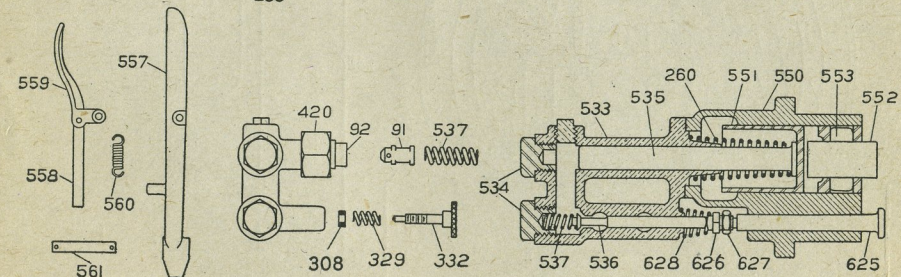
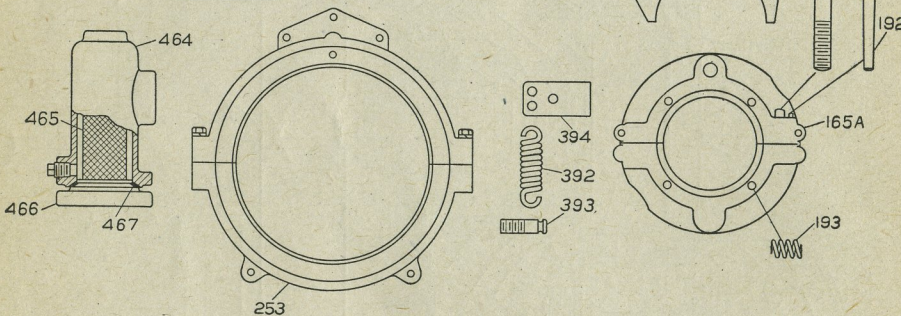
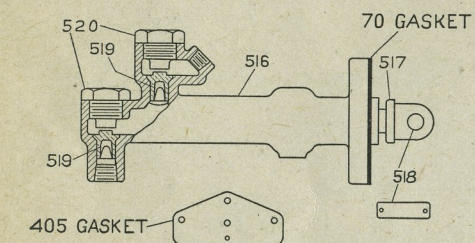
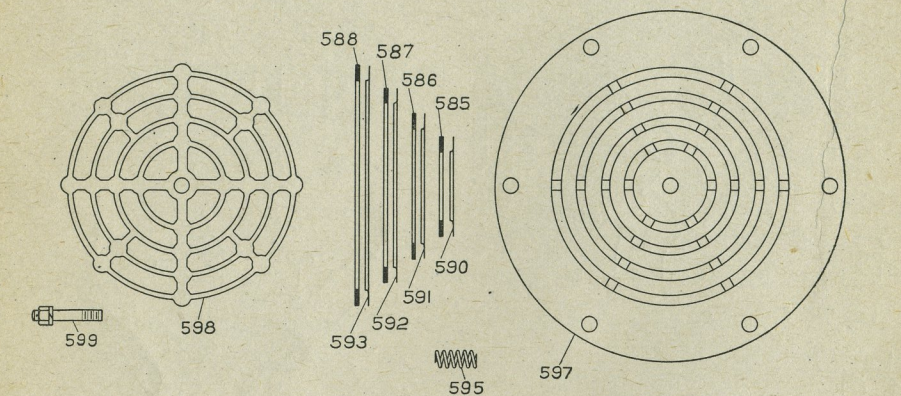
Repair Numbers Arranged Numerically	The group number in heavy type, when shown at the head of a group of parts, includes all items mentioned in that group.	Number Used On				Included in Group Number		
		1 Cyl. Eng.	2 Cyl. Eng.	3 Cyl. Eng.	4 Cyl. Eng.			
178-199	Belt pulley key.....	1	1	1	1	172-C 5-C		
	Piston pin dowel spring.....	1	2	3	4			
	Air suction pipe lower base shim.....	1	2	3	4	18-C		
	Connecting rod cap dowel.....	2	4	6	8			
	Upper base cover.....	1	2	3	4	165A-C		
	Eyebolt.....	2	2	2	2			
	Crank case air stop ring screw.....	4	8	12	16	165A-C		
	Crank case air stop ring screw lock wire.....	4	8	12	16			
	Crank case air stop ring dowels.....	4	8	12	16	165A-C		
	Crank case air stop ring springs.....	8	16	24	32			
	Patent plate.....	1	1	1	1	14-C		
	Patent plate screws.....	2	2	2	2			
	Patent plate screw washers.....	2	2	2	2	14-C		
	Lower base-upper base gasket halves.....	2	4	6	8			
	Upper base cylinder gasket.....	1	2	3	4			
	Upper base cover and air valve gasket.....	3	6	9	12			
	201	<b>201-C Injection Nozzle</b> .....	1	2	3	4		
		Injection nozzle body, always fitted with valve balls (202), valve spring (203) and tip (204).....	1	2	3	4		
		Injection nozzle valve ball.....	1	2	3	4		
Injection nozzle valve spring.....		1	2	3	4			
Injection nozzle tip.....		1	2	3	4			
Injection pipe nozzle connection.....		1	2	3	4			
Injection pipe nozzle connection nut.....		1	2	3	4			
Lubricator bracket.....		1	1	1	1			
Lubricator link.....		1	1	1	1			
Lubricator link pin, with nut and lock washer.....		1	1	1	1			
Lubricator link pin nut.....	1	1	1	1				
Lubricator link pin lock washer.....	1	1	1	1				
225	<b>225-C Exhaust Pot</b> .....	1	1	1	2			
	Exhaust pot, always fitted with drain plug (and gland studs (667) and gland stud nuts for multiple cylinder engines only).....	1	1	1	2			
	Exhaust pot top cover (615), bottom cover (616), top and bottom cover gaskets (617), top and bottom cover bolts and nuts, hand hole cover (281), hand hole cover gasket (76), hand hole cover clamp (282) and inlet flange (229), with gasket (618) and bolts, with nuts (for multiple cylinder engines; also packing gland (666) and packing).....							
	Exhaust pot inlet flange.....	1						
	Exhaust nozzle outlet flange.....	1						
	Exhaust pot inlet flange bolts with nuts.....	8						
	Exhaust pot inlet flange bolt nuts.....	8						
	Exhaust nozzle outlet flange bolts with nuts.....	8						
	Exhaust nozzle outlet flange bolt nuts.....	8						
	Air suction pipe.....	1	2	3	4			
Air starting check valve cage hole plug.....	1	2	3	4				
253	<b>253-C Crank Pin Oiler Ring (two piece)</b> .....	1	2	3	4	25-C		
	NOTE.—Two-piece ring always furnished for repairs.							
	Crank pin oiler ring (two-piece), always fitted with cap screw lock washer and plug (258).....	1	2	3	4			
	Crank pin oiler ring cap screw.....	2	4	6	8			
	Crank pin oiler ring screw lock washer.....	2	4	6	8			
	Crank pin oiler ring crank shaft screw.....	1	2	3	4			
	Crank pin oiler ring spout.....	1	2	3	4			
	256	<b>256-C Governor Spring</b> .....	2	2	2		2	501-C
		Governor spring, always fitted with spring plugs (52).....	2	2	2		2	
		Governor spring eyebolts (51) and adjusting screws (85).....						
258	Crank pin oiler ring plug.....	1	2	3	4	253-C		
260	Injection pump plunger spring.....	1	2	3	4			
265	Governor weight pin grease cups.....	2	2	2	2	531-C 533-C 83-C		
271	Lubricator, complete (for repairs, see Special Repair List).....	1	2	3	4			
	Lubricator bracket bolt, with nut.....	2	2	2	2			
	Lubricator bracket bolt nut.....	2	2	2	2			
277	Cooling water thermometer.....	1	2	3	4	75-C		
281	Exhaust nozzle hand hole cover.....	2	4	6	8			
281	Exhaust pot hand hole cover.....	1	1	1	2	225-C		
282	Exhaust nozzle hand hole cover clamp, with set screws.....	2	4	6	8			
282	Exhaust pot hand hole cover clamp, with set screws.....	1	1	1	2	75-C 225-C		
282	Exhaust nozzle hand hole cover clamp set screws.....	2	4	6	8			
	Exhaust pot hand hole cover clamp set screws.....	1	1	1	2			

Before ordering, read instructions on page 12.



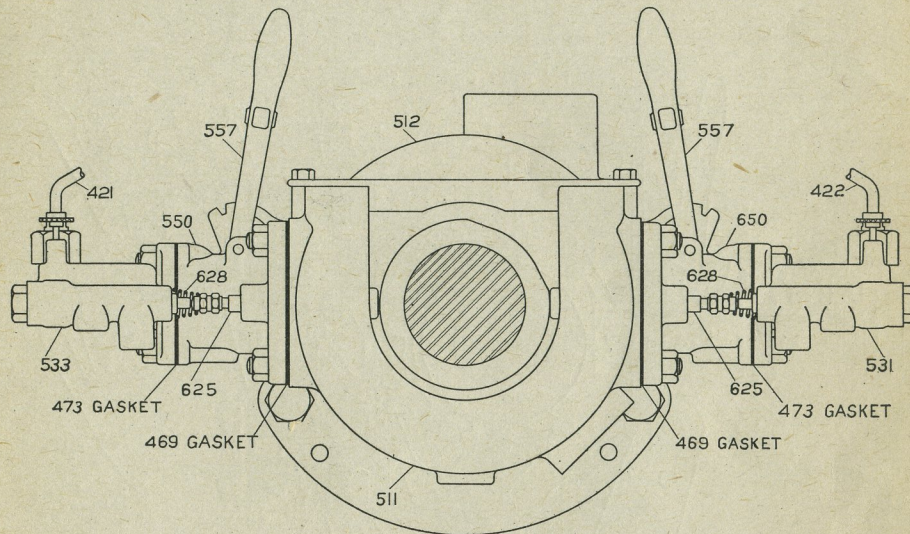




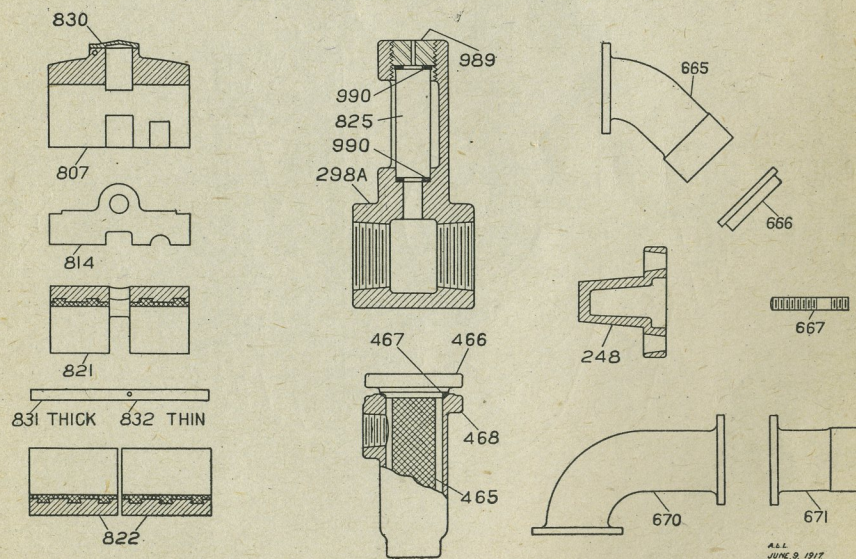


ALL  
JUNE 9, 1917  
71YK4

PUMPS FOR TWO CYLINDER ENGINES

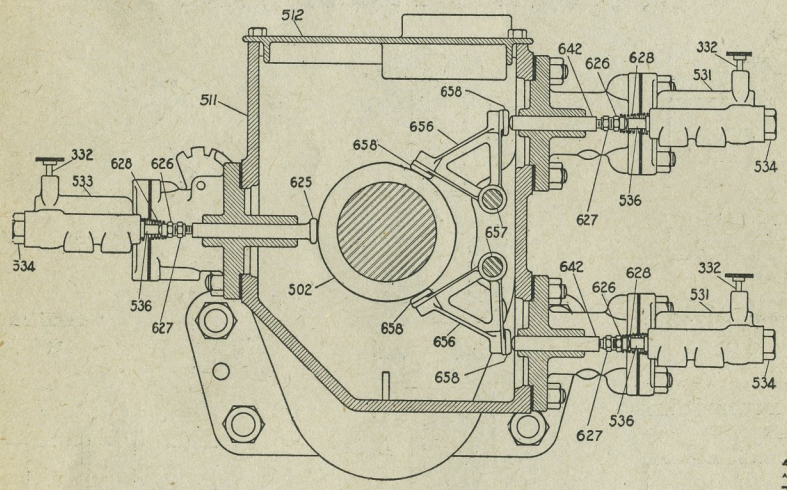
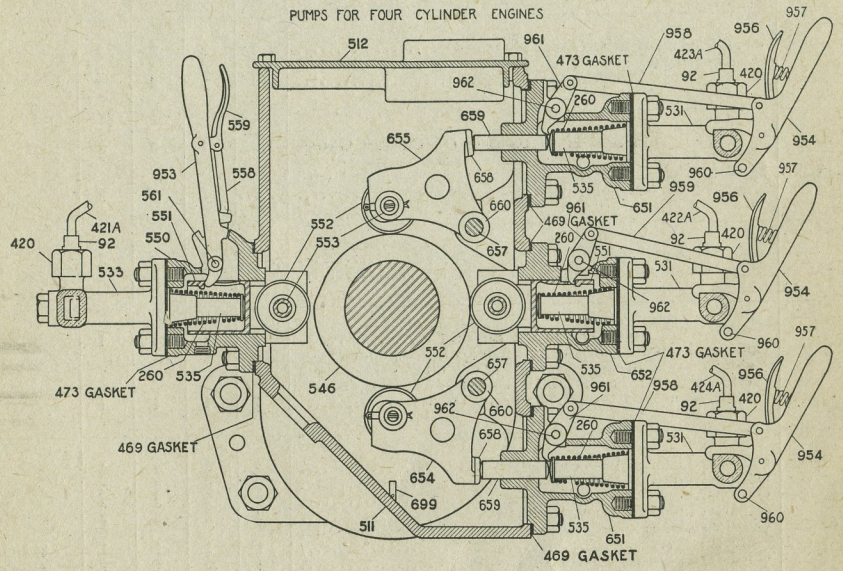
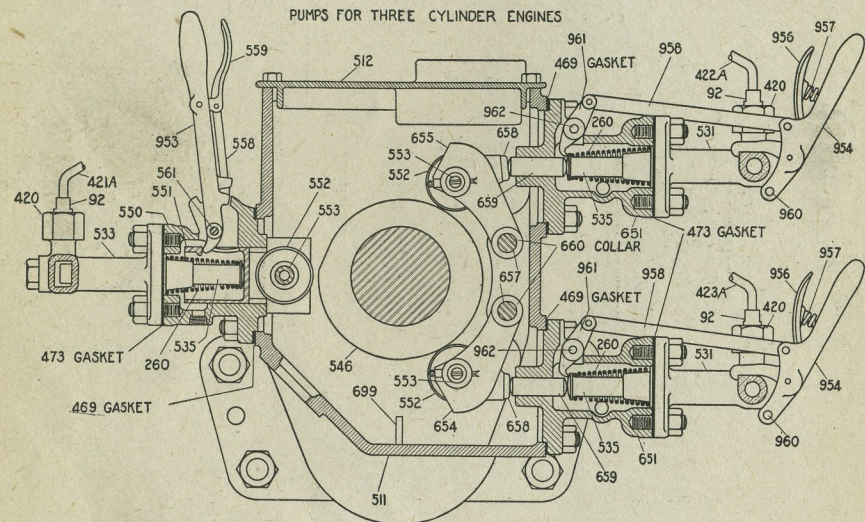


PARTS USED ON TWO, THREE AND FOUR CYLINDER ENGINES ONLY

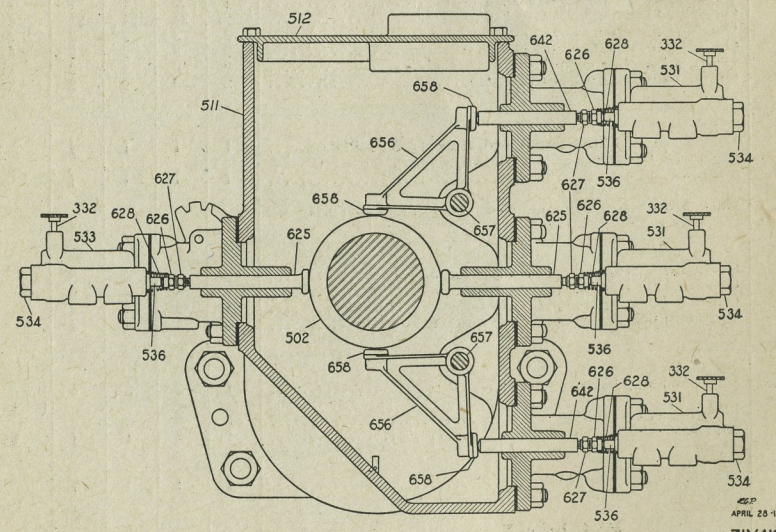


ALL  
JUNE 9, 1917  
71Y2K1





48P  
APRIL 20-1919  
71Y3K3



48P  
APRIL 23-1919  
71Y4K3



Repair Numbers Arranged Numerically	The group number in heavy type, when shown at the head of a group of parts, includes all items mentioned in that group.	Number Used On				Included in Group Number
		1 Cyl. Eng.	2 Cyl. Eng.	3 Cyl. Eng.	4 Cyl. Eng.	
297A	<b>297A-C Main Bearing Oil Cistern Gauge</b> (Used on End Bearings)	2	2	2	2	
	Main bearing oil cistern gauge body, always fitted with gauge glass (825), plug (989) and gaskets (990).....	2	2	2	2	
	Main bearing oil cistern gauge pipe nipple.....	2	2	2	2	
	Main bearing oil cistern gauge pipe tee.....	2	2	2	2	
298A	<b>298A-C Main Bearing Oil Cistern Gauge</b> (Used on Center Bearings)	.....	1	2	3	
	Main bearing oil cistern gauge body, always fitted with gauge glass (825), plug (989) and gaskets (990).....	.....	1	2	3	
308	Main bearing oil cistern gauge body pipe plug.....	.....	1	2	3	531-C 533-C
	Injection pump by-pass valve gland.....	1	2	3	4	
310	<b>310-C Outboard Bearing</b>	1	1	1	1	
	Out-board bearing base, always fitted with cap studs, nuts, shim dowels, drain plugs, bearing cap (311), shims, thick (313), shims, thin (314), oil stops (315), oil cistern covers (316), oil hole covers (317) and rings (M833).....	1	1	1	1	
311	Out-board bearing base cap studs.....	4	4	4	4	310-C 310-C 310-C 310-C 310-C 310-C 310-C 310-C 310-C 310-C
	Out-board bearing base cap stud nut.....	8	8	8	8	
	Out-board bearing base drain plugs.....	2	2	2	2	
	Out-board bearing base shim dowels.....	2	2	2	2	
	Out-board bearing base cap, always furnished with base (310) etc.....	1	1	1	1	
	Out-board bearing base cap shim, thick.....	4	4	4	4	
	Out-board bearing base cap shim, thin.....	24	24	24	24	
	Out-board bearing base cap oil stop.....	2	2	2	2	
	Outboard bearing base oil cistern covers.....	2	2	2	2	
	Outboard bearing cap oil hole covers.....	2	2	2	2	
Outboard bearing adjusting wedge.....	2	2	2	2		
319	<b>319-C Outboard Bearing Sole Plate</b>	1	1	1	1	
	Outboard bearing sole plate, always fitted with adjusting screws and nuts.....	1	1	1	1	
	Outboard bearing adjusting wedges (318), and sole plate cap screws with lock washers.....					
	Outboard bearing sole plate adjusting screws.....	8	8	8	8	
	Outboard bearing sole plate adjusting screw nuts.....	8	8	8	8	
	Outboard bearing sole plate cap screws.....	4	4	4	4	
	Outboard bearing sole plate cap screw lock washers.....	4	4	4	4	
329	Injection pump by-pass valve gland spring.....	1	2	3	4	531-C 533-C
332	Injection pump by-pass valve.....	1	2	3	4	
340	Air starting check valve nut.....	1	1	1	1	854-C
347	Starting burner tank cock.....	1	1	1	1	
362	<b>362-C Relief Valve</b>	1	2	3	4	
	Relief valve body.....	1	2	3	4	
	Relief valve (363) and cap (364).....					
363	Relief valve with nut.....	1	2	3	4	362-C
364	Relief valve nut.....	1	2	3	4	362-C
	Relief valve cap.....	1	2	3	4	

Before ordering, read instructions on page 12.

FOR REPLACING CYLINDER HEADS OF EARLIER DESIGN, AND FOR STARTING

## Fairbanks-Morse "Y" Vertical Oil Engines with Center Injection

(See also the regular instructions sent with the engine)

The "Y" Engine Cylinder Head, as shown below, has a movable stem (119), with an operating handle (121) near the injection nozzle (201A). This is for use in starting only.

Before priming the combustion chamber by means of the injection pump, turn this operating handle in a counter-clockwise direction until the projection on the handle rests against the injection pipe. After the engine has started and as soon as the ignitions are regular, turn the handle back about one-half a turn in a clockwise direction. If the ignitions become irregular, turn it again to the starting position and let the engine operate under this condition until the combustion chamber is hot enough for regular ignitions, when the handle should again be turned one-half away.

It is absolutely necessary that all of the engine jackets be completely filled with water before the starting torch is lighted. If this is not followed, cracked jacket walls will result.

When cylinder heads with center injection replace others of earlier design, the injection cam must be set somewhat earlier, so as to inject from seven to nine degrees before dead center of the main crank, or as early as the full load operation will allow without knocking. When altering the setting of the injection cam, the position of the governor on the shaft should be changed correspondingly.

The original injection pipe may be used by straightening the bend at the upper end and connecting to the new injection nozzle with the extension furnished. The starting burner must be changed to the position shown on the chart below, using the new parts furnished and bending or shortening the burner tubing to suit. The outlet water pipe will also require a slight re-arrangement, which will be evident when the new head is applied.

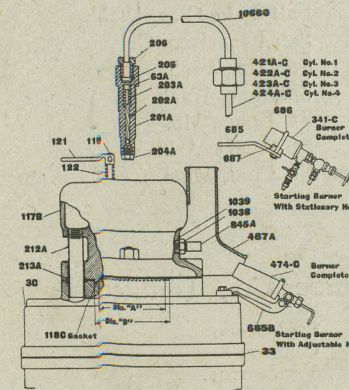


Chart 1929GN

### REPAIRS

3C Cylinder head, always fitted with combustion chamber studs, air starting check valve studs, and relief valve bushing.

(On orders for cylinder head, the diameter "A" and the diameter "B" must be given in addition to the repair number and the engine number.)

**421A-C Injection Pipe, Cylinder No. 1**  
421A Injection pipe, cylinder No. 1, always fitted with connections (92 and 205), and nuts (420 and 206).

**422A-C Injection Pipe, Cylinder No. 2**  
422A Injection pipe, cylinder No. 2, always fitted with connections (92 and 205), and nuts (420 and 206).

**423A-C Injection Pipe, Cylinder No. 3**  
423A Injection pipe, cylinder No. 3, always fitted with connections (92 and 205), and nuts (420 and 206).

**424A-C Injection pipe, Cylinder No. 4**  
424A Injection pipe, cylinder No. 4, always fitted with connections (92 and 205), and nuts (420 and 206).

**487A-C Starting Burner Shield**  
487A Starting burner shield with two cap screws and two lock-washers. (Furnished only when replacing two piece side injection cylinder heads.)

Starting burner shield cap screws.  
Starting burner shield cap screw lock-washer.

**685-C Starting Burner Bracket**  
685 Starting burner bracket with bolt, nuts, and saddle (687). (Furnished only when replacing two piece side injection cylinder heads.)

**685B-C Starting Burner Bracket**  
685B Starter burner bracket with cap screws, lock-washer and nut.

Burner hex head cap screws.  
Burner hex head cap screws nut.  
Burner hex head cap screws lock-washers.

(Over)







- 686 Starting burner bolt with nuts.
- 687 Starting burner bolt nuts.
- 845A Starting burner saddle.
- 1038 Starting tube.
- 1039 Combustion chamber starting tube bushing gasket.
- 10660 Injection pipe extension. (When 421A-C, 422A-C, 423A-C, or 424A-C is ordered, one piece pipe is furnished.)
- Combustion chamber studs.
- Combustion chamber stud nuts.
- Air starting check valve studs.
- Air starting check valve stud nuts.
- Relief valve bushing.
- 33 Cylinder head gasket.
- 63A Injection nozzle nut.

**117B-C Combustion Chamber**

- 117B Combustion chamber, always fitted with pipe plugs, pipe bushing, starting tube bushing (1038), gasket (10.9), starting tube (845A), cooling water tube (212A), and starting spoon (119-C).

(On orders for combustion chamber, the diameter "A" and the diameter "B" must be given in addition to the repair number and the engine number.)

- Combustion chamber pipe plugs.
- Combustion chamber pipe bushing.
- 118C Combustion chamber gasket.

(On orders for combustion chamber gasket, the diameter "A" and the diameter "B" must be given in addition to the repair number and the engine number.)

**119-C Starting Spoon**

- 119 Starting spoon stem with spoon.  
Starting spoon handle (121), and spring (122).
- 121 Starting spoon handle with bolt, nut and lock-washer.  
Starting spoon handle bolt.  
Starting spoon handle bolt nut.
- 122 Starting spoon handle bolt nut lock-washer.  
Starting spoon stem spring.

**201A-C Injection Nozzle**

- Injection nozzle body (201A), injection nozzle valve (202A), injection nozzle valve nut (63A), injection nozzle spring (203A), injection nozzle tip (204A).

- 201A Injection nozzle body.
- 202A Injection nozzle valve.
- 203A Injection nozzle spring.
- 204A Injection nozzle tip.
- 205 Injection pipe nozzle connection.
- 206 Injection pipe nozzle connection nut.
- 212A Cooling water tube.
- 213A Cooling water tube gasket.

**Repair Parts List—Fairbanks-Morse Type "Y" Vertical Oil Engines 2450D**

Repair Number Arranged Numerically	The group number in heavy type, when shown at the head of a group of parts, includes all items mentioned in that group.	Number Used On				Included in Group Number
		1 Cyl. Eng.	2 Cyl. Eng.	3 Cyl. Eng.	4 Cyl. Eng.	
392	Crank case air stop ring back lash springs			6	8	25-C
393	Crank case air stop ring back lash spring pins			6	8	25-C
394	Crank case air stop ring back lash spring clips			6	8	25-C
	Crank case air stop ring back lash spring bolts			6	8	
	Crank case air stop ring back lash spring bolt nuts			6	8	
401	Flywheel hub bolts with nuts	4	4	4	4	13-C
	Flywheel hub bolt nuts	8	8	8	8	
403	Flywheel key	1	1	1	1	13-C
404	Belt pulley hub bolts with nuts	2	2	2	2	172-C
	Belt-pulley hub bolt nuts	4	4	4	4	
405	Crank pin oiler ring gasket	1	2	3	4	25-C
407	Cylinder core hole cover gasket	2	4	6	8	1-C
409	Upper base lower base dowel with nut	4	8	12	16	2-C
409	Pump case lower base dowel with nut	2	2	2	2	511-C
	Upper base lower base dowel nut	4	8	12	16	
	Pump case lower base dowel nut	2	2	2	2	
418	Cylinder port cover gasket	1	2	3	4	1-C
419	Flywheel turning bar	1	1	1	1	
420	Injection pipe connection nut at pump end	1	2	3	4	421A-C 422A-C 423A-C 424A-C
<b>421A-C Injection Pipe, Cylinder No. 1</b>						
421A	Injection pipe, cyl. No. 1, always fitted with connections (92 and 205), and nuts (206 and 420)	1	1	1	1	
<b>422A-C Injection Pipe, Cylinder No. 2</b>						
422A	Injection pipe, Cyl. No. 2, always fitted with connections (92 and 205), and nuts (206 and 420)	1	1	1	1	
<b>423A-C Injection Pipe, Cylinder No. 3</b>						
423A	Injection pipe, Cyl. No. 3, always fitted with connections (92 and 205) and nut (206 and 420)			1	1	
<b>424A-C Injection Pipe, Cylinder No. 4</b>						
424A	Injection pipe cylinder No. 4, always fitted with connections (92 and 205) and nuts (206 and 420)				1	
432	Lubricator tube, cylinder No. 1, exhaust side	1	1	1	1	
433	Lubricator tube, cylinder No. 1, air side	1	1	1	1	
434	Lubricator tube, cylinder No. 1, governor side	1	1	1	1	
435	Lubricator tube, cylinder No. 1, crank pin	1	1	1	1	
437	Lubricator tube, cylinder No. 2, exhaust side		1	1	1	
438	Lubricator tube, cylinder No. 2, air side		1	1	1	
439	Lubricator tube, cylinder No. 2, governor side		1	1	1	
440	Lubricator tube, cylinder No. 2, crank pin			1	1	
442	Lubricator tube, cylinder No. 3, exhaust side			1	1	
443	Lubricator tube, cylinder No. 3, air side			1	1	
444	Lubricator tube, cylinder No. 3, governor side			1	1	
445	Lubricator tube, cylinder No. 3, crank pin				1	
447	Lubricator tube, cylinder No. 4, exhaust side				1	
448	Lubricator tube, cylinder No. 4, air side				1	
449	Lubricator tube, cylinder No. 4, governor side				1	
450	Lubricator tube, cylinder No. 4, crank pin				1	
451	Tube elbow (lubricator or burner tubes)	6	10	14	18	
452	Tube connector (burner tubes)	2	4	6	8	
453	Tube tee (burner tubes)		2	4	6	
454	Tube union (lubricator or burner tubes)					
<b>460-C Shaft Extension</b>						
460	Shaft extension	1	1	1	1	
	Shaft extension oil throw rings (164)					
<b>464-C Pump Strainer, Used on</b>						
	Auxiliary fuel pump	1	1	1	1	
	Front injection pump	1	1	1	1	
	Back injection pump		1			
464	Pump strainer body with pipe plug	2	3	2	2	
	Pump strainer screen (465), screen body (466), strainer gasket (467), bolts and nuts.					
	Pump strainer body pipe plug	2	3	2	2	
465	Pump strainer screen	2	3	3	3	464-C 468-C
466	Pump strainer screen body	2	3	3	3	
467	Pump strainer screen body gasket	2	3	3	3	
	Pump strainer screen body bolt	8	12			
	Pump strainer screen body bolt nut	8	12			

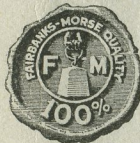
**Fairbanks, Morse & Co.**

(INCORPORATED)

Chicago, Ill.

- Atlanta, Ga.
- Baltimore, Md.
- Boston, Mass.
- Buenos Aires
- Cincinnati, Ohio
- Cleveland, Ohio
- Dallas, Tex.
- Denver, Colo.
- Des Moines, Iowa
- Detroit, Mich.
- Indianapolis, Ind.
- Jacksonville, Fla.
- Kansas City, Mo.
- London
- Los Angeles, Cal.

- Louisville, Ky.
- Milwaukee, Wis.
- Minneapolis, Minn.
- New Orleans, La.
- New York, N. Y.
- Omaha, Neb.
- Philadelphia, Pa.
- Portland, Ore.
- Salt Lake City, Utah
- San Francisco, Cal.
- Seattle, Wash.
- Spokane, Wash.
- St. Louis, Mo.
- Stuttgart, Ark.
- St. Paul, Minn.



**The Canadian Fairbanks-Morse Co., Limited**

- |                 |          |           |
|-----------------|----------|-----------|
| Halifax         | Toronto  | Saskatoon |
| St. John, N. B. | Hamilton | Calgary   |
| Quebec          | Windsor  | Vancouver |
| Montreal        | Winnipeg | Victoria  |
| Ottawa          | Regina   |           |

Copyright, 1921, Fairbanks, Morse & Co.

Before ordering, read instructions on page 12.



Repair Numbers Arranged Numerically	The group number in heavy type, when shown at the head of a group of parts, includes all items mentioned in that group.	Number Used On				Included in Group Number
		1 Cyl. Eng.	2 Cyl. Eng.	3 Cyl. Eng.	4 Cyl. Eng.	
468	<b>468-C Pump Strainer</b> .....			1	1	
	(Used on Back Pumps of 3 and 4-Cylinder Engines)					
	Pump strainer body.....			1	1	
	Pump strainer screen (465), screen body (466), strainer gasket (467) and screws.					
469	Injection cam roller slide guide pump case gasket.....	1	2	3	4	
470	Auxiliary fuel pump case gasket.....	1	1	1	1	
471	Air starting valve cage elbow gasket.....	1	1	1	1	571-C
472	Pump case lower base gasket.....	1	1	1	1	
473	Injection pump slide guide gasket.....	1	2	3	4	
474	<b>474-C Starting Burner with Adjustable Hood</b> ..	1	2	3	4	
	Starting burner body, always fitted with tip (476).....	1	2	3	4	
	Starting burner fuel valve (477), packing rings (483), gland (478), gland nut (479), strainer screen (482), screen plug (481), hood (475), hood plug (485), adjusting stop (480), tube gland (490), and tube gland nut (491).					
475	Starting burner hood with plug (485).....	1	2	3	4	474-C
476	Starting burner tip.....	1	2	3	4	474-C
477	Starting burner fuel valve.....	1	2	3	4	474-C
478	Starting burner fuel valve packing gland.....	1	2	3	4	474-C
479	Starting burner fuel valve packing gland nut.....	1	2	3	4	474-C
480	Starting burner adjusting stop with bolt and nut.....	1	2	3	4	474-C
481	Starting burner strainer screen plug.....	2	4	6	8	474-C
482	Starting burner strainer screen.....	2	4	6	8	474-C
483	Starting burner fuel valve packing ring.....	3	6	9	12	474-C
485	Starting burner hood plug.....	1	2	3	4	474-C
487	<b>487-C Starting Burner Shield</b> .....	1	2	3	4	
	Starting burner shield.....	1	2	3	4	
	Starting burner shield band halves (488), shield bolts, with nuts, and clamp bolts, with nuts.					
488	Starting burner shield band halves, always fitted with clamps (489).....	2	4	6	8	
489	Starting burner shield band clamps.....	2	4	6	8	
	Starting burner shield band bolts, with nuts.....	4	8	12	16	
	Starting burner shield band bolt nuts.....	4	8	12	16	
	Starting burner shield clamp bolts, with nuts.....	1	2	3	4	
	Starting burner shield clamp bolt nuts.....	1	2	3	4	
490	Starting burner tube gland.....	2	4	6	8	474-C
491	Starting burner tube gland nut.....	2	4	6	8	474-C
501	<b>501-C Governor</b> .....	1	1	1	1	
	Governor spider, always furnished with hub bolt (506), with nuts.....	1	1	1	1	
	Governor spring weight pins (48), spring adjusting screw plate (70), link weight pins, with nuts (504), governor links (505), governor weights (507), governor weight pins (83-C) and governor springs (256-C).					
502	Governor sleeve, always fitted with sleeve pins (503).....	1	1	1	1	
503	Governor sleeve pins.....	2	2	2	2	
504	Governor link weight pin, with nut.....	2	2	2	2	501-C
	Governor link weight pin nut.....	2	2	2	2	
505	Governor link.....	2	2	2	2	501-C
506	Governor spider hub bolt, with nuts.....	1	1	1	1	501-C
	Governor spider hub bolt nuts.....	2	2	2	2	
507	Governor weights, always fitted with weight pin bushings (167).....	2	2	2	2	501-C
511	<b>511-C Pump Case</b> .....	1	1	1	1	
	Pump case, always fitted with slide guide studs, push rod guide studs, auxiliary fuel pump studs, air starting valve cage studs, drain plug, oil level pipe plug, and dowel (409) with nut.....	1	1	1	1	
	Pump case cover (512) and cap screws.					
	Pump case slide guide studs.....	4	8	12	16	
	Pump case slide guide stud nuts.....	4	8	12	16	
	Pump case push rod guide studs.....			8	8	
	Pump case push rod guide stud nuts.....			8	8	
	Pump case auxiliary fuel pump studs.....	2	2	2	2	
	Pump case auxiliary fuel pump stud nuts.....	2	2	2	2	
	Pump case air starting valve cage studs.....	4	4	4	4	
	Pump case air starting valve cage stud nuts.....	4	4	4	4	

Before ordering, read instructions on page 12.

Repair Numbers Arranged Numerically	The group number in heavy type, when shown at the head of a group of parts, includes all items mentioned in that group.	Number Used On				Included in Group Number
		1 Cyl. Eng.	2 Cyl. Eng.	3 Cyl. Eng.	4 Cyl. Eng.	
512	Pump case drain plug.....	1	1	1	1	
	Pump case oil level plug.....	2	2	2	2	
	Pump case lower base cap screws.....	2	2	2	2	
	Pump case lower base cap screw washers.....	1	1	1	1	
	Pump case cover.....	2	2	2	2	
	Pump case cover cap screws.....	1	1	1	1	
513	Pump case oil throw.....	1	1	1	1	
516	<b>516-C Auxiliary Fuel Pump</b> .....	1	1	1	1	
	Auxiliary fuel pump body, always fitted with plunger (517).	1	1	1	1	
	Auxiliary fuel pump valves (519), plugs (520) and pin (518).					
517	Auxiliary fuel pump plunger.....	1	1	1	1	516-C
518	Auxiliary fuel pump plunger pin, with cotters.....	1	1	1	1	516-C
	Auxiliary fuel pump plunger pin cotters.....	2	2	2	2	
519	Auxiliary fuel pump valve.....	2	2	2	2	516-C
520	Auxiliary fuel pump plug.....	2	2	2	2	516-C
524	Auxiliary fuel pump eccentric.....	1	1	1	1	
525	<b>525-C Auxiliary Fuel Pump Eccentric Strap</b> ....	1	1	1	1	
	Auxiliary fuel pump eccentric strap half, always fitted with strap half (526), shims (527), bolts (528) and lock washers.					
526	Auxiliary fuel pump eccentric strap half, always fitted with strap half (525).....	2	2	2	2	525-C
527	Auxiliary fuel pump eccentric strap shims.....	2	2	2	2	525-C
528	Auxiliary fuel pump eccentric strap bolts, with nuts and cotters.....	2	2	2	2	525-C
	Auxiliary fuel pump eccentric strap bolt nuts.....	2	2	2	2	
	Auxiliary fuel pump eccentric strap bolt cotters.....	2	2	2	2	
	Auxiliary fuel pump eccentric strap bolt lock washers.....	2	2	2	2	
	Auxiliary fuel pump eccentric drive studs.....	2	2	2	2	546-C
	Auxiliary fuel pump eccentric drive stud nuts.....	2	2	2	2	
	Auxiliary fuel pump eccentric drive stud cotters.....	2	2	2	2	
529	<b>531-C Injection Pump (Back)</b> .....		1	2	3	
	Injection pump body, always fitted with pipe plug, plugs (534), plunger (535), suction valve (536) and suction valve spring (537).....		1	2	3	
	Injection pump plunger spring (260), discharge valve (91), discharge valve spring (537), by-pass valve (332), by-pass valve gland (308) and by-pass valve gland spring (329).					
533	<b>533-C Injection Pump (Front)</b> .....	1	1	1	1	
	Injection pump body, always fitted with pipe plug, plugs (534), plunger (535), suction valve (536) and suction valve spring (537).....	1	1	1	1	
	Injection pump plunger spring (260), discharge valve (91), discharge valve spring (537), by-pass valve (332), by-pass valve gland (308) and by-pass valve gland spring (329).					
534	Injection pump plug.....	2	3	4	5	531-C 533-C
	Injection pump pipe plug.....	1	2	3	4	
	Injection pump plunger.....	1	2	3	4	
	Injection pump suction valve.....	1	2	3	4	
	Injection pump suction or discharge valve spring.....	2	4	6	8	
546	<b>546-C Injection Cam</b> .....	1	1	1	1	
	Injection cam, always fitted with clamp (547), rivets (548), cap screw, pin (566) and studs (529).....	1	1	1	1	
547	Injection cam clamp, with cap screw.....	1	1	1	1	546-C
548	Injection cam clamp cap screw.....	1	1	1	1	546-C
	Injection cam clamp rivets.....	2	2	2	2	
550	<b>550-C Injection Cam Roller Slide Guide (Front)</b> ...	1	1	1	1	
	Injection cam roller slide guide, always fitted with injection pump studs.....	1	1	1	1	
	Injection cam roller slide (551-C).					
	Injection pump slide guide studs.....	2	2	2	2	
	Injection pump slide guide stud nuts.....	2	2	2	2	
551	<b>551-C Injection Cam Roller Slide</b> .....	1	2	1	2	550-C 650-C 652-C
	Injection Cam Roller Slide.....	1	2	1	2	
	Injection cam roller (552), pin (553) and lock pin.					
552	Injection cam roller.....	1	2	1	2	551-C, 654-C 655-C
553	Injection cam roller pin.....	1	2	1	2	551-C, 654-C 655-C
	Injection cam roller pin lock pin.....	2	4	2	4	

Before ordering, read instructions on page 12.



Repair Numbers Arranged Numerically	The group number in heavy type, when shown at the head of a group of parts, includes all items mentioned in that group.	Number Used On				Included in Group Number
		1 Cyl. Eng.	2 Cyl. Eng.	3 Cyl. Eng.	4 Cyl. Eng.	
557	<b>557-C Injection Pump Hand Lever</b> .....	1	2	.....	.....	
	Injection pump hand lever, always furnished with rivet.....	1				
	Injection pump hand lever latch bolt (558), rivet, handle (559), spring (560) and cotters.					
558	Injection pump hand lever rivet.....	1	2	.....	.....	
559	Injection pump hand lever latch bolt.....	1	2	.....	.....	557-C
560	Injection pump hand lever latch handle.....	1	2	.....	.....	557-C
	Injection pump hand lever latch spring.....	1	2	.....	.....	557-C
561	Injection pump hand lever latch spring cotters.....	2	4	.....	.....	
	Injection pump hand lever pin, with cotters.....	1	2	1	1	
	Injection pump hand lever pin cotters.....	2	4	2	2	
565	Air starting cam.....	1	1	1	1	
566	Air starting cam drive pin.....	1	1	1	1	546-C
570	Air starting valve.....	1	1	1	1	571-C
571	<b>571-C Air Starting Valve</b>	1	1	1	1	
	Air starting valve cage, always fitted with elbow studs.....	1	1	1	1	
	Air starting valve (570), elbow (574), nuts, shims (573), elbow gasket (471), and air cock.					
573	Air starting valve cage pump shims.....	3	3	3	3	571-C
574	Air starting valve cage elbow.....	1	1	1	1	571-C
	Air starting valve cage elbow studs.....	4	4	4	4	571-C
	Air starting valve cage elbow stud nuts.....	4	4	4	4	571-C
	Air starting valve cage elbow air cock.....	1	1	1	1	571-C
577A	<b>577A-C Crankshaft Shim</b> .....	1	1	1	1	
	Crankshaft shim halves, thick (for 14x17 size engines only) ..	8	8	8	8	
	Crankshaft shim halves, thin (578A) (for all size engines) ..					
578A	Crankshaft shim halves, thin (for all size engines).....	6	6	6	6	577-C
	Crankshaft shim cap screws.....	8	8	8	8	
585	Air valve leather No. 1 (not used on 12x15 size engines).....	1	2	3	4	588-C
586	Air valve leather No. 2.....	1	2	3	4	588-C
587	Air valve leather No. 3.....	1	2	3	4	588-C
588	<b>588-C Air Valves</b> .....	1	2	3	4	
	Air valve leather No. 4.....	1	2	3	4	
	Air valve leather No. 3 (587), leather No. 2 (586) and leather No. 1 (585), (585 not used on 12x15 size engines.)					
590	Air valve ring No. 1 (not used on 12x15 size engines).....	1	2	3	4	593-C
591	Air valve ring No. 2.....	1	2	3	4	593-C
592	Air valve ring No. 3.....	1	2	3	4	593-C
593	<b>593-C Air Valve Rings</b> .....	1	2	3	4	
	Air valve ring No. 4.....	1	2	3	4	
	Air valve ring No. 3 (592), ring No. 2 (591), and ring No. 1 (590), (590 not used on 12x15 size engines).					
595	Air valve springs.....	20or24	40or48	72	96	
597	Air valve seat.....	1	2	3	4	
598	Air valve guide, always fitted with stud (599).....	1	2	3	4	
599	Air valve guide stud.....	1	2	3	4	
	Air valve guide stud nut.....	1	2	3	4	
	Air valve guide stud lock washer.....	1	2	3	4	
	Air valve guide stud cotter.....	1	2	3	4	
602	Lower step handle.....	1	1	1	1	
603	Upper step handle.....	1	1	2	3	
604	Upper step nut.....	1	1	2	3	
604	Upper step handle nut.....	2	4 or 2	8	12	
607	Upper step.....	2	2	4	6	
608	Lower step.....	1	1	2	3	
611	Exhaust pipe nipple.....	1	1	1	1	
615	Exhaust pot top cover.....	1	1	1	2	225-C
616	Exhaust pot bottom cover.....	1	1	1	2	225-C
617	Exhaust pot cover gasket.....	2	2	2	4	225-C
	Exhaust pot cover bolts with nuts.....	24	24	24	48	
	Exhaust pot cover bolt nuts.....	24	24	24	48	
618	Exhaust pot inlet flange gasket.....	1				225-C
618	Exhaust nozzle flange gasket.....	1	2	3	4	
618	Exhaust pot elbow gasket.....			2		
625	<b>625-C Injection Pump Suction Valve Push Rod</b> (Used on front pump and back center pump.)	1	2	1	2	
	Injection pump suction valve push rod.....	1	2	1	2	
	Injection pump suction valve push rod adjusting screw (626), screw nut (627), and spring (628).					

Before ordering, read instructions on page 12.

Repair Number Arranged Numerically	The group number in heavy type, when shown at the head of a group of parts, includes all items mentioned in that group.	Number Used On				Included in Group Number
		1 Cyl. Eng.	2 Cyl. Eng.	3 Cyl. Eng.	4 Cyl. Eng.	
626	Injection pump suction valve push rod adjusting screw.....	1	2	3	4	625-C 642-C
627	Injection pump suction valve push rod adjusting screw nut.....	1	2	3	4	
628	Injection pump suction valve push rod spring.....	1	2	3	4	
633	Drip fitting.....	1	1	1	1	
642	<b>642-C Injection Pump Suction Valve Push Rod</b> (Used on upper and lower back pumps.)			2	2	
	Injection pump suction valve push rod.....			2	2	
	Injection pump suction valve push rod adjusting screw (626), screw nut (627) and spring (628).					
650	<b>650-C Injection Cam Roller Slide Guide (Back)</b>		1	.....	.....	
	Injection cam roller slide guide, always fitted with studs.....		1	.....	.....	
	Injection cam roller slide (551-C).					
	Injection cam roller slide guide studs.....		2	.....	.....	
	Injection cam roller slide guide stud nuts.....		2	.....	.....	
651	<b>651-C Injection Pump Plunger Push Rod Guide</b> .....			2	2	
	Injection pump plunger push rod guide always fitted with studs.....			2	2	
	Injection pump plunger push rod (659)					
	Injection pump plunger push rod guide studs.....			4	4	
	Injection pump plunger push rod guide stud nuts.....			4	4	
652	<b>652-C Injection Cam Roller Slide Guide (Back)</b> .....			.....	1	
	Injection cam roller slide guide, always fitted with studs.....			.....	1	
	Injection cam roller slide (551-C).					
	Injection cam roller slide guide studs.....			.....	2	
	Injection cam roller slide guide stud nuts.....			.....	2	
654	<b>654-C Injection Cam Roller Carrier (Lower)</b> .....			1	1	
	Injection cam roller carrier, lower, always fitted with mushroom (658).....			1	1	
	Injection cam roller (552), pin (553) and cotters.					
655	<b>655-C Injection Cam Roller Carrier (Upper)</b> .....			1	1	
	Injection cam roller carrier, upper, always fitted with mushroom (658).....			1	1	
	Injection cam roller (552), pin (553) and cotters.					
656	<b>656-C Governor Rocker Arm</b> .....			2	2	
	Governor rocker arm, always fitted with mushroom (658).....			2	2	
657	Injection cam roller carrier shafts.....			2	2	654-C 655-C
658	Cam roller carrier mushrooms.....			4	4	
658	Governor arm mushroom.....			2	2	
659	Injection pump plunger push rods.....			2	2	
660	Injection cam roller carrier shaft collars.....			2	2	656-C
	Injection cam roller carrier shaft, set screws.....			2	2	651-C
	Injection cam roller carrier shaft set screw nuts.....			2	2	
665	Exhaust pipe elbow connections.....		2	.....	4	225-C
666	Exhaust pipe exhaust pot packing glands.....		2	3	4	
667	Exhaust pot exhaust pot packing gland studs.....		8	12	16	
	Exhaust pipe, exhaust pot packing gland stud nuts.....		8	12	16	
670	Exhaust pipe elbow connections.....			2	.....	
671	Exhaust pipe straight connections.....			3	.....	
	Exhaust pipe connection bolts with nuts.....	16	16	40	32	
	Exhaust pipe connection bolt nuts.....	16	16	40	32	
675	<b>675-C Starting Burner Tank</b> .....	1	1	1	1	
	Starting burner tank body, always fitted with studs and pipe plug.....	1	1	1	1	
	Starting burner tank cover (676), cover nuts, gasket (682), plug (677) and pipe (678).					
	Starting burner tank cover studs.....	4	4	4	4	
	Starting burner tank cover stud nuts.....	4	4	4	4	
	Starting burner tank pipe plug.....	1	1	1	1	
	Starting burner tank cover.....	1	1	1	1	675-C
677	Starting burner tank filling hole plug.....	1	1	1	1	675-C
678	Starting burner tank outlet pipe, always fitted with screen (679).....	1	1	1	1	675-C
679	Starting burner tank outlet pipe screen.....	1	1	1	1	675-C

Before ordering, read instructions on page 12.



Repair Numbers Arranged Numerically	The group number in heavy type, when shown at the head of a group of parts, includes all items mentioned in that group.	Number Used On				Included in Group Number
		1 Cyl. Eng.	2 Cyl. Eng.	3 Cyl. Eng.	4 Cyl. Eng.	
680	Starting burner tank bracket.....	1	1	1	1	
	Starting burner tank bracket cap screws.....	2	2	2	2	
681	Starting burner tank bracket washers.....					
681	Lower step washers.....					
682	Starting burner tank cover gasket.....	1	1	1	1	675-C
<b>685A-C Starting Burner Bracket for Burner with Adjustable Hood.....</b>						
685	Starting burner bracket.....	1	2	3	4	
	Starting burner bracket adapter (688), cap screws, nut and lock washer.....	1	2	3	4	
<b>685-C Starting Burner Bracket for Burner with Stationary Hood.....</b>						
685	Starting burner bracket.....	1	2	3	4	
	Starting burner bolt (686), with nuts and saddle (687)	1	2	3	4	
686	Starting burner bolt, with nuts.....	1	2	3	4	685-C
	Starting burner bolt nuts.....	2	4	6	8	
687	Starting burner saddle.....	1	2	3	4	685-C
688	Starting burner bracket adapter.....	1	2	3	4	685A-C
	Starting burner bracket adapter screws with nuts.....	2	4	6	8	
	Starting burner bracket adapter screw nuts.....	2	4	6	8	
	Starting burner screw with nut and lock washer.....	1	2	3	4	
	Starting burner screw nut.....	1	2	3	4	
	Starting burner screw lock washer.....	1	2	3	4	
693	Auxiliary fuel tank overflow pipe.....	1	1	1	1	
	Auxiliary fuel tank overflow pipe union.....	2	2	2	2	
695	Injection pump suction pipe. (See, also, 703)	1	1	1	1	
699	Pump case oiler pipe.....	1	1	1	1	
700	Air starting pipe, upper.....	1	1	1	1	
701	Air starting pipe, lower.....	1	1	1	1	
	Air starting pipe nipple.....	2	2	4	4	
	Air starting pipe union.....	1	1	2	2	
	Air starting pipe elbow—90°.....	2	2	2	2	
	Air starting pipe elbow—45°.....	1	1	1	1	
703	Injection pump suction pipe.....	1	1	1	1	
706	Starting burner fuel tube from tank to burner.....	1	1	1	1	
707	Starting burner air tube from tank to burner.....	1	1	1	1	
708	Starting burner fuel tube from tank to tee.....	1	1	1	1	
709	Starting burner air tube from tank to tee.....	1	1	1	1	
710	Starting burner fuel tube from tee to burner No. 1, 2 or 3.....	1	2	3	3	
711	Starting burner air tube from tee to burner No. 1, 2 or 3.....	1	2	3	3	
712	Starting burner fuel tube from tee to flywheel end cylinder.....	1	1	1	1	
713	Starting burner air tube from tee to flywheel end cylinder.....	1	1	1	1	
714	Starting burner fuel or air tube from tee to tee.....	1	2	4	4	
For tube elbows, connectors, tees and unions, see 451, 452, 453 and 454.						
For tube clamps, see 1011.						
<b>805-C Main Bearing Cap, Governor End.....</b>						
805	Main bearing cap, governor end, always fitted with cover (830) and hinge pin.....	1	1	1	1	14-C
<b>806-C Main Bearing Cap, Opposite Governor End.....</b>						
806	Main bearing cap, opposite governor end, always fitted with cover (830) and hinge pin.....	1	1	1	1	14-C
<b>807-C Main Bearing Cap, Center.....</b>						
807	Main bearing cap, center, always fitted with cover (830) and hinge pin.....	1	2	3	3	14-C
812	Main bearing oil stop, governor end.....	2	2	2	2	14-C
813	Main bearing oil stop, opposite governor end.....	2	2	2	2	14-C
814	Main bearing oil stop, center.....	2	4	6	6	14-C
<b>816-C Main Bearing Shell, Opposite Governor End.....</b>						
816	Main bearing upper shell, opposite governor end, always fitted with lower shell (817) and dowels.....	1	1	1	1	
	Main bearing shell shim, thick (823), and shim, thin (824)	1	1	1	1	
817	Main bearing lower shell, opposite governor end, always furnished with upper shell (816) and dowels.....	1	1	1	1	816-C
<b>818-C Main Bearing Shell, Governor End.....</b>						
818	Main bearing upper shell, governor end, always fitted with lower shell (819) and dowels.....	1	1	1	1	
	Main bearing shell shim, thick (827), and shim, thin (828)	1	1	1	1	

Before ordering, read instructions on page 12.

Repair Numbers Arranged Numerically	The group number in heavy type, when shown at the head of a group of parts, includes all items mentioned in that group.	Number Used On				Included in Group Number
		1 Cyl. Eng.	2 Cyl. Eng.	3 Cyl. Eng.	4 Cyl. Eng.	
819	Main bearing lower shell, governor end, always fitted with upper shell (818) and dowels.....	1	1	1	1	818-C
820	Main bearing shell dowels.....	2	4	6	8	
<b>821-C Main Bearing Shell, Center.....</b>						
821	Main bearing upper shell, center, always fitted with lower shells (822) and dowels.....	1	2	3	3	
	Main bearing shell shim, thick (831), and shim, thin (832)	1	2	3	3	
822	Main bearing lower shells, center, always fitted with upper shell (821) and dowels.....	2	4	6	6	821-C
823	Main bearing shell shim, thick, opposite governor end.....	4	4	4	4	816-C
824	Main bearing shell shim, thin, opposite governor end.....	24	24	24	24	816-C
825	Main bearing oil gauge glass.....	2	3	4	5	297-AC 298-AC
827	Main bearing shell shim, thick, governor end.....	4	4	4	4	818-C
828	Main bearing shell shim, thin, governor end.....	24	24	24	24	818-C
830	Main bearing cap cover.....	2	3	4	5	805-C 806-C 807-C
831	Main bearing shell shim, thick, center.....	4	8	12	12	821-C
832	Main bearing shell shim, thin, center.....	24	8	72	72	821-C
833	Main bearing oil ring.....	2	3	4	5	
M833	Outboard bearing oil ring.....	2	2	2	2	310-C
836	Piston pin oil scraper, always fitted with pipe (838), dowel (840) and pipe pin.....	1	2	3	4	7-C
837	Piston pin oil scraper spring.....	1	2	3	4	7-C
838	Piston pin oil scraper pipe with pin.....	1	2	3	4	7-C
839	Piston pin oil scraper pipe guide.....	1	2	3	4	7-C
840	Piston pin oil scraper dowel.....	1	2	3	4	7-C
	Piston pin oil scraper pipe pin.....	1	2	3	4	
845	Starting tube.....	1	2	3	4	117-C
851	Cylinder port cover.....	1	2	3	4	1-C
853	Air starting check valve, with nut (340) and cotter.....	1	1	1	1	854-C
	Air starting check valve cotter.....	1	1	1	1	
<b>854-C Air Starting Check Valve.....</b>						
854	Air starting check valve cage.....	1	1	1	1	
	Air starting check valve (853), inlet flange (855), spring (856), stop (857), washer and gasket (858)	1	1	1	1	
855	Air starting check valve inlet flange.....	1	1	1	1	854-C
856	Air starting check valve spring.....	1	1	1	1	854-C
857	Air starting check valve stop.....	1	1	1	1	854-C
	Air starting check valve spring washer.....	1	1	1	1	
858	Air starting check valve inlet flange gasket.....	1	1	1	1	854-C
951	Cylinder core hole cover, plain.....	1	2	3	4	1-C
952	Cylinder core hole cover, tapped.....	1	2	3	4	1-C
<b>953-C Injection Pump Hand Lever, Front.....</b>						
953	Injection pump hand lever, always furnished with rivet.....	1	1	1	1	
	Injection pump lever latch handle (559), rivet, bolt (558), spring (560) and cotter.....	1	1	1	1	
<b>954-C Injection Pump Lever, Back.....</b>						
954	Injection pump hand lever, always furnished with rivets.....	2	3	3	3	
	Injection pump lever latch handle (956), spring (957)	2	3	3	3	
955	Injection pump lever arm pin with cotter pins.....	2	3	3	3	
	Injection pump lever arm cotter pins.....	4	6	6	6	954-C
956	Injection pump lever latch handle.....	2	3	3	3	
	Injection pump lever latch handle rivet.....	2	3	3	3	
957	Injection pump lever latch handle spring.....	2	3	3	3	954-C
958	Injection pump lever link (upper and lower).....	2	2	2	2	
959	Injection pump lever link (center).....	1	1	1	1	
	Injection pump lever link rivet.....	2	3	3	3	
960	Injection pump hand lever pin with cotter pins.....	2	3	3	3	
	Injection pump hand lever cotter pins.....	4	6	6	6	
961	Injection pump lever arm.....	2	3	3	3	
962	Injection pump lever arm fulcrum pin with cotter pins.....	2	3	3	3	
	Injection pump lever arm fulcrum cotter pins.....	4	6	6	6	
<b>985-C Auxiliary Fuel Tank.....</b>						
985	Auxiliary fuel tank body, always fitted with cover (986) pin, drain plug, gauge glass plug (989), gasket (990), gauge glass (991) and pipe plug.....	1	1	1	1	
	Auxiliary fuel tank cover.....	1	1	1	1	985-C
	Auxiliary fuel tank cover hinge pin.....	1	1	1	1	
	Auxiliary fuel tank drain plug.....	1	1	1	1	
	Auxiliary fuel tank pipe plug.....	1	1	1	1	

Before ordering, read instructions on page 12.



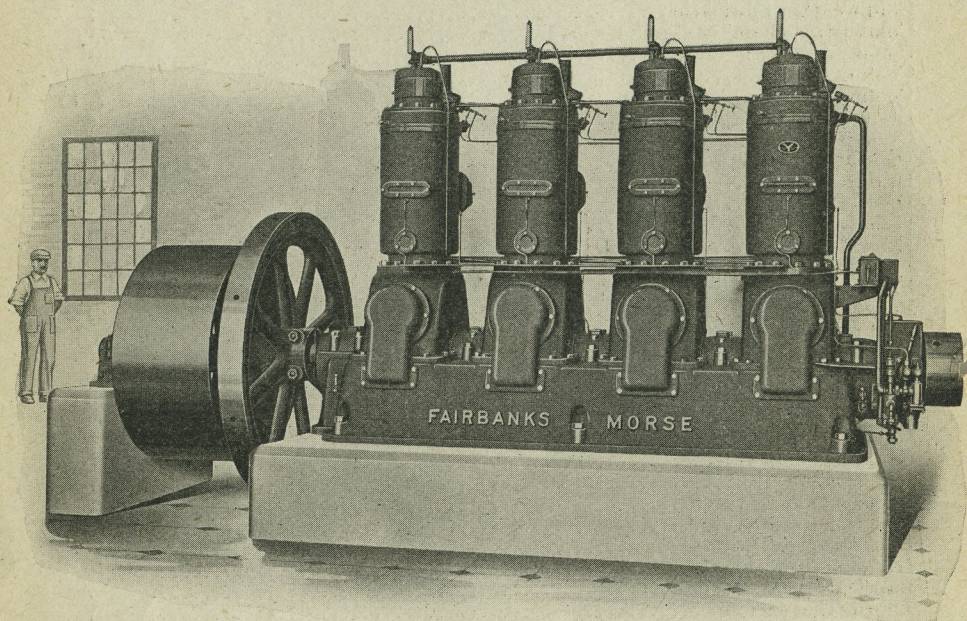
Repair Numbers Arranged Numerically	The group number in heavy type, when shown at the head of a group of parts, includes all items mentioned in that group.	Number Used On				Included in Group Number
		1 Cyl. Eng.	2 Cyl. Eng.	3 Cyl. Eng.	4 Cyl. Eng.	
989	Auxiliary fuel tank gauge glass plug	1	1	1	1	985-C 297A-C 298A-C 985-C 297A-C 298A-C 985-C
989	Main bearing oil cistern gauge glass plug	2	3	4	5	
990	Auxiliary fuel tank gauge glass gasket	2	2	2	2	
990	Main bearing oil cistern gauge glass gasket	4	6	8	10	
991	Auxiliary fuel tank gauge glass	1	1	1	1	
	Auxiliary fuel tank to bracket bolt with nut	2	2	2	2	
	Auxiliary fuel tank to bracket bolt nut	2	2	2	2	
1010	Lubricator tube clamp with 2 screws (for one tube)	4	3	3	3	
1011	Lubricator or burner tube clamp with 2 screws (for two tubes)	4	8	10	12	
1012	Injection pipe clamp with 2 screws (for one pipe)	2	5	5	6	
1013	Lubricator tube clamp with 2 screws (for 4 or 5 tubes)		1	2	2	
1014	Lubricator tube clamp with bolt and nut (for 4 tubes)		1	2	2	
1015	Lubricator tube clamp with 2 screws (for three tubes)			1	1	
1016	Lubricator tube clamp with bolt and nut (for two tubes)			2	2	
1017	Injection pipe clamp with 2 screws (for two pipes)			2	1	
1018	Lubricator tube clamp with 2 screws (for seven tubes)				2	
1019	Lubricator tube clamp with bolt and nut (for six tubes)				3	
1020	Injection pipe clamp with 2 screws (for three pipes)				2	
<b>749-C Gaskets and Packing.</b>		1 set	1 set	1 set	1 set	
33	Cylinder head gasket	1	2	3	4	75-C
76	Exhaust nozzle hand hole cover gaskets	2	4	6	8	
77	Exhaust nozzle cylinder gasket	1	2	3	4	
118	Combustion chamber gasket	1	2	3	4	
179	Air suction pipe lower base shim	1	2	3	4	
197	Lower base, upper base gasket halves	2	4	6	8	14-C
198	Upper base cylinder gasket	1	2	3	4	
199	Upper base cover and air valve gasket	3	6	9	12	
405	Crank pin oiler ring gasket	1	2	3	4	25-C
407	Cylinder core hole cover gasket	2	4	6	8	1-C
418	Cylinder port cover gasket	1	2	3	4	1-C
467	Pump strainer screen body gasket	2	3	3	3	464-C 468-C
469	Injection cam roller slide guide pump case gasket	1	2	3	4	571-C
470	Auxiliary fuel pump case gasket	1	1	1	1	
471	Air starting valve cage elbow gasket	1	1	1	1	
472	Pump case lower base gasket	1	1	1	1	
473	Injection pump slide guide gasket	1	1	1	1	
573	Air starting valve cage pump case shim	1	1	1	1	
617	Exhaust pot cover gasket	3	3	3	3	225-C
618	Exhaust pot inlet flange gasket	2	2	2	4	
618	Exhaust pot elbow gasket	1				
618	Exhaust nozzle flange gasket		2			
682	Starting burner tank cover gasket	1	2	3	4	
858	Air starting check valve inlet flange gasket	1	1	1	1	675-C
990	Auxiliary fuel tank gauge glass gasket	2	2	2	2	854-C
990	Main bearing oil cistern gauge glass gasket	4	6	8	10	985-C
	Exhaust pot inlet gland packing (1/2 lb. ball)		2	3	4	297A-C 298A-C 225-C
<b>748-C Springs.</b>		1 set	1 set	1 set	1 set	
122	Starting stem spring	1	2	3	4	119-C
178	Piston pin dowel spring	1	2	3	4	5-C
193	Crank case air stop ring spring	8	16	24	32	165A-C
203	Injection nozzle valve spring	1	2	3	4	201-C
256	Governor spring always fitted with plugs (52)	2	2	2	2	256-C
260	Injection pump plunger spring	1	2	3	4	531-C 533-C
392	Crank case air stop ring back lash spring			6	8	25-C
329	Injection pump by pass valve gland spring	1	2	3	4	531-C 533-C
537	Injection pump suction and discharge valve spring	2	4	6	8	531-C 533-C
560	Injection pump hand lever latch spring	1	2			557-C, 953-C
595	Air valve spring	20or24	40or48	72	96	
628	Injection pump suction valve push rod spring	1	2	3	4	625-C
837	Piston pin oil scraper spring	1	2	3	4	642-C
856	Air starting check valve spring	1	1	1	1	7-C 854-C
<b>Tools.</b>						
419	Flywheel turning bar	1	1	1	1	
189	Eye bolt	2	2	2	2	
	Main bearing shell dowel lifting screw	1	1	1	1	
	Open end wrenches	1 set	1 set	1 set	1 set	
	Adjustable wrench	1	1	1	1	
	Monkey wrench	1	1	1	1	
	Socket wrench for injection cam clamp screw	1	1	1	1	
	Fair gas pliers	1	1	1	1	
	Oiler	1	1	1	1	

INDEX

Air cock	Page 9
Air starting	9
Air piping	4, 8, 9
Air tank	4
Bearings, main and crank	8, 9
Bearing, piston pin	6
Burner starting	6
Cam setting	8
Check valves	11
Cold weather lubrication	10
Combustion chamber starting spoon	7
Compressed air burner	5, 9
Cooling tower	8
Cooling water	3
Crank pin bearing	3, 7, 10
Crank shaft end play	6
Deposit in cooling water	6
Drains	10
Dust in air	3, 10
Exhaust piping	3
Extension shaft	1
Fill the water jackets	2
Flywheel removal	3, 7
Foundation	2
Fuel reservoir	1
Fuel strainer	5, 9
Fuel tank	5
Governor	4
Governor setting	5, 11
Governor spring	11
Grinding pump valve	5
Injection nozzle	11
Injection nozzle valve	5
Injection pump	5
Injection pump adjustment	4, 11
Irregular explosions	11
Lubricating oil	10
Lubricating system	7
Main bearings	7
Nozzle tips	6
Oil in pump case	5
Oil, lubricating	7
Oiling main bearing	7
Piping	5
Piston pin	2, 3, 4, 5
Piston rings	6
Ports	10
Priming cylinder	10
Priming injection pump	9
Running water	9
Speed changes	3
Starting engine	5
Starting 3 or 4 cylinder engine	7
Starting spoon	10
Stopping engine	5, 9
Temperature (cooling water)	9
Thermometer	10
Water piping	3

Before ordering, read instructions on page 12.





(3479G)

200 H. P. Type "Y" Oil Engine with Standard Belt Pulley.