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PARTS CATALOG

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690-3906 of 9 April 1952
spec. 733/107/52 of 7 May 1952

CONTRACT ____________

150 KW

MAY 3 1943

VESSEL DESIGNATION U.S.M.C. HULLS 595 to 598 Incl.
607 to 612 Incl.
624 to 628 Incl.

ENGINE NO. SEE LIST
20728 to 31 Incl.
20740 to 44 Incl.
20755 to 60 Incl.

NO. OF CYL 6

BORE 9"

STROKE 10 1/2"

TYPE Stationary 150 KW

SPEC. NO. 1525-1

Model EN 668

ATLAS IMPERIAL DIESEL ENGINE CO.

OAKLAND CALIF. MATTOON ILL.

TC7-Ed 1-1

TABLE OF CONTENTS

The material in the Instructions has been arranged in sections each dealing with a specific subject or subdivision of the engine. The sections are arranged alphabetically and the Titles and main contents are listed below.

GENERAL ENGINE DATA

The Atlas Imperial Diesel Engine described herein is of the heavy duty, solid injection, full Diesel type, designed especially for reliability and a long life of trouble-free operation. It operates on the four stroke cycle, the sequence of operation being as follows:

1st Stroke — On the downward or suction stroke of the piston, the inlet valve is open and pure air is drawn into the cylinder through the air inlet manifold.

2nd Stroke — On the second or compression stroke, this air is compressed to about 400 lbs. per square inch, the heat of compression raising the air temperature to a point above the ignition temperature of the fuel. Just before the piston reaches top center, the injection is completed shortly after the piston has passed the top dead center.

3rd Stroke — On the power stroke the injected fuel oil burns, increasing the pressure within the cylinder, and driving the piston down through its working stroke. Shortly before bottom center position is reached, the exhaust valve opens.

4th Stroke — As the piston returns toward the head, the burned gases are discharged through the exhaust valve, and as the piston reaches top center the exhaust valve is closed, the inlet valve is opened, and the cycle is repeated.

The 9" x 10½" bore and stroke engines are built in 4, 5, 6 and 8 cylinder models. The horsepower rating and the rated speed of the engines are stamped on the engine nameplate and these ratings should never be exceeded.

On the nameplate will also be found the engine serial number which should always be stated when ordering parts and in any correspondence with the factory or Sales agencies. The firing order, valve timing and the model designation will also be found on the engine nameplate. When corresponding or ordering parts it is desirable that the model number be stated also. The engine serial number is, however, more important and if the model number is not known the number of cylinders and the bore and stroke of the engine may be stated.

The number of orifices, the orifice diameter and the angle of the orifices in the spray valve tip are also stamped on the engine nameplate. The number of holes or orifices is stamped first, followed by the diameter of the holes in thousandths and in turn followed by the hole angle in degrees. For example, 5-10-20 indicates a spray valve tip which has five holes or orifices of .010" diameter. The axis of the holes or orifices are inclined 20° with the horizontal. If ordering spray valve tips the stamping on the nameplate should be stated.

The following data apply to all 9" x 10½" bore and stroke engines.

PRESSURES:

Lubricating Oil Pressure ----------40 to 50 lbs./Sq.In.
Fuel Oil (at transfer pump discharge)-10 lbs./Sq.In. MAX.
Fuel Oil (in rail)----------1500 to 5000 lbs./Sq.In.
Starting Air Pressure----------125 to 250 lbs./Sq.In.

TEMPERATURES:

Cooling Water - Engine Outlet----------160° F. Max.
Lubricating Oil - Cooler Outlet----------140° F. Max.
Exhaust Temperature (At full load, full speed)---730° F. Max.

DATA FOR ATTACHED AUXILIARIES:

4, 5, 6 AND 8 CYLINDER ENGINES

High Pressure Fuel Pump - Single Acting
Bore----------1/2"
Stroke----------1"
No. of Cylinders------2
Operating Speed-------.832 x Engine R.P.M.

Fuel Transfer Pump - Internal Gear Type - Tuthill Pump Co. Model 2CS
Capacity (514 Engine R.P.M.)4.2 G.P.M.

4, 5 & 6 CYLINDER ENGINES

Lubricating Oil Pressure Pump - Internal Gear Type Tuthill Pump Co. Model 4CSA
Capacity (514 Engine R.P.M.)10.3 G.P.M.

Lubricating Oil Sump Pump (If Used) - Internal Gear Type Tuthill Pump Co. Model 4CSA
Capacity (514 Engine R.P.M.)15.4 G.P.M.

8 CYLINDER ENGINES

Lubricating Oil Pressure Pump - Internal Gear Type Tuthill Pump Co. Model 5CSA
Capacity (514 Engine R.P.M.)17.6 G.P.M.

Lubricating Oil Sump Pump (If Used) - Internal Gear Type Tuthill Pump Co. Model 5CSA
Capacity (514 Engine R.P.M.)25.7 G.P.M.

FUEL AND LUBRICATING OILS

1. RECOMMENDED FUEL OIL SPECIFICATION

Viscosity	35 to 70 S.U. Seconds at 100° F.
Gravity (A.P.I.)	Minimum 24°
Conradson Carbon (A.S.T.M.-D189)	Maximum 0.5%
Ash	Maximum 0.05%
B.S.&W.	Maximum 0.1%
Sulphur (A.S.T.M.-D129)	Maximum 1.0%
Ignition Quality	40 to 60 Cetane Number or equivalent in other ignition index.

2. EFFECT OF FUEL PROPERTIES ON PERFORMANCE

As adjusted at the factory the engine will operate satisfactorily on fuels with viscosities per above specification. It is possible to use thinner fuels but the operation is apt to be "snappy" and it may be difficult to maintain even cylinder load balance at varying loads. Fuels with viscosities less than 35 S.U.S. may also require special spray tips with smaller orifice holes than standard or the fuel pressure may have to be reduced. On the other hand fuels with high viscosities may require larger spray orifices than standard, increased fuel pressure and in extreme cases longer period of injection. To insure good operation it is recommended that the viscosity be held to the specification.

The gravity is of secondary importance. A minimum of 24° A.P.I. is merely given since heavier fuels generally require special treatment, such as heating and centrifuging, before they can be burned successfully.

The "Conradson Carbon" or "Carbon Residue" in the oil is an index to the amount of carbon which will form in the combustion chamber. Fuels with high "Conradson Carbon" may cause carbon to build up on the spray valve tips to such an extent that the fuel sprays are deflected causing poor operation and smoky exhaust. The higher the Conradson Carbon the more frequently will it be necessary to clean the spray valve tips. Experience also indicates that maintenance costs will be higher when fuels with high "Carbon Residues" are used.

The Ash content of a fuel is a measure of the amount of mineral material it contains. After burning the mineral residues are abrasive and it is consequently important that the Ash content be limited to 0.05%. If the content is higher rapid wear of cylinder liners, pistons and rings will result.

The item B.S.&W. (Bottom Sediment and Water) is an index to the fuel's cleanliness. It is good economy to use clean fuel and store it in clean tanks. Cleanliness in handling the fuel is also important (See paragraph entitled "Importance of Cleanliness in Fuel Handling" in Section N).

When the fuel oil is consumed in the engine Sulphur burns to Sulphur-dioxide. Under normal operating conditions most of this gas is ejected with the exhaust gases. If, however, temperature conditions are low enough, that is, if the engine is idling at low speed and under cold conditions, the sulphur-dioxide gas combines with condensed water vapors to form a corrosive acid which will attack metals used in the engine and exhaust system. It is consequently particularly important to hold the sulphur content low in fuels used for engines subject to variable loads with long periods of idling and also for engines subject to frequent starting and stopping.

The Cetane number of a fuel is an index of the ignition quality. Low Cetane values produce excessive knocking. Excessively high Cetane fuels cause high exhaust temperatures and smokiness of the exhaust.

Although the Flash Point does not affect the suitability of a diesel fuel it is well to specify a minimum of 150° F. since state laws and Classification Societies generally require this minimum. The Pour Point of the fuel should be at least 15° F. below the lowest temperature to which the fuel storage tank is subjected.

3. LUBRICATING OIL

We recommend that a good grade of pure mineral oil be used in these engines. The oil should be stable under the temperature conditions encountered in the engine and should be resistant to oxidation and sludging. In general, regarding quality of lubricating oil we refer you to a Lubrication Instruction Book which will be sent to any customer or operator requesting it. This book contains some good pointers on the selection and care of lubricating oils.

It is not necessary to use compounded oils, i.e., oils containing additives, inhibitors, anti-oxidants, carbon removers, etc. in Atlas Engines. There are, however, many good compounded oils on the market and these may be used providing extreme caution is exercised and the action of the oil in the engine is observed closely.

When a pure or "straight" mineral oil is used some carbon or other deposits will generally be found in the crankcase and sump tank. The amount of these deposits depend greatly on the quality of the oil which has been used and for good grades of oil the deposits are not excessive and in any way harmful to the engine. The chemicals contained in the compounded oils enable these oils to carry the carbon and other constituents of the usual crankcase deposits in suspension. The compounded oils also have a strong tendency to break loose and carry away any existing crankcase deposits and since there is a limit to the amount that can be carried in suspension clogging of filters and oil lines may result. It is consequently of utmost importance to thoroughly clean out the crankcase, oil lines and sump tank before changing from a straight mineral oil to a compounded oil. As an added precaution we suggest that the first batch of compounded oil be used only for about 25 hours and then drained off. These precautions apply also when changing from one compounded oil to another compounded oil of different make or brand.

If a compounded oil is used the non-corrosiveness of this oil must be looked into very carefully. In this connection the Engineering Dept. of the Atlas Imperial Diesel Engine Co. is available for consultation and they will be glad to advise whether or not an oil is suitable for use in this engine.

With regard to viscosity grade our recommendations are that the viscosity at 130° F. be between 235 and 270 Secs. Saybolt Universal. This corresponds to an S.A.E. viscosity rating of 30 to 40. In other words, the oil to be used should be a heavy S.A.E. 30 or a light S.A.E. 40 oil.

In regard to drainage periods we suggest that the first batch of oil be drained after 100 hours of service. Thereafter the suggested drainage period is 200 to 250 hours. This period may be lengthened somewhat on engines which are equipped with waste packed filters. In that case if the filter cartridge is changed before the oil is badly discolored and loaded up with insolubles or foreign particles, drainage periods of 400 to 600 hours can be used. In the cases where no waste packed filters are used the oil will of course not be "worn out" after 200 hours of service if it is of a good grade. It will, however, be dirty and will contain insolubles which should be removed from the lubricating oil before it is re-used.

The same lubricating oil as used in the crankcase of the engine is also suitable for use in the mechanical lubricator. In the case of the mechanical lubricator, however, it is highly desirable that new oil be used.

INSTALLATION INSTRUCTIONS

GENERATING UNITS

1. The success of an engine installation depends greatly upon the construction of the foundation and upon the care exercised in lining up the engine to the connected generator. Poor installations will result in excessive vibration and continual change in alignment. The result is poor performance and failure of vital parts. For this reason Atlas Imperial Diesel Engine Co. cannot guarantee an engine unless the instructions in regard to alignment given in the following have been followed.

   For generating sets on board ship, in cranes and dredges, etc. two different arrangements are in common use. These two arrangements require different treatment as far as alignment between the engine and generator is concerned and will therefore be treated separately in the following. In one case, the foundation for the engine and generator is built into the hull or crane structure and virtually forms a part of this structure. In the second case, a separate steel sub-base is used upon which the engine and generator is mounted. This sub-base in turn is fastened to the hull structure. A separate structural steel sub-base under the engine and generator must always be used for marine installations in wooden hulls.

   In the case where a separate steel sub-base is used, it is possible to finish the top of this sub-base so that the engine and the generator rests on finished surfaces which are then located properly with respect to each other. This is not possible when the engine bed forms a part of the hull or crane structure. In that case, the engine and generator supporting surfaces are only approximately plain surfaces and their location relative to each other is only approximately correct.

2. INSTALLING THE ENGINE AND GENERATOR ON A STEEL STRUCTURE INTEGRAL WITH THE HULL OR CRANE

   When preparing the engine and generator foundation, always obtain certified outline prints. Do not use figures or cuts in bulletins or sales literature.

   (a) Preparing the Engine Bed

   The top faces upon which the engine and generator will rest should as nearly as possible be straight planes and in the case of marine installations they should be level for the average ship trim. In a horizontal plane, the surfaces supporting the engine and those supporting the generator should be located so that the center line of the engine crankshaft and the center line of the generator shaft will line up. Athwartships the top surfaces supporting the engine and the top surfaces supporting the generator should be level. The foundation should be constructed so as to allow $\frac{1}{2}$" to 1" thick shims or chocks between the engine and the supporting top faces. In the case of the supports for the generator stator and the generator pedestal bearing about $\frac{1}{4}$" to $\frac{1}{2}$" should also be allowed for shimming.

   The importance of rigidity in the engine and generator foundation can not be over-emphasized and it must be securely fastened to the hull or other structure so as to be virtually a part of this structure. Stiffeners should be fitted to prevent the foundation from twisting and weaving. The main foundation beams should be stiffly connected and braced to each other and to the hull or crane structure. Foundations should be welded or riveted and the use of bolts or screws, which may work loose, should be avoided.

   (b) Installing the Engine

   In the case of marine installations, it is advisable to install the engine and generator and line them up relative to eabh other after launching. If the installation is done before launching, the engine and generator should be fastened to their foundations temporarily and the alignment should be checked up after the vessel is afloat. This particularly applies to smaller vessels.

   The engine should be lowered onto its foundation and allowed to rest on the leveling screws. Shift the engine sideways and level it up until the crankshaft center line is located in the proper position. The vertical adjustment may be accomplished by means of the leveling screws and in the final position there should be about $\frac{1}{2}$" to 1" between the top of the foundation and the engine base supporting ledges. Next lower the generator stator, rotor and shaft and the pedestal bearing in place to ascertain that the foundation will allow line up with the engine as it is placed. These items may be left in place but should not be connected to the engine crankshaft or flywheel until later.

When it has been ascertained that line up of the engine and generator can be accomplished, shims or chocks under the engine base should be fitted. A chock should be carefully fitted under each foundation bolt with the engine resting on its leveling screws. The shims or chocks should be approximately the same width as the engine supporting ledges and should be about 4" to 6" long. The chocks under foundation bolts adjacent to dowels should be wide enough to extend beyond the dowel holes. Slots should be provided for the foundation bolts which should next be inserted. Then loosen up the leveling screws and tighten up the foundation bolts so that the engine is held firmly to the chocks and foundation.

It is now necessary to check that the foundation is supporting the engine evenly over the entire length. The easiest way to do this is to check up the alignment of the crankshaft. It will then be necessary to remove all the crankcase doors and apply a gap or strain gage as shown in Fig. C-1. As shown in this figure, two light punch marks should be placed directly opposite each other on each crank throw. A #696 Starrett Strain Gage or equivalent should be used and the distance between the inside faces of the crank webbs with the cranks on upper and lower centers should be checked. Readings for any one crank should not differ more than .002".

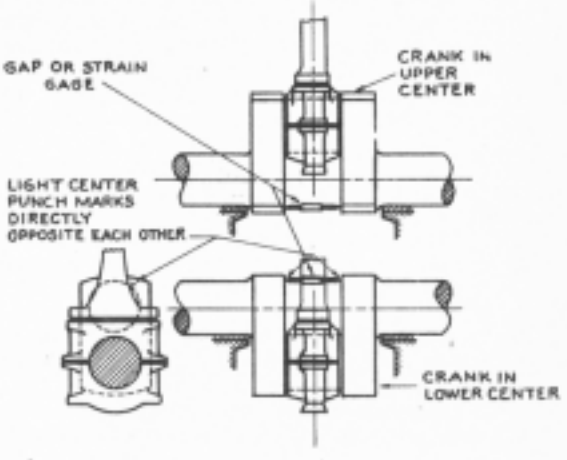


FIG. C-1

It is highly desirable that the flywheel be removed before the strain gage readings are taken. This is particularly desirable if the flywheel is unusually heavy. If the flywheel is left on the shaft, a somewhat larger difference than .002" may be expected on the adjacent crank. However, if the strain gage readings on all other cranks are within the value given, it may be assumed that the foundation is supporting the base properly.

Note that during this checking operation, the engine should be firmly bolted down on its foundation and the crank shaft main bearing caps should be left in place. It is not necessary to remove the bearing caps and jack the crankshaft against the lower bearings as is done when main bearing wear is checked by means of a strain gage. The cylinder compression release valves should be open so that there is no cylinder compression at hand when making this check. If the strain gage readings show that uneven support is at hand, correction should be made and the test repeated before proceeding any further.

(c) Lining up the Generator

If the flywheel was removed during the preceding operation, it should now be mounted and the generator shaft and outboard bearing can then be lined up. Usually the generator shaft is provided with a flange or a flanged coupling for bolting to the engine flywheel, and in some cases, it will be found convenient not to mount the generator stator until the generator shaft and outboard bearing have been lined up. This will facilitate the reaming of the dowel holes between the generator shaft flange and the flywheel. In order to understand the lining up procedures dealt with in the following, Figures C-2a to C-2f should be studied. In these figures the elastic deflections which are at hand are shown in a greatly exaggerated scale. The flywheel is located adjacent to the first crank and the generator rotor between the flywheel and the outboard bearing. The engine crankshaft center line is in each case designated by line C-C.

Fig. C-2a illustrates the condition that would be at hand if there were no elastic deflections in the engine crankshaft and the generator shaft. In that case the center of the outboard bearing should be located in line with the crank shaft center line. However, deflections and deformations take place in all cases due to the fact that the shafts are elastic and support the flywheel and generator rotor weights. Fig. C-2b and Fig. C-2c shows the deflections which would be at hand with the crank adjacent to the flywheel in the upper and the lower positions and the outboard bearing in line with the crankshaft

center. In that case strain gage readings on the last crank would show a greater value with the crank in the lower position (dimension X) than with the crank in the upper position (dimension Y). Actually the elastic deformations are usually carried over to the second crank but the deflections in this crank compared to those in the crank adjacent to the flywheel are usually small and in the figures deflections in the second crank are not shown.

Fig. C-2d illustrates that the lining up the generator shaft to the engine crankshaft by means of feelers between the flywheel and generator shaft coupling faces only locates the outboard bearing in an approximately correct position in the vertical plane. Fig. C-2f illustrates correct alignment of the generator shaft and outboard bearing. In this case, the strain gage readings with the crank on top center and with the crank at bottom center would be the same. It should be noted that the deflections in the figures are exaggerated and that it is usually not necessary to tilt the outboard bearing as shown in Fig. C-2f.

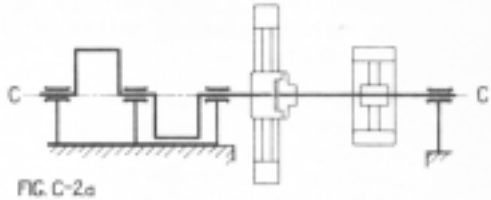


FIG. C-2a

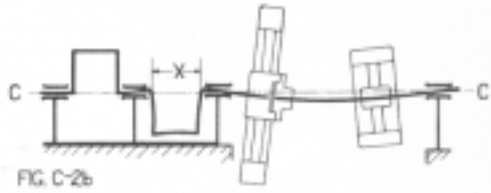


FIG. C-2b

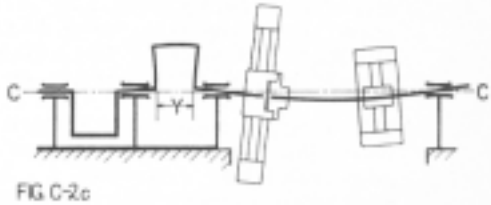


FIG. C-2c

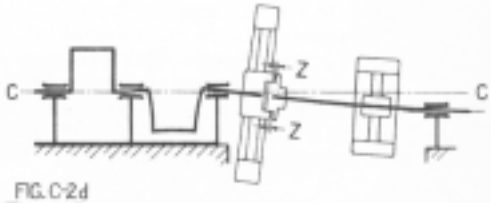


FIG. C-2d

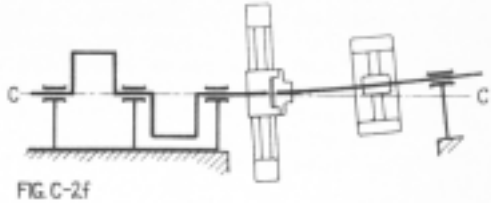


FIG. C-2f

The first rough line up of the generator shaft is as follows: Enter the generator flange or coupling spigot into the corresponding flywheel bore until there is only a few thousands between the flywheel and generator flange faces. Using feelers, shift the outboard bearing sideways and up and down until the distance between the flywheel and flange faces (dimension Z on Fig. C-2d) is equal in four planes. In other words, it should be just possible to insert, for instance, a 0.005" feeler between the outside of the generator flange and flywheel faces at top and bottom and midway at the two sides.

This procedure will give the correct sideways location for the outboard bearing but will not locate it correctly in the vertical plane as can be seen by referring to Fig. C-2d. In order to obtain the final vertical position of the outboard bearing, it is necessary to again use the strain gage on the crank adjacent to the flywheel. But before this is done, the generator shaft flange must be firmly bolted to the flywheel. Strain gage readings on the last crank will then usually show a greater value with the crank down than with the crank in the upper position and in order to eliminate this difference, it will be found necessary to raise the outboard bearing so as to obtain the condition shown in Fig. C-2f.

Strain gage readings should also be taken for the two horizontal positions of the crank to check the sideways location of the outboard bearing. The alignment can be considered satisfactory when all strain gage readings are within .002" but under no circumstances should there by any greater difference.

When the final alignment has been accomplished, the dowels should be fitted. The engine is provided with at least four dowel holes usually located close to foundation bolt holes. The chocks for the corresponding foundation bolt holes should be extended under the dowel holes. The dowel holes should be used as guides for drilling holes through the chocks and the foundation and all holes should then be line reamed for the dowels. It is essential that the dowels have a good drive fit both in the engine base and in the foundation. Although it is not necessary to do so, the holes for the hold down bolts can be reamed in the engine and the foundation and fitted bolts used. In that case, it is of course unnecessary to provide for dowels. Usually there is provision on the generator pedestal bearing and stator frame for dowels. However, if this is not the case, the holes for the hold down bolts must be reamed and fitted bolts

used Spaces between the chocks under the engine supporting ledges may be filled with type metal to insure a substantial support under the engine base.

3. INSTALLING THE ENGINE AND GENERATOR PROVIDED WITH STRUCTURAL STEEL SUB-BASE

Generating sets mounted on structural steel sub-bases have been carefully lined up at the factory and, when tested there, strain gage readings were taken to check the alignment. In other words, when the unit was tested at the factory, the engine crankshaft was free of misalignment strains; the alignment corresponding to that shown on Fig. C-2f.

The sub-base is a rigid structure and if installed correctly it will hold the engine and generator in alignment. It should be recognized however that the sub-base is nevertheless an elastic structure and as such is subject to deflections due to supported weights and also due to forces set up by tightening up on the foundation bolts. The resultant deflections are small but are nevertheless of importance from the standpoint of proper alignment. It is not practical from a weight and space standpoint to make the sub-base so stiff that it can not be deformed for instance, by supporting it only at the extreme ends or so stiff that it will resist pulling down on an uneven foundation by means of the foundation bolts.

(a) Installing the Generating Unit

It is consequently necessary to carefully shim under the sub-base after it has been lowered onto its foundation and a shim should be fitted under each foundation bolt where the sub-base does not rest on the foundation. It is not necessary however to allow for any specified thickness of shims. The base can be supported on the high points of the foundation and shims fitted between the sub-base and foundation only where necessary.

Lower the entire unit onto the foundation then ascertain if shimming is necessary under each foundation bolt in the following manner. Use a dial indicator and arrange it so that it is supported by the foundation structure (not the sub-base). Let the indicating arm of the instrument press down lightly on the top face of the sub-base directly above the foundation bolt which is being tried. Set the indicator dial to zero and tighten up the foundation bolt nut firmly. After tightening up, the indicator reading should still be zero. If this is not the case, it will be necessary to insert shims under the foundation bolt between the sub-base and the foundation. These shims should be slotted or provided with holes for the foundation bolt. Then tighten up the foundation bolt again and if the indicator reading is not zero, it will be necessary to again change the shimming until the indicator reads zero both before and after tightening up of the foundation bolts. Repeat this procedure for each and every foundation bolt. Then tighten up all the foundation bolts firmly.

The sub-base is now clamped firmly to the foundation and is deflected into the same shape it assumed when it was originally lowered onto the foundation and resting on the high points only. This may or may not be the right shape for perfect alignment and it is now necessary to check the alignment of the engine and the generator. The engine and the sub-base form an exceedingly stiff beam and therefore there is no danger that the engine itself has been pulled out of shape, but there is a possibility that misalignment may exist between the engine and the generator.

(b) Checking the Alignment of Engine and Generator

In order to check the alignment between the engine and the generator, it is necessary to remove the crankcase doors adjacent to the flywheel and check the final alignment by means of a strain gage as described in Paragraph 2c. By referring to Figures C-2a through C-2f, it can then readily be determined whether or not the generator end of the sub-base should be raised or lowered.

Considering the crank adjacent to the flywheel, if the strain gage reading with the crank down is greater than with the crank up, the generator outboard bearing should be raised up relative to the engine. In order to accomplish this, it is not necessary to break loose the generator and outboard bearing from the sub-base. Any misalignment which may exist can be corrected by adding shims under the sub-base. In case it should be necessary to add shims under the generator and outboard bearing end of the sub-base, all foundation bolts on this end should be loosened. Shims should first be added under the foundation bolts on the extreme end. These bolts should then be tightened up and the strain gage readings on the last crank repeated. If the addition of these shims corrected any misalignment situation which may have existed, a progressively lesser number of shims should be added under the foundation bolts as the engine is approached. As these shims are being fitted, an indicator should be used to

ascertain that the sub-base is not pulled out of shape when the foundation bolts are tightened up.

After the vertical alignment has been thoroughly checked, the horizontal alignment between the engine and the generator should be checked by means of strain gage readings on the last crank in the two horizontal positions. It sometimes happens that a sub-base is sprung during shipment or in handling. It is consequently advisable to also check the horizontal alignment between the engine and the generator. If misalignment is found to exist in the horizontal plane, it can not however be corrected by shimming under the sub-base. In that case, it is necessary to break loose the outboard bearing from the sub-base and shift it sideways until the correct alignment has been established.

4. INSTALLING ENGINES CONNECTED TO TWO-BEARING GENERATORS

In this case the engine crankshaft and flywheel must always be connected to the generator shaft by means of a flexible coupling.

If the unit is mounted on a steel structure which is integral with the hull or crane structure, the instructions given in Paragraphs 2 (a) and 2 (b) apply to the preparation of the foundation and installation of the engine. The generator should then be lined up so that the center lines of the generator shaft and the engine crankshaft co-incide. This can usually be accomplished by means of feelers between the two flexible coupling halves. Shift the generator sideways and up and down until the distance between the faces on the two coupling halves is the same at top and bottom and the two sides. At the same time ascertain that the centers of the two coupling halves line up.

After the alignment has been accomplished it should be checked by means of strain gage readings on the crank adjacent to the flywheel. In this case the flywheel weight is supported by the crankshaft and it can consequently be expected that the strain gage reading with the crank down will be more than with the crank up. The difference should however not exceed .003".

If a structural steel sub-base is used under a generating unit consisting of an engine and a two-bearing generator, the unit should be installed in accordance with Paragraph 3(a). The final alignment should be checked in accordance with Paragraph 3(b). If the sub-base has not been sprung in shipment or handling and has been installed in accordance with the instructions in Paragraph 3(a), the alignment should be satisfactory and there should be no occasion for changing the shimming under the sub-base.

5. SERVICE PIPING

Plan all piping carefully and use as short and direct lines as possible. To improve the general appearance of the installation, piping should be laid below the engine room floor when it is possible to do so. Removable floor plates should be provided and care should be taken that all piping is accessible.

6. FUEL AND LUBRICATING OIL PIPING

See Section N for pipe sizes and arrangement of the fuel day tank. See Section T for lubricating oil day tank connections. Pipe sizes are stated in these Sections. Provide drain valves and vent valves where necessary and remove all scale and dirt from pipes and fittings before installing.

7. COOLING WATER PIPING (Marine Installations)

Locate the sea chest far enough below the water line to prevent uncovering when the vessel rolls. It should be provided with a coarse grating. Inside the hull a strainer of ample size should be provided with gate valves on each side so that it can be isolated for cleaning. For engines equipped with centrifugal circulating water pumps it is particularly important that the resistance in the sea chest, strainer and piping be as small as possible. Use as few bends as possible and do not make either suction or discharge piping longer than necessary. Locate the overboard discharge not more than 3' above the water line. All valves should be gate valves - not globe valves. Use pipe sizes called for on the outline drawing.

8. STARTING AIR PIPING

Air tanks should conform to A.S.M.E. specifications and should have ample strength for 250 lbs. per square inch pressure. Each tank should be equipped with a safety valve and a globe valve for isolation. A drain valve should also be provided at the lowest point and this valve should be accessible.

Tanks should be connected to the engine starting air header using the pipe size called for on the outline drawing. Provide a globe valve next to the engine. All valves and fittings should be of heavy pattern for at least 250 lbs. per sq. inch pressure. If the engine is equipped with an air compressor it should be connected to the tanks with pipe of the size called for on the outline drawing and valves and fittings of heavy pattern. The air compressor discharge pipe should preferably be run to the air tank. It should not be connected to the piping between the tank and the starting air header. The air compressor unloader should preferably be connected to the tank with its own piping or tubing. Under no circumstances should it be connected to the compressor discharge line.

9. EXHAUST SYSTEM

All exhaust piping should be installed in the shortest and most direct manner possible. When bends are necessary use long sweep fittings. Use the pipe size called for on the outline drawing for lengths up to 20' containing a maximum of three bends. For 3 to 6 bends increase the pipe to the next nominal size and for each additional 30' length increase by one pipe size.

In order to protect the engine and piping from undue strains a length of flexible metal tubing should be installed as near to the engine as possible. It is also recommended that flanged connections be used for ease of dismantling and cleaning. For multiple installations it is necessary that separate exhaust lines be used. A.I.D.E. Co. will not approve of installations where the exhaust pipes for two or more engines are combined before reaching the atmosphere.

OPERATING INSTRUCTIONS

Before the operator attempts to run the engine, he should carefully study the chapters dealing with the mechanical details, especially the governor and fuel injection system. After familiarizing himself with the principles involved, the operator will understand the significance of the various movements of the control levers and will be able to handle the engine intelligently.

1. AIR STARTING SYSTEM - STARTING AIR LEVER

The starting air valves, located in the cylinder heads, are mechanically operated and are actuated from the camshaft by means of lifters or followers, push rods and rockers (see Section H). Wedges are interposed between the lifters and push rods and normally, before the engine is started and when it is running, the small ends of the wedges are located between the push rods and lifters allowing the latter to be lifted out of engagement of the cams by means of springs. The starting air wedges are pinned to levers which in turn are mounted on and operated by the starting air wedge shaft. This shaft is located in the push rod compartment of the cylinder block, approximately level with the fuel wedge shaft, on the inside. The starting air wedge shaft extends through the cylinder block and is operated by a lever located at the governor end. With the starting air shut-off valve closed the action of the wedges can be felt as the starting air lever is raised. Raising this lever moves the wedge shaft and wedges so that the big end of the wedges will be between the push rods and lifters, thus putting the latter in engagement with the starting air cams.

2. SPEED CONTROL

It is advisable to start the engine at a fairly slow speed and the operator should study Section Q dealing with the governor before attempting to start the engine. If the engine is equipped with a Woodward governor the load limit knob should be set at 4 or 5 before starting. In case the engine is equipped with a standard Atlas governor the speed control handle should be about half way up the quadrant.

3. INITIAL STARTING AND STARTING AFTER PROLONGED SHUTDOWN

(a) A final check should be given all fuel, air, lubricating oil and water lines, giving attention to the location and position of shut-off valves, check valves, etc. It is well to trace each system through making sure that there are no short circuits or blockages.

(b) For the initial starting it is well, although not absolutely necessary, to fill the pressure lines and passages of the lubricating oil system. For this purpose a small hand operated gear pump or piston pump can be used. When the pressure lines are full, a slight pressure will register on the pressure gauge. This procedure will insure lubricating oil pressure immediately upon starting.

(c) Hand oil the engine at all the points listed under "4-HOUR ROUTINE" in the "Maintenance & Inspection" Section. Fill the mechanical lubricator and turn its crank several revolutions.

(d) If the engine has previously been timed by means of fuel pressure or if it has been barred over several turns it is good practice to close the spray valve isolating valves and open the compression release valves and then turn the engine over on air until any excess fuel in the combustion chambers has been blown out.

(e) Check the oil level in engine sump, day tank or sump tank.

(f) If engine is radiator cooled check the water level in radiator.

(g) Bar the engine to place any one of the pistons 20^{0} to 25^{0} after top center. Compression release valves should be open when barring, then closed. (This operation is not necessary on 8 cylinder engines and can as a rule be omitted on 6 cylinder engines also.)

(h) Set governor control for approximately half speed and fuel pressure regulating valve at the third or fourth notch.

(i) Open the two vents on top of the high pressure fuel pump and operate the hand priming pump until fuel flows from both of these points. Then close these vents and pump up the fuel pressure to approximately 1500 lbs. per sq. inch by means of the priming pump handle on the high pressure fuel pump.

(j) Raise the starting air lever to the start position. The engine will then turn

the way to zero in order to stop the engine. If desired, the engine may be stopped without disturbing the governor setting by pulling the link connecting the governor linkage to the wedge shaft in the push rod compartment of the cylinder block. This pulls out the fuel wedges directly, without recourse to the governor action. A collapsible link in the mechanism permits this action without damage to the governor action.

LOWER BASE, CRANKSHAFT AND BEARINGS

1. BASE

The cast iron base is heavily ribbed to support the main bearing saddles and to form a rigid structure upon which the engine is built. A trough extending longitudinally along the bottom serves as a drain for the lubricating oil, and accommodates the lubricating oil manifold, from which oil is piped to the main bearings and to the intermediate gear bearings. The construction of the oil sump in the bottom of the base is varied to suit the requirements of the installation, three different arrangements being in common use.

(a) The wet sump base, which is the most common application. A hopper shaped sump, bolted to the bottom of the base and extending below the mounting foot carries the lubricating oil supply for the engine. The single lubricating oil pump sucks directly from this sump and a bayonet gage in the side of the base indicates the depth of the oil.

(b) Dry base with separate sump. This arrangement is often used for stationary engines, where it is usually possible to locate a separate lubricating oil sump or day tank below the level of the engine. The bottom of the base is flush with the mounting foot of the engine, and the oil return from the bearings is piped from the end of the drain trough in the base to the sump tank.

The suction of the lubricating oil pump is connected to the sump tank and the pump discharges to the lubricating oil cooler and the main bearing manifold in the base.

(c) Dry base with sump pump. This arrangement is used primarily for marine engines, where a dry base engine is desired and it is impossible to locate a sump tank below the level of the engine. Two lubricating oil pumps are provided, the sump pump scavenging the oil from the bottom of the base and discharging into a day tank, and the pressure pump, sucking from the day tank and discharging to the oil cooler and manifold.

2. MAIN BEARINGS AND ADJUSTMENT

The crankshaft turns in babbitt lined steel backed bearing shells, held in place in the base by the main bearing caps. The crankshaft is located longitudinally by babbitt faces on the shells of the center bearing. The thrust clearance is .005" to .009" when new and should not be allowed to exceed .020". On four, five, and six cylinder engines, the same shells are also used on the flywheel end bearing but there are no mating thrust faces on the shaft so that they do not act as a thrust bearing.

Adjustment of the main bearings is by means of shims, and running clearance should set at .0045" to .0055" when the bearings are fitted. Bearing clearances can be accurately measured with two pieces of lead wire of about .025" diameter and one inch long, which are compressed between shell and journal about 1" from each end of the bearing by tightening the cap bolts. The thickness, measured with a micrometer, is the running clearance. Clearances should be checked annually, and should not be allowed to exceed .010". Keep shims even on both sides.

3. MAIN BEARING SHELLS

The bearing shells are prevented from rotating in the base by the shims, and are located fore and aft by a square head dowel pin in the bottom of the bearing saddles which engages a circumferential groove around the outside of the shell. As fitted, the shells project above the base and face of the caps from .002" to .003" on each side, but are squeezed down flush when the capnuts are pulled up. There should not be any appreciable clearance between the base, shim, and cap after final tightening. The bearing shells and caps are all numbered and must always be replaced in the bearing from which they were removed. Never interchange them, either from one bearing to another, or from top to bottom.

4. REMOVAL AND ASSEMBLY OF MAIN BEARINGS

After removing the cotter pins and main bearing nuts, the cap, upper shell and shims may be lifted out. As this operation is performed the positions of the numbers stamped on each of these parts should be noted so that the parts can be reassembled in their proper positions. Unless the bearing is considerably worn it may not be possible to remove the lower shell by hand and it is usually necessary to turn it out of the base by barring the engine over after inserting a capscrew in the oil hole in the journal. The head of the capscrew will contact the edge of the bearing shell and roll the bearing out with the journal.

When assembling the main bearing shells care must be taken to keep all parts absolutely clean. It is of utmost importance that any dirt be prevented from lodging between the shell and the saddle. Extreme care must be exercised in locating the bottom shell in a fore and aft direction before turning it into the base. Misalignment will cause the groove to miss the dowel pin in the base and trouble will then be encountered in backing the shell out again for another try.

5. CRANKSHAFT ALIGNMENT

The crankshaft should be checked at annual overhauls, or at intervals not greater than 7000 service hours, for misalignment due to uneven wear of the bearings. When the engine was erected at the factory the bearings were carefully scraped in, so as to bring the bearing surface of all shells in line. If one of these surfaces, due to uneven wear, becomes lower than the adjacent shells, it is evident that the crankshaft will be bent each time the adjacent cylinders fire and the connecting rods force the journal down against this low bearing. This condition must be guarded against, as neglect or ignorance of it will ultimately result in a broken shaft.

The simplest way to check crankshaft alignment is by means of a bridge gauge, which can be supplied with the engine as extra equipment. If a bridge gauge is desired it must, however, be ordered when the order for the engine is placed. It can not be supplied later.

With the bridge gauge straddling the journal and resting firmly and squarely on the bearing cap seats in the lower base, the distance between the top of the main bearing journal and the machined face on the bridge gauge is measured by means of a feeler gauge. At the time the engine was erected these measurements were taken and were stamped on the bridge gauge. As the age of the engine increases the bearing surfaces will wear, with the result that these measurements will gradually increase. As long as they all increase by the same amount the shaft will still be in line however, and there need be no worry, even though they do not agree with the original readings stamped on the bridge gauge. But if at any time the "wear down", or difference between the current reading and original reading varies by more than .004" between two adjacent bearings, the low shell should be replaced at once and the crankshaft re-aligned, a job that should be undertaken only by an experienced mechanic. A careful record should be kept of all bridge gauge readings taken from time to time.

The bridge gauge measurements described above should be made successively, removing one bearing cap at a time and replacing it before proceeding to the next bearing. When making measurements the crankshaft journal must be forced down against the shell by means of a jack bearing against the centerframe. Protect the shaft journal with a piece of wood or sheet copper. An indication of low bearing shells will usually be given by looseness of the shell in the saddle. If it is possible to

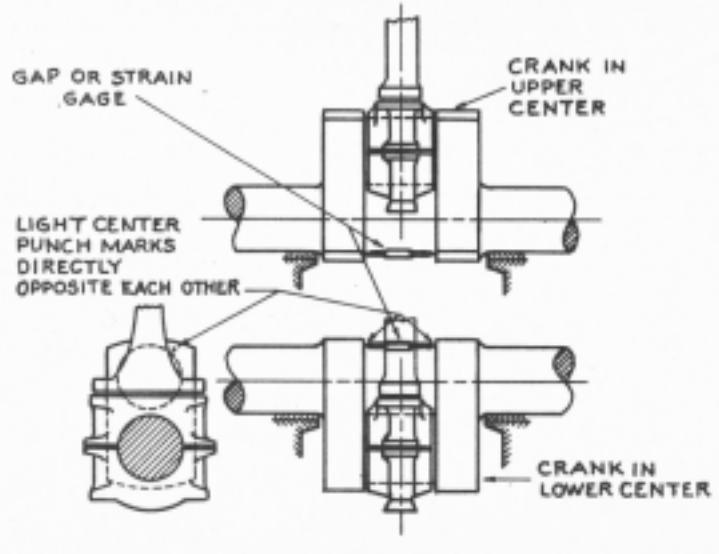


FIG. F-1

freely rotate one of the lower shells by hand when adjacent bearing caps are bolted down, it is quite probable that this shell is unduly worn and it should be checked with the bridge gauge at once.

If a bridge gauge is not available, crankshaft alignment may be checked with a gap or strain gage as follows: Stamp two center punch marks as shown in Fig. F-1 on all cranks. Starting with No. 1 cylinder crank, remove adjacent main bearing caps and locate the crank as near lower center as gap gage will permit. Using jack screws between bearing journal and center frame force shaft against lower bearing half (protect shaft with a piece of wood or sheet copper) and record the gap gauge reading. Then loosen jackscrews and bar over until crank is on upper dead center. Again tighten jack screws and record the gauge reading. Repeat on all other cranks.

Comparison of gauge measurements in upper and lower centers will indicate crankshaft alignment conditions. Normally the measurements for the cranks in top position are slightly larger than measurements for the same cranks in the bottom position. However, the difference in measurement for any one crank should not exceed .0005" per inch of shaft diameter. If this is the case, realignment of the crankshaft bearings is indicated.

6. FLYWHEEL AND OIL SEAL

The flywheel is bolted to the flanged end of the crankshaft, on the timing gear end of eight cylinder engines and on the opposite end on four, five, and six cylinder engines.

In the standard construction, the flywheel is centered on the outside of the crankshaft flange and the driven stub shaft flange is centered by a spigot engaging the flywheel bore. The coupling bolts are studded into the crankshaft flange and extend through the flywheel and stub shaft flange, nuts on the free end clamping the assembly together. These nuts should be tested at semi-annual inspections and should always be kept snug and securely cotter pinned. Dowel pins in reamed holes extend through the three pieces and take the torque drive. The flywheel is secured to the crankshaft during shipment by two flat head screws in countersunk holes.

In some special cases, particularly in generator drives, the crankshaft studs extend through the flywheel only, and the driven shaft is secured to the flywheel by a second set of coupling bolts on a larger diameter bolt circle, studded into the flywheel. The flywheel retaining nuts are recessed into the wheel and are covered by the stub shaft flange.

A labyrinth, formed by an oil thrower pressed on the outside of the crankshaft flange and mating with a split oil guard bolted to the end of the engine base constitutes the oil seal around the crankshaft at the flywheel end of the engine. On standard engines the opposite end of the crankshaft is brought out through the base for any auxiliary drives that may be required. On four, five, and six cylinder engines a key way is provided and the driven pulley is pressed or clamped on the end of the shaft. An oil thrower pressed on the shaft and a felt packed oil guard form the oil seal. On eight cylinder engines the driven pulley is bolted and doweled to the end of the shaft and a standard commercial oil seal is used, pressed into the forward end cover. If the forward drive is not used a cap may be placed over the end of the shaft.

NOTE: The torsional vibration conditions in the engine crankshaft are appreciably affected by the dimensions of drive pulleys mounted on the end of the crankshaft opposite the flywheel. Whenever an engine is equipped at the factory with auxiliary drive pulleys the torsional vibration stresses have been carefully calculated for the particular pulley that is supplied. It is important therefore that no changes in size or dimensions be made on this pulley unless approval has first been obtained from the Engineering Department of Atlas Imperial Diesel Engine Co. It is likewise important that no auxiliary drive pulleys be added to an engine not originally equipped with them unless approval has first been obtained from the Atlas Engineering Department. The Atlas Imperial Diesel Engine Co. will not be responsible for any crankshaft breakages in cases where pulleys have been added or changed without approval.

CENTERFRAME--CYLINDER BLOCK & LINER, CYLINDER HEAD & VALVES

1. CENTERFRAME

The centerframe, which rests on the engine base and supports the cylinder block, carries the camshaft bearings and forms the crank case housing. The tie bolts are studded into the base and extend up through the centerframe and into the cylinder block, where recesses are provided in each side for the nuts. The centerframe is located on the base and the cylinder block on the centerframe by dowels. Crank case sealer is used to make the joints between the three pieces, and if these joints are disturbed the old sealer must be thoroughly scraped off and replaced by new sealer when reassembling. Glyptol Lacquer is recommended for sealer.

2. CYLINDER BLOCK AND CYLINDER LINERS

The individual cylinder liners are mounted in the cylinder block, which forms the water jacket surrounding the liners and supports the cylinder heads. A compartment on the camshaft side of the cylinder block encloses the valve lifters, push rods, starting air manifold and the wedge shafts controlling the fuel and starting air valves.

The cylinder liners are special alloy iron castings, heat treated to relieve stresses and secure correct hardness. They are accurately machined to close tolerances and should be handled carefully and care taken not to damage the fits at top and bottom. Spare liners should always be stored in a vertical position and should be securely fastened down if stored on board ship. The water seal at the bottom of the liner consists of two rubber grommets which should always be replaced with new ones whenever a liner is pulled. When lowering a liner into place, grease the grommets freely with cup grease and use care to enter the grommets into the cylinder fit or they may be pinched and damaged. The liner has from .002" to .005" clearance in the cylinder at both top and bottom fits and no difficulty should be encountered in installing a new liner. A paper gasket .010" thick is used for the upper water seal between the liner and cylinder, and a new gasket should always be used when replacing a liner. The fits and shoulders on both liner and cylinder should be carefully scraped and wiped clean to assure a water tight joint. Care must be taken not to damage these shoulders, as a water leak will result.

Pockets are cut into the bottoms of the liners for connecting rod clearance, and dowels in the tops of the liners engage keyways in the centerframe and assure correct orientation of the liners. Nipples, screwed into the liners and projecting through the side of the cylinder block, feed oil to the pistons from the mechanical lubricator. Packing glands form the water seal at the cylinder block wall.

3. CYLINDER HEAD

The individual cast iron cylinder heads are carefully designed for strength and uniform cooling. The area above the liner is fully water jacketed, and a housing extends out from the camshaft side of the head to mate with the opening in the top of the push rod compartment in the cylinder block. The six cylinder head bolts are studded into the cylinder block, and the head is centered by a spigot which engages a counterbore in the top of the liner. A 1/32" thick copper gasket under the spigot forms the gas seal, and a soft cork gasket around the push rod compartment opening makes an oil tight seal at this point and still allows the head to be pulled down tightly on the copper gasket. Brass bushings screwed into the tops of the cylinder block and extending up into drilled holes in the head carry the cooling water into the head. They are sealed by rubber grommets, which should always be replaced by new ones when a head is pulled. When replacing a head, carefully wipe all dirt from the lower surface and thoroughly clean both sides of the copper gasket, as well as the surfaces of the head and liner which bear against it. Always use care to protect the spigot on the bottom of the head, as nicks and scratches will result in a leaky joint. Place heads on wooden blocks, never on concrete floor or steel deck, and use care that spare heads are not damaged in storage and handling. Covers over the tops of the heads fully enclose the valve rockers and push rods. The covers are split horizontally, the lower half bolted down against a gasket. The top cover is hinged to the lower half and is held in place by wing nuts, making the valve operating gear readily accessible for inspection and oiling.

4. INLET AND EXHAUST VALVES

The one piece forged steel inlet and exhaust valves seat directly in the head and are guided in replaceable cast iron bushings pressed into the head. The exhaust valves are forged of a special heat resistant alloy steel and may be distinguished from the inlet valves by the "EXH" and "INL" stamped on the valve heads. The inlet valves are forged of chrome nickel steel and are not suitable for exhaust valves.

They should never be used interchangeably, except in an emergency, and then for a short period only.

Two concentric valve springs are used on each valve. They are centered by the valve guide and are held in place by a retainer which is secured to the valve stem by means of a split taper collar. Depressing the retainer against the spring permits removal of the collar and disassembly of valve and springs.

If valve faces are badly pitted they should be refaced on a lathe, as excessive grinding to remove pits will wear down the seats in the heads unnecessarily and will also cut a groove in the valve face. Badly pitted seats should also be refaced with a seat reamer before grinding, taking particular care to keep the seat concentric and square with the bore of the guide. Always finish the grinding with fine compound. Use extreme care that no grinding compound is introduced into the guide, and thoroughly remove all traces of compound when reassembling, and lubricate the valve stems with clean engine oil. The valve guides should be replaced if excessively worn, and new guides must be reamed to .6250" - .6255" diameter after pressing in. The inlet and exhaust valve stems should be oiled every four to eight hours while the engine is in operation. See detailed instructions in Section Z.

5. STARTING AIR VALVE

The starting air valve is seated directly in the head and is guided by a bushing which works in the head and to which the valve stem is clamped. Two piston rings form the air seal between the bushing and the head. The bushing is secured to the valve by a nut on the end of the stem. It rests against a shoulder on the valve stem, and a piece of steel tubing slipped over the stem serves as a spacer between the top of the bushing and the spring retaining washer, against which the nut bears, and also acts as a guide for the spring. The lower end of the valve spring bears against a washer which rests on the cylinder head. The valve operating gear is described in Section L. The instructions in Paragraph 4 regarding grinding the inlet and exhaust valves apply also to the starting air valves. Leaky starting valves may be detected by excessive heating of the starting air manifold connection leading to the valves.

6. COMPRESSION RELEASE OR SNIFTER VALVES

The compression release or snifter valves are located at the bottom of the cylinder heads, on the camshaft side. They permit release of the cylinder pressure when barring over the engine and are also used as shut off valves when indicating or taking compression pressures.

The hole tapped in the cylinder head for the snifter valve is located at the inner side of the push rod compartment and the body of the valve extends across this compartment and projects out through the outer cylinder head wall. The valve seat is at the inner end of the body, and the long needle valve stem is threaded to the body at its outer end.

7. SAFETY VALVES

The safety valves are located on the manifold side of the cylinder heads, in tees screwed into tapped holes communicating with the cylinder combustion chambers. They are spring loaded relief valves, and serve to relieve excessive cylinder pressures, acting as telltales to indicate that the pressures are too high. The popping of these valves is a definite indication that something is wrong and should be investigated at once.

The valves are adjustable by tightening the spring retaining cover, and should be set to relieve at 800 lbs. per square inch. A setscrew locks the collar to retain the setting. They should be tried out occasionally by prying up the lower spring washer with a screw driver, to assure that they are in operating condition.

PISTON AND CONNECTING ROD

1. PISTON

The pistons which are of the one-piece, solid-skirt type are made of high grade cast iron and are heat treated to relieve stresses and to obtain proper hardness. The piston is ground straight, that is without taper, from the bottom up to the ring belt. The clearance in the liner is .009" to .011". The head of the piston being exposed to high temperatures is given a larger clearance, approximately .0055" to .006" per inch of bore diameter.

2. PISTON PIN

The case hardened and ground piston pin is stepped, with differential fits in the piston pin bosses. The fits are about .0005" to .0015" press on the large end and metal to metal to .001" loose on the small end. Rotation of the pin in the piston is prevented by the engagement of a dowel which projects radially from the large end of the pin with a groove in the bottom of the boss. A setscrew threaded into the larger pin boss enters an indentation in the pin to act as a retainer. The setscrew is in turn secured by a locknut.

3. PISTON RINGS

There are 6 rings per piston, an oil ring above and below the piston pin and four compression rings. Always assemble the oil rings with the bevel up, to slide over the oil film on the upstroke and scrape it down on the return. When overhauling pistons, thoroughly clean all carbon from rings and grooves and top of piston. Fuel deposit on the piston skirt can best be dissolved with cleaning solvent or paint remover. Be sure oil drain holes below oil rings are open.

Check rings for side clearance in grooves and end clearance, as measured in place in the liner. Side clearance should be .003" to .005" with new pistons and rings and end or gap clearance .005" per inch of bore diameter for the two top rings. For the other rings the gap clearance should be .003" per inch of bore diameter.

Rings should be discarded when the side clearance exceeds .008" and the end clearance .007" to .008" per inch of bore diameter. It is also a good policy to discard any rings which have been stuck for any length of time as they are apt to be out of round and may not hold compression. Always check new rings, measuring the side clearance, in the groove in which the ring is to run, with feeler gauge, and the end clearance with the ring in the liner at the smallest diameter. Never install rings with less clearance than that given above. As the oil rings wear the width of the flat increases, with consequent decrease in width of bevel and oil scraping ability. Experience will determine permissible wear without excessive oil pumping.

4. CONNECTING ROD

The connecting rods are steel drop forgings, rifle drilled to carry oil to the piston pins. Shims between foot of rod and crankpin box provide adjustment to balance compression pressures in the cylinders to the desired value. The distance "X" (see Fig. K-1), between the top of the piston and the top of the liner should be 7/16". When taking measurement "X" the piston should be at top dead center and the cylinder liner must be securely clamped down into the cylinder. The cylinder stud nuts must also be tight when making this adjustment. The above connecting rod adjustment should be used for altitudes from sea-level to 1500' and will then produce compression pressures of 400 to 410 pounds per square inch. If the engine is located at higher altitudes than 1500 feet above sea-level dimension "X" should be smaller and in accordance with the following tabulation:

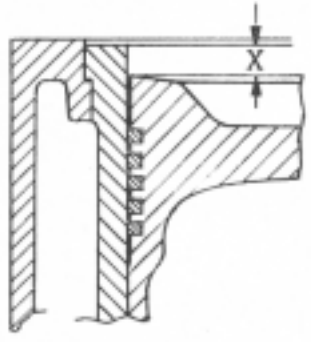


FIG. K-1

Altitude Ft. Above Sea Level	Dimension "X" Inches
2000	.384
4000	.341
6000	.290
8000	.245
10000	.202

A bronze bushing for the piston pin is pressed in the upper end of the rod. If this bushing is replaced it must be reamed to allow a piston pin clearance of .0015" to .0025". Care must be taken to keep the reamed hole exactly parallel with the foot of the rod. The oil grooving in the bushing is carefully designed for correct lu-

brication, and new bushings must be inserted in rod with the oil holes vertical. A ball check valve at the bottom of the rod prevents return of the column of oil in the rod on the upstroke. Examine these valves at annual overhauls. The ball lift should not exceed 3/32".

5. CONNECTING ROD BEARINGS

The crankpin boxes are steel castings with babbitt lining centrifugally cast and accurately bored. No attempt should be made to rebabbitt these boxes in the field. New boxes may be obtained from A.I.D.E. Co. and a credit allowance will be made for old boxes returned. Bearing adjustment is by means of shims between halves of bearing. Bearing clearances when adjusted should be .0008" to .0009" per inch of bearing diameter.

Clearances are best measured with a lead wire compressed between bearing and journal, as described in Section F. Keep the shim thickness equal on the two sides. Inspect the bearing surfaces for even bearing. Areas which are not bearing on the shaft will be discolored, and such bearings as well as new ones should be carefully scraped to secure even bearing over at least 3/4 of the entire area. End clearance is .005" to .012" and should not be allowed to exceed .025".

6. CONNECTING ROD BOLTS

The connecting rod bolts, fitting in reamed holes, hold the two halves of the crankpin boxes together and to the foot of the rod. The nuts should be kept pulled up tightly but not overstressed. They should not be sledged but should be pulled up by hand with a pipe not over three feet long on the wrench. It is good practice to keep a record of the length of connecting rod bolts, measured with a micrometer at annual overhauls and to discard bolts that show more than .010" increase in length. It is further recommended that all connecting rod bolts be replaced every two years, assuming the engine to have had continuous service during that time, say 8000 hours or more. It is nearly always old bolts that have been in service for some time and have been overstressed by pulling up the nuts too tightly that fail. Replacing bolts as suggested above is cheap insurance against the possibility of wrecking an engine through connecting rod bolt failure. Replace cotter pins carefully, always using new cotter pins. Be sure that they are a close fit in the hole and bend the ends back tightly against the sides of the nut. If this work is left to inexperienced mechanics it should be very carefully inspected at the completion of the job. Always replace rods, bearings and pistons in the cylinders from which they were removed. All parts are numbered.

CAMSHAFT AND VALVE OPERATING GEAR

1. CAMSHAFT

The camshaft is made of 2" ground steel shafting. The keyways in the shaft are indexed for the firing sequence stamped on the engine nameplate. Number 1 cylinder is located at the governor end of the engine.

2. CAMSHAFT BEARINGS

The camshaft bearings are accurately machined cast iron blocks with pressed in bronze bushings. Bearing bore in bushing is reamed to 2.004" - 2.005" diameter, which allows a running clearance of .004" to .006". If replaced the bushings must be reamed, and oil and mounting holes drilled through after pressing in. A groove must be chipped to communicate with the oil hole if it does not intersect the groove in the bushing. The bearing blocks are held in machined seats cut in the webs of the centerframe and are secured by capscrews.

The camshaft thrust is carried by the bearing adjacent to the drive gear, the hub of the drive gear and the end of the first cam engaging the ends of the bearing. Various combinations of thrust washers are used on different engines, and must always be replaced when assembling the shaft exactly as removed. The first cam should be located on the shaft to allow .015" to .020" thrust clearance. The thrust bearing is oiled by a line from the sight feed lubricator and the bearing at the other end of the shaft by an oil cup, which should be filled daily. The remaining camshaft bearings are lubricated by spray from the connecting rod boxes. Catch basins in the tops of the bearings collect the oil.

3. CAMS

The cams are accurately ground to shape after being case hardened. The fuel valve cam consists of a case hardened steel disc in which a case hardened steel toe is inserted. This toe controls the action of the spray valve, the disc serving as a base circle. The cams are a sliding or light tap fit on the camshaft and are held in position by taper keys driven securely into place after the cams have been located to line up with the lifter rollers. The exhaust cams serve as hubs to which the fuel cam discs are bolted, while the inlet and starting air cams are machined on opposite ends of common hubs. Progressing from the governor end of the engine, the cam sequence is inlet, air starting, fuel and exhaust on right hand engines and exhaust, fuel, air starting and inlet on left hand engines. The fuel cams are located on the cylinder center lines.

4. CAMSHAFT REMOVAL

In order to remove the camshaft from the engine it is necessary to remove the centerframe covers, including the governor and lubricating oil pump assemblies, and also the gear casing. Before removing the latter the camshaft gear should be pulled from its hub and the intermediate gear and high pressure fuel pump removed. The push rods should be removed and the lifters raised and clamped or blocked up clear of the shaft. Hose clamps may be used to advantage. Remove the camshaft retaining bolts, and the shaft may then be driven out. Sledge each bearing out of its seat a little at a time, using a timber inserted through the door openings in the opposite side of the centerframe. The end of the timber should be placed as close to the bearing as possible. The fits of the bearings in their seats can be relieved somewhat by loosening the cylinder block nuts on the camshaft side.

5. CAMSHAFT DISASSEMBLY

After the camshaft has been removed from the engine it should be carefully measured up and an accurate sketch made for use when reassembling. Note the exact position of each cam, the lubricating oil pump gear, thrust washers, etc. Note the numbers stamped on the bearings and be sure that they are replaced in the same positions. If the original bearings are replaced, holes for the centerframe door retaining bolts must be drilled and tapped in the new bearings to match the holes in the doors. Use a 27/64" drill, 1" deep, and a 1/2"-13 tap.

The cams are loosened by driving against the small end of the taper keys with a drift. FOR RIGHT HAND ENGINES THE KEYS ARE LOOSENED BY DRIVING AWAY FROM THE DRIVE GEAR END OF THE SHAFT, AND FOR LEFT HAND ENGINES BY DRIVING TOWARD THE DRIVE GEAR END. The engines are designated right or left hand according as to whether the control side of the engine is on the right or left of an observer facing the timing gear end of the engine. The lubricating oil pump gear located near the center of the shaft, adjacent to one of the exhaust cams, is also secured by a taper key. The slope of this key is opposite to that of the cam keys so that the large ends of

the keys in the gear and the exhaust cam butt against each other and it is impossible to drive either key out. The gear may be loosened, however, by driving it away from the cam, using a brass bar or babbitt hammer.

The cams should slide on the shaft freely after the keys have been removed, but if it should be necessary to drive them off, only a babbitt hammer or brass drift should be used. Any burrs, particularly at keyways, must be dressed down with a file. If this precaution is not taken the cams may seize as they are removed and forcing the cams the remainder of the distance will score the shaft. The drive gear hub is shrunk on the shaft and secured by a taper key, driven in from the free end. There should not be any occasion for removing this flange, as it is not subject to wear, and if the camshaft is replaced a new flange will be furnished with the new shaft.

6. CAMSHAFT ASSEMBLY & INSTALLATION

When the camshaft is being reassembled the same precautions with regard to burrs apply. Coating the bores of the cams with white lead will aid materially in sliding the cams into place without scratching the shaft. The bores of either new or old cams should be inspected carefully for any defects likely to scratch the shaft. Bearings and cams are installed successively from the gear end. The bearings are located on the shaft in accordance with the sketch made prior to disassembly, and are locked in place by driving in the taper keys. FOR RIGHT HAND ENGINES DRIVE EACH KEY TOWARD DRIVE GEAR END OF THE SHAFT. (LARGE ENDS OF KEYS SHOULD POINT AWAY FROM GEAR END.) FOR LEFT HAND ENGINES DRIVE EACH KEY AWAY FROM THE GEAR END (LARGE ENDS OF KEYS SHOULD POINT TOWARD GEAR END.) Note that the slope of the key for the lubricating oil pump drive gear is opposite to that of the cams, as explained in Paragraph 5. The parts can be assembled by driving the gear home against its key. The assembled camshaft is then installed in the engine. After starting each cam bearing in its seat the bearings are driven into place a little at a time with a heavy brass bar. Each bearing should be driven a little and then left until all the others have been knocked in the same amount so that the camshaft will not be bent. The cam bearings will seat more easily if the cylinder block nuts are loose. The gear casing and the intermediate gear should next be assembled and the engine timed in accordance with the detailed instructions given in Paragraphs 11 and 12 after which the governor, lubricating oil pump and high pressure fuel pump assemblies may be replaced on the engine.

7. VALVE LIFTERS

The steel valve lifters work in cast iron guides bolted to the top of the centerframe and carry case hardened rollers on steel pins on their lower ends. Clearance between lifters and guides is .0015" to .0025", between rollers and pins is .001" to .002", and the pins are riveted into the lifter forks, with the ends flush, so that they may enter the guide bores.

Wedges, linked to control shafts extending along each side of the lifters and mounted on brackets bolted to the centerframe, are interposed between the fuel and air starting lifters and their push rods, and provide means of control of the fuel and air starting valves. The operation of the fuel valve mechanism is fully described in Section O under FUEL SYSTEM. The starting air valve wedges are withdrawn when the engine is running. This has the effect of shortening the push rods, and springs under the lifters hold the push rods and lifters up, with the rollers clear of the cams. When the engine is to be started the wedge shaft is rotated by means of a hand lever on one end, pulling the wedges in between the lifters and push rods. The lifters are forced down against the cams, which then operate the starting air valves, admitting air to the cylinders in the proper sequence for starting the engine.

8. PUSH RODS

The push rods for the fuel rockers are fabricated from seamless steel tubing, while those for the inlet, exhaust and air starting rockers are solid rods. Steel ends are welded to the tubing forming fuel rods, the lower end rounded to fit into the lifter guide and the upper end forming a socket to receive the adjusting screw in the fuel valve rocker. Sockets are screwed onto the upper ends of the inlet and exhaust and air starting push rods and receive ball studs which are pressed into the rockers. Push rod adjustment is made by screwing the sockets up or down on the rods, and is locked by jam nuts.

9. VALVE ROCKERS

The valve rockers are fulcrumed on a shaft supported by a bracket bolted to the top of the cylinder head. The shaft is secured in place in the bracket by two setscrews and is drilled for lubrication, a grease gun fitting at one end supplying grease to the rocker bearings. A grease gun is provided with the engine tools and the bear-

ings should be serviced daily. Bronze bushings in the rockers are reamed to 1.5010" to 1.5015" after pressing in, which allows .001" to .0025" clearance on the shaft.

The case hardened rollers on the valve ends of the inlet and exhaust rockers work directly on the ends of the valve stems and turn on headed pins, secured in the rockers by cotter pins. The roller clearance on the pins is .0005" to .0015". A hardened steel button pressed into the air starting valve rocker bears against the valve stem. A secondary rocker is used for the fuel valve, mounted on a shaft carried by a separate bracket. The main rocker bears down on one end of this secondary rocker, the other end of which lifts the spray valve as the mechanism operates. The action is more fully described in Section O. The bronze bushing in the secondary rocker should be reamed to .7500" to .7505" after pressing in, which allows .0005" to .0015" clearance. The shaft is held between the bearing retaining bolts. An oil hole in the top of the rocker provides for lubrication and should be hand oiled daily. Both rockers are steel forgings, and the bearing surfaces are case hardened.

10. TIMING GEAR TRAIN

The camshaft is driven from a gear on the crankshaft by means of an intermediate gear. On four, five, and six cylinder engines the crankshaft gear is shrunk on the shaft. If replaced the new gear should be heated to approximately 600° F. and slipped over the shaft. Do not overheat the gear, as this will damage the steel structure. Once it is started on the shaft move it immediately to its final position against the shoulder at the fit, as it will be impossible to move it further once it begins to cool and seize the shaft.

On eight cylinder engines the crankshaft gear is split, and is held in place on the shaft by split collars clamped over each end of the gear.

The intermediate gear turns on a pin mounted in a bracket bolted to the end of the centerframe. The bracket is positioned and doweled to the centerframe to allow .006" to .008" gear backlash, and the pin is retained in the bearing bracket against a shoulder by nut and washer on the end of the shaft. Radial clearance between gear end and pin is .0015" to .0025", and side clearance is 1/32". Lubrication is positive from the engine force feed system.

The camshaft drive gear is bolted and doweled to the hub shrunk on the end of the camshaft. Unless the crankshaft or camshaft gears are replaced these dowels need not be disturbed, but if either of the gears is replaced the camshaft gear must be redoweled to its hub, after the shaft has been timed in accordance with instructions in Paragraph 12. Use a #U (.368" Dia.) drill and ream to .372"-.373" diameter for 3/8" dowels.

11. CAMSHAFT TIMING (Reassembling with Original Gears)

In order to time the engine it is necessary to position the camshaft gear on its hub and to mesh the gears so as to obtain the correct relation between the two shafts, and then to adjust the push rods to open and close the valves at the correct points. Unless the crankshaft or camshaft gears have been replaced the camshaft can be correctly timed after overhauling by meshing the gears according to the timing marks that were stamped on the gear teeth when the engine was erected. Prick punch marks are stamped on the ends of the mating teeth on the crankshaft, intermediate and camshaft gears. Three teeth are stamped at each meshing point, a tooth on one gear and the two straddling teeth on the mating gear.

12. CAMSHAFT TIMING (Reassembling after replacing gears)

If either the crankshaft or camshaft gears have been replaced, the camshaft can be timed as follows:

(a) Spot No. 1 piston 2½° B.T.C.
(b) Set the camshaft gear relative to its hub so that clamping bolts are approximately in the center of the slots. Orient camshaft gear so that old dowel holes will not interfere with redowelling.
(c) Turn the camshaft (with intermediate gear out of mesh) so that the inlet and exhaust lifters of No. 1 cylinder are each raised an equal distance. (NOTE: The piston was set at 2½° B.T C. as this is the mean position between the 10° B.T.C., opening of the inlet valve, and the 5° A.T C., closing of the exhaust valve, and at this position both valves should be open an equal distance.)
(d) Holding crankshaft and camshaft in above positions and allowing camshaft gear to slip on its hub as required, mesh the intermediate gear and tighten the clamp bolts between the camshaft gear and hub. After all valves have been timed and checked, drill and ream the dowel holes as described in Paragraph 10.

13. SPOTTING THE PISTON

Before proceeding with the discussion on valve timing the following instructions regarding the correct method of spotting a piston should be considered. Whenever a piston is to be spotted for valve setting it should be brought into position by turning the engine in the direction of rotation in order to take up all gear backlash. If the engine is turned past the desired position, it should be turned well back in the opposite direction, and then again brought up to the required point.

14. POINTER LOCATION

The location of the flywheel pointer should be checked occasionally by "splitting the center". With one of the cylinder heads removed crank the engine to a point about 20° off top center. Measure the exact distance from the top of the liner down to the piston and observe the pointer reading on the flywheel. Then set the piston to the same distance below the top of the liner on the other side of top center and observe the flywheel pointer reading. If the readings do not agree adjust the pointer to give equal readings on each side. The position of the piston should preferably be taken with an indicator and in each case the piston should be cranked upward into position.

FIG. L-1

15. VALVE TIMING

The valve timing may be determined from the markings stamped on the flywheel, as illustrated in Fig. L-1. The top center of each piston or pair of pistons is marked with the piston numbers (No. 1 is on the timing gear end of the engine), and degree marks are stamped on each side. The graduations are by degrees, and each fifth degree is marked with a numeral. The correct valve timing is given in the following table, and is stamped on the name plate of each engine.

Starting Air Valve	Opens - - - - -	10° A.T.C.
" " "	Closes- - - - -	55° to 60° B.B.C.
Inlet Valve	Opens- - - - - - - - -	10° B.T.C.
" "	Closes - - - - - - - -	35° A.B.C.
Exhaust Valve	Opens- - - - - - - - -	35° B.B.C.
" "	Closes - - - - - - - -	5° A.T.C.
Fuel Spray Valve	Opens - - - - - - -	see engine name plate
" " "	Closes- - - - - - -	see engine name plate

16. INLET AND EXHAUST VALVE TIMING

After the correct relation between the crankshaft and camshaft has been determined as described in Paragraphs 11 and 12, the push rods must be adjusted as follows: (See Section O for timing of fuel spray valve.)

(a) Spot piston at 10° B.T.C. at the end of the exhaust stroke.
(b) Adjust inlet push rod so that valve is just opening.
(c) Spot piston at 5° A.T.C. on the suction stroke.
(d) Adjust exhaust pushrod so that valve is just closing.
(e) Check clearance between valve stems and rocker rollers. The cams are designed for 1/32" clearance with the valves set as above and with the engine cold, but this will vary somewhat due to manufacturing tolerances. When making the adjustments aim at the opening and closing points but keep the clearances between .020" and .040", varying the opening and closing points slightly if necessary. Excessive clearances mean a noisy engine and increased wear on parts. Insufficient clearances prevent valves from seating properly, with consequent blowby and destruction of valves and seats.
(f) Check and record closing point of inlet valve and opening point of exhaust valve. These points should fall within 5° of the position given in the timing table.
(g) Adjust and record valve timing for the other cylinders as above.

17. STARTING AIR VALVE TIMING

(a) Block the starting valve wedge shaft in its starting position.
(b) Spot piston at 10° B.T.C. at the end of the compression stroke and adjust the pushrod so that the valve is just opening. Check the closing point, which should fall within 5° of the position given in the table. (See Paragraph 15).
(c) Adjust and record starting air valves for the other cylinders as above.

FUEL SUPPLY SYSTEM

The complete fuel system may be conveniently divided into two parts, the fuel supply system and the fuel injection system. The fuel supply system is made up of the fuel transfer pump and the fuel day tank and filter; while the fuel injection system includes the high pressure fuel pump, the fuel rail, or accumulator, the fuel pressure regulating valve, the fuel spray valves, and the necessary connecting tubing.

1. IMPORTANCE OF CLEANLINESS IN FUEL HANDLING

The high pressure fuel pumps and fuel spray valves have been referred to as the heart of the Diesel engine and the proper functioning of these parts is necessary for the successful operation of the engine. These pumps depend upon lapped plungers working in cylinders with clearances measured in hundred thousandths of an inch and it is vital that the fuel entering these parts be kept free of any grit or foreign matter. The engine is equipped with a filter and a strainer for this purpose but it is also necessary for the operators to use every possible care in getting clean fuel oil and in keeping it clean until it is delivered to the engine. Fuel tanks and piping should be thoroughly cleaned when installed and should be kept covered at all times.

The fuel filter should be periodically cleaned and serviced according to the detail instructions given in Paragraph 3. The best filters obtainable will be useless if dirt is introduced into the fuel after it has passed through them, and it is therefore of great importance that every effort be made to protect the fuel pipes after the filter during repairs and overhauls. Cleanliness in handling fuel, piping and injection equipment is of vital importance and will pay good dividends in trouble-free operation. Many times mysterious and expensive pump and fuel spray valve troubles have been traced to careless handling of fuel and carelessness in storing and installing spare parts.

2. FUEL TRANSFER PUMP

The fuel transfer pump, which is mounted on the gear casing just below the governor, is illustrated in Fig. N-1. It is an internal gear type pump, similar to the lubricating oil pump, and is driven from the camshaft gear.

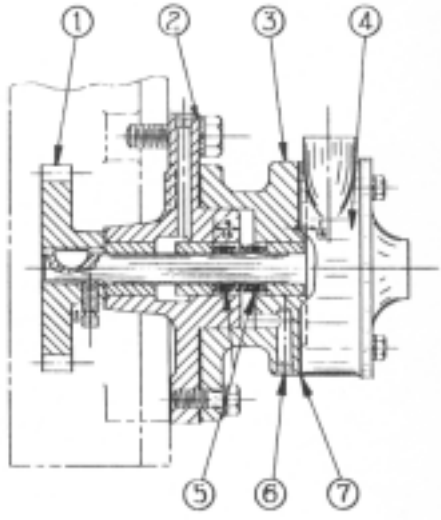


FIG. N-1

Referring to Fig. N-1, the fuel pump assembly, consisting of pump (4), adapter (3), and bearing (2) is bolted to the end of the gear casing. The bearing is located and doweled to the gear casing to allow .004"- .006" backlash between drive gear (1) and the camshaft gear. End clearance for the pump rotor should be from .001' to .003", and is determined by the thickness of gasket (7). If replaced, measure the old gaskets with a micrometer and replace with exactly the same thickness. The pump shaft rotates on bronze bushings pressed into the bearing and adaptor, and if replaced the new bushings must be reamed to .6250" - .6255" diameter after pressing in and with the two pieces bolted together. The bushings must be located in the bores in accordance with the dimensions given in Fig. N-1 in order to allow the correct space for oil seal (5). The two bushings in bearing (2) are pressure lubricated from the engine oiling system and the bushing adjacent to the fuel pump is lubricated by fuel oil. The oil seal prevents leakage of fuel along the shaft, and any slight leakage past the seal drains off through hole (6). This connection may be piped off to a drain pan if desired, but should never be plugged, as the fuel oil may then be forced through into the engine and will dilute the lubricating oil.

3. FUEL OIL DAY TANK AND FILTER

The fuel oil day tank and filter are shown in Fig. N-2. A continuous flow of fuel oil from the fuel transfer pump enters the unfiltered fuel compartment (4) through tube (1). The metal edge type fuel filter (2) is mounted in the side of tank (6). It has .003" spacing and is provided with a cleaning knife (3), operated by handle (8), which scrapes the dirt and muck off the outside of the cleaning spool. The handle should be turned every four or five hours, and should always be turned immediately after stopping the engine, as the dirt can then settle freely through the

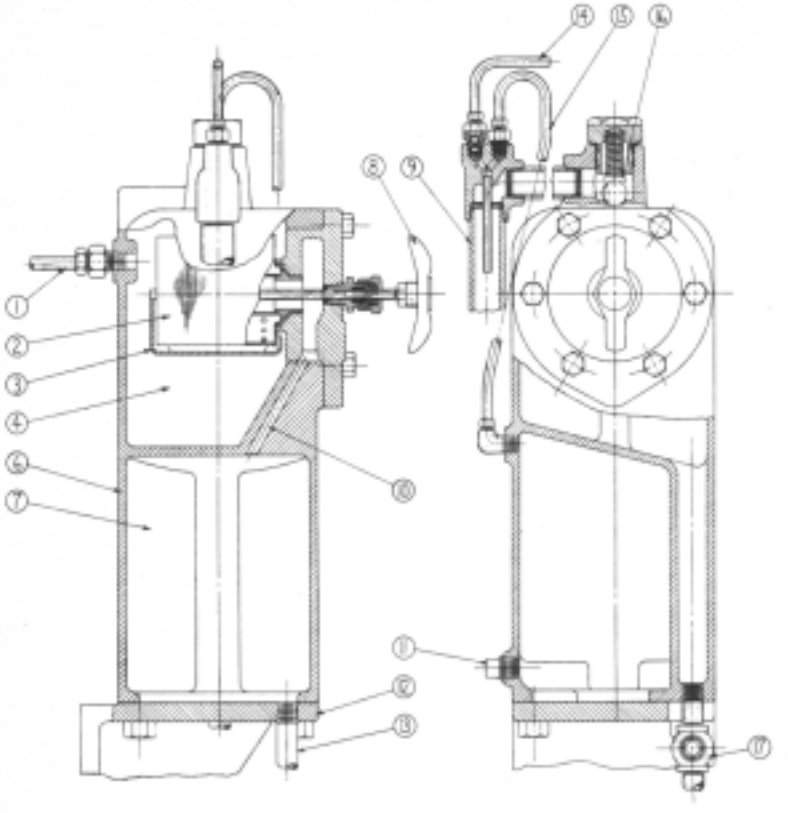


FIG. N-2

quiescent fuel. The dirt and sediment collects in the sludge compartment at the bottom of the tank, and should be drained off through cock (17) at frequent intervals. This may be done to advantage when the engine is running, the pressure in compartment (4) assuring thorough cleaning.

After passing the filter the fuel flows through hole (10) into the clean fuel compartment (7), and then to the high pressure fuel pump through pipe (13). This pipe is screwed into mounting bracket (12) which forms the bottom of the tank. Compartment (7) can be drained by removing plug (11). The excess fuel from the transfer pump passes through relief valve (16) and returns to the service tank through overflow pipe (9). The relief valve maintains a pressure of 6 lbs. per sq. in. in the filtered fuel compartment. When the high pressure system of the engine is being primed air is admitted to compartment (7) through tubes (14) and (15), allowing the fuel to flow to the priming pump. The check valve in tube (14) permits sucking air when priming and prevents escape of fuel oil when the engine is in operation. When the engine starts the air in compartment (7) escapes through tube (15). The pressure in filtered fuel compartment (7) assures a continual flow of fuel through tube (15) into the overflow pipe, with no possibilities of reverse flow of unfiltered fuel from the overflow pipe to compartment (7).

4. FUEL FILTER (SPECIAL)

On some engines built to government requirements the fuel day tank with built in filter is omitted and a Purolator duplex metal edge type filter is used instead.

The special filter is of full duplex construction with built in switch-over valve which allows either unit to be cut out for cleaning. When the handle is vertical the flow is through both units. The filtering element is made up of a flat metal ribbon wound around a central spool, adjacent layers being slightly separated from each other by raised ridges running across the ribbon. The successive layers of the ribbon are spaced .001" apart and it is these spaces that form the filtering medium, the fuel oil flowing through the spaces and leaving the dirt on the outside of the spool. The elements are made double, that is with two concentric filter spools to conserve space. The necessary cleaning interval for the elements will depend upon the fuel used and will be determined by experience. Once a week is suggested, but this may be altered to suit conditions. The elements should be removed for cleaning and thoroughly washed out in clean fuel oil or cleaning solvent and then blown out with compressed air.

1. FUEL INJECTION SYSTEM

The common rail fuel injection system used on the Atlas engines is one of the most rugged and reliable of the various systems in use on modern Diesel engines. Like any good piece of machinery it must be kept in proper adjustment and repair, however, and the satisfactory operation of the engine is more dependent on the proper functioning of the injection system than on any other part of the equipment. It is therefore covered in some detail in the following description, and it is particularly recommended that careful attention be given to this section and that the instructions given herein in regard to adjustments etc. be very carefully followed at all times.

Briefly described, the common rail injection system consists of:

(a) A high pressure pump capable of developing several thousand pounds pressure, and with a capacity in excess of the fuel requirements of the engine.

(b) The accumulator or rail to which fuel is fed from the high pressure fuel pump and from which high pressure lines lead the fuel to the spray valves.

(c) The mechanically operated spray valves, one in each cylinder head.

(d) Mechanical means for opening the spray valves at the proper time in the piston cycle and for holding them open the length of time necessary to inject the exact amount of fuel required to carry the load that the engine is pulling.

(e) A pressure regulating or bypass valve, for the purpose of controlling the pressure in the injection system and bypassing the fuel delivered by the pump in excess of the engine requirements.

2. HIGH PRESSURE FUEL PUMP

The high pressure fuel pump has two lapped plunger type pumps, actuated from a crankshaft by means of connecting rods and cross heads. The unit is enclosed in a housing which is bolted to the gear casing on the manifold side of the engine. The drive gear on the end of the crankshaft meshes with the intermediate camshaft drive gear, and the housing is positioned and doweled to the gear casing to allow .004" to .006" backlash in the gears. A small hand operated plunger is also built into the pump, and is used for priming the high pressure fuel system prior to starting and to build up pressure in the system when timing the engine or testing the spray valves.

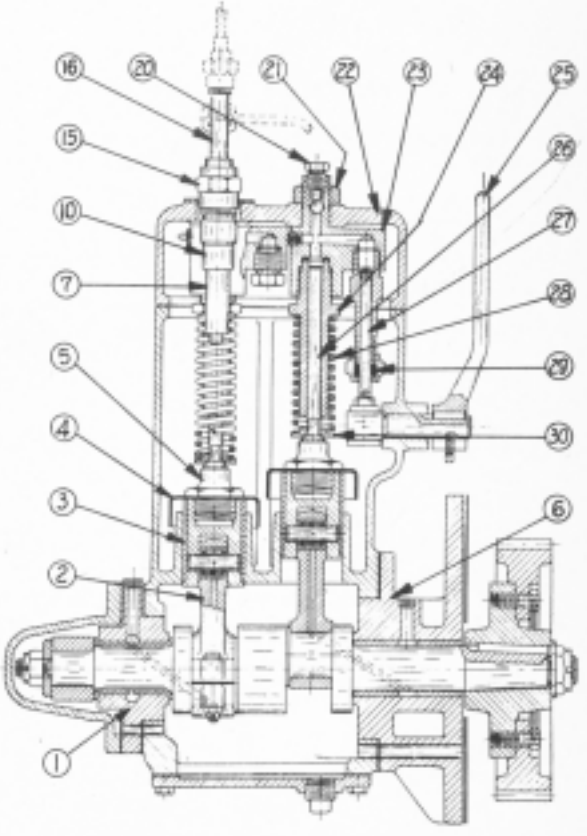


FIG. O-1

The construction is illustrated in Fig. O-1. Crankshaft bearings (1) and (6) in either end of the housing are separate castings, bolted to the housing and bronze bushed for the bearing surfaces. If replaced the bushings must be reamed to 1.6250" to 1.6255" and 1.5000" to 1.5005" diameter, after pressing in. The larger dimension is for the bearing in the gear end, which also carries the mounting flange by which the unit is attached to the gear casing. Both bearings are pressure lubricated from the engine force feed system, and oil holes through the crankshaft carry oil to the crank pin bearings. The connecting rods are also drilled, and feed oil up to the needle bearings at the wrist pins. A drain hole in the gear end bearing

returns the oil to the engine. Fuel leakage from the pumps collects in the upper compartment of the pump housing and is led off through a drain hole.

Bronze connecting rods (2) have .0015" to .0025" clearance on the crankpins and .004" to .008" side clearance. Bearing adjustment is by shims. If the wrist pin bearings are replaced they must be pressed into the rods with the oil holes on the horizontal axis. The replaceable bronze sleeves (3) on the cross heads have from .002" to .004" clearance in the guide bores in the housing. They are held in place by shoulders at the bottom of the cross heads and by oil guards (4) and plugs (5) at the upper ends. Lubrication is from the wrist pins.

The two identical pump units are shown in enlarged detail in Fig. O-2. Each consists of head (23), plunger (26) and barrel (24) and valve cage (10). The heads are mounted in housing cover (22) and are retained by nuts (21). The pump barrels and valve cages are screwed into the heads. Straight threads are used on the pump barrels, copper gaskets making the seal, and taper pipe threads are used for the cages. The priming pump unit is also mounted in one of the pump heads, the corresponding hole in the other head being closed with a plug. Discharge tee (16) is used on one of the pumps only and the vertical outlet connected to the accumulator and the horizontal outlet to the discharge of the other pump.

The pump plungers are held down against the cross heads by springs (28), retained to the lower ends of the plungers by horseshoe washers (30). The plungers are raised by the cross heads on the discharge stroke and are returned on the suction stroke by the springs. The plungers and barrels are lapped together in matched pairs and are not interchangeable. Always use care to prevent mixing them and to prevent damage to the lapped surfaces. If either piece becomes scored or damaged both must be replaced. Always wash parts thoroughly in clean solvent or fuel oil and lubricate with clean engine oil before replacing. Avoid touching the lapped surfaces with the hands, and avoid entering the plunger into the barrel unless both are absolutely clean and lubricated. Always keep spare pumps well greased and wrapped in waxed paper.

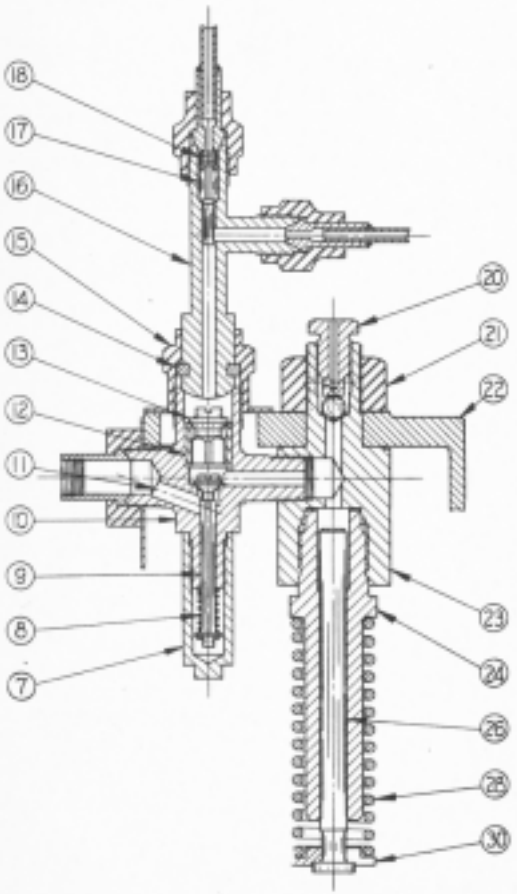


FIG. O-2

When dismantling the pump, housing cover (22) with the pump assemblies attached may be removed as a unit. Hold the pump plungers in place as the unit is lifted, as they will drop out of the barrels when free of the cross heads and may then be damaged. The lower end of the priming pump plunger may be disengaged from its operating fork as the unit is raised.

Suction valves (9) and discharge valves (13) are located in valve cages (10), one to each pump unit, as previously mentioned. (See Fig. O-2.) Fuel under a slight head from the transfer pump and day tank unit is supplied through port (11). The suction valve is guided and seated directly in the cage, and valve spring (8) is enclosed by bonnet (7), which prevents external leakage. A flat along one side of the valve stem permits displacement of the fuel in the bonnet space as the valve stem moves in and out. The discharge valve is fluted and is guided in a hardened steel seat (12), which is pressed into the valve cage. The valve lift is limited by the lower end of discharge fitting (16).

Referring to Fig. O-2, both suction and discharge valves are accessible through the discharge opening after removal of discharge fitting (16), which is secured to the valve cage by retaining nut (15) and split ring (14). Valve leakage as evidenced by low or erratic fuel pressure can usually be stopped by lapping the seats lightly with fine grinding compound, but if this does not correct the difficulty the entire valve and cage assembly should be replaced. Be sure that all traces of grinding compound are thoroughly washed off at completion of grinding operation. If the lower end of the discharge fitting above discharge valve (13)

shows signs of heavy hammering this is usually due to discharge valve seat (12) being loose in the cage. The cage and seat must then be replaced. An auxiliary discharge valve (17), located in the discharge valve fitting makes the pump less sensitive to leakage of the regular valve. It is held against its seat by spring (18), which bears against the end of the fuel tube.

Referring to Fig. O-1 priming pump plunger (27) is actuated by linkage from hand lever (25). (See Fig. O-1) The upper end of the plunger is formed as a valve head, which engages a seat in the barrel, preventing leakage when the engine is in operation. Leakage may be stopped by lapping lightly with fine grinding compound. Packing (29) at the bottom of the barrel seals the plunger when the pump is in use. Vent plugs (20) in each valve head should be loosened when priming the engine to allow the escape of air entrapped in the fuel system. Tighten the plugs as soon as solid fuel appears.

The high pressure fuel pump has been designed to give long trouble-free performance provided that it is given reasonable care. Water, dirt and other impurities in the fuel will materially shorten the life of the plungers and barrels. The normal working pressure is 4000 to 5000 lbs. per square inch but the pump is capable of building up pressures far in excess of this figure. Carelessness in the care of the pressure regulating valve, may cause it to become ineffective, and the resulting high pressure may injure the pump and also damage other parts of the injection system. It is consequently important that the fuel pressure regulating valve be kept in good operating condition so that excessive pressures may not be built up, with consequent damage to the pumps and other parts of the injection system.

3. ACCUMULATOR

To prevent large pressure fluctuations in the injection system each time a spray valve opens or a pump delivers fuel the volume of the system is increased by the addition of an accumulator. The fuel in the accumulator, due to its compressibility, tends to maintain a constant pressure in the fuel system without appreciable fluctuations. The accumulator is located in the push rod compartment of the cylinder block, just below the starting air manifold. It is made of 2½" O.D. seamless steel tubing with plugs welded in each end. The accumulator also serves as a "rail" distributing the fuel to the various spray valves.

4. INJECTION TUBING

All of the high pressure lines used in the injection system are seamless steel tubing. The ends are formed by brazing union sleeves to the tubing, and union nuts fasten these ends to the various fittings. 1/4" O.D. x .065" wall thickness tubing is used. A high grade tubing is used, made especially for this service, and standard seamless steel tubing should never be substituted.

The importance of keeping the injection lines clean cannot be overemphasized. When an injection line is removed from the engine the open ends should be covered with clean paper which should not be removed until the tubing is to be placed on the engine again. If there is any doubt as to the cleanliness of an injection line it should be thoroughly cleaned before installing. To clean a line it should be washed repeatedly in cleaning solvent or gasoline and should be blown out with an air hose between each washing. This cleaning process should be carried on until there is no uncertainty as to the cleanliness of the tubing.

The high pressure fuel tubes from the pump to the accumulator and from the accumulator to the pressure regulating valve are carried through the cylinder block wall by special through type elbow fittings, with union tube connections at each end. Isolating valves in each of the injection lines from the rail to the spray valves permit cutting off the fuel to any cylinder. They are gland packed needle valves, located near the top of the cylinder block, with the stem and stuffing box projecting through to the outside of the block. The tubes from the accumulator lead to the lower connections of the valves and extension stems screwed into pipe tapped holes in the tops of the valves project up into the cylinder heads. Injection tubes lead from the ends of these stems to the spray valves. A double isolating valve is also provided, connected into a line leading from the ends of the fuel accumulator. One connection leads to the fuel pressure gage, and the other provides an outlet for testing spray valves, as described in Paragraph 8.

5. FUEL PRESSURE REGULATING VALVE

Injection pressure control is afforded by the adjustable pressure relief valve. This valve is of the by-pass type in which the opposing forces of a spring and the fuel pressure acting on the stem of a needle valve maintain constant fuel pressures. If the pressure starts to drop the spring closes the needle slightly reducing the amount of fuel by-passed with the result that the pressure is held constant.

Referring to Fig. O-3 the regulating valve is built around valve body (7). The hardened steel valve seat (8) is held between the body and adapter stud (9) which screws on the bottom of the body and through which passage (18) allows the by-passed fuel to escape. Fuel inlet elbow (16) is threaded into the side of the body, supplying fuel to the annular space around the reduced section of the valve stem (17). The top of the body is bored to receive stem packing (15) and packing gland (14). Screwed to the top of the body is relief valve spring cage (5). This cage is screwed down upon the drain cup holding the latter in place against a shoulder on the body.

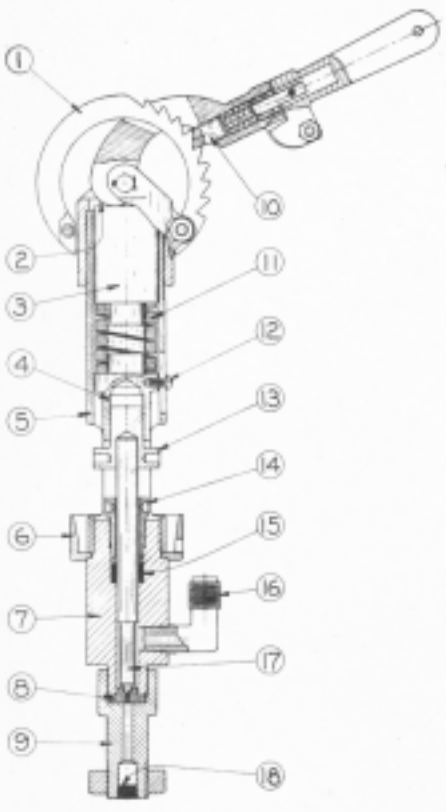


FIG. O-3

Cage (5) carries upper spring seat (3), Spring (11), and the lower spring seat. Valve spring adjusting screw (13) which is bored to receive the upper end of the valve is threaded into the bottom of the lower spring seat. A small machine screw in the lower spring seat engages a slot in the cage and prevents rotation of the seat when the adjusting screw is being turned. The bearing assembly which holds the control handle and sector (1) is threaded to the upper end of cage (5). The lower part of the control handle is shaped to form a cam which actuates the upper spring seat. A spring loaded pawl (10) in the handle engages teeth in sector (1) so that the handle will remain in position after it has been adjusted. A downward force on the end of the handle pulls the pawl away from the sector and allows the handle to be lowered.

The injection pressure is normally changed by moving the handle up or down. Moving the handle in an upward direction increases the pressure, downward movement lowers the pressure. The pressure increase or decrease per notch is approximately 600 to 800 lbs. However, the pressure in any notch may be changed by means of adjusting screw (13).

Packing (15) will need replacing when the fuel leakage around the valve stem (17) becomes excessive. Tighten the packing gland just enough to prevent leakage. Never attempt to stop leakage by tightening the gland severely when new packing is needed. A loss of fuel pressure can often be traced to dirt lodged between valve stem (17) and the seat (8). This condition can be remedied by removing adapter stud (9) and valve seat (8) from the bottom of the relief valve and thoroughly cleaning the valve and its seat. Occasionally it may be necessary to lap the needle and its seat to prevent excessive by-passing and a low fuel pressure. After performing this operation all traces of grinding compound should be carefully washed off before the valve is reassembled.

6. SPRAY VALVES

The purpose of the spray valve (or fuel injection valve) is to meter the fuel accurately, to deliver it precisely at a definite moment, in a definite time into the combustion chamber in the form of a finely atomized spray. It might be stated that the successful operation of the engine depends upon the proper functioning of the spray valves more than on any other item. If the engine does not perform properly and the exhaust is smoky, the functioning of the fuel valves should be checked first of all. In the great majority of cases servicing the fuel valves and making them function properly corrects the trouble.

Fundamentally, the spray valve is a heavily spring loaded needle valve. Referring to Fig. O-4 the seat of the needle valve is incorporated in the tip or nozzle (1) just above the entrances to the spray orifices. The lower end of valve body (4) is counterbored to receive the end of the spray valve tip. A shoulder on the spray tip (1) which is centered in the counterbore, is held securely against the lower end of the body by nut (2). Valve assembly (3) is made up of two sections. The lower section has a conical end which is ground to the seat in the spray valve tip. This lower stem section is pressed into an extension (10) which in turn is screwed into an adjusting nut provided with a shoulder at the lower end. On top of the shoulder is mounted a ball type thrust bearing which is the lower retainer for spring (9). Upper spring retainer (12) screws into the upper end of valve spring

casing (13) which in turn is threaded to the upper end of valve body (4).

The flange used for clamping the valve is drilled and tapped to receive fuel elbow (6) which supports the small metal edge type filter (15). Fuel is carried from this point to the nozzle in the annular space surrounding stem (3). Leakage upward along the stem is prevented by packing (7) held between an upper and lower gland and secured by packing nut (8).

7. REMOVAL OF SPRAY VALVE FROM ENGINE (See Fig. O-4)

(a) Remove the two capscrews holding spray valve rocker bearing (43) in place, and remove the bearing and rocker assembly.

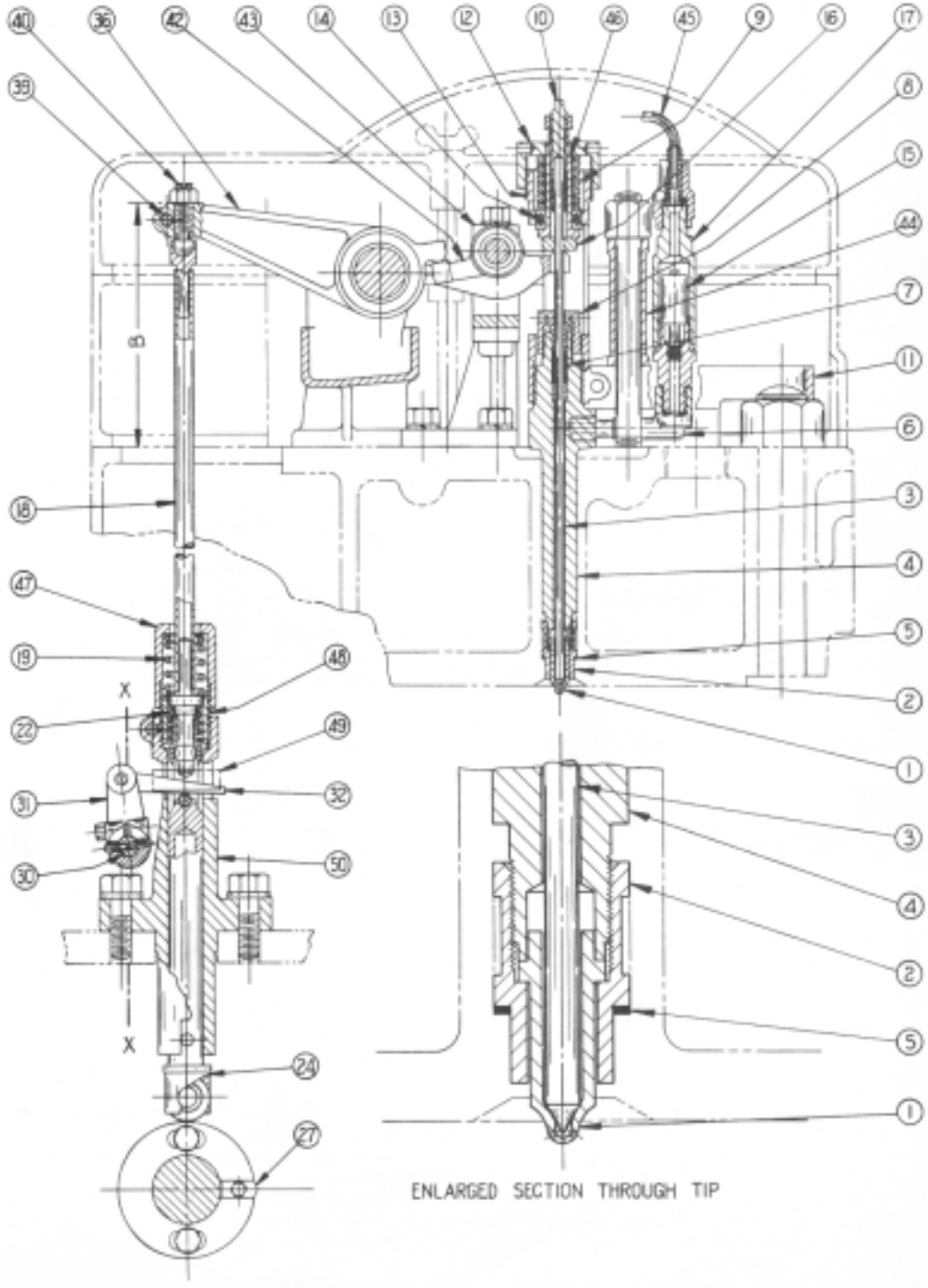


FIG. O-4

(b) Disconnect the injection line (45) from the top of the spray valve filter.

(c) Loosen the clamp nut and remove clamp (11) and bridge (44).

(d) Remove the spray valve from the head. It may be necessary to work the valve loose by rotating it back and forth and in some cases to pry it upward with a bar to remove it. As the valve is lifted out of the head note whether copper gasket (5) remains in the hole or comes out with the valve.

8. TEST EQUIPMENT

All the parts for a spray valve test stand are included in the tool equipment supplied with the engine. The spray test clamp which holds the spray valve directly below the flanged section of the body should be mounted on some convenient location near the engine. The long stud supplied with this equipment screws into the outer end of the clamp. The test handle is supported on the upper end of the stud by a nut which can be screwed up or down on the stud until the desired height of fulcrum has been obtained. Fuel is supplied from the extra fuel rail valve through a length of tubing supplied with the tool equipment. Fuel pressure is obtained by means of the hand operated priming pump built into the high pressure fuel pump. To test a spray valve proceed as follows:

(a) Clamp the spray valve in the test stand and connect it to the fuel rail.

(b) Close all the isolating valves on the fuel rail and open the valve which supplies the test stand.

(c) With the priming pump build up a pressure of about 2000 to 4000 lbs. per square inch.

(d) Open the valve quickly three or four times by hitting the end of the test handle sharp blows with the fist, watching as the valve operates to see if a fine fuel spray comes out of each hole in the tip.

(e) Wipe off the tip carefully, pump up the pressure to about 4000 lbs. per square inch again and operate the spray valve as described in step (d) until the pressure has dropped to about 2000 lbs. per square inch. Then watch the bottom of the tip for a period of time to see if drops of fuel form, indicating tip leakage.

9. DISASSEMBLY OF SPRAY VALVE (See Fig. O-4)

If the sprays are not uniform, if one or more orifices are entirely plugged up, or if drops of fuel form on the end of the tip after testing as described in step (e) of the preceding section, the spray valve must be taken apart and serviced. Proceed as follows:

(a) Clamp the spray valve at the flanged section of the body in a vise.

(b) Unscrew upper spring retainer (12) with a suitable pin or drift.

(c) Loosen packing nut (8) and remove stem assembly (3 and 10) together with the retainer (12), spring (9) and thrust bearing (14).

(d) Unscrew valve seat nut (2). Spray tip (1) will usually come off with the nut.

(e) Drive the tip out of the nut with the punch supplied for this purpose in the tool equipment. Use care not to damage end of tip.

(f) Clean the outer surface of the tip with a wire brush, dipping the tip into cleaning solvent or fuel oil frequently during the brushing.

10. CLEANING THE SPRAY ORIFICES

If the sprays are not uniform or an orifice is plugged up the holes in the spray tip must be cleaned. Again, if it is necessary to disassemble the spray valve for some other reason such as leakage, it is good practice to clean the orifices at the same time. It sometimes happens that all of the orifices become slightly clogged with the result that they deliver less fuel. Such a condition cannot be detected when the spray valve is tested but if the holes are cleaned every time service work is performed upon the spray valves this condition will be taken care of.

The cleaning of the orifices should be performed only with the music wire and pin vise supplied with the tool equipment, not with the ends of hat pins and other such

devices. If the original wire is lost obtain a piece of music wire of not more than .009" dia. for this purpose. Work the wire in and out of each orifice until the holes are clean. This operation should be performed carefully so that the orifice will not be deformed.

11. CORRECTING SPRAY VALVE TIP LEAKAGE

Leakage of the spray valve is usually due to a small amount of dirt between the needle and the valve seat. Often this condition can be remedied by washing the tip thoroughly and cleaning the end of the valve stem. This procedure should be attempted first in all cases of valve leakage.

If, after washing the tip and spindle, drops of fuel still form on the bottom of the tip shortly after the fuel valve is sprayed, it will be necessary to reseat the valve by lapping. The procedure of reseating a tip is as follows:

(a) Clamp the valve body in a vise horizontally.
(b) Loosen spring retainer (12).
(c) Apply a small amount of fine valve grinding compound to the end of valve stem (3).
(d) Place the tip over the valve stem and insert it fully into the valve body.
(e) Adjust retainer (12) so that the stem exerts a light pressure on the tip.
(f) Oscillate the tip back and forth and rotate the spindle slowly. Be sure that the tip is held against the body as this operation is being performed so that the tip will be properly guided.
(g) Repeat steps "c", "d", and "f", if necessary.

It should not be necessary to lap the tip more than two or three times to correct ordinary cases of leakage. However, if the seat in the tip has been badly damaged no amount of lapping will remedy the situation. In such instances a new tip should be installed. When installing a new tip the joint between the tip and the valve body must first be lapped. A small amount of fine valve grinding compound is applied to the upper face on the shoulder of tip (1). The tip is then installed in the end of the valve body and oscillated back and forth. The tip is held gently against the body as this operation is being performed. One light lapping process should be sufficient to produce a perfect seal between the tip and valve body. The tip is then lapped to the valve stem by the method described in this paragraph.

12. VALVE PACKING ADJUSTMENT

Packing nut (8) should never be appreciably more than finger-tight. A small amount of fuel leakage past the packing is necessary for proper lubrication of the spindle. Too tightly adjusted packing will prevent this lubrication and will result in a scored spindle and sluggish valve action. If a spray valve leaks excessively along the spindle after the packing has been lightly tightened up the need for new packing or a new spindle or both is indicated.

13. ASSEMBLY OF THE SPRAY VALVE - SPRAY VALVE "LIFT"

Referring to Fig. O-4, spring (9) must be adjusted to a certain tension in order to assure proper functioning of the spray valve. It is further important that the adjustment of all the spray valve springs be the same or that the "lift" on all the spray valves be the same. With "lift" as used in the following instructions is understood the lift which spring (9) will allow before its coils touch each other and prevent further upward movement of the valve stem. (The actual lift when the spray valves are operating in the engine is of course determined by the position of fuel wedge (32), the adjustment on pushrod (18) and cam (27). This actual lift is less than the "lift" as defined in this paragraph.) Proceed as follows to assemble the valve and adjust for proper "lift" (or opening tension):

(a) Wet spindle (3) with clean fuel oil and slip it into position in the valve body.
(b) Clean the spray valve tip and install it carefully on the valve body. Tighten valve seat nut (2) securely.
(c) Screw down on spring retainer (12) carefully until the coils of spring (9) just touch. Be careful not to screw down so hard that valve stem (3) bends, rendering it useless. It is best to have the valve in the test stand when performing this operation and determine when spring (9) becomes solid by means of the test handle. When it is not possible to lift the spray valve stem by means of the test handle the spring coils are touching. The "lift" is then zero.

(d) Unscrew spring retainer (12) 3/4 to 7/8 turns which will make the "lift" 1/16". The "lift" on all the valves should be between 1/16" and 5/64".
(e) Screw down on packing nut (8) until it is just finger-tight.

(f) Test the functioning of the valve as described in paragraph 8.

14. ASSEMBLY OF SPRAY VALVE IN ENGINE

The spray valve is installed in the engine in the reverse order of its removal. Again referring to Fig. O-4, if copper gasket (5) is in the cylinder head merely lower the valve into position. If the copper gasket (5) was removed with the valve, the gasket can be held in position on the lower end of the valve by a thin coating of grease applied to the washer.

After installing the valve it will be necessary to reset the push rod as described in paragraph 18. After timing, in order to clear the cylinder of excess oil, always turn the engine over on air with the snifter valves open and with the fuel isolating valves closed.

15. SPRAY VALVE FUEL FILTERS

In addition to the fuel filter in the fuel day tank an individual filter (15) is supplied at each spray valve. The spray valve filters are of the metal edge type and have a spacing of .0015". They are installed in housing (17) which screw into the fuel inlet elbows at the spray valves. The frequency at which these filters will need cleaning will depend upon the quality of the fuel and the condition of the filter in the day tank. After disassembling the housings it will be possible to unscrew the filter unit. Wash each unit thoroughly in clean solvent or fuel and blow it clean with compressed air, being careful not to injure the windings when handling it.

16. SPRAY VALVE OPERATING MECHANISM (See Fig. O-4)

The spray valve is actuated through cam (27), lifter or cam follower (24), push rod (18), and rockers (36) and (42). Motion of the lifter is transmitted to the pushrod through wedge (32). The pushrod is held up free of the wedge by spring (22), so that, except during the time that the lifter is raised by the cam, there is clearance between the wedge and the pushrod. As can readily be seen in Fig. O-4, moving the wedge inward will decrease this clearance and the spray valve will open sooner, will lift higher, and will close later. Moving the wedges outward produces the opposite results. The outer end of the wedge is pinned to lever (31), which is clamped to wedge shaft (30). This shaft is rotated by the governor, through connecting linkage. The governor thus moves the wedges in and out as it operates under fluctuations in the engine speed, and so exercises complete control over the spray valves.

When the engine was tested at the factory, wedge levers (31) were adjusted to be parallel to each other and in line on wedge shaft (30) and were then clamped and pinned to the shaft. If new levers or a new wedge shaft are installed it is important that they be lined up in accordance with the above. The position of the fulcrum of wedges (32) for the full load full speed position (wedges fully in) should be about 1/4" inside the vertical line X-X through the center of the wedge shaft. It is determined by stop (49) which is bolted to one of the lifter guides and which limits the motion of the fulcrum pin. The position of the wedge fulcrum for idling at low speeds should be as shown in Fig. O-4, that is about 1/4" outside of line X-X. In other words line X-X should divide the total movement of the wedge fulcrum into two approximately equal parts.

Levers (36) on all cylinders should be parallel, and should be adjusted so that the dimension "B" in Fig. O-4 is approximately 7-1/32 inches. This adjustment is made by locating spray valve spindle sleeve (46) on the spindle extension (10). Back out adjusting screw (40) so that rocker (36) is free of the pushrod. Hold rocker (36) up so that the forked end of rocker (42) is bearing firmly up against washer (16) (do not lift with sufficient force to open the spray valve). Screw sleeve (46) up or down as required to locate rocker (36) in the desired position. Secure adjustment with the jam nut provided.

Buffer spring (19) positions the push rod relative to the lifter and assists spray valve spring (9) in returning part of the operating mechanism as the spray valve is being closed. The buffer spring assembly is permanently made up at the factory. Sleeve (48) is screwed into cage (47) to produce correct tension on spring (19) and the two parts are then welded together. The complete assembly is screwed in the top of lifter guide (50) and clamped after it has been properly adjusted. As the buffer spring assembly is screwed down spring (19) forces the pushrod downward against the weaker spring (22) and brings the end of the push rod closer to the wedge and lifter. Proper adjustment of the buffer spring assembly is as follows:

(a) Bar the engine until the fuel cam follower is on the base circle of the cam.

(b) Set the wedge shaft and wedges in full load position (wedges "fully in" as determined by the governor weights being fully in) and unscrew cage (47) until there is clearance between the lower end of the pushrod and the upper face of the wedge.

(c) Slowly screw down cage (47) and at the same time move the wedge back and forth sideways with fingers.

(d) As soon as the wedge is felt to tighten unscrew the cage one-half turn and lock it in this position with the clamping screw.

NOTE: When timing the spray valves as described in the following the buffer spring assembly should always be unscrewed about one or two turns. When timing is completed adjust the buffer spring in accordance with instructions in this paragraph.

17. SPRAY VALVE TIMING (See Fig. O-4)

The timing procedure described in the following is for a spray valve opening of 6° B.T.C. (Before Top Center) and a spray valve closing of 20° A.T.C. (After Top Center). The proper spray valve timing to use is stamped on the engine name plate and should always be followed. (The standard valve timing is 6° - 20°. However, these timings are somewhat modified to suit special conditions of service.) If the timing on the name plate differs from 6° - 20° opening and closing the following instructions should be modified accordingly. Proceed as follows:

(a) Unscrew all buffer Spring Cages one or two turns. Shut off all the isolating valves in the fuel rail except for Number 1 cylinder.

(b) Be sure that wedges are in the full load position ("fully in") as determined by the governor weights being against their inner stops. (Normally the wedges will be "fully in" when the engine is shut down but it is well to check this point.)

(c) Spot Number 1 cylinder at 7° A.T.C. on the power stroke. (Half way point between 6° B.T.C. opening point and 20° A.T.C. closing point.) Then unbolt and turn the fuel cam until the center of the toe is directly in line with the axis of the lifter. Clamp the fuel cam temporarily.

(d) Set the crankshaft 6° B.T.C. on the compression stroke. Bar the engine up to this point in the direction of rotation.

(e) Pump up a fuel pressure of about 1500 lbs. per sq. inch with the hand pump.

(f) Slowly screw down on adjusting screw (40) (with clamp screw (39) loose), until the pointer on the pressure gauge drops indicating that the spray valve has opened. Tighten screw (39) and check the adjustment by backing the engine up a few degrees, pumping the fuel pressure up again and barring the engine slowly in the ahead direction until the pressure again drops. If the flywheel pointer is not at 6° B.T.C. readjust and check again.

(g) Bar the engine over to 25° A.T.C. and again pump up the fuel pressure. Then bar the engine backwards slowly until the pressure drops. This point, which is the closing of the spray valve, should be 20° A.T.C.

(h) If this point is past 20° A.T.C. too long a spray period is at hand. It will be necessary to advance the fuel cam slightly and repeat steps "d", "e", "f", and "g". If on the other hand the spray valve closes before 15° A.T.C., retard the cam slightly and repeat steps "d", "e", "f", and "g".

(i) Repeat steps "c" to "g" on the remaining cylinders and record the spray valve timings.

(j) Adjust the buffer springs as per instructions in paragraph 16. Note that buffer spring cages should always be unscrewed when spray valves are timed.

18. BALANCING THE ENGINE FOR EQUAL LOAD ON ALL CYLINDERS

Theoretically, if the spray valves have been timed exactly and correctly (as outlined in the preceding paragraph) the amount of fuel injected in each cylinder should be the same. Consequently, the total engine load should also be equally divided between all the cylinders. Practically however, it is impossible to time all the spray valves exactly alike, and even if that could be accomplished manufacturing tolerances on such items as orifices in the spray valve tips, fuel cams, wedges, etc. are apt to affect the cylinder balance. The division of load between the various cylinders should consequently be checked after the engine is running, preferably at full load. Since the exhaust temperatures are proportional to the

loads that the various cylinders are carrying the amount of fuel injected should be adjusted so that the exhaust temperatures for the various cylinders are alike, or nearly alike.

The amount of fuel injected and consequently the load carrying capacity of a cylinder may be changed by adjusting screw (40). Referring to Fig. O-4, clamp screw (39) should be loosened and the adjusting screw turned to affect the adjustment. It should be noted, however, that this adjustment will affect the spray valve timing. Therefore, the adjustment should not be appreciable and should not exceed one turn of the adjusting screw from the position obtained when timing the spray valve.

The proper procedure for balancing the engine can be summarized as follows:

(a) Assuming that all the spray valves have been correctly timed it should be possible to balance the engine by turning adjusting screws one turn or less. Screwing down the adjusting screw will increase the exhaust temperature of the cylinder and vice versa.

(b) If an adjustment of one turn is not sufficient the timing of all the spray valves should be checked and, if necessary, adjusted as described in Paragraph 17.

(c) If the valve timing is found to be satisfactory or if, after making any necessary correction in the spray valve timing, a correction of one turn of the adjusting screw is still insufficient, defective combustion is indicated. This may be due to one or more spray tip orifices being plugged or to any of the defects dealt with under the heading "Smoky Exhaust" in the "Maintenance and Inspection" section.

1. GOVERNOR

The flyball type governor is mounted on the timing gear casing on the operating side of the engine and is driven by the camshaft gear. It is illustrated in Fig. Q-1.

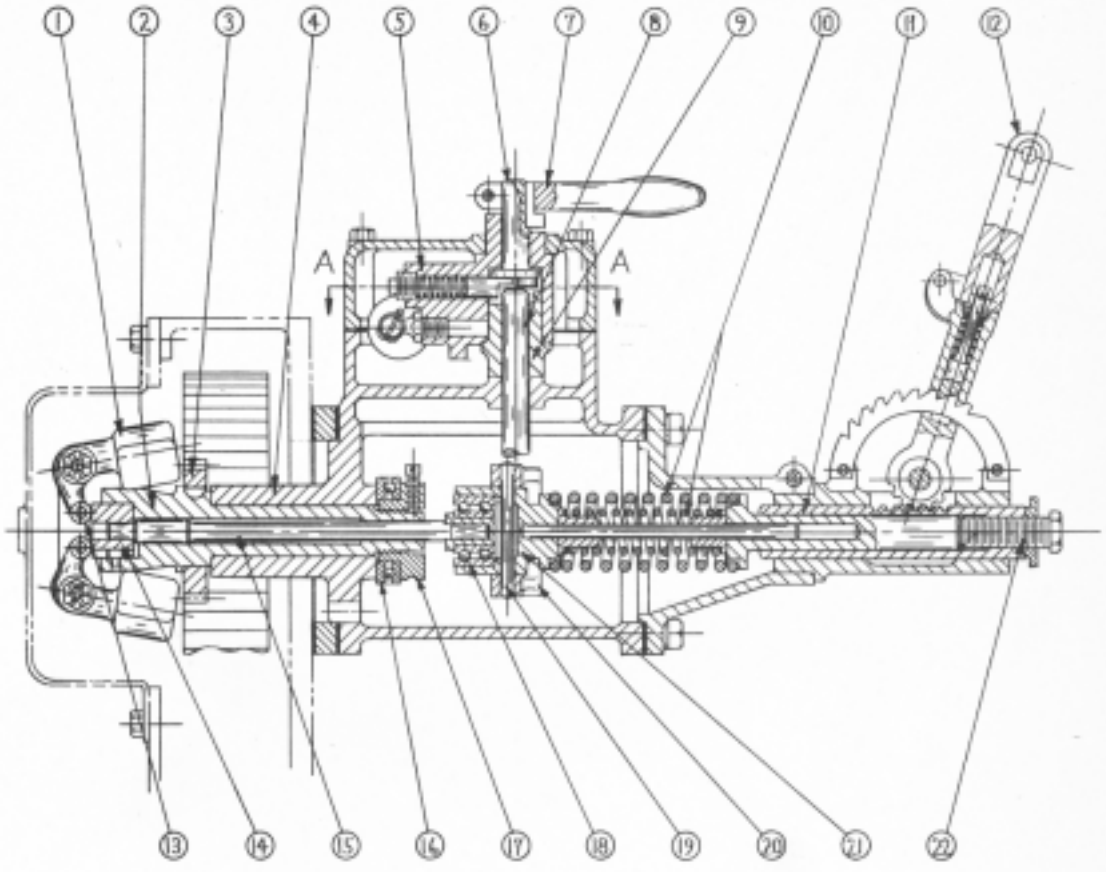


FIG. Q-1

Governor housing (4), which forms the governor bearing, is bolted and doveled to the gear casing. It is located to allow .004"-.005" backlash between governor gear (3), which is keyed and pressed on governor body (2), and the camshaft gear. Lubricating oil from the pressure pump is piped to the bearing through a drilled hole in the housing. Governor weights (1) are mounted on fulcrum pins in governor body (2) and carry hardened steel rollers (13) on riveted pins. As the flyballs tend to move out due to centrifugal force, the rollers bear against thrust plate (14) and transmit the force developed by the weights through quill rod (15), thrust bearing (18) and spring block (21) to governor springs (10). The thrust reaction is taken by bearing (16), which is secured to the governor body by threaded retaining collar (17). Thrust clearance is adjusted to .010" and the collar is locked by a set screw, secured in place by a locking wire through the head.

Spring block (21) follows the motion of the weights resulting from variations in engine speed. This motion is further transmitted by means of pin (19) and fork (20) to vertical shaft (8), to which fork (20) is clamped. Additional linkage connects vertical shaft (8) to the fuel wedge shaft to which each of the wedges are linked, thus completing the connection from the governor weights to the fuel wedges. The engine speed is controlled by varying the tension of the governor spring through hand lever (12) and rack (11). The lever is held in place by a latch which engages a toothed quadrant. A break mechanism in the handle permits moving the lever to the left, which reduces the spring tension. This allows the governor weights to move out, withdrawing the fuel wedges and reducing the engine speed. Conversely moving the control lever to the right increases the engine speed. Adjusting screw (22) controls the engine speed and should be set to give the desired full load speed

(see engine name plate) with the governor control lever in the last notch. The engine will then idle at the proper speed with the control handle in the first notch. The adjustment is secured by means of a lock nut.

2. STOPPING MECHANISM

The engine is stopped by rotating the hand lever on top of the governor housing. Lever (7) (See Fig. Q-1) is connected through a release mechanism to floating lever (5) on top of vertical shaft (8). Lever (5) is linked directly to the fuel wedge shaft. The release mechanism is shown in detail in Fig. Q-2 which is an enlarged section taken through line A-A in Fig. Q-1. It serves to break the connection between Lever (5) and vertical shaft (8), releasing the wedge shaft from governor control. Referring to Fig. Q-2 it will be noted that set screw (25) and plunger (23), both of which are mounted in lever (5), form a rigid connection between lever (5) and drive collar (9). Collar (9) is clamped to vertical shaft (8) and appears in Fig. Q-2 as the annular segment, the opposite ends of which bear against the diagonally milled flat on the lower side of plunger (23) (shown dotted in Fig. Q-2) and the end of setscrew (25). This is the normal position of the mechanism when the engine is running, levers (5) and drive collar (9) operating as a single unit. When lever (7) is pulled to stop the engine, eccentric (24) on the lower end of shaft (6) engages the end of plunger (23) and forces it back against its spring, out of engagement with collar (9). Lever (5) is then free to rotate clockwise without interference with collar (9). As stopping lever (7) is moved further the projecting end of the key in shaft (6) engages a boss extending from the top of lever (5) (not shown in Fig. Q-1) and thereafter lever (5) follows the motion of hand lever (7), pulling out the fuel wedges and stopping the engine.

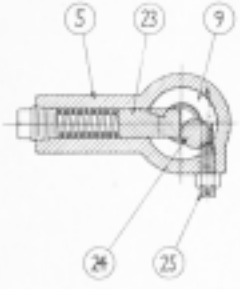


FIG. Q-2

3. LINKAGE - ATLAS GOVERNOR TO FUEL WEDGE SHAFT

The rod connecting the governor mechanism to the fuel wedge shaft is adjustable in the ball socket joints at either end. This adjustment should be set so that when the governor stopping lever (6) (See Fig. Q-1) is in the mid position of its stroke between full load and idling the connecting lever on the wedge shaft is vertical.

4. WOODWARD GOVERNOR & DRIVE

Complete instructions in regard to functioning, adjustments and servicing of the Woodward governor are contained in the pamphlet entitled "UG-8 GOVERNOR INSTRUCTIONS" by the Woodward Governor Co., Rockford, Illinois. This pamphlet will be found at the end of Section Q.

The construction of the Woodward governor drive and overspeed governor is illustrated in Fig. Q-3. The drive is contained in housing (9), which is bolted to the centerframe and gear casing and on which the governor is mounted. Drive shaft (10) rotates in a bronze bushing in one end of the housing and in a ball bearing in the other end. The bushing is pressure lubricated and if replaced must be reamed to 1.0000" to 1.0005" in diameter after pressing in and the oil hole must be drilled through. The reamed hole must be kept concentric

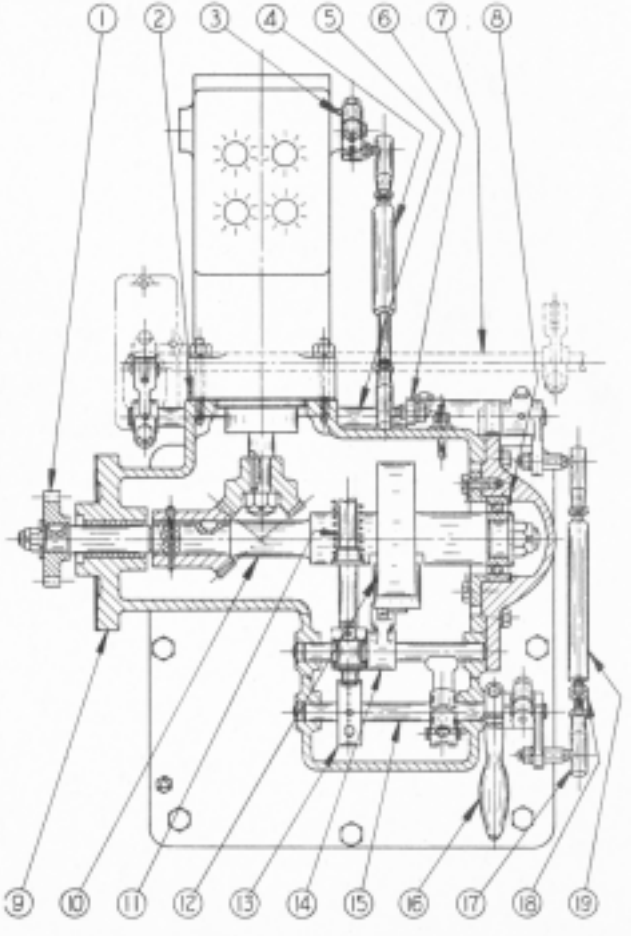


FIG. Q-3

with and square to the bore in the opposite end of the casing. Drive gear (1) mounted on the end of the shaft meshes with the camshaft drive gear. Clearance between the governor bevel drive gears is determined by shims (2) under the governor and shims (8) in the ball bearing housing. These shims are adjusted to bring the gear teeth in line and to allow approximately .004" backlash in the gears. If the governor is ever replaced, check this clearance carefully as the lengths of the governor shafts may vary.

5. LINKAGE - WOODWARD GOVERNOR TO FUEL WEDGE SHAFT

The governor linkage is illustrated in Fig. Q-3. Governor terminal shaft lever (3) is connected by means of collapsible link (4) to lever (6) which is clamped to shaft (5). This shaft in turn is linked to fuel wedge shaft (7) located inside of the cylinder block.

All of the levers are clamped and pinned to their respective shafts, so that they may be correctly reassembled if dismantled. Governor terminal lever (3) is mounted on the splined governor terminal shaft by means of a split splined bushing, which is pinned to the lever. If removed from the shaft it must be reassembled in the same position and shaft and lever should be marked prior to disassembly. Collapsible link (4) permits movement of the linkage to the stop position by the overspeed governor against the action of the Woodward governor. Under normal engine operation it acts as a fixed link, but when the overspeed governor trips, a spring inside the linkage collapses, shortening the link. Both ends are adjustable in the rod ends, and should be set to equalize the available governor shaft motion with the desired fuel wedge shaft motion.

6. OVERSPEED GOVERNOR (With Woodward Governor Only)

The overspeed governor is built into the Woodward Governor drive. It is a safety device, stopping the engine in case of overspeeding by withdrawing the fuel wedges. Its operation is a definite indication that something is wrong, either with the regular governor or with the linkage, and the engine should not be run until the trouble has been located and corrected. UNDER NO CIRCUMSTANCES should operation of the engine be permitted with this device disconnected or made inoperative, as severe overspeeding of the engine may be very dangerous and may result in a complete wreck of the engine. The construction is illustrated in Fig. Q-3. Horseshoe shaped overspeed governor weight (12) is held to the governor drive shaft by a spring acting on a pin which goes through the drive shaft. The spring tension has been adjusted for a tripping speed approximately 7 to 10% above the normal operating speed by means of shims under the outer end of the spring. There should be no occasion for changing the shims, but the assembly can be dismantled if desired by pressing in on the spring end of the driving pin until the split washer on the weight end is free, allowing removal of this washer.

When the speed for which the spring is set is exceeded, the weight is thrown out by centrifugal force and engages the roller in the end of lever (14). This lever in turn raises spring loaded pin (11) and releases latch (13). Latch shaft (15) is also spring loaded, and when released it rotates, lifting rod (17). This rod projects into sleeve (19), which normally works up and down on the rod as the governor responds to variations in engine speed. Nuts (18) on rod (17) should be located so that there is approximately 1/32" to 1/16" clearance between the upper nut and the lower end of sleeve (19) when the fuel wedges are in full load position. When the overspeed governor trips and rod (17) is raised, nuts (18) engage and lift sleeve (19). This action rotates control shaft (5), pulling out the fuel wedges and stopping the engine. The stop may be reset by means of lever (16).

Woodward Governor Co:
Rockford, Ill.

UG-8 GOVERNOR INSTRUCTIONS

INSTRUCTIONS TO POWER PLANT OPERATORS

Your Woodward Governor is a precision instrument, but there is nothing mysterious about it. You don't have to be an engineer or a scientist to operate it and get the finest possible governing.

The illustration on drawing DS-140 shows the location of all the controls mentioned below. All of them may be adjusted while the engine is running.

STARTING ENGINE: With the knob on the top dial (LOAD-LIMIT) turn the red hand to a point just a little higher than where the black hand usually runs when the engine is idling (probably somewhere between 1-1/2 and 4 on the dial). This prevents the engine from getting too much fuel and accelerating too rapidly. Start the engine.

When the engine is sufficiently warmed up, turn the red hand way over to 10. If for any reason you want to keep this engine from taking full load, set the red hand at a lower point. The black hand (which shows the fuel control position) can never go beyond the red hand.

If the engine carries any load other than an A.C. generator, the governor is now ready for load, so apply it when ready. You can adjust the speed of the engine by turning the synchronizer knob on the governor, or by operating the synchronizer switch on the switchboard if the governor is equipped with a snychronizing motor. If the engine drives an A.C. generator, set the speed droop at about 50 and then synchronize in the usual way. After the unit is on the line, load can be picked up by turning the synchronizer toward FAST or dropped off by turning it toward SLOW.

THE FOLLOWING INSTRUCTIONS APPLY ONLY TO A.C. GENERATING PLANTS WHICH ARE OPERATING ALONE. THEY DO NOT APPLY IF YOUR PLANT IS TIED IN WITH OTHER PLANTS.

In order to maintain 60 cycle frequency most easily, adjust your governor as follows. These instructions should be followed unless the manufacturer of your engine has given you other instructions.

All but one of the governors on the line at one time should have speed droop. If you have any engines which do not have a Woodward Governor, they probably have from 3% to 5% speed droop. Therefore:

(a) Set the speed droop dials of all governors (except one) at about 30 on the dial if you have all Woodward Governors.

(b) If you have some engines that do not have Woodward Governors, set all (except one) of the speed droop dials at 50 or higher.

Set one governor on zero speed droop or as far to the left as the pointer will go. THIS ENGINE WILL NOW TAKE ALL OF THE LOAD CHANGES WITHIN THE LIMITS OF ITS CAPACITY, and when you have learned how to adjust it closely enough, it will hold the normal frequency to very close limits. You will have to adjust it only once a day or less to keep your electric clock correct within a few seconds a day.

You should watch your load on the watt meters or on the governor load indicators, and when you find that the engine whose governor has zero speed droop is almost to full load, PICK UP MORE LOAD ON THE OTHER ENGINES. If you find that it has almost no load, TAKE SOME LOAD OFF THE OTHER ENGINES. After you have run this way a while, you will learn what times during the day you will have to do this.

You adjust your speed or frequency (cycles) by means of synchronizer adjustment on the engine with zero speed droop, and you adjust load by changing speed (synchronizer) setting on the other engines.

THE FOLLOWING INSTRUCTIONS APPLY IF YOUR PLANT IS TIED IN WITH OTHER PLANTS

Set the speed droop dial at about 50.

Start the engine and synchronize as above.

If the engine tries to take too great a share of the load changes, set the speed droop higher. If it does not take its share, set it lower.

Pick up load in the usual manner by adjusting the synchronizer knob.

It may be that if your system is not too large and you have one unit that is large enough to take care of any load changes that may occur, you can set its governor on zero speed droop so it will do all the regulating for the system, just as though it were a single plant. The best way to find out if you can do this is to try it, first making sure that the load limit is set so that the engine cannot be overloaded.

STOPPING ENGINE: Take the load off the engine by turning the synchronizer knob toward SLOW.

After the unit has been taken off the line, shut it down in the usual way.

THE FOLLOWING INSTRUCTIONS APPLY IF YOUR ENGINE IS NOT DRIVING AN A.C. GENERATOR

If your engine is driving a D.C. generator, pump, or anything but an alternating current generator, set the speed droop at zero on all engines. In direct current service, it is occasionally desirable to run with a little speed droop to aid in load division, particularly in cases where generator compounding is not identical.

TAKING CARE OF YOUR GOVERNOR

It will not take much care to keep your Woodward Governor running properly for many years.

OIL: Keep the governor oil level high enough so it can be seen in the gage glass. Your regular engine oil will be all right although SAE 20 to 30 is usually best. The oil should be acid-free and should not sludge or retain air. IT MUST BE CLEAN AND NEW. Wash your pail or oil can thoroughly with gasoline before you use it for governor oil.

Should any part become worn or damaged, you can order a new one, giving its part number as shown on the drawings and the serial number of the governor.

ALWAYS GIVE THE SERIAL NUMBER OF YOUR GOVERNOR WHEN WRITING OR ORDERING PARTS.

INSTRUCTIONS TO ENGINE ERECTORS

You will not find it difficult to install and adjust a Woodward type UG-8 governor. If the governor was fitted on the engine at your factory, you will only have two simple things to do. If they are not done, the governor will not work properly, and your engine will not perform as well as other engines whose governors are correctly adjusted.

1. PUT IN OIL

(a) Fill the governor with oil through the filler cup in the governor cover. The level must be brought up to a point where the oil shows in the gage glass on the front of the governor. This level should be maintained in service.

USE CLEAN, NEW ENGINE OIL. The pail or can used to carry oil to the governor should be thoroughly washed with gasoline before it is used.

(b) It is a good idea to roll the engine over slowly a few revolutions to fill the governor cylinder with oil. This is not necessary, but it will make the first start of the engine much smoother.

2. ADJUST THE COMPENSATION

The compensation adjustments made at your factory may not be satisfactory when the engine is installed in the field. You should go through the procedure indicated here, even though the governor appears to work all right. The fact that a governor does not hunt does not necessarily mean that it is correctly adjusted.

(a) Loosen the nut holding the compensation adjusting pointer 70-6 and set the pointer at its extreme downward position.

(b) Remove the compensating screw plug 54-7 and open compensating screw 36-11 two or three turns.

(c) Start the engine and let it hunt for thirty seconds or so.

(d) Gradually close the needle valve until hunting stops, or until it is only about 1/8 turn open.

(e) If this does not stop the hunting, open the needle valve to about one turn and raise the compensation adjusting pointer about two graduations.

(f) Close the needle valve gradually again as under (d).

(g) Repeat until hunting stops.

(h) It is desirable to have as little compensation as possible. Closing the needle valve farther than necessary will make the governor slow to return to normal speed after a load change. Excessive dashpot plunger travel caused by adjustment of the compensation adjusting pointer too far toward maximum position will cause excessive speed change upon load change.

METHOD OF OPERATION

SCHEMATIC OPERATION

Movements of the operating parts of the governor are actually proportional to the amount of speed change, but have been greatly exaggerated in the drawings to make them more visible.

Assume, for the purpose of explanation, that the prime mover is rotating at normal speed as shown on the speed indicator and carrying approximately half load as shown by the black hand. Assume, also, that the governor adjustments are all properly set and that speed droop is zero.

LOAD REDUCTION

Cut #1. The flyballs are in their normal position for the respective speed and no speed droop. The load limit is set at about 9/10 load, as shown by the red hand. The pilot valve is central. The power piston is stationary. The larger or actuating compensating plunger is approximately central. The small or receiving compensating plunger is central.

Cut #2 A certain amount of load is thrown off the unit. The speed instantly starts to increase. As the speed increases, the flyballs move out, the speeder rod is forced up against the downward thrust of the speeder spring, pivot points "A" and "B" are raised, the pilot valve plunger is lifted from its central position, and pressure oil is admitted from "P" through the center holes in the pilot valve bushing into port "X" and on into the power cylinder where it starts moving the power piston down, which rotates the terminal shaft to reduce the flow of energy medium to the Prime mover. Oil laying on the lower side of the power piston is forced out through port "Y", through the lower hole in the pilot valve bushing and into the sump "S".

Cut #3. As the power piston moves down, pivots "D", "E" and "F" are pulled down and "G" is raised. The larger or actuating compensating plunger is, therefore, raised. Since the compensating dashpot is filled with oil, the upward movement of the compensating actuating plunger pulls the smaller or receiving compensating plunger downward against the upward force of the double acting compression compensating spring, which attempts to keep the receiving plunger central at all times. The downward movement of the compensating receiving plunger pulls pivot "C" downward and as pivot "A" is temporarily stationary due to the fact that the flyballs are still in their outward position, it acts as a fulcrum, causing the downward movement of pivot "B", and consequently the pilot valve plunger. These various parts do not make a single, definite and complete move but make short moves in sequence and the action is continued until the pilot valve plunger is lowered to its central position, thus stopping the flow of pressure oil from "P" to port "X" and thus stopping the motion of the power piston.

If the movements of the various parts have been properly proportioned and inter-related, the pilot valve plunger will be centered and the movement of the power piston will be stopped at a position corresponding to a flow of energy medium just sufficient to accommodate the reduced load on the unit. All that is necessary now is to hold the power piston stationary until the speed returns to normal or until a subsequent speed change occurs.

The upward movement of the actuating compensating plunger created a vacuum in the compensating dashpot case, which caused the receiving plunger to be drawn downward. At the same time, oil from the sump "P" began to flow through the compensating needle valve into the case to break up the vacuum and allow the compensating spring to return the receiving plunger to its central position. The needle valve is small and consequently had little effect while the actuating plunger was in motion. Now, however, the movement of the actuating plunger has stopped and, therefore, the flow through the needle valve will allow the compensating spring to bring the receiving plunger back to normal at any predetermined rate according to the setting of the needle valve. If the needle valve has been properly set, the receiving plunger will return to its central position in exact unison with the return of the prime mover speed to normal and consequently the return of the flyballs to their normal central position. Such being the case, pivot "C" will move upward in exact ratio to the downward movement of pivot "A" caused by the return of the flyballs to center. Pivot "E" will, therefore, remain stationary, the pilot valve plunger will not be disturbed, and the power piston will remain stationary.

Cut #4. The cycle has been completed, the speed is normal, the load is as shown by the black hand, the flyballs are central, the receiving compensating plunger is central, and the power piston is stationary. The only permanent changes that have resulted are the position of the black hand, which shows the new loading of the unit; the position of the power piston; and the position of the compensating actuating plunger.

LOAD INCREASE

The action when load is added to the unit is just the reverse. The speed starts to drop, the flyballs move in, pivots "A" and "B" are lowered, the pilot valve plunger is lowered, pressure oil is admitted from "P" to "Y" and the power piston moves up to rotate the terminal shaft and increase the flow of energy medium. As the power piston moves up, pivots "D", "E" and "F" are raised and "G" is lowered. The compensating actuating plunger is forced downward, the compensating receiving plunger is forced upward, raising pivot "C" and lowering pivot "B" until the pilot valve plunger centers, stops the flow of pressure oil into port "Y" and stops the movement of the power piston at the exact position corresponding to the increased load on the unit. As the energy medium flow is corrected, the speed of the unit returns to normal. In unison with the return of the speed to normal and consequently the return of the flyballs to their central position, the compensating receiving plunger, due to the flow of oil out through the compensating needle valve and the centering action of the compensating spring, returns to its central position. The pilot valve plunger is not disturbed and the power piston remains stationary awaiting another change in speed resulting from a change in load.

THE LOAD LIMIT

The purpose of the load limit is to prevent the unit from taking on more load than that for which the red hand is set by mechanically preventing the pilot valve plunger from rising above center when a loading corresponding to the setting of the red hand has been reached. It also provides a means of shutting the unit down by merely turning the red hand to zero.

Action: Referring to the cuts, as the power piston moves upward to increase the flow of energy medium, pivot "D" is forced upward, lifting the left end of the load limit lever. Just as the top of the load limit lever contacts the load limit cam, the shutdown lever contacts the top of the slot in the pilot valve plunger stem. As the power piston continues to rise, the load limit lever is rotated clockwise, pushing down on the shutdown rod and on the left end of the shutdown lever, and thus lifting the pilot valve plunger back to center. The flow of high pressure oil from "P" through port "Y" to the lower side of the power piston is cut off and the power piston is brought to a stop so that the load on the engine is exactly that for which the red hand was set. Any attempt of the flyballs to increase the flow of energy

medium further does not affect the pilot valve as it is held from moving below center by the shutdown lever. The spring coupling absorbs the downward movement of the speeder rod.

To reduce the load limit setting or to shut the unit down completely, turn the red hand counter-clockwise. The load limit cam will force the load limit lever to revolve clockwise about "D", forcing the shutdown lever to lift the pilot valve and allow high pressure oil from "P" to enter port "X". The power piston moves down, as does pivot "D". As pivot "D" moves down, the load limit lever rotates counter-clockwise about its contact point with the cam, since it is held upward against the cam by the power piston rod on one end and by the spring coupling through the shutdown lever on the other end. Downward movement of the power piston is stopped when the load limit lever reaches a position where the pilot valve plunger can regain its normal central position.

SPEED DROOP

The purpose of speed droop is to cause all units operating in parallel to take their proportionate share of the total load.

Action: As shown in the cuts, the speed droop fulcrum is exactly over pivot "I" and consequently does not produce a drooping of the unit speed as the unit takes on load. In other words, the speed of the unit will remain the same regardless of the amount of load on the unit (within the capacity of the unit). But, revolve the speed droop knob clockwise and the speed droop fulcrum will be moved along the speed droop lever and consequently away from exact center. The farther away from exact center it is moved, the greater will be the droop in the speed.

With the speed droop fulcrum off center, assume that the power piston moves to increase energy medium flow. The terminal shaft will be revolved counter-clockwise. Pivot "H" will be lowered and, as the speed droop fulcrum is not directly over pivot "I", pivot "I" will be raised, thus relieving some of the compression on the speeder spring. The flyballs will, therefore, recenter at a lower speed than before and the pilot valve will be centered and the power piston stopped before it reaches a position corresponding to the original speed. In other words, the speed of the unit will not be returned to the speed at which it was operating but to a slightly lower speed of an amount corresponding to the distance the speed droop fulcrum is off center.

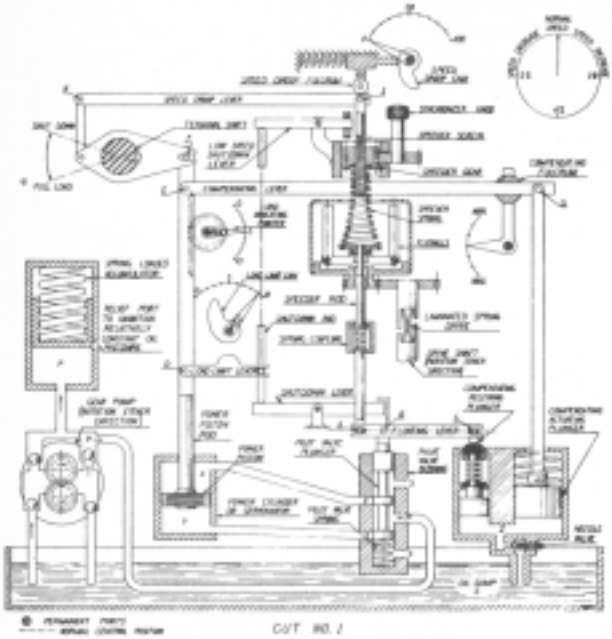
If the power piston moves in the direction to decrease energy medium flow, the speed will raise an amount corresponding to the distance the speed droop fulcrum is off center.

THE SYNCHRONIZER

The purpose of the synchronizer or speed adjusting mechanism is to permit varying the unit speed for synchronizing when the unit is being paralleled with other units. If the unit is operating in parallel on a system many times the capacity of the individual unit, an adjustment of the speed setting will result in a change of the system speed, but the change in speed may be so infinitesinal as to be unreadable on ordinary switchboard instruments. Practically, therefore, a change in the synchronizer setting merely changes the loading of the unit due to the small amount of influence the capacity of the unit has on the total capacity of the system.

Action: Revolve the synchronizer knob clockwise. The gearing is such that the speeder gear revolves clockwise, thus screwing down on the speeder screw against the speeder spring. The increased loading on the speeder spring causes the flyballs to move in. The pilot valve is pushed down, the power piston moves up to increase the flow of energy medium and thus the speed of the unit. The unit will increase in speed until the flyballs return to their normal central position and stop the action of the pilot valve. This speed will be the normal speed of the unit until the synchronizer is again reset.

Revolving the synchronizer knob counter-clockwise will cause a reversal of operation and the unit speed will be lowered.



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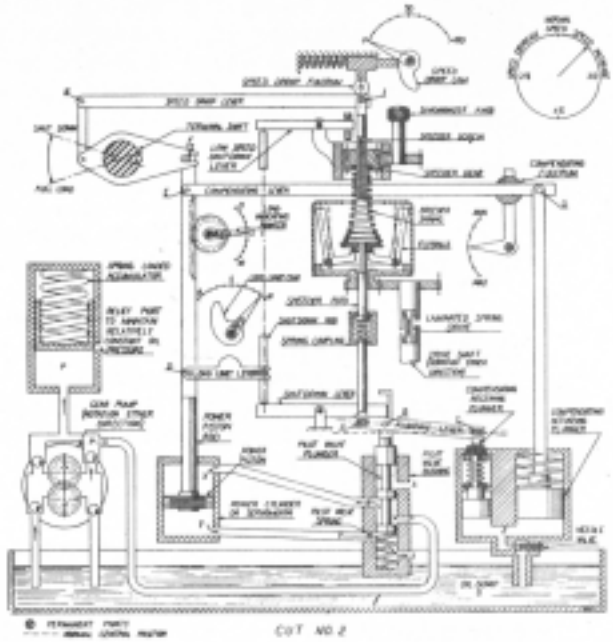

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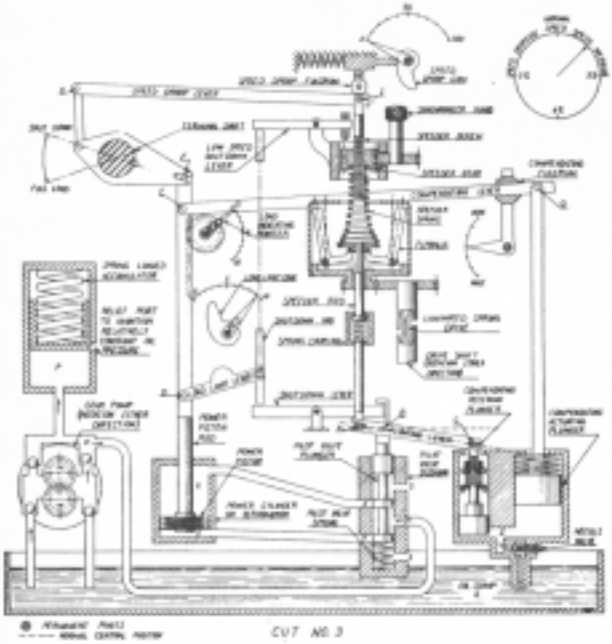

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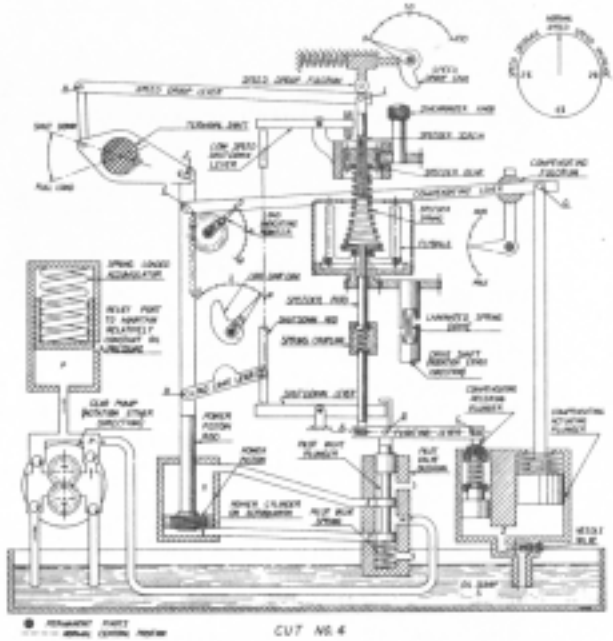

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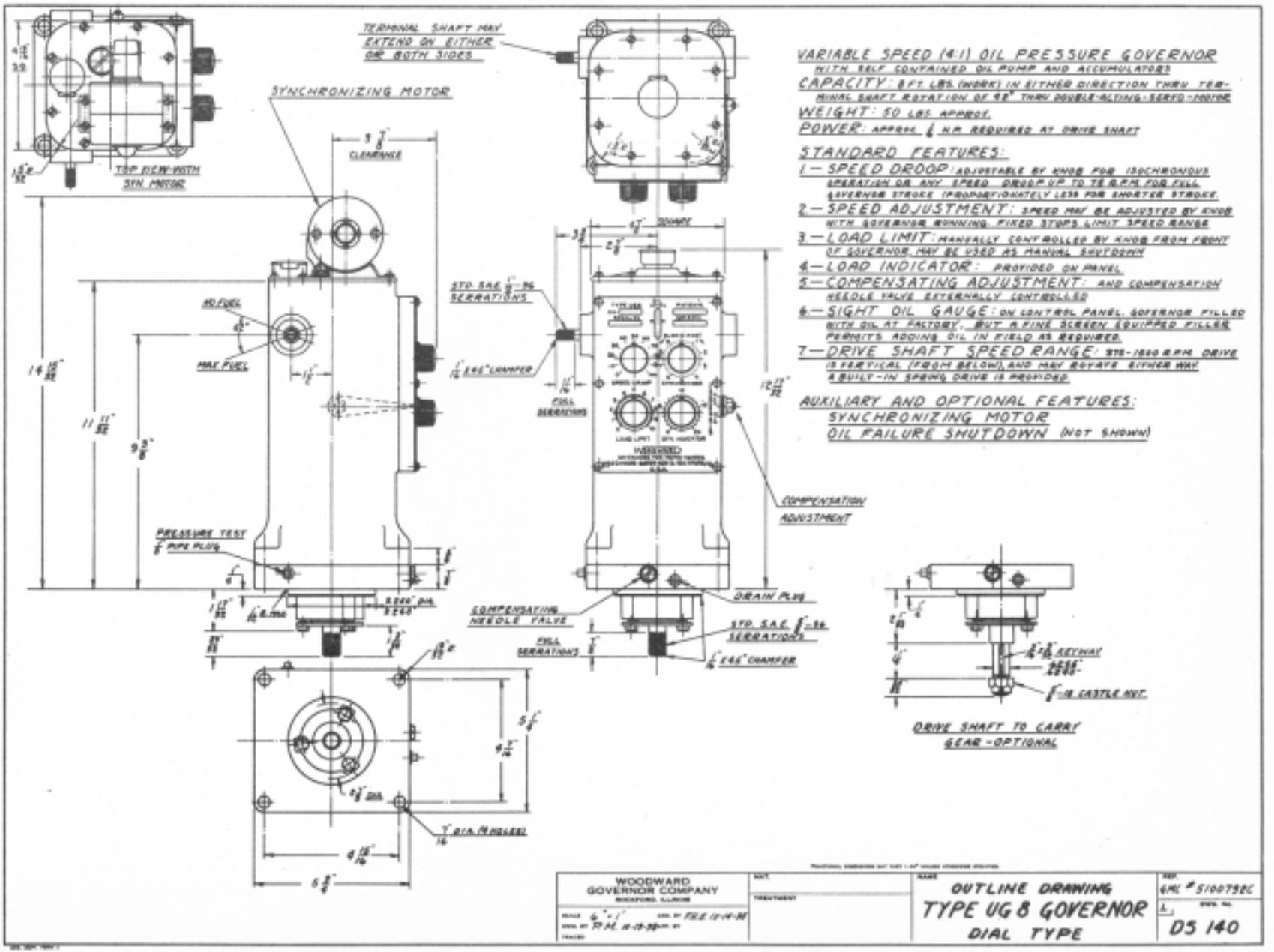


VARIABLE SPEED (4:1) OIL PRESSURE GOVERNOR
WITH SELF CONTAINED OIL PUMP AND ACCUMULATOR

CAPACITY: 8 FT. LBS. (WORK) IN EITHER DIRECTION THRU TERMINAL SHAFT ROTATION OF 42° THRU DOUBLE-ACTING-SERVO-MOTOR

WEIGHT: 50 LBS. APPROX.

POWER: APPROX. 1/4 H.P. REQUIRED AT DRIVE SHAFT

STANDARD FEATURES:

1—SPEED DROOP: ADJUSTABLE BY KNOB FOR ISOCHRONOUS OPERATION OR ANY SPEED DROOP UP TO 12 R.P.M. FOR FULL GOVERNOR STROKE (PROPORTIONATELY LESS FOR SHORTER STROKE.

2—SPEED ADJUSTMENT: SPEED MAY BE ADJUSTED BY KNOB WITH GOVERNOR RUNNING. FIXED STOPS LIMIT SPEED RANGE

3—LOAD LIMIT: MANUALLY CONTROLLED BY KNOB FROM FRONT OF GOVERNOR. MAY BE USED AS MANUAL SHUTDOWN

4—LOAD INDICATOR: PROVIDED ON PANEL

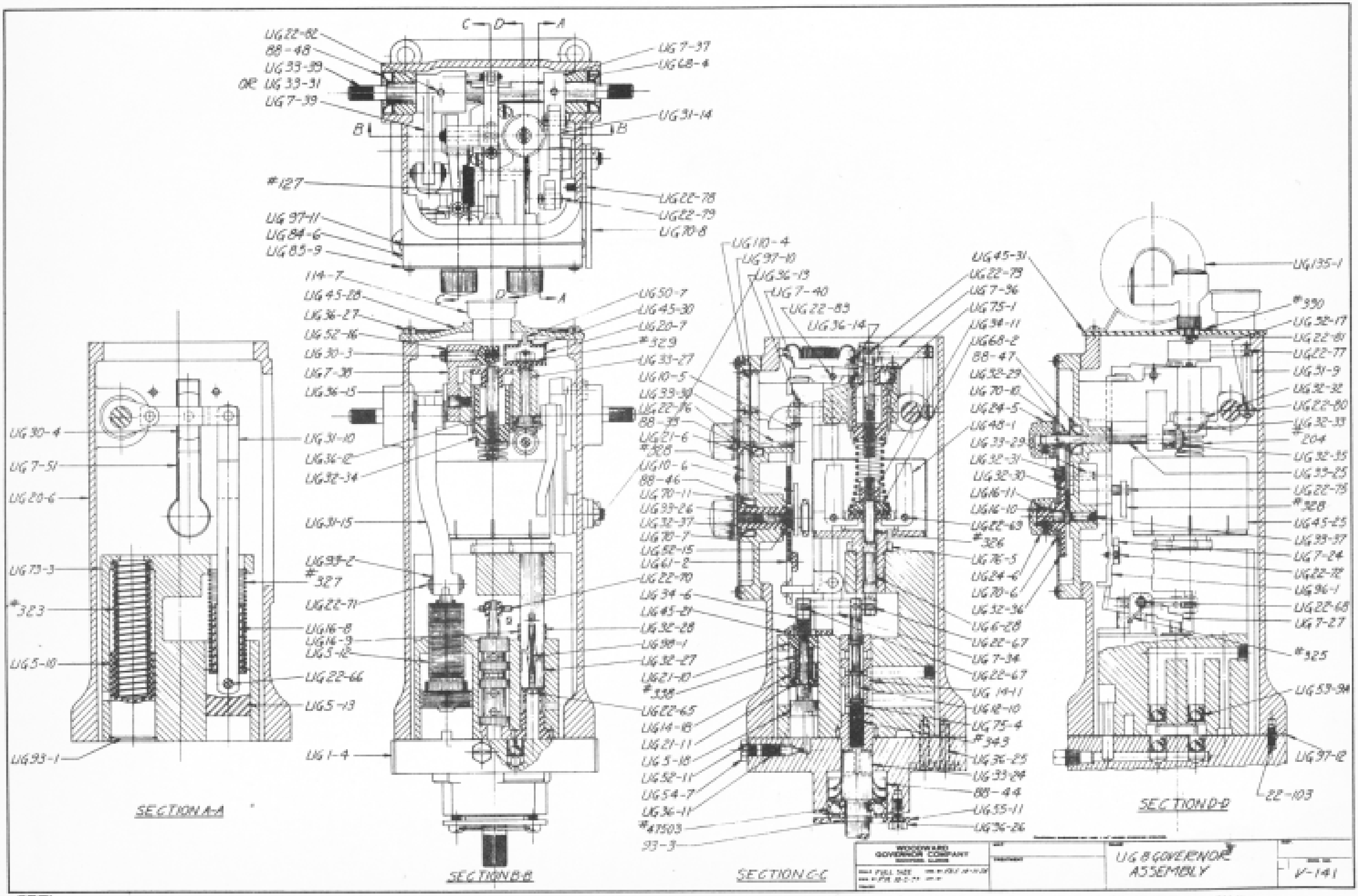
5—COMPENSATING ADJUSTMENT: AND COMPENSATION NEEDLE VALVE EXTERNALLY CONTROLLED

6—SIGHT OIL GAUGE: ON CONTROL PANEL. GOVERNOR FILLED WITH OIL AT FACTORY, BUT A FINE SCREEN EQUIPPED FILLER PERMITS ADDING OIL IN FIELD AS REQUIRED.

7—DRIVE SHAFT SPEED RANGE: 375-1500 R.P.M. DRIVE IS VERTICAL (FROM BELOW) AND MAY ROTATE EITHER WAY. A BUILT-IN SPRING DRIVE IS PROVIDED.

AUXILIARY AND OPTIONAL FEATURES:
SYNCHRONIZING MOTOR
OIL FAILURE SHUTDOWN (NOT SHOWN)

WOODWARD GOVERNOR COMPANY ROCKFORD, ILLINOIS	NOT. TREATMENT	NAME OUTLINE DRAWING TYPE UG 8 GOVERNOR DIAL TYPE	REF. GMC # 51007926 DWG. NO. DS 140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C
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UG 22-68
UG 7-27
#325
UG 53-94
UG 97-12
22-103
SECTION D-D
WOODWARD GOVERNOR COMPANY
ROCKFORD, ILLINOIS
SCALE FULL SIZE
UG 8 GOVERNOR ASSEMBLY
V-141

LUBRICATING OIL SYSTEM

1. The lubricating oil system consists of the oil sump (either in a separate sump tank or in the engine base), the lubricating oil pump, the lubricating oil strainer and cooler, and the necessary piping and manifold to carry the oil through the engine and to the bearings.

   In addition to the lubricating oil system as outlined above, there is also the Madison-Kipp sight feed lubricator, which supplies a measured quantity of oil to each piston and cylinder liner.

   The normal flow of oil through the system is from the oil sump to the pressure pump, then through the lubricating oil strainer and cooler to the main bearing manifold in the base, from which connections lead to each main bearing. Drilled holes in the crankshaft carry the oil from the main bearing journals to the crankpin bearings, from which it feeds up to the piston pin bearings through the rifle drilled connecting rods. The oil drains down into the bottom of the engine base, where, in "wet base" engines it collects in the base sump, to be sucked up again by the pressure pump. In "dry base" engines with sump pump it is scavenged from the base by the sump pump and delivered to the day tank, to which the suction of the pressure pump is connected. In "dry base" engines without sump pump the oil drains by gravity from the drain trough in the bottom of the base to the sump tank.

2. LUBRICATING OIL SUMP - WET BASE ENGINES

   On the sump type, or so called "wet base" engines, the lubricating oil sump pan is bolted to the bottom of the engine base. The sump is hopper shaped and carries the entire supply of oil for the engine. The oil drains into the sump through holes in the bottom of the base. Screens covering these holes are removable from inside of the base and should be thoroughly washed out when the oil is changed.

   A bayonet gage projecting down into the sump from the side of the base indicates the oil level. It should NEVER BE ALLOWED TO DROP BELOW THE "LOW" mark on the gage, and should preferably be kept up near the "FULL" mark. A drain plug is provided at the bottom of the sump pan, and unless it is readily accessible after the installation is completed it should be piped to a convenient location. Do not use a pipe smaller than the connection, and keep it short.

3. LUBRICATING OIL DAY TANK (Engines with Sump Pump)

   The lubricating oil is discharged by the sump pump to the cylindrical lubricating oil day tank of about 20 gallons capacity. The tank should be located above the level of the engine and reasonably close to it. A casting riveted to the top of the tank supports a screen and provides two openings, one for the discharge pipe from the sump pump and a filler opening for adding new oil to the system. A gage glass near the top indicates the depth of oil in the tank. It should be kept near the center of the glass and SHOULD NEVER BE ALLOWED TO DROP BELOW THE GLASS. A connection is provided for the pressure pump suction about eight inches above the bottom of the tank. There is also an opening at the bottom, which should be provided with a valve or cock to permit draining off the sludge.

4. LUBRICATING OIL SUMP (Dry Base Engines Without Sump Pump)

   A separate cylindrical sump tank of about 20 gallons capacity is furnished for dry base engines without sump pumps. The tank must be located below the engine level so that the oil can drain to it by gravity. A casting riveted to the top of the tank provides an opening for the oil drain from the engine and also a filler opening through which new oil can be added to the system. All oil entering the tank passes through a screen supported by the top casting. The oil level in the tank may be determined through the filler opening by means of a sounding rod. It should be kept up to within about four inches of the top of the tank and should NEVER BE ALLOWED TO DROP TO MORE THAN EIGHT INCHES BELOW THE TOP.

   It is good practice to thoroughly wash out the tank when changing oil. The suction pipe from the pressure pump extends nearly to the bottom of the tank and carries a foot valve on the lower end to keep the pump primed.

5. LUBRICATING OIL PRESSURE PUMP

   The lubricating oil pump, illustrated in Fig. T-1, is of the internal gear type. It is mounted on one of the centerframe doors, on the control side of the engine, and is driven from a gear on the camshaft. Referring to Fig. T-1, the end clearance between pump rotor (3) and the housing should be from .001" to .003", and is determined by the thickness of paper gaskets (2) under cover (1). If the clearance is

too great the pump efficiency will be reduced and if insufficient the rotor will bind. If the gaskets are replaced, measure the thickness with a micrometer and replace with exactly the same thickness.

Pump shaft (9) rotates in bronze bushings (8) which are pressed into the housing. If replaced, ream to .7500" to .7505" after pressing in. Drive gear (10) is keyed to the shaft and locked in place by a set-screw, which must be securely wired. The pump housing is positioned and doweled on the center-frame to allow .004" to .006" gear backlash. The gasket under the housing is 1/32" thick, which must be maintained or the backlash will be altered.

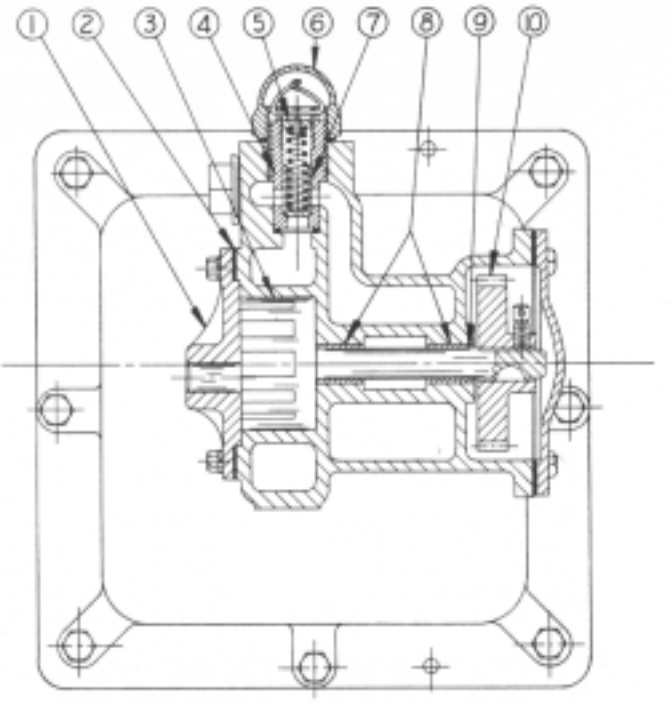


FIG. T-1

6. LUBRICATING OIL PRESSURE REGULATING VALVE

The spring loaded lubricating oil regulating valve (7) is built into the pump housing, as illustrated in Fig. T-1. The entire assembly is contained in cage (4), which is screwed into the housing against a copper gasket. It is sealed by cap (6) screwed onto the projecting end of the cage against a second copper gasket. The valve is adjustable by means of spring retaining plug (5), which may be screwed in or out of the cage. The adjustment is locked by a wire through the cage and plug as shown, and should be maintained at 40 to 50 lbs. per square inch.

Note that low lubricating oil pressure may not necessarily be due to relief valve adjustment. It may result from one or more of the following causes. They should be investigated before attempting to correct the pressure by adjusting relief valve at the pressure pump.

(a) Low lubricating oil level in filter and day tank unit.
(b) Restriction in suction pipe to either of the lubricating oil pumps.
(c) Broken pressure pipes or fittings.
(d) Crankshaft bearing failure.
(e) Worn pump gears.
(f) Viscosity of oil too low, excessive temperature of oil, or thinning out with fuel oil.

7. SUMP PUMP

When a sump pump is used it is identical with the pressure pump as described in Paragraph 4, except that the relief valve is not used. A blind plug fills the hole in the pump housing. The sump pump runs at a somewhat higher speed than the pressure pump.

8. LUBRICATING OIL COOLER

The lubricating oil cooler is mounted on the manifold side of the engine, and a pipe crossing through the engine below one of the main bearing saddles carries the oil from the pump to the cooler. The discharge from the cooler is piped back into the engine base, to the main bearing manifold.

The construction of the Ross type oil cooler is shown on Fig. T-2. The shell of the cooler is a completely closed circuit effected by brazing the tube sheets on each end to the seamless copper shell, and then mechanically rolling the tubes securely into the tube sheets at both ends. The bonnets are bolted to the shell flanges, with molded asbestos gaskets between, and can be removed for inspection and cleaning of the inside of tubes. The flow of the oil is guided by bronze baffles inside the shell to produce the most efficient heat transfer.

FIG. T-2

Zinc electrode plugs are provided in the bonnets to prevent electrolysis. They should be examined thirty days after installation and every thirty days thereafter. Any appreciable erosion within this period indicates electrolytic action, and if present a careful inspection should be made to determine if it is due to short circuits or external grounded electric currents. Any such conditions should be corrected at once, but if no external currents are found it is evident that the erosion is due to local electrolysis, and the zincs should be replaced frequently to protect the equipment.

The cooler should be cleaned periodically. Remove the cooler from the engine, take off the bonnets and clean the inside of the tubes. Fill the jacket with suitable cleaning solution, but avoid any fluids which are corrosive to bronze or copper. Drain and blow out with compressed air carefully.

The drain plugs at the bottom of both bonnets should be removed and all water in the cooler drained out whenever the engine is allowed to stand in freezing weather.

9. LUBRICATING OIL STRAINER

The lubricating oil strainer is connected in a by-pass line, taken from the main flow at the cooler inlet and discharging the filtered oil to the governor and fuel pump bearings.

FIG. T-3

The strainer is of the metal element type as shown on Fig. T-3. The elements are made up of flat metal ribbon wound around a central spool, adjacent layers being slightly separated from each other by raised ridges running across the ribbon. The successive layers of the ribbon are spaced .003" apart and it is these spaces that form the filtering medium. The oil flows from the outside toward the center and leaves the dirt on the outside of the spool. The strainer may be cleaned by turning the cleaning handles on top, which rotate knives bearing on the edges of the windings, scraping off the dirt and allowing it to settle to the bottom of the sump tanks. The strainer should preferably be cleaned when the engine is not

running so that the dirt may settle to the bottom, although there is no objection to cleaning with the engine running. Cleaning should be at sufficiently frequent intervals to prevent stoppage of oil flow and the sump tanks should be drained before the dirt in the bottom builds up to the level of the elements. Experience will determine the correct intervals.

10. LUBRICATOR AND DRIVE

The Madison-Kipp lubricator supplies a measured quantity of lubricating oil to the pistons, introduced at the center of the liner on each side. Nipples screwed into the liners and projecting through the cylinder block and sealed thereto by packing glands carry the oil through the water jackets.

The lubricator is fully described in the Madison-Kipp bulletin attached at the end of the book. Oil feeds to the pistons should be adjusted to 20-25 drops per minute when the engine is new, but this may be reduced to approximately 15 to 20 drops per minute after the pistons and rings have been well worn in. KEEP THE LUBRICATOR WELL FILLED WITH CLEAN OIL. Use the same oil that is used in the engine. Do not under any circumstances allow it to run dry as serious damage to the pistons and liners may result. This should be made a regular part of the engine room routine and should never be neglected. The lubricator is mounted on a bracket on the manifold side of the engine, and is driven from an eccentric on the end of the camshaft. The eccentric is enclosed and is lubricated by a feed from the lubricator, but the exposed linkage should be hand oiled daily.

11. SPECIAL EQUIPMENT

On engines built to special government requirements modifications in the standard equipment as described in the preceding paragraphs have been made in order to meet these requirements. The most important changes affecting the lubricating oil coolers and filters are described in the following.

SPECIAL LUBRICATING OIL COOLER

Certain government specifications require a minimum size on the cooler tubing and also require that it should be possible to withdraw the tube bundle for cleaning. In this particular case the Ross type cooler is similar to the cooler described in paragraph 8 except that the tube bundle and the tube sheets are separate from the shell. On one end the tube sheet is clamped between the shell and the bonnet while on the other end the tube sheet is floating. The floating tube sheet is elongated and seal is affected by means of a gland and packing. To remove the bundle first loosen the bonnet on the floating end. Then remove the bonnet on the opposite end whereupon the tube bundle can then be withdrawn. Zinc plates are mounted in each of the two bonnets and the instructions in regard to the zincs given in paragraph 8 apply in this case also.

SPECIAL LUBRICATING OIL STRAINERS AND FILTERS

The lubricating oil strainer on special government engines is usually of the duplex type with switchover valve allowing either element to be cut out for service or cleaning. All strainers are of the metal element type similar to the one described in paragraph 9 and the instructions given in this paragraph in regard to cleaning apply in this case also.

A great variety of oil filters of the cartridge types are available and they may be arranged either as full flow or by-pass filters. In full flow filters the entire amount of oil is passed through whereas when the by-pass arrangement is used only 10% to 15% of the total amount of oil is passed through the filter. A typical by-pass filter manufactured by Briggs Clarifier Co. is described in the following.

The Briggs Clarifier filter is usually not attached to the engine but is mounted in some convenient location and piped to the engine lubricating oil system. Half inch piping should be used and the clarifier should be hooked up in accordance with information given on the outline drawing. The clarifier is provided with a four-way cock allowing it to be cut out for servicing. 1-1/2 to 2 ft. clearance should be allowed above the filter for easy removal of the cartridges. The filter cartridges should be changed when the oil begins to darken or when by chemical analysis the oil shows a precipitation number of more than .05 or a neutralization number of more than .3. These values are generally accepted as the limits for efficient engine operation. Since the Briggs clarifier acts as a by-pass filter a restriction orifice is built into the inlet connection in order to limit the flow through the filter to 10% to 15% of the total amount of oil circulated. Under no circumstances should the restriction orifice be removed from by-pass filters as this will rob the engine force feed lubricating system of too much oil and will lead to burned out bearings and insufficient lubrication in general.

MAINTENANCE & INSPECTION

1. GENERAL RULES

Observing the following general rules will go a long way toward insuring satisfactory and trouble-free operation. Refer to preceding sections for detail instructions.

KEEP YOUR ENGINE CLEAN

Inspect the engine regularly and keep it wiped clean. If oil is left standing it quickly hardens and must be washed or scraped off. It is much easier to keep the engine clean than to get it clean, and there is always less trouble with a clean engine than with one that is covered with oil and dirt.

LEAVE WELL ENOUGH ALONE

When the engine is running satisfactorily and smoothly, do not continually try to better the operation with minor adjustments.

NEVER ALLOW YOUR ENGINE TO SMOKE

When the exhaust from an engine is smoky it clearly indicates that combustion is not perfect and that residue, in the shape of smoke, is clinging to the oily surfaces of the cylinders, pistons, piston rings, valves, etc. When this happens you are creating trouble for yourself and doing an injustice to the engine. Therefore, the first thing in consideration of the operation of a Diesel engine is: DO NOT ALLOW YOUR ENGINE TO SMOKE

KEEP A COMPLETE LOG OF ENGINE OPERATION

A complete log should always be kept of the engine operation, and back sheets should be consulted frequently and compared with present conditions. In this way gradual changes can be detected and investigated and insignificant troubles corrected before becoming real ones. Any unusual noises or other irregularities should be logged so that they will be investigated at the regular routine inspections.

INSPECTING REPAIRS

At completion of any adjustment or repair job, always make a thorough inspection to see that all parts have been correctly replaced, that bolts and nuts are tight, and that all cotter pins and locking wires are in place. If work involved rotating parts, bar engine around at least two full revolutions (so that camshaft is turned one revolution) to be sure that all parts are clear. Be sure that no tools or rags are left inside the engine.

2. SMOKY EXHAUST

Dark smoky exhaust usually occurs when the engine is loaded up (3/4 to full load) and indicates defective combustion which is usually due to one of the following causes:

(a) Excessive carbon on spray valve tips.

(b) Leaking spray valve.

(c) Leaky exhaust, inlet, or air starting valves.

(d) Buffer springs may be incorrectly adjusted.

(e) Fuel cam or roller may be worn.

(f) Leaky or stuck piston rings.

(g) Uneven cylinder load balance.

If the dark exhaust smoke is not even but occurs in the form of puffs it is likely that the combustion is defective in one or two cylinders only. Where the trouble lies can usually be determined by cutting out spray valves one at a time. When this is done however, the engine should not carry more than about 3/4 load or the remaining cylinders will be overloaded.

Sometimes the exhaust smoke is lighter and may be termed blueish-white in color. When viewed against a clear sky, it resembles the appearance of steam but is usually

a little more blueish in color. Blueish-white exhaust smoke generally occurs during prolonged idling or when the engine is loaded up after a period of idling. This type of exhaust smoke consists primarily of vaporized or partially burnt fuel and is due to misfiring in one or more cylinders. Inspection of the exhaust manifold or muffler in this case generally shows the internal surfaces to be wetted by fuel and in extreme cases pools of fuel may be formed in these parts.

Blueish-white exhaust smoke, unless it is dense, is generally not harmful to the engine, and as a rule practically all of the vaporized fuel is ejected with the exhaust gases. The unburnt fuel may however mix with soot and other products of combustion and in time cause sticking of piston rings and exhaust valves. In extreme cases where long periods of idling and long periods of heavy loading occur alternately, exhaust passages, manifold and muffler may gradually become partially plugged and the areas restricted to a point where the engine operation is affected.

The remedy for this type of exhaust smoke is to make sure that the engine fires on all cylinders when idling or at low loads. Which particular cylinders are misfiring can generally be determined by feeling the exhaust elbows. This should be done carefully however to avoid burning the hands on those that are hot. The fuel injection pressure should be reduced when idling to about 2200 to 2500 lbs. per square inch as this tends to lengthen out the injection periods and prevent misfiring. The injection timing should also be checked in accordance with paragraph 17 in Section O. In extreme cases, it may be necessary to balance the engine for equal loading on cylinders at idling or low load instead of at full load (See paragraph 18, Section O).

3. INSPECTION AND MAINTENANCE ROUTINE

The following routine for regular inspection and maintenance work is suggested as a guide for the operator, but experience with the engine over a period of time may indicate changes that should be made in the schedule.

It will be noted in the following schedules that spray valve cleaning has not been included. It is believed the spray valves should be cleaned only when necessary, rather than at definite intervals. The necessity for cleaning will be indicated by increased or uneven exhaust temperatures or smoky exhaust and at either of these indications the spray valves should be inspected and cleaned, if necessary.

In the following, work to be done under each routine should include work listed under preceding routines. For example, work under "Annual Routine" includes everything listed under all other routines.

8-HOUR ROUTINE

(a) Hand oil the following points:

1. The inlet and exhaust valve stems.
2. The rocker arms at their fulcrums and at their push rod ends.
3. Inlet and exhaust lifters, fuel wedges, lifter and buffers.
4. Wedge shaft bearings.
5. Mechanical lubricator lineage.

If the inlet and exhaust valves are sluggish in action it is preferable to use penetrating oil on the stems. If this is not available a mixture of equal parts of engine lubricating oil and kerosene may be used. (A mixture of two-thirds engine fuel oil and one-third lubricating oil can be used in an emergency.) For all other points in above schedule use engine lubricating oil.

(b) Every four hours check the oil level in the mechanical lubricator. Check oil level in sump or day tank. Fill with clean engine oil when necessary. If engine is equipped with sump tank check the oil level and add oil if necessary.

(c) Turn the handle of the lubricating oil and fuel strainers. Always turn cleaning handles immediately after stopping the engine.

(d) Take readings of all indicating instruments such as gages, thermometers, etc.

DAILY OR 24-HOUR ROUTINE

(a) Clean out the sump tanks of the lubricating oil and fuel oil filters.

(b) Check the feeds of the mechanical lubricator.

200 TO 300-HOUR ROUTINE

(a) Check intake and exhaust valve timing.

(b) Check spray valve timing. (After starting engine check cylinder load balance.) (See Section O)

(c) Clean out lubricating oil day tank or sump tank if lubricating oil is dirty or dark in color.

(d) Remove crankcase doors and inspect connecting rods. Be sure that all connecting rod bolts are tight and that everything is in order. Inspect lower part of cylinder liner bore.

(e) On engines equipped with cartridge type filters these may or may not need replacement. The time between replacements will vary with the type of fuel or lubricating oil used and with the operating conditions to which the engine is subjected. When the lubricating oil turns black rapidly following an oil change, the cartridges should be replaced.

(f) Inspect zincs in oil and water coolers. Replace if necessary.

SEMI-ANNUAL ROUTINE

(a) Pull cylinder heads and pistons, remove rings and clean pistons and grooves thoroughly. Check rings for side and end clearance.

(b) Examine cylinder liner walls. Watch for shoulders due to ring travel.

(c) Grind intake and exhaust valves. Check valve springs for length and tension and for defects.

(d) Recondition spray valves. Inspect stem packing and repack if necessary. Inspect stem for wear and replace if worn. Inspect and clean spray valve tips. Grind stem to tip.

(e) Inspect main and connecting rod bearings. Check clearances and inspect bearing surfaces. Adjust clearances if necessary.

(f) Inspect gear train carefully, observing backlash, indications of wear on teeth, and clearance on intermediate gear bearings.

(g) Inspect camshaft assembly. Watch for worn or loose cams, loose or worn rollers or pins on the lifters. Be sure all keys and lock bolts are in place and tight.

(h) Disassemble lubricating oil cooler and inspect for corrosion. Clean thoroughly before reassembling. Renew zinc plugs if necessary.

(i) Check flywheel and coupling bolts. Tighten up if necessary.

(j) Check all hold-down bolts between engine and foundation. If they are loose check the engine alignment.

ANNUAL ROUTINE

(a) Check crankshaft alignment. If shaft needs realignment it is recommended that work be done by an experienced and careful mechanic.

(b) Examine cylinder jackets and exhaust manifold water jackets. If scale is over 1/16" thick it should be removed by scale remover solution.

(c) Remove and inspect lubricating oil and fuel oil transfer pumps. Note conditions of bearings, shafts and seals. Replace if necessary.

(d) Inspect all starting air valves and grind if necessary.

(e) Remove top cover and mounting plate on high pressure fuel pump. Note condition of pump plungers and barrels. Disassemble crossheads and connecting rods and inspect for wear. Inspect suction and discharge valves and grind seats. Check valve lifts.

(f) Inspect governor and all moving parts for wear and signs of distress. Inspect entire linkage between governor and wedge shaft for lost motion and wear. Fuel wedges, links and pins should also be inspected for wear and

replaced if necessary.

(g) Inspect Mechanical Lubricator and connections to cylinder liners. Inspect ratchet mechanism for wear and proper functioning. Hand crank lubricator and observe the feed to each liner. Watch for water leaks at the nipples going through the water jackets.

(h) Clean out crankcase thoroughly. Be sure that all cleaning solution is drained out after cleaning is completed.

FOREWORD

This Parts Catalog has been compiled to serve the dual purpose of providing a means for ordering parts and to furnish illustrations to aid in the dismantling and reassembling of the various units of the engine.

This Parts Catalog is made to conform to the original construction of the engine, and the Atlas Imperial Diesel Engine Co. does not assume the responsibility or obligate itself to maintain this catalog to conform to any subsequent changes made on the engine after it leaves the factory. Complete records of all changes and service orders for each engine are maintained at the factory in an effort to always supply correct parts, but due to occasional substitution of parts in the field, of which we have no knowledge, and the fact that we have no assurance that parts furnished from the factory are installed, we cannot guarantee the furnishing of correct parts.

The right is reserved to change the construction or material of any part or parts without incurring the obligation of installing such changes on engines already delivered.

INSTRUCTIONS FOR ORDERING PARTS

Always furnish Engine Number when ordering parts or when communicating with factory or agency. This number will be found on name plate located on operating side of engine. It is VERY NECESSARY THAT THE ENGINE NUMBER BE GIVEN as it helps to insure the furnishing of correct parts and is also the means whereby the factory service records of each engine are maintained.

Always give PART NUMBER, PART NAME AND QUANTITY. If part has no Part Number then give a COMPLETE DESCRIPTION AND SIZE OF PART,

Be particular to state POST OFFICE ADDRESS, TOWN, COUNTY and STATE to which parts are to be shipped.

Specify how merchandise is to be shipped--whether by FREIGHT, EXPRESS or PARCEL POST.

Confirm all Telephone and Telegraph orders in writing.

Claims for shortages or errors must be made within five days from the receipt of goods or same will not be considered.

Broken or damaged goods should be refused, or a complete description made of damage by the carrier agent on the freight bill. If this is done, full damage can generally be collected from the transportation company.

No responsibility is assumed for delay or damage to merchandise while in transit. Our responsibility ceases upon delivery of shipment to the transportation company, from whom a receipt is received showing that shipment was in good condition when delivered to them; therefore, claims if any, should be made with the transportation company and not with the Atlas Imperial Diesel Engine Co.

Code Address: "ATGAS" - OAKLAND --- Codes: BENTLEY'S - PRIVATE

INSTRUCTIONS ON "HOW TO USE PARTS CATALOG"

In order TO LOCATE PART NUMBERS it is IMPERATIVE that the person concerned thoroughly understands the makeup of this book. He should CAREFULLY READ THE INSTRUCTIONS given on this and the following page, and thoroughly familiarize himself with the necessary steps involved. Particularly is this important when sub-assemblies are involved.

DO NOT ORDER PARTS BY REFERENCE NUMBERS as these numbers sometimes change and wrong parts might be supplied.

This catalog is made up of four basic sections, as follows:-

1. INDEX SHEET -- This sheet lists the various groups into which the engine is divided and must be used for obtaining the group sheet number.

2. GROUP LIST SHEET -- This sheet lists the parts which comprise the group, and are numbered with the prefix "L" or "2L".

3. PLATE (OR LINE DRAWING) -- Plates are arranged to face the group sheet to which they apply, and in most cases shows only the parts listed in the group. Occasionally a plate may include two or more groups making it necessary to always first obtain the group number from the index. If this is not done you may by chance turn to a plate showing the part wanted but will not find it listed on the group sheet facing this plate.
   NOTE:----- If no plate is found facing the group sheet, then the part wanted can be identified by the description. This will apply mainly to piping, and in this connection the actual pipe and fittings on the engine should always be measured and then ordered accordingly, due to unavoidable variations between engines.

4. SUB-ASSEMBLIES -- The term "Sub-assembly" (or the Word "Assembly" appearing in the part name) is used to indicate parts which are made up of two or more parts (or pieces) and yet must be considered as a unit part. For example, parts that are welded together, parts that have bushings pressed in, or parts that have to be machined together.
   A Sub-assembly list will be found immediately following the last group sheet, and itemizes the various parts used in each assembly. These assemblies are arranged in numerical sequence and always have the prefix "X", "G" or "GA" in the assembly number.
   NOTE:----- Certain parts of assemblies indicated by an "*" in place of a reference number, are not sold individually, and if wanted, the complete assembly must be ordered.

REFERENCE NUMBERS ON PLATES OR ASSEMBLY DRAWINGS

SINGLE NUMBERS or the TOP NUMBER (when more than one number appears in the circle) refers directly to a corresponding number on the group list sheet.

A circle with MORE THAN ONE NUMBER indicates part in question is a component part of a sub-assembly. The top number will refer to a corresponding number on the group list sheet, and the lower number will refer to a corresponding number in the sub-assembly.

TO FIND A PART WITH TWO REFERENCE NUMBERS IN THE CIRCLE PROCEED AS FOLLOWS:- (NOTE:- Select a part on any plate and follow step by step as explained.)

1st -- Using the top number in the circle locate corresponding reference number on the group list sheet, which will be an assembly ("X" or "G" number).

2nd -- Using the Part Number ("X" or "G" No.) of the assembly locate same in the numerical assembly list at rear of book.

3rd -- Refer back to the plate and obtain the second or lower number in the reference circle, then locate this number in the reference number column of the sub-assembly, and this will be the part desired.

If there are MORE THAN TWO NUMBERS in the reference number circle, proceed exactly as outlined above, only this time the part in the first assembly located will be another sub-assembly, so therefore it will be necessary to find the second assembly, and then referring back to the plate take the third number in the reference circle and match it with the corresponding number in the second assembly.

The following page will show a typical example and illustrate the above explanation step by step.

The following illustrated example will show the procedure as explained on opposite Page, for finding parts involved in sub-assemblies.

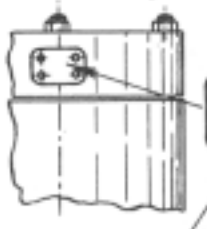
For this illustration assume that the part number for the Cylinder Head Cleanout Cover is wanted:-

We know that this cover would be listed with the "Cylinder Head" so we turn to the Index Sheet and locate the "Cylinder & Head Group" which gives us the sheet number.

PARTS CATALOG ---- INDEX — ENGINE NO. 11830
6 Cyl. 13 x 16 Marine Engine

	No. Req'd.	Group No.
BASE SECTION		
Base -- (Studs - Covers - Bearing Caps Etc.)	1	2L27
Base Oil Piping-(Main Manifold - Crank Brg.Oil Lines)	1	2L629
Crankshaft & Flywheel -- (Thrust Shaft & Bearing)	1	2L30
CYLINDER & VALVE MECHANISM SECTION		
Cylinder & Head	6	L-9776
Valve Rockers & Push-Rods	6	L-9777
Valve Lifters & Guide	6	L-6919
Piston & Connecting Rod	6	2L361

We find the sheet number for this group to be L-9776, and now we turn to this sheet and opposite we find a Plate or group drawing.



ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

L-9776
PLATE NO. K-1890

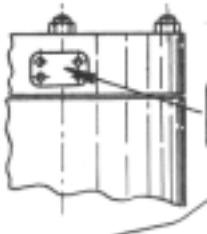
REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. GRWG. NO.
1		X1283	1	CYLINDER ASSEMBLY	
2		753A-PB4	4	WASHER - Cyl. to Centerframe Stud	
3			4	NUT -- 1 3/4-5-NC-Hex. - - (Steel)	
4		X2810	1	HEAD ASSEMBLY - Cylinder	
5		C-3957	1	GASKET - Head to Cylinder	
6		610A-03	8	GROMMET - Cyl. to Head Water By-Pass Pipe	
7			8	NUT -- 1 1/2-6-NC-Hex. - - (Steel)	
8		785	1	FLANGE - Cyl. Head Water Outlet Hole (Blind)	

NAME CYLINDER & HEAD GROUP
ORIGINALLY ISSUED FOR 13 x 16 MAR. - STAT.
FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST — ATLAS IMPERIAL DIESEL ENGINE CO. OAKLAND, CALIF. MATTOON, ILL.

L-9776

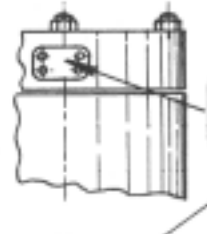
Looking at the Plate we locate the part we want and find the reference number to be 4-1-8. We now take the top number "4" and match this with the reference number "4" on the group list sheet. We find this to be X2810 Head Assembly, so that this assembly must next be found in the sub-assembly list at rear of book.



SUB-ASSEMBLY LIST

REF. NO.	PART NO.	NO. REQ'D.	NAME
X2810			HEAD ASSEM. - CYLINDER -- Includes
1	X2818	1	HEAD ASSEM.
2	X2811	1	VALVE & CAGE ASSEM.
3	X2812	1	VALVE & CAGE ASSEM.
4	C-2155L5	2	RING - Piston

After finding assembly X2810 in sub-assembly list, we now take the second of the reference numbers in the oval which is "1" and match this with the corresponding number of the sub-assembly. We find this to be X2818 Head Assembly so we now have to proceed to this assembly.



SUB-ASSEMBLY LIST

REF. NO.	PART NO.	NO. REQ'D.	NAME
X2818			HEAD ASSEM. - CYLINDER -- Includes
*		1	HEAD CYLINDER
*		6	PIPE PLUG -- 1 1/4 Std.
1	C-5520L5	4	STUD - In. & Exh. Cage
2	S-3060	2	STUD - Air Valve Cage
7	C-447	2	NOZZLE - Cooling
8	C-8214	2	COVER - Cleanout (Blind)

After this assembly X2818 is found we now take the bottom reference number in the oval which is "8" and match this with the corresponding reference number in X2818. We now have the unit part which we want.

PARTS CATALOG

ATLAS IMPERIAL DIESEL ENGINE CO.

ENG. NO._____

TO_____INCL.

- NOTE -

THIS CATALOG APPLIES ONLY TO ENGINES AS INDICATED ABOVE

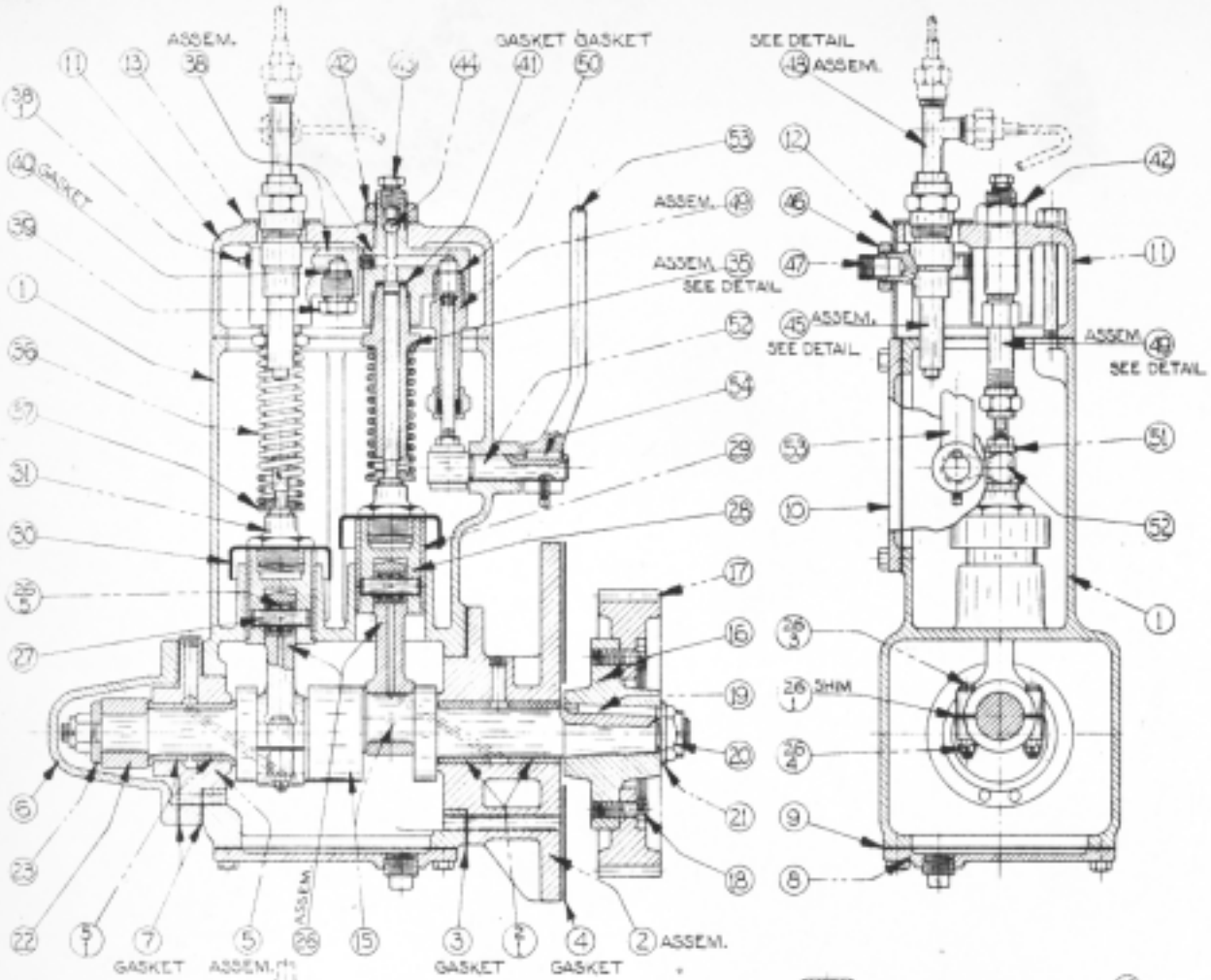
INDEX

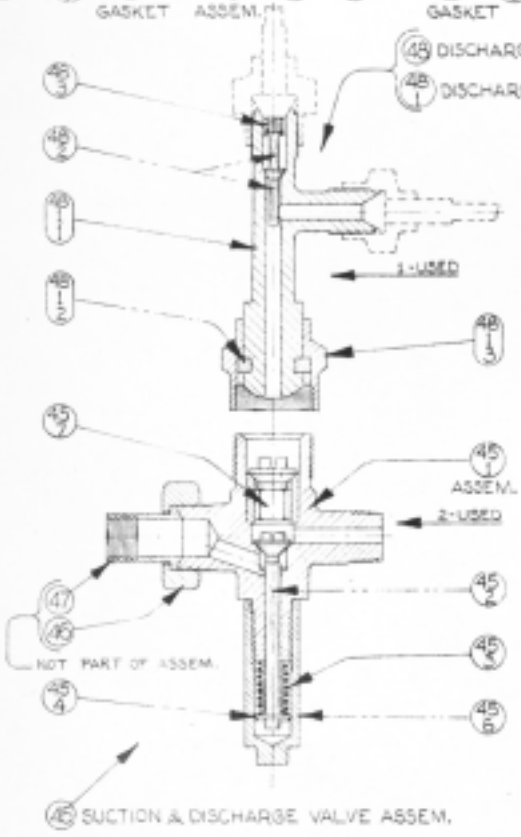
ENG. SIZE 9 x 10 1/2 No. CYL 6 TYPE STATIONARY (R.H.)(MARITIME)

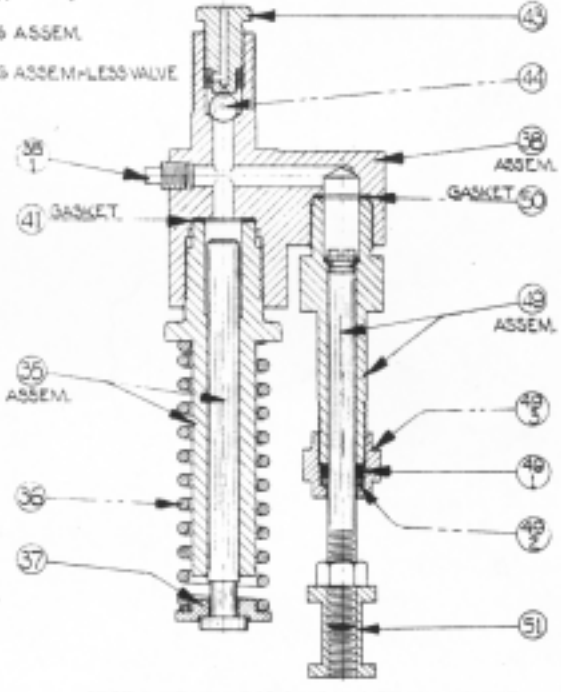
Spec. No. 1525-1

ES No. _____

Issue No. 1







SECTION THRU BODY-HEAD & PRIMING PUMP

PLATE
No. K-1977

DO NOT ORDER PARTS BY REF. No.

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L26
PLATE NO. K-1977

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
26		X2773	1	ROD ASSEM. - Fuel Pump Connect.	
27		2C1325	1	PIN - Rod to Crosshead	
28		2C1326	1	CROSSHEAD - Pump Connect. Rod	
29		831C-FXC4	1	SLEEVE - Crosshead	
30		831D-FXC4	1	GUARD - Crosshead Oil	
31		C-3027	1	PLUG - Crosshead	

2L26

NAME FUEL PUMP CROSSHEAD & CONNECTING ROD GROUP

ORIGINALLY ISSUED FOR 9 x 10 1/2

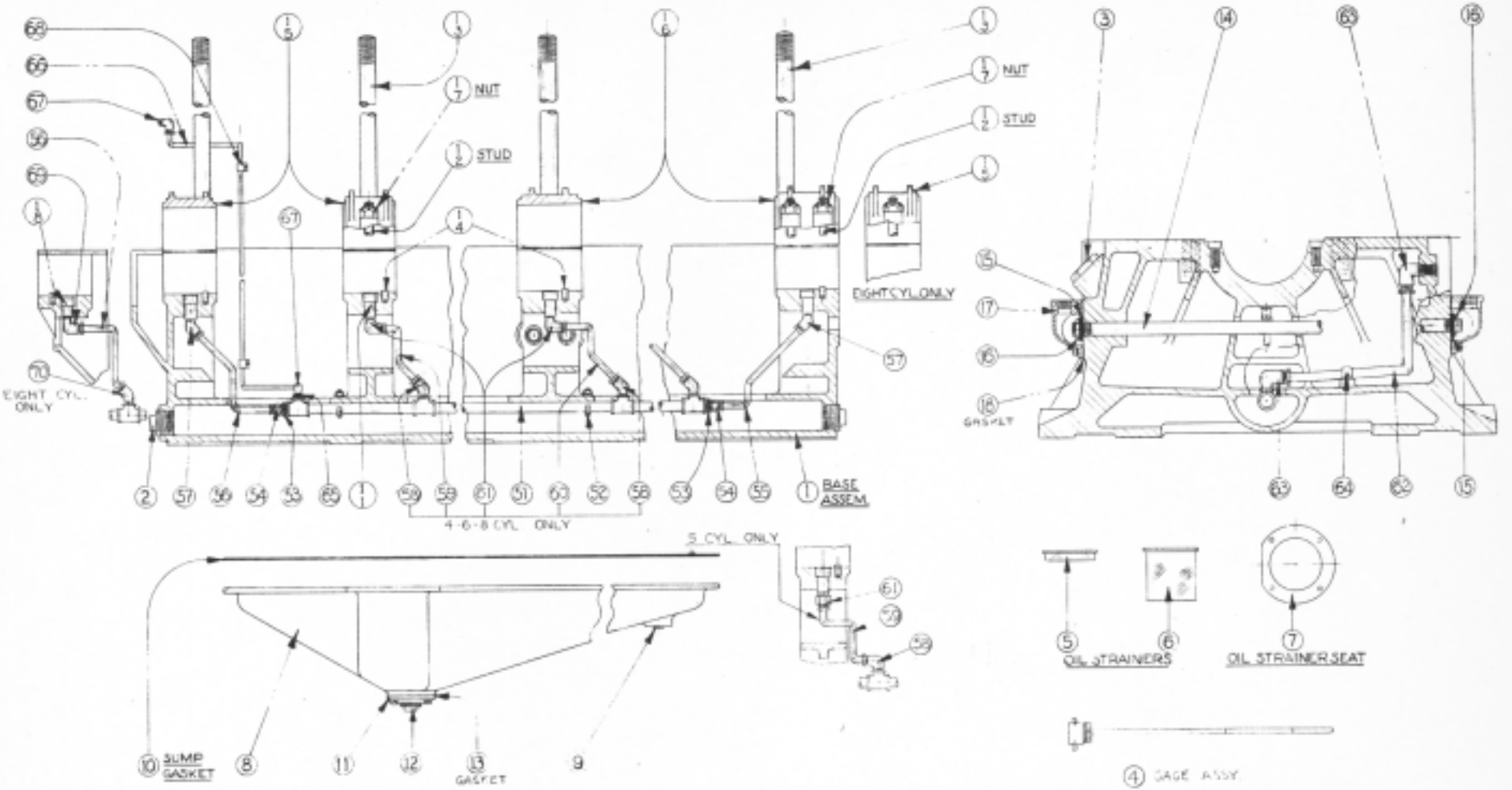
FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

PLATE
No. K-1961

DO NOT ORDER PARTS BY REF. NUMBERS



ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L171
PLATE NO. K-1961

REF. NO.	*	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO. (Piping - K-1756)
51		X3051	1	MANIFOLD ASSEM. - Lube Oil
52		C-3110	5	BOLT - Manifold Clamp
			5	NUT -- 3/8-24-NF-Hex. - - (St.)
			5	LOCKWASHER -- 3/8 SAE Reg. - - (St.)
				--- Manifold to Crank. Brg. (End Brgs.) ---
53			2	REDUCING BUSHING -- 1/2 x 3/8 Std. - (C.I.)
54		C-9801-P 1/2	2	CONNECTOR - Tube
55			1	TUBE -- 1/2 O.D. x .049 x 14 1/4 Lg. -(H.D. Cop.
56			1	TUBE(Gear End)--1/2 ODx .049x 13 1/4 Lg(H.D.Cop.
57		2C133-P 1/2	2	ELBOW - Tube (45°)
				--- Manifold to Crank. Brg. (Int.) ---
58		2C133-P 1/2	5	ELBOW - Tube (45°)
59			4	TUBE -- 1/2 O.D. x .049 x 8 3/4 Lg.-(H.D. Cop.)
60			1	TUBE(Center)--1/2 O.D.x .049x 9 1/2 Lg.(H.D.Cop)
61		C-9804-P 1/2	5	ELBOW - Tube
				--- Base to Manifold (Man. Inlet) ---
62			1	TUBE -- 7/8 O.D. x .065 x 18 Lg.-(H.D. Cop.)
63		C-9804-P 7/8	2	ELBOW - Tube
64		2C1007	1	CLAMP - Tube to Base
			1	MACHINE SCREW--1/4-20 x 3/8 Lg. -Rnd. Hd.-(St.)
			1	LOCKWASHER -- 1/4 SAE Reg. - - (St.)
				--- Man. to Int. Gear Brg. ---
65			1	REDUCING BUSHING -- 3/8 x 1/8 Std. - (C.I.)
66			1	TUBE -- 1/4 O.D. x .030 x 40 Lg.-(S.D. Cop.)
67		C-9804-P 1/4	2	ELBOW - Tube Fitting
68		S-2811	2	CLAMP - Tube
			2	MACHINE SCREW--1/4-20 x 1/2 Lg.-Rnd.Hd.-(St.)
			2	LOCKWASHER -- 1/4 SAE Reg. - - (St.)

2L171

NAME BASE OIL PIPING GROUP

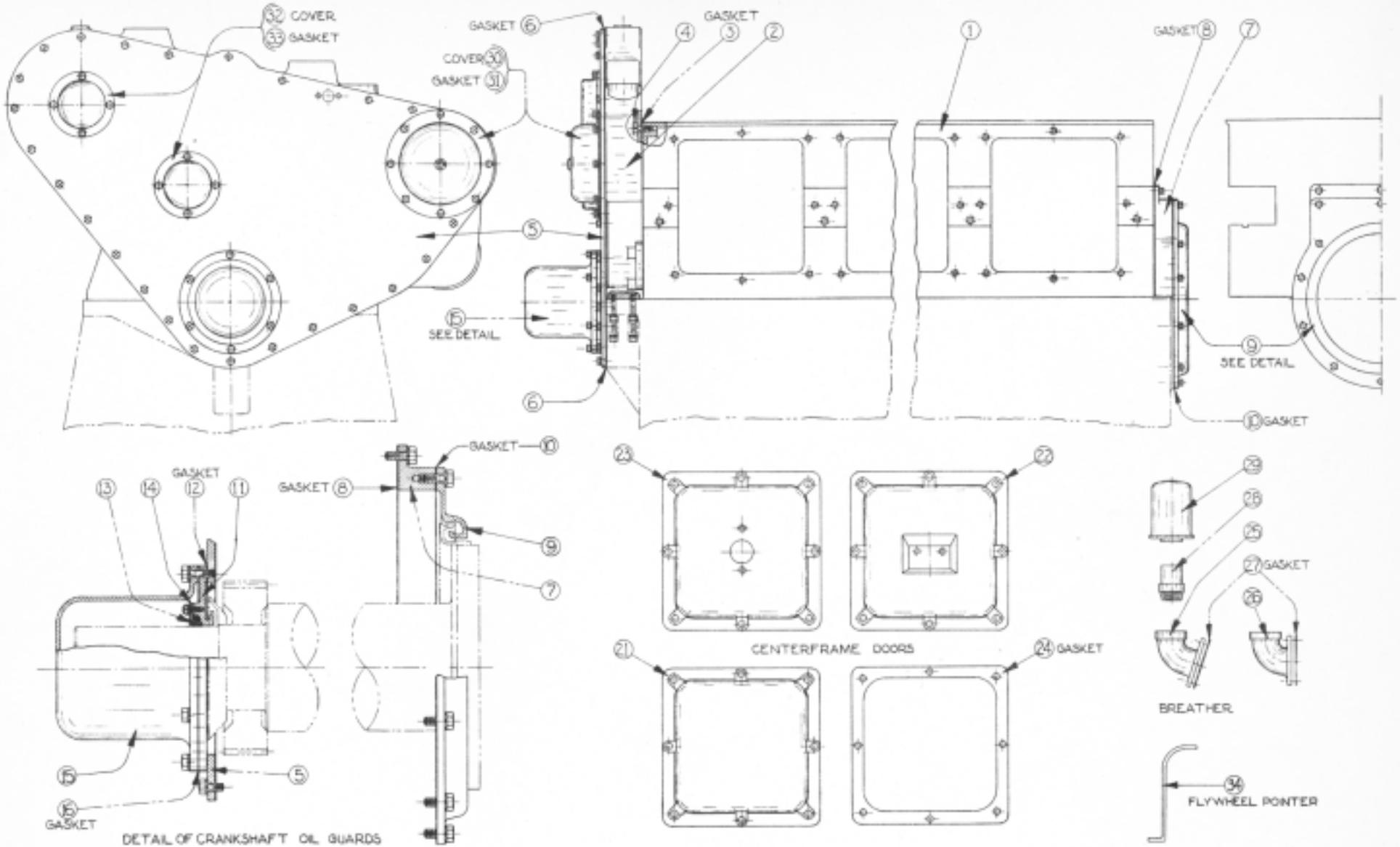
ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 STAT.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

PLATE
No. K-1956



DO NOT ORDER PARTS BY REF. No.

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L370
PLATE NO. K-1956

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
21		F-2768	8	DOOR - Centerframe Side	
22		W-1658	1	DOOR - Centerframe Side (Filter Bracket)	
23		F-2767	2	DOOR - Centerframe Side (Breather)	
24		F-1099	11	GASKET - Centerframe Side Door	
			88	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg. - (St.)	
			88	LOCKWASHER -- 1/2 SAE Reg. - - (St.)	
25		F-2110	2	ELBOW - Breather Adaptor Pipe	
27		S-851	2	GASKET - Elbow to Door	
			4	CAPSCREW -- 3/8-16-NC x 7/8 Lg. - (St.)	
			4	LOCKWASHER -- 3/8 SAE Reg. - - (St.)	
28		4996	2	PIPE - Breather Cap Adaptor	
29		5028	2	CAP - Breather	
30		F-727	1	COVER - Governor End	
31		F-1097	1	GASKET - Cover to Gear Hous. Cover	
			4	CAPSCREW -- 3/8-16-NC x 1 Lg. - (St.)	
			4	CAPSCREW -- 3/8-16-NC x 5/8 Lg. - (St.)	
			8	LOCKWASHER -- 3/8 SAE Reg. - - (St.)	
32		F-665	2	COVER - Fuel Pump & Int. Gear End	
33		F-1096	2	GASKET - Cover to Gear Hous. Cover	
			8	CAPSCREW -- 3/8-16-NC x 5/8 Lg. - (St.)	
			8	LOCKWASHER -- 3/8 SAE Reg. - - (St.)	
34		S-1805	1	POINTER - Flywheel	
			2	CAPSCREW -- 1/4-20-NC x 1/2 Lg.-(St.)	
			2	LOCKWASHER -- 1/4 SAE Reg. - - (St.)	

2L370

NAME CENTERFRAME & GEAR HOUSING COVERS GROUP

ORIGINALLY ISSUED FOR 6 CYL. 6 1/2-9 x 10 1/2 STAT.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L372
PLATE NO.

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
				--- Reduc. Tee at Gear Hous. to Fuel Pump ---	
		C-9801-P 3/8	1	CONNECTOR - Tube Fitting	
			1	TUBE--3/8 O.D. x .035 x 5 1/2 Lg.-(S.D. Cop.)	
		C-9801-P 3/8	1	CONNECTOR - Tube Fitting	
			1	TEE -- 1/4 Std. - - (M.I.)	
			1	NIPPLE -- 1/4 x 2 Lg. - (W.I.)	
		C-9801-P 3/8	1	CONNECTOR - Tube Fitting	
			1	TUBE -- 3/8 O.D. x .035 x 20 Lg.-(S.D. Cop.)	
		C-9801-P 3/8	1	CONNECTOR - Tube Fitting	
				--- Filter Out. Line Reducing Tee to Gov. - Trans. Pump & Press. Gage ---	
		C-9801-P 3/8	1	CONNECTOR - Tube Fitting	
			1	TUBE -- 3/8 O.D. x .035 x 22 Lg.-(S.D. Cop.)	
		C-9801-P 3/8	1	CONNECTOR - Tube Fitting	
			1	TEE -- 1/4 x 1/8 x 1/4 Std. Reducing - (M.I.)	
		C-9801-P 3/8	1	CONNECTOR - Tube Fitting	
			1	TUBE(Press. Gage)--3/8 ODx .035x 28 Lg.(S.D. Cop.	
		C-9805-P 3/8	1	ELBOW - Tube Fitting	
			1	TUBE(Gov.)--1/4 ODx .030x 26 Lg.-(S.D. Cop.)	
		C-9801-P 1/4	1	CONNECTOR - Tube Fitting	
		C-9807-P 1/4	1	TEE - Tube Fitting	
			1	TUBE(Trans. Pump)-1/4 ODx .030x 10 Lg.(S.D. Cop.	
		C-9804-P 1/4	1	ELBOW - Tube Fitting	

2L372

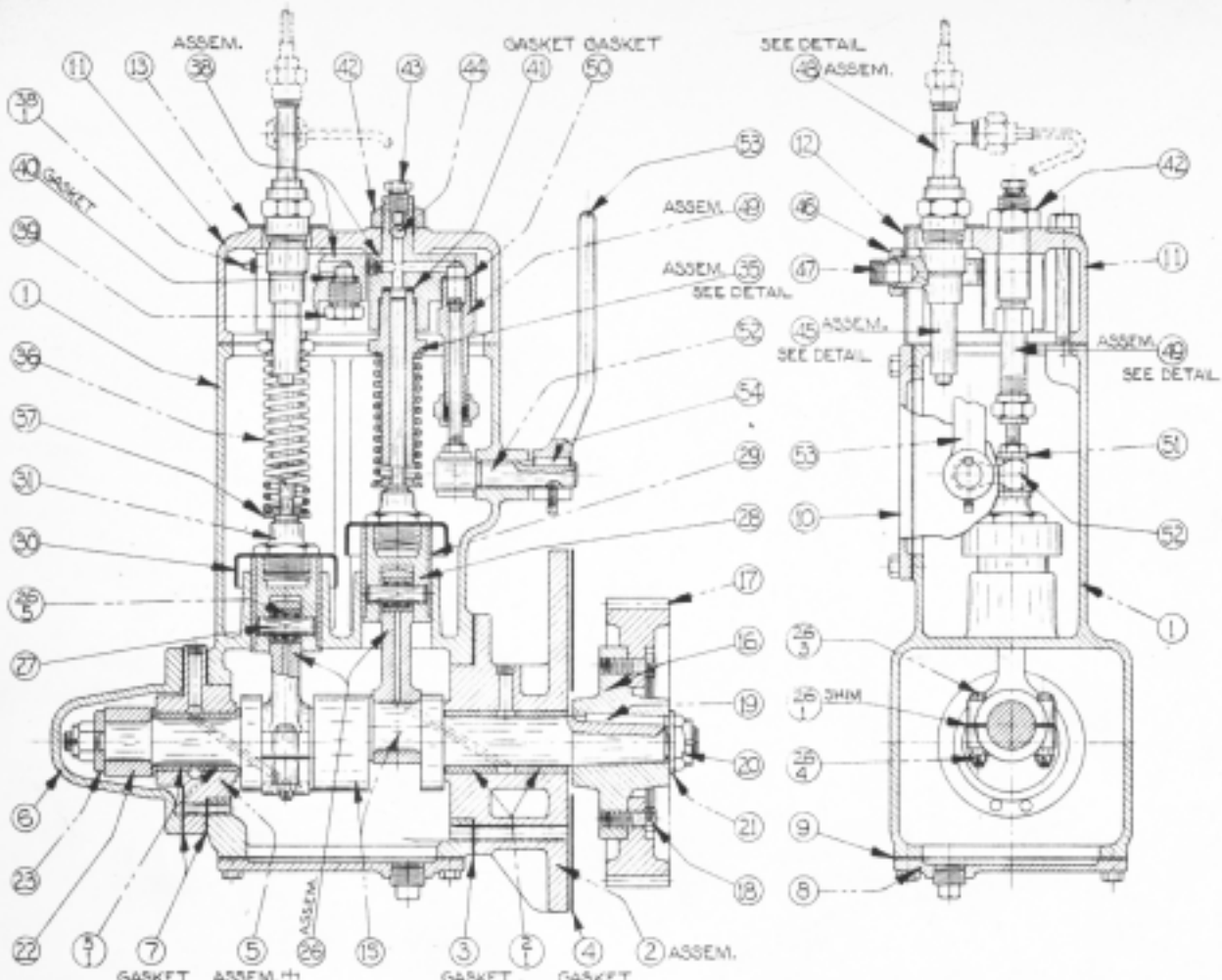
NAME LUBE OIL PIPING GROUP

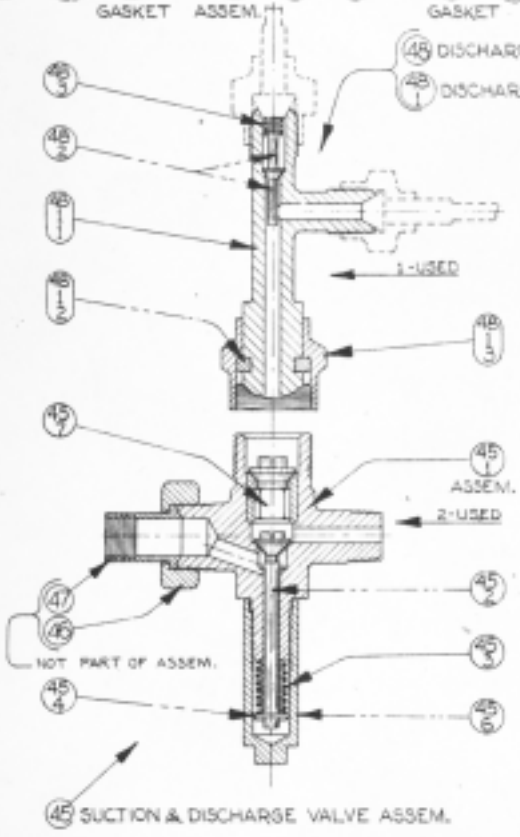
ORIGINALLY ISSUED FOR 4-5-6-8 CYL. 9 x 10 1/2

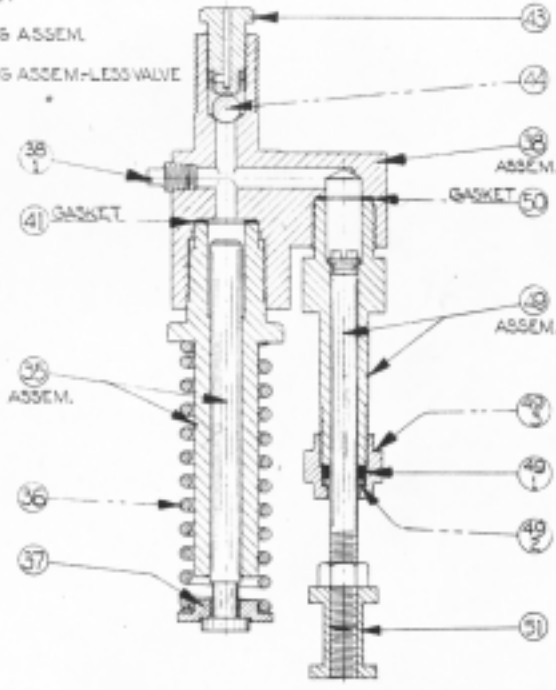
FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.







SECTION THRU BODY-HEAD & PRIMING PUMP

PLATE
No. K-1977

DO NOT ORDER PARTS BY REF. No.

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L449
PLATE NO. K-1977

REF. NO.	*	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO.	
35		X5353	2	BODY ASSEM. - H.P. Fuel Pump	
36		C-6222	2	SPRING - Pump Plunger	
37		S-2936	2	WASHER - Spring Retainer	
38		X3225	2	HEAD ASSEM. - H.P. Fuel Pump	
39		2C2160	1	PLUG - Pump Head (Priming Pump Hole)	
40		2C2119	1	GASKET - Plug to Head	
41		S-2882	2	GASKET - Head to Pump Body	
42			2	NUT -- 1-14-NF-Hex. - (St.)	
43		C-8875	2	PLUG - H.P. Fuel Pump Bleeder	
44			2	STEEL BALL -- 7/16 Dia. - (St.)	
45		X2605	2	VALVE & CAGE ASSEM.-Pump Suction & Discharge	
46		802A-E	2	NUT - Union -- 3/8 Std.-(Crane #523-Nut Only) - (Brass)	
47		802B-E	2	SLEEVE - Union -- 3/8 Std.-(Crane #523-Sleeve Only)-(Brass)	
48		G796-EB32	1	FITTING ASSEM.-Pump Discharge(With Check Valve)	
49		X3227	1	PUMP ASSEM. - Fuel Priming	
50		2C2119	1	GASKET - Priming Pump to Head	
51		1279-BXB3	1	COLLAR - Priming Pump Plunger	
			1	NUT -- 7/16-20-NF-Hex. - (St.)	
52		S-392	1	SHAFT - Priming Pump Lever	
53		C-7464	1	LEVER - Priming Pump	
54		5127	1	KEY - Priming Pump Lever	
			1	SETSCREW--1/4-20-NC x 1/2 Lg.-Sq.Hd.-Cup Pt.(St)	

Plunger Frame MD (Priming Pump)

X2605 VALVE & CAGE ASSEM. - PUMP SUCTION & DISCHARGE Includes

1	X2608	1	CAGE ASSEMBLY
2	S-679	1	VALVE - Suction
3	S-681	1	SPRING - Suction Valve
4	S-683	1	WASHER - Spring Retainer
		1	COTTER PIN -- 1/16 x 1/2 Lg.
6	C-9686	1	CAP - Suction Valve Stem
7	C-9634	1	VALVE - Discharge

2L449

NAME PRIMING & H.P. FUEL PUMP GROUP
ORIGINALLY ISSUED FOR 7x8½ -- 9x10½ STAT. - R.H.

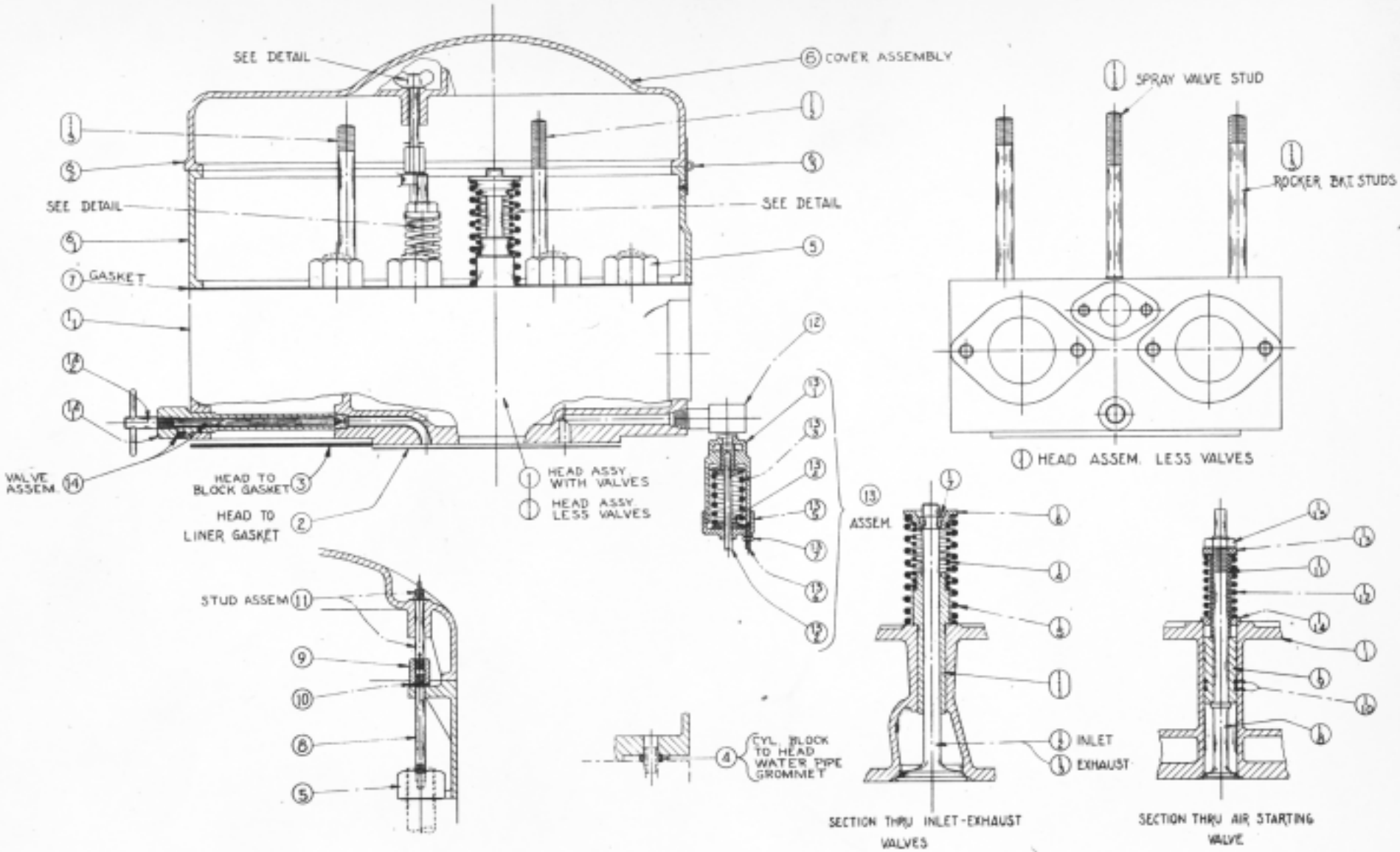
FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

PLATE
N° K-1993

DO NOT ORDER PARTS BY REF. NUMBERS



ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L479

PLATE NO. K-1993

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		X1755	1	HEAD ASSEM. - Cylinder	
2		502-LX	1	GASKET - Cyl. Head to Liner	
3		F-1537	1	GASKET - Cyl. Head to Cyl. Block	
4		610A-RB3	6	GROMMET - Cyl. Block to Head Water By-Pass Pipe	
5			6	NUT -- 1 1/4-7-NC-Hex. - - (St.)	
6		X3189	1	COVER ASSEM. - Cyl. Head	
7		505F-KX	1	GASKET - Head Cover	
8		C-2006L4 7/8	2	STUD - Cyl. Head Cover (Lower)	
9		2C1995	2	NUT - Cyl. Head Cover	
10			2	LOCKWASHER -- Type 11 Shakeproof - 3/8 -(St.)	
11		X3205	2	STUD ASSEM. - Cyl. Head Cover (Upper)	
			2	PLAIN WASHER -- 3/8 SAE Std. - - (St.)	
			2	COTTER PIN -- 1/8 x 3/4 Std. - (St.)	
12		1196-FXC4	1	PLUG - Cyl. Press. Relief Safety Valve Adaptor	
13		X204	1	VALVE ASSEM. - Cyl. Press. Relief Safety	
14		G1197-KXH	1	VALVE ASSEM. - Compression Release (Snifter)	

NAME CYLINDER HEAD & COVER GROUP

ORIGINALLY ISSUED FOR 6-8 CYL. 8½-9 x 10½ IND.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF MATTOON, ILL.

2L479

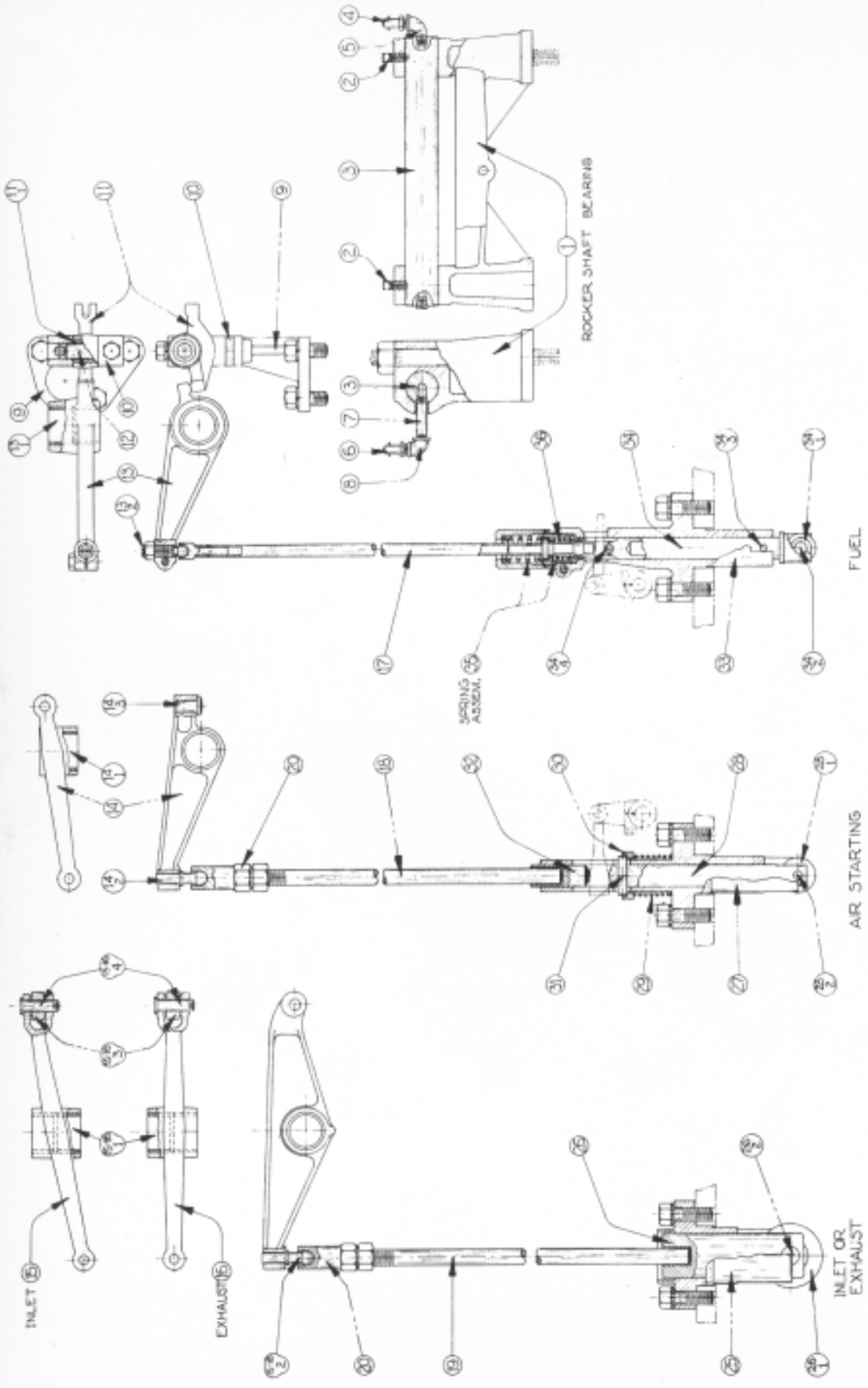


PLATE
No. K-1963

DO NOT ORDER PARTS BY REF. NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

PLATE NO. 2L493 K-1953

ASSEM. DRWG. NO. S.V. Lift. F-2635

REF. NO.	*	PART NO.	NO. REQD.	PART NAME
25		529-C	2	GUIDE - In. & Ex. Valve Lifter
			4	CAPSCREW -- 5/8-11-NC x 1 3/4 Lg. - (St.)
			4	LOCKWASHER--Shakeproof 5/8 - Type 12 - (St.)
26		X1211	2	LIFTER ASSEM. - In. & Ex. Valve
27		599-KXH6	1	GUIDE - Air Start. Valve Lifter
			2	CAPSCREW -- 5/8-11-NC x 1 3/4 Lg. - (St.)
			2	LOCKWASHER -- Shakeproof 5/8 - Type 12 - (St.)
28		G594-RB3	1	LIFTER ASSEM. - Air Start. Valve
29		888-C3	1	SPRING - Air Start. Valve Lifter
30		594A-RB3	1	COLLAR - Air Start. Valve Lifter Spring Retainer
31		883A-E	1	PIN-Air Start. Val. Lifter Spring Collar Retain.
32		C-8252	1	SOCKET - Air Start. Valve Push-Rod
33		F-2634	1	GUIDE - Spray Valve Lifter
			2	CAPSCREW -- 5/8-11-NC x 1 3/4 Lg. - (St.)
			2	LOCKWASHER -- Shakeproof 5/8 - Type 12 - (St.)
			1	CAPSCREW(Clamp)--3/8-16-NC x 1 1/2 Lg. - (St.)
34		X113	1	LIFTER ASSEM. - Spray Valve
35		X228	1	SPRING ASSEM. - Spray Valve Push-Rod Buffer
36		S-3012	1	SPRING - Spray Valve Push-Rod (Lower)

NAME VALVE LIFTER & GUIDES GROUP

ORIGINALLY ISSUED FOR 9 x 10 1/2 STAT.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L493

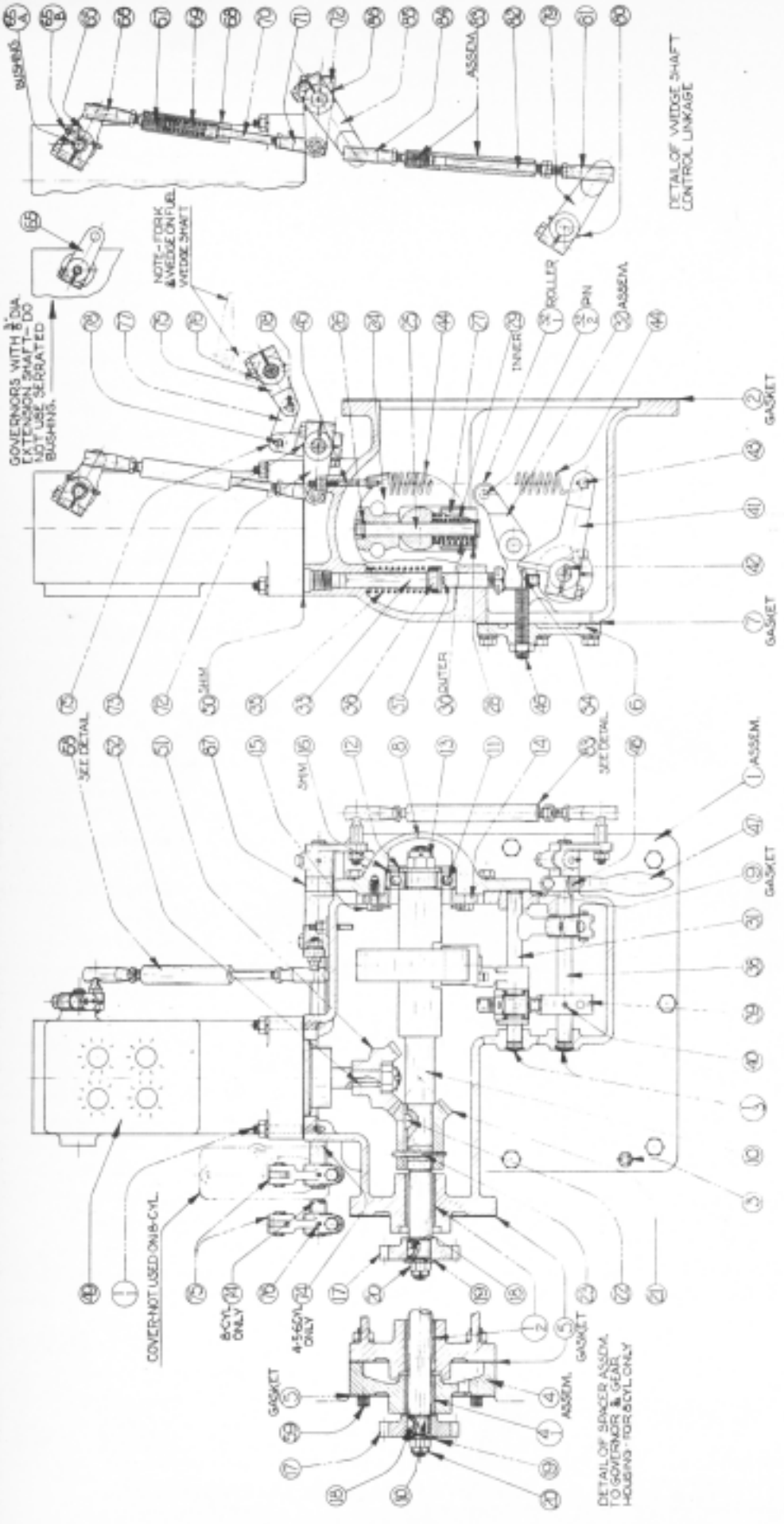


PLATE
No. K-1882

DO NOT ORDER PARTS BY REF NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L594

PLATE NO. K-1882

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
			---	Wedge Shaft Control Linkage (From Gov.) ---	
65		2C2042	1	LEVER - Wedge Shaft Control (On Gov.)	
			1	CAPSCREW -- 3/8-16-NC x 1 1/4 Lg. - (St.)	
65A		2C2366	1	BUSHING - Gov. Lever (Serrated)	
65B			1	TAPER PIN -- #2 x 1 1/2 Lg. - (St.)	
66		C-8408	1	BALL JOINT	
			1	NUT -- 3/8-24-NF-Hex. - - (St.)	
			1	LOCKWASHER -- 3/8 SAE Reg. - - (St.)	
67		2C1895	1	STUD - Wedge Shaft Control Sleeve	
68		2C1894	1	SLEEVE - Wedge Shaft Control	
69		2C1896	1	SPRING - Wedge Shaft Control Sleeve	
70		2C1354	1	PLUNGER - Wedge Shaft Control Sleeve	
71		C-8408	1	BALL JOINT	
			2	NUT -- 3/8-24-NF-Hex. - - (St.)	
			1	LOCKWASHER -- 3/8 SAE Reg. - - (St.)	
72		2C1893	1	LEVER - Wedge Shaft Control (On Int. Shaft)	
			1	CAPSCREW -- 3/8-16-NC x 1 1/4 Lg. - (St.)	
73			1	TAPER PIN -- #2 x 1 1/4 Lg. - (St.)	
74		C-6623L14 3/4	1	SHAFT - Wedge Shaft Cont. Lever (Int.)	
75		2C1366	2	LEVER - Wedge Cont. (On Int. & Wedge Shaft)	
			2	CAPSCREW -- 3/8-16-NC x 1 Lg. - (St.)	
76			2	TAPER PIN -- #2 x 1 1/4 Lg. - (St.)	
77		2C1365	1	LINK - Wedge Shaft Control Lever	
78			2	PIN -- 5/16 Std. SAE Rod-End - - (St.)	
			2	COTTER PIN -- 3/32 x 1/2 Lg. - (St.)	
			---	Wedge Throw-out Linkage(From Overspeed Gov.) ---	
79		C-9330	1	LEVER - Wedge Throw-out (On Over. Gov.)	
			1	CAPSCREW -- 3/8-16-NC x 1 1/4 Lg. - (St.)	
80			1	TAPER PIN -- #2 x 1 1/4 Lg. - (St.)	
81		C-8409	1	BALL JOINT	
			2	NUT -- 3/8-24-NF-Hex. - - (St.)	
			1	LOCKWASHER -- 3/8 SAE Reg. - - (St.)	
82		2C1364	1	PLUNGER - Wedge Throw-out Sleeve	
			2	HALF NUT -- 3/8-24-NF-Hex. - - (St.)	
83		X3010	1	SLEEVE ASSEM. - Wedge Throw-out	
84		C-8409	1	BALL JOINT	
			2	NUT -- 3/8-24-NF-Hex. - (St.)	
			1	LOCKWASHER -- 3/8 SAE Reg. - - (St.)	
85		C-9330	1	LEVER - Wedge Throw-out (On Int. Shaft.)	
			1	CAPSCREW -- 3/8-16-NC x 1 1/4 Lg. - (St.)	
86			1	TAPER PIN -- #2 x 1 1/4 Lg. - (St.)	
87		2C1383	1	SPACER - Wedge Throw-out Lever	

NAME WEDGE SHAFT CONTROL LINKAGE GROUP -- (WOODWARD & OVERSPEED GOVERNOR)

ORIGINALLY ISSUED FOR 4-5-6 C. 9 x 10 1/2 STATIONARY

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L594

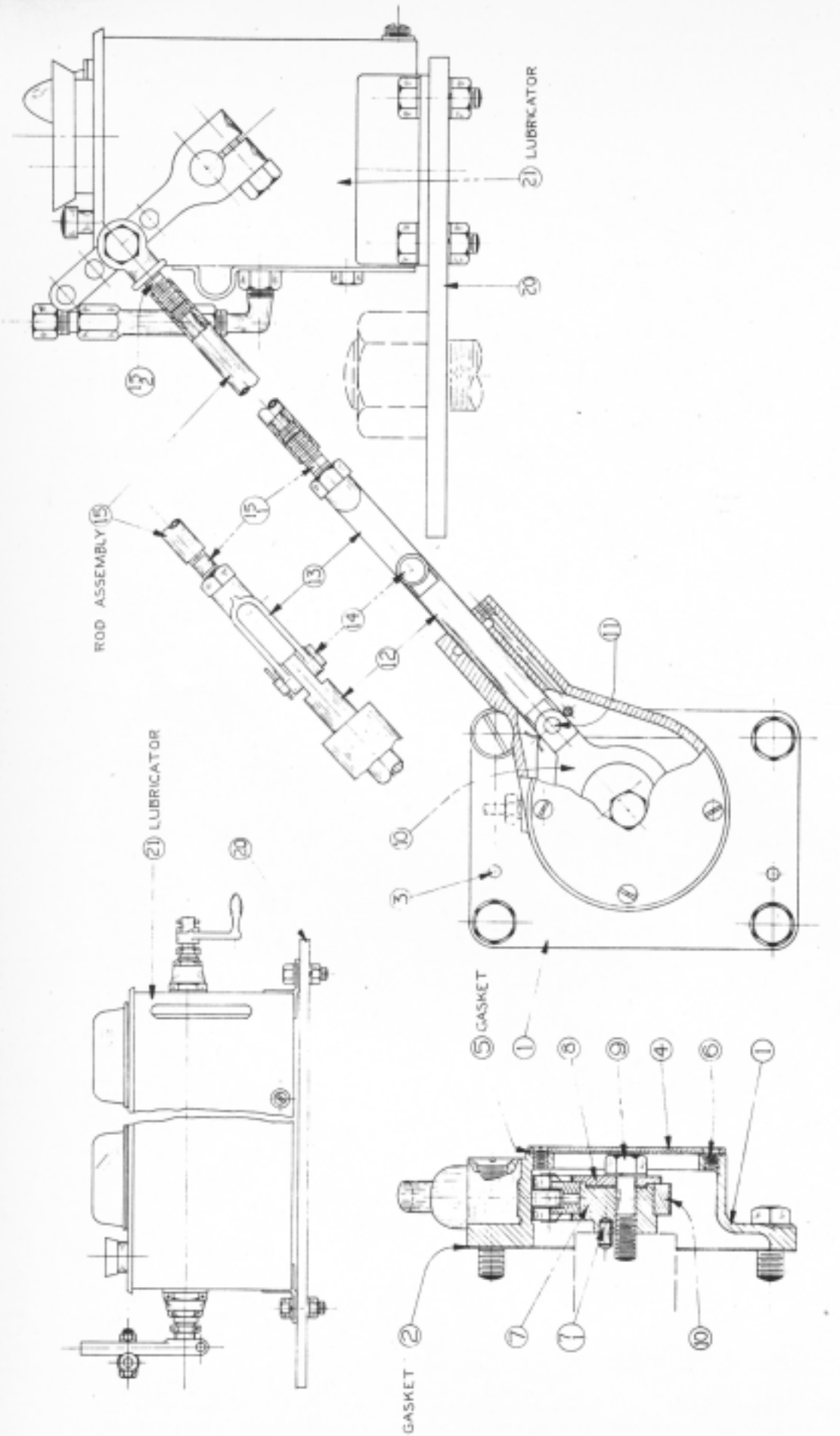


PLATE No.
K-1971

DO NOT ORDER PARTS BY REFERENCE NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L608

PLATE NO. K-1971

REF. NO.	*	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO.
20		F-5097	1	BRACKET - Lubricator
			4	CAPSCREW -- 3/8-16-NC x 1 1/4 Lg. - (St.)
			4	PLAIN WASHER -- 3/8 SAE Std. - - (St.)
			4	LOCKWASHER -- 3/8 SAE Reg. - - (St.)
21			1	LUBRICATOR -- Madison Kipp L.H. End Drive - 8 Feed Complete as per Their Drg. No. 10740
			1	TUBE(Cyl.#1)--1/4 ODx .030x 13 Lg.-(S.D. Cop.)
			1	TUBE(Cyl.#2)--1/4 ODx .030x 27 Lg.-(S.D. Cop.)
			1	TUBE(Cyl.#3)--1/4 ODx .030x 41 Lg.-(S.D. Cop.)
			1	TUBE(Cyl.#4)--1/4 ODx .030x 55 Lg.-(S.D. Cop.)
			1	TUBE(Cyl.#5)--1/4 ODx .030x 69 Lg.-(S.D. Cop.)
			1	TUBE(Cyl.#6)--1/4 ODx .030x 83 Lg.-(S.D. Cop.)
		C-9832-P 1/4	6	ELBOW - Tube
			1	TUBE(Lub.Drive)--1/4 ODx .030x 48 Lg.(S.D. Cop.)
			1	TUBE-Cam. Brg.(Gear End)--1/4 O.D. x .030 x 141 Lg.-(S.D. Cop.)
		C-9830-P 1/4	2	CONNECTOR - Tube
		S-2410	1	CLAMP - Tube (For 7 - 1/4 O.D. Tubes)
		S-1496	1	CLAMP - Tube (For 6 - 1/4 O.D. Tubes)
		S-1495	1	CLAMP - Tube (For 5 - 1/4 O.D. Tubes)
		S-1494	1	CLAMP - Tube (For 4 - 1/4 O.D. Tubes)
		S-1493	1	CLAMP - Tube (For 3 - 1/4 O.D. Tubes)
		S-1492	1	CLAMP - Tube (For 2 - 1/4 O.D. Tubes)
			6	MACHINE SCREW--1/4-20 x 5/8 Lg.-Rnd.Hd.-(St.)
			6	NUT -- 1/4-20-NC-Hex. - - (St.)
				--- Camshaft Bearing Oil Pipe ---
			1	NIPPLE -- 1/8 x 1 Lg. - - (W.I.)
			1	NIPPLE -- 1/8 x 4 Lg. - - (W.I.)
			1	ELBOW -- 1/8 Std. Pipe - - (M.I.)
			1	SLEEVE -- 1/8 Std. Pipe - - (M.I.)
			1	OIL CUP -- Bowen #5 - Hinged Lid - 1/8" (St.)

2L608

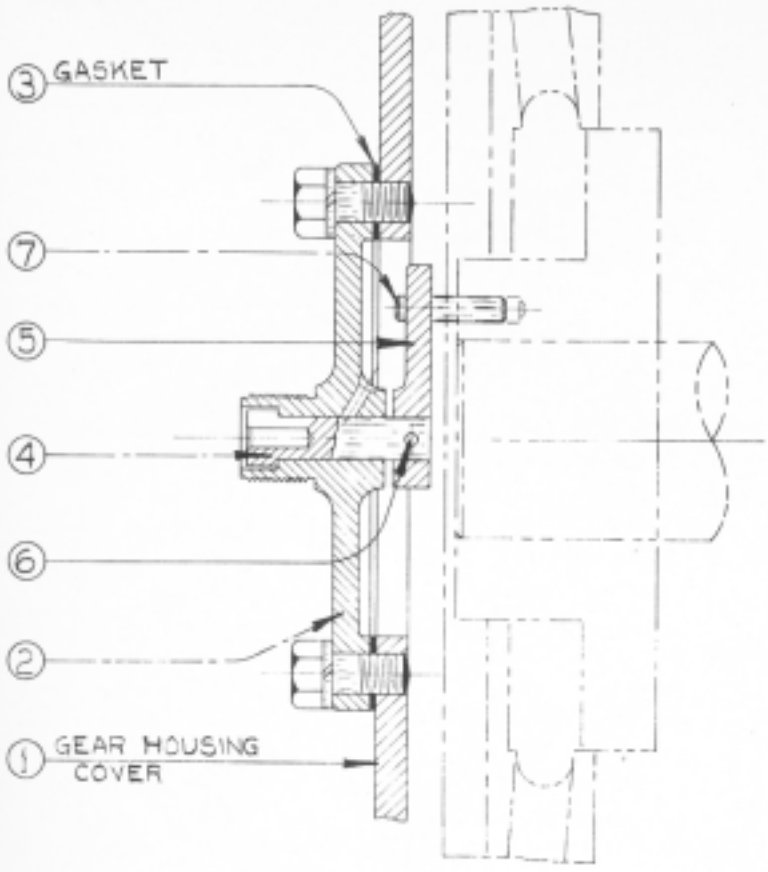
NAME LUBRICATOR & MISCELLANEOUS OIL PIPING GROUP

ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 STAT.-R.H.

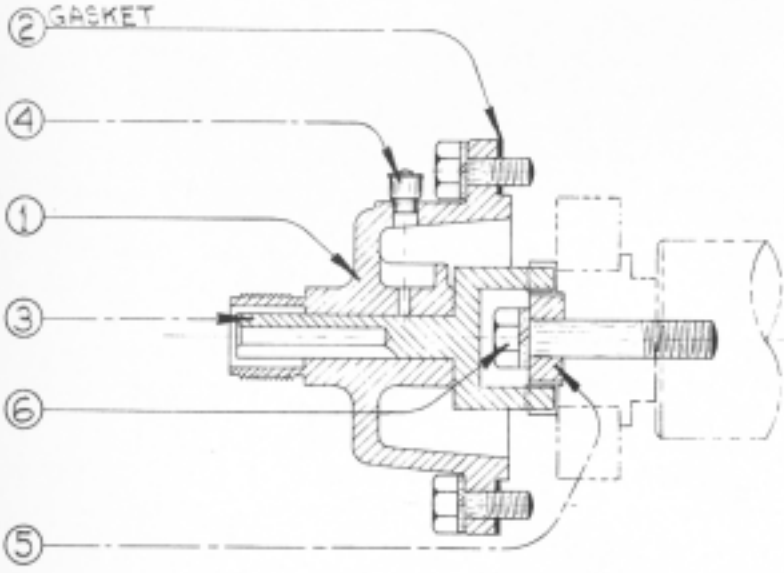
FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.



TYPE 1 -- 4-5-6 CYL. ENGINES



TYPE 2 -- 8 CYL. ENGINES

DO NOT ORDER PARTS BY REF. NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L620

PLATE NO. W-1875

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
2		C-1080	1	BEARING - Tachometer Drive Shaft	
3		S-1642	1	GASKET - Bearing to Housing Cover	
			4	CAPSCREW -- 3/8-16-NC x 7/8 Lg. - (St.)	
			4	LOCKWASHER -- 3/8 SAE Reg. - - (St.)	
4		C-1079	1	SHAFT - Tachometer Drive	
5		C-1081	1	ARM - Tachometer Drive	
6			1	TAPER PIN -- #2 x 1 1/4 Lg. - (St.)	
7		C-7972L1 1/8	1	PIN - Tachometer Drive--(Presses in Cam Gear Hub)	

2L620

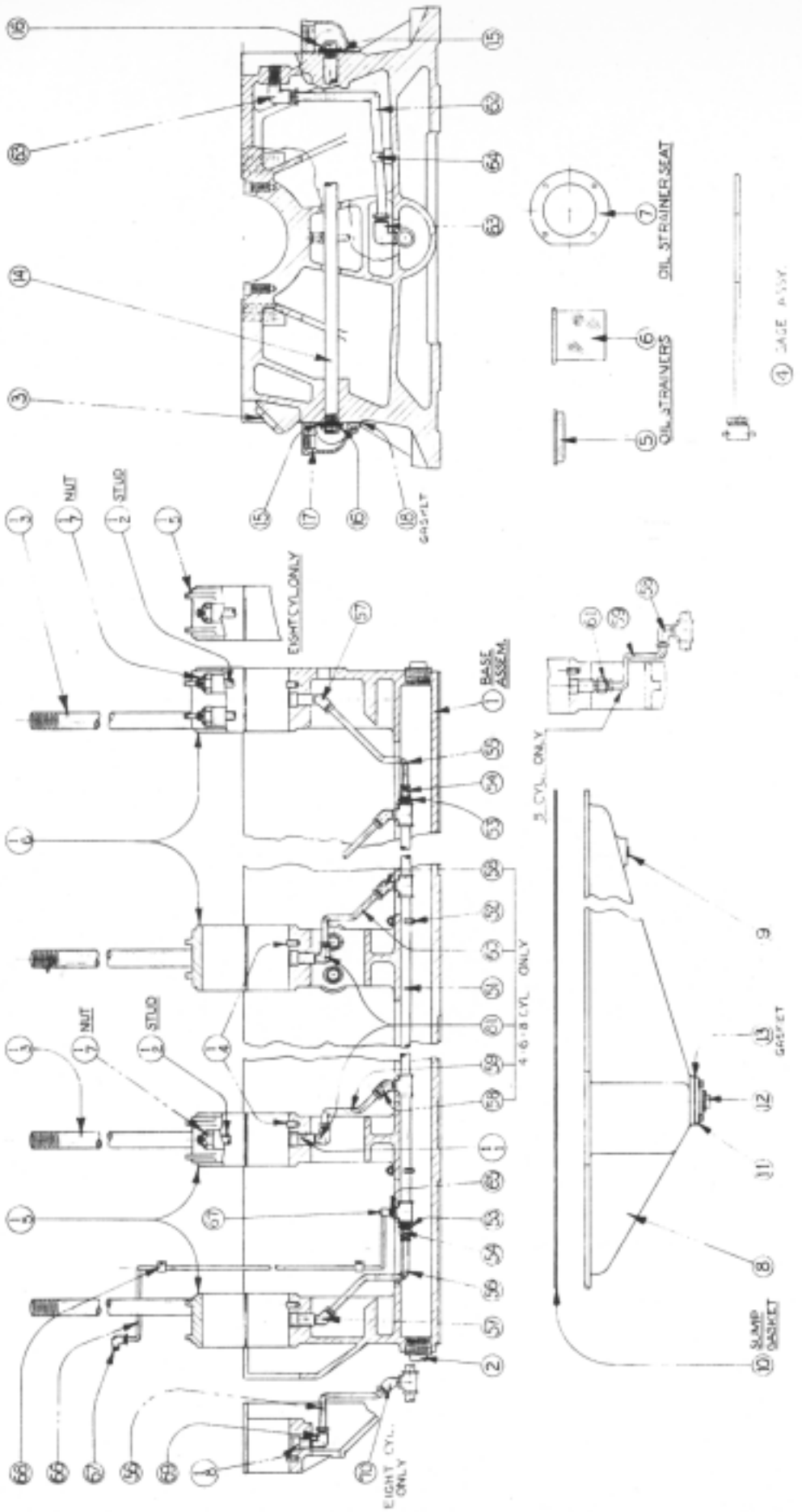
NAME TACHOMETER DRIVE GROUP

ORIGINALLY ISSUED FOR 4-5-6 CYL. 9 x 10 1/2 STAT.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.



PLATF
No. K-1961

DO NOT ORDER PARTS BY REF. NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L965

PLATE NO. K-1961

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		X3266	1	BASE ASSEMBLY	
2			2	PIPE PLUG -- 2 Std. - (C.I.)	
			1	PIPE PLUG -- 3/4 Std. - C't's'k. Hd.-(C.I.)	
4		X2887	1	GAGE ASSEM. - Lube Oil Level	
5		X645	3	STRAINER ASSEM. - Lube Oil (Short)	
6		X646	1	STRAINER ASSEM. - Lube Oil (Long)	
7		4980	4	SEAT - Lube Oil Strainer	
			16	CAPSCREW -- 3/8-16-NC x 3/4 Lg.-(St.)	
			16	LOCKWASHER -- 3/8 SAE Reg. - - (St.)	
8		K-2110	1	SUMP - Base Oil	
9			1	PIPE PLUG -- 3/4 Std. - C't's'k. Hd.-(C.I.)	
10		F-4827	1	GASKET - Oil Sump to Base	
			42	CAPSCREW -- 3/8-16-NC x 1 Lg. - (St.)	
			42	LOCKWASHER -- 3/8 SAE Reg. - - (St.)	
11		X3561	1	COVER ASSEM. - Base Oil Sump (Bottom)	
			1	PIPE CAP -- 1 1/2 Std. - (C.I.)	
13		2C3002	1	GASKET - Cover to Sump	
		C-2408L1 1/4	8	CAPSCREW - Cover to Sump	
			8	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
14		2C1972	2	PIPE - Lube Oil Cross-over	
15		C-3117	4	WASHER - Lube Oil Pipe Seal	
16		367-1	4	LOCKNUT - Lube Oil Pipe	
17		W-2027	2	COVER - Lube Oil Cross-over Pipe End	
18		C-9924	2	GASKET - Cover to Base	
			8	CAPSCREW -- 3/8-16-NC x 2 Lg. - (St.)	
			8	LOCKWASHER -- 3/8 SAE Reg. - (St.)	
			1	WIRE(Sump Cover Capscrew)--#16 Ga. x 38 Lg.-(St)	
		X3576	1	NIPPLE ASSEM.- Lube Oil Return	
		2C3078-P 1/2	1	FLANGE - Pipe	
		2C3121-P 1/2	1	GASKET - Flange	
			4	CAPSCREW -- 1/2-13 NC x 1-1/2 Lg. -- (St.)	
			4	NUT -- 1/2-13-NC Hex -- (St.)	
			4	LOCKWASHER -- 1/2 SAE Reg. -- (St.)	

NAME BASE GROUP - - - - - - - - - - - - - (SEPARATE OIL SUMP)

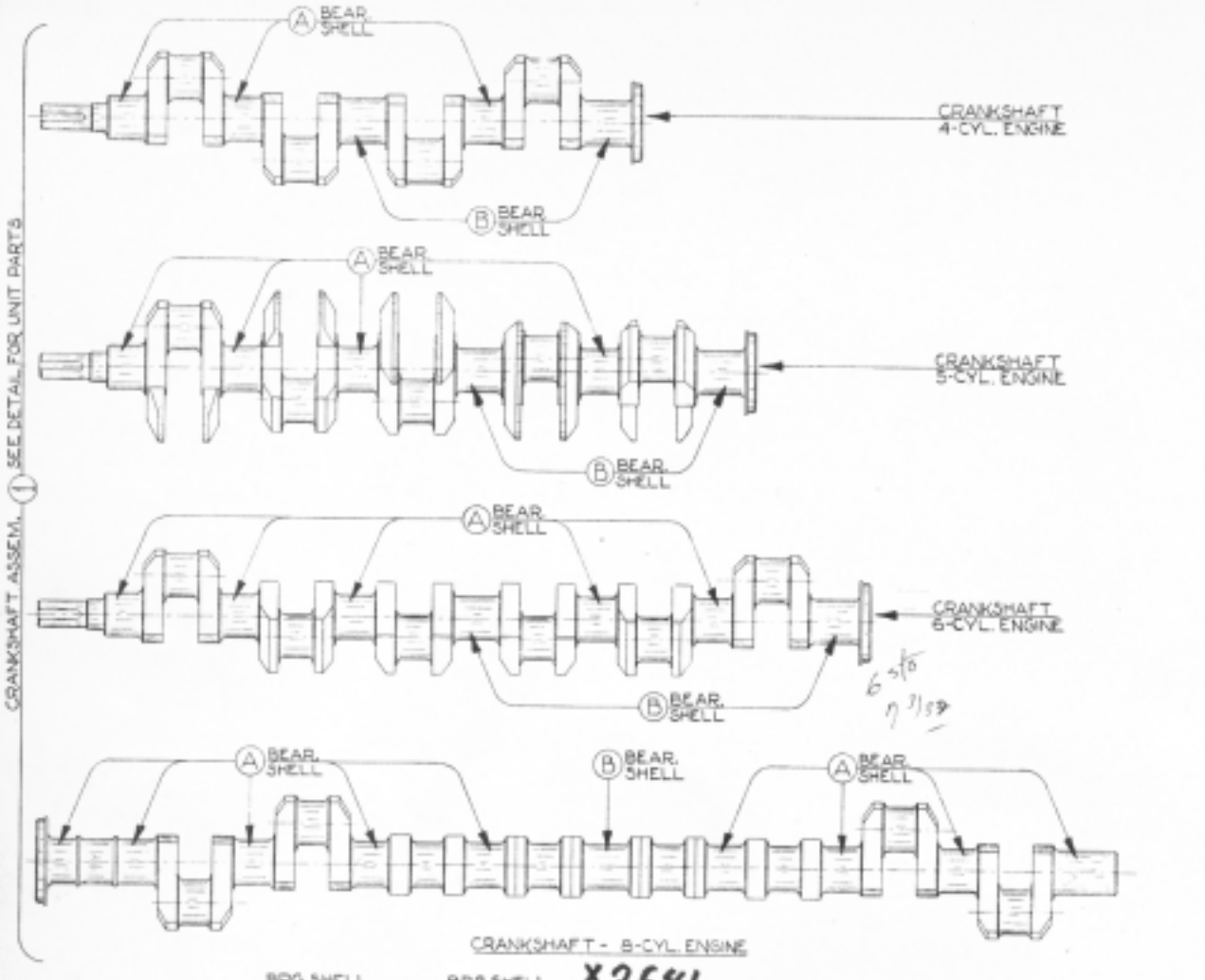
ORIGINALLY ISSUED FOR 6 CYL. 9 x 10½ STAT. - R.H.

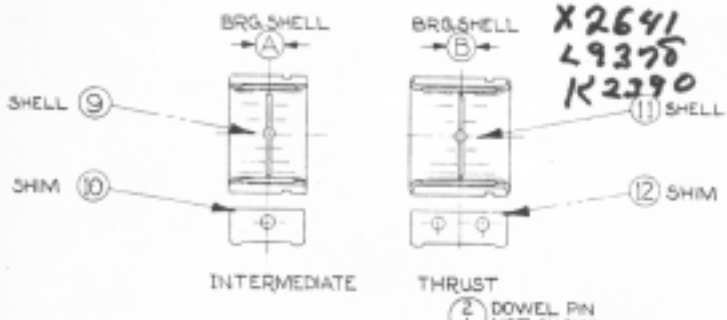
FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L965





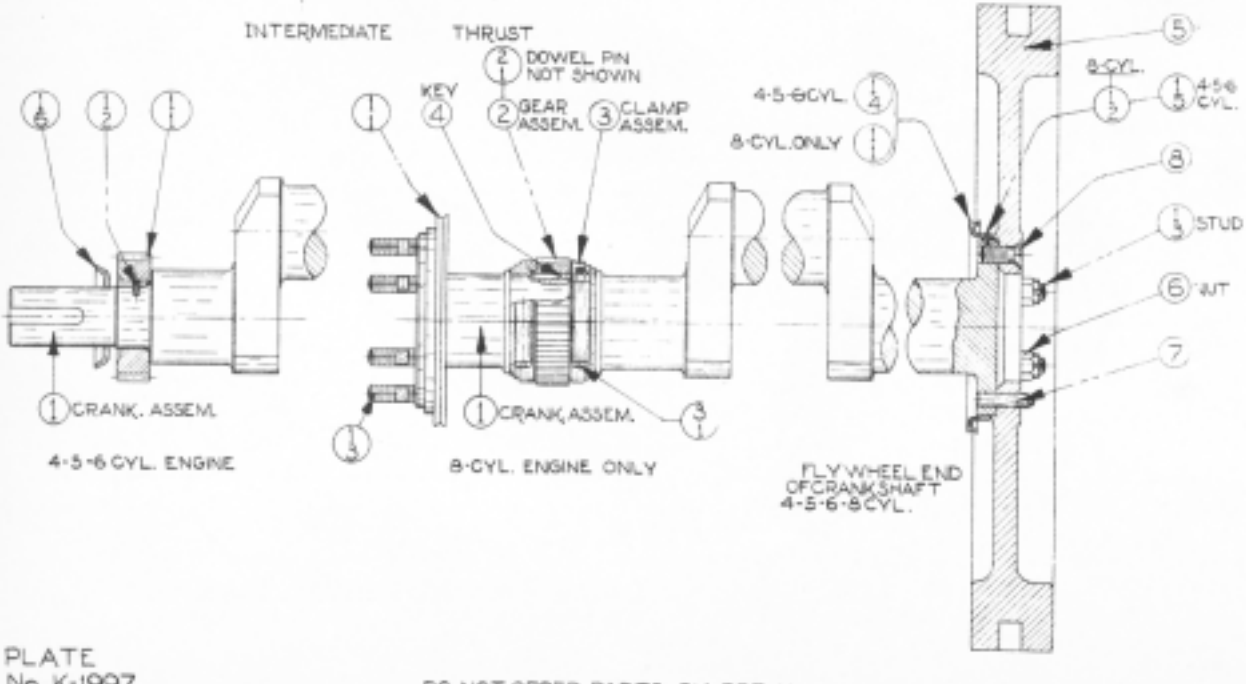


PLATE
No. K-1997

DO NOT ORDER PARTS BY REF. No.

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

21968

PLATE NO. K-1997

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		X3528	1	CRANKSHAFT ASSEMBLY	
5		W-2054	1	FLYWHEEL	
6			6	CASTLE NUT -- 1-14-NF-Hex. - (St.)	
			6	COTTER PIN -- 1/8 x 1 3/4 Lg. - (St.)	
7		C-6386L2 1/2	3	PIN - Flywheel to Crankshaft Dowel	
9		F-2012	10	SHELL - Crankshaft Bearing	
10		720A-LXH-A	10	SHIM - Crank. Brg. - (1/16)	
10		720A-LXH-B	20	SHIM - Crand. Brg. - (1/32)	
10		720A-LXH-D	50	SHIM - Crank. Brg. - (.010)	
10		720A-LXH-E	40	SHIM - Crank. Brg. - (.003)	
11		F-2014	4	SHELL - Crankshaft Bearing-(Center & Fly. End)	
12		721A-LXH-A	4	SHIM - Crank. Brg. - (1/16)	
12		721A-LXH-B	8	SHIM - Crank. Brg. - (1/32)	
12		721A-LXH-D	20	SHIM - Crank. Brg. - (.010)	
12		721A-LXH-E	16	SHIM - Crank. Brg. - (.003)	

NAME CRANKSHAFT & FLYWHEEL GROUP

ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 STAT.

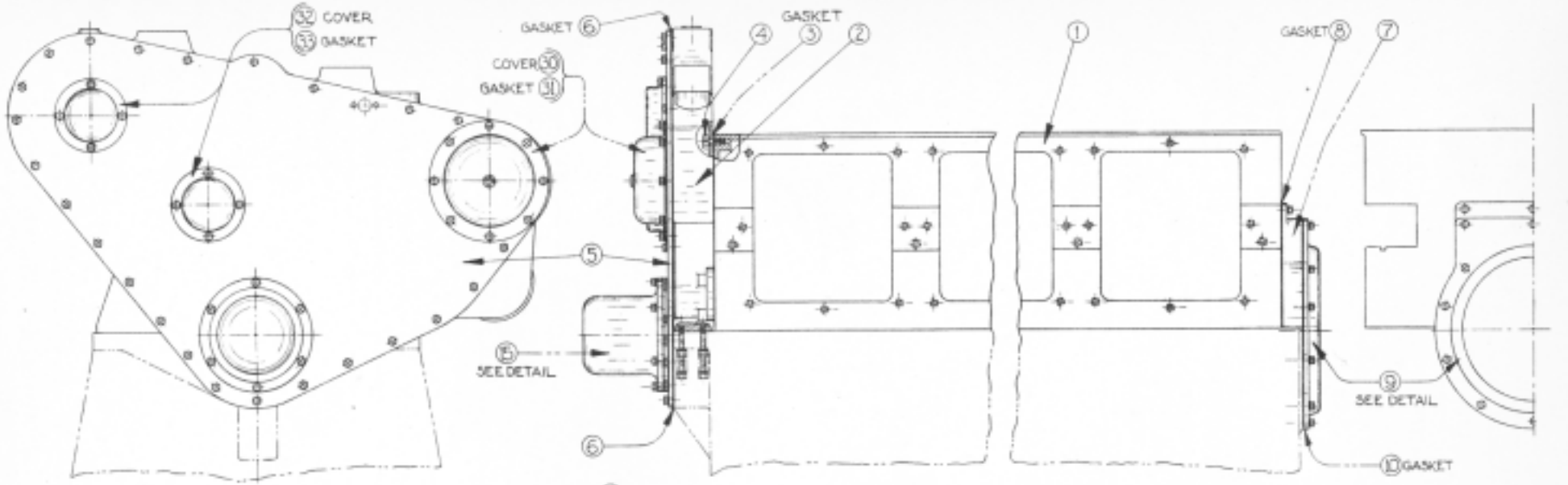
FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

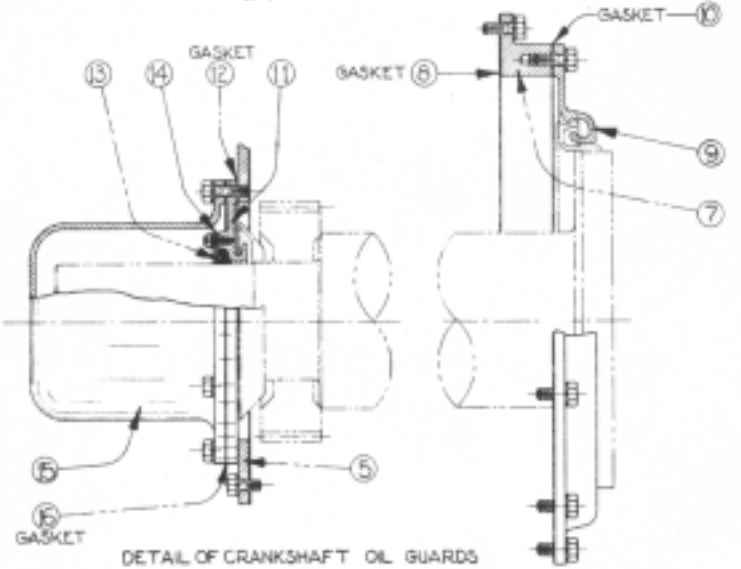
PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

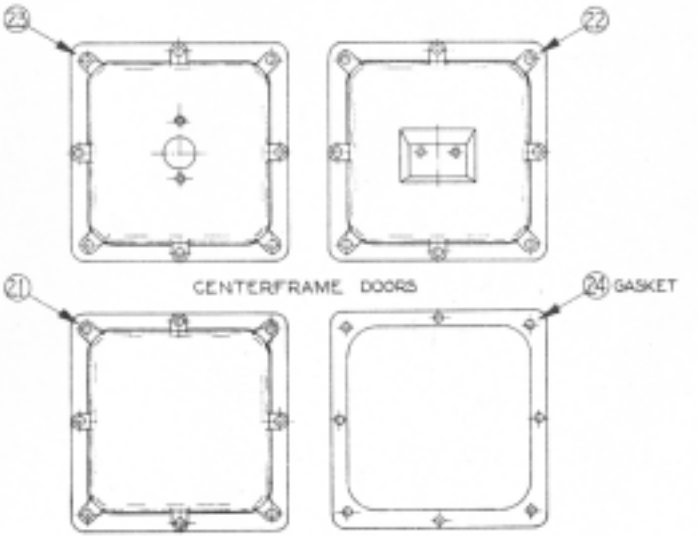
21968

PLATE
No. K-1956

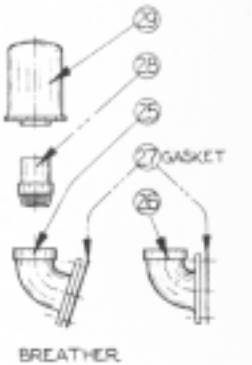




DETAIL OF CRANKSHAFT OIL GUARDS



CENTERFRAME DOORS



BREATHER

DO NOT ORDER PARTS BY REF. No.

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
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21970

PLATE NO. K-1956

REF. NO.	*	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO.]
1		K-1213	1	CENTERFRAME
			2	PIPE PLUG (Fuel Drain Hole)--3/8 Std.-(C.I.)
2		K-1244	1	HOUSING - Timing Gear
3		F-1094	1	GASKET - Gear Housing to Centerframe
4		C-2408L1	12	CAPSCREW - Gear Housing to Centerframe
			1	WIRE -- #16 Ga. x 60 Lg. - (St.)
			2	CAPSCREW(Hous. to Base)--1/2-13-NCx 2 1/4 Lg(St)
			2	CAPSCREW(Hous. to Base)--1/2-13-NCx 4 1/2 Lg(St)
			4	LOCKWASHER -- 1/2 SAE Reg. - (St.)
5		K-1821	1	COVER - Timing Gear Housing
6		F-1095	1	GASKET - Cover to Gear Housing & Base
			24	CAPSCREW -- 3/8-16-NC x 3/4 Lg. - (St.)
			24	LOCKWASHER -- 3/8 SAE Reg. - (St.)
7		F-5072	1	SPACER - Crankshaft Oil Guard (Fly. End)
8		S-2896	1	GASKET - Spacer to Centerframe
			3	CAPSCREW -- 3/8-16-NC x 1 Lg. - (St.)
			3	LOCKWASHER -- 3/8 SAE Reg. - (St.)
9		F-1733	1	GUARD - Crankshaft Oil (Fly. End)
10		S-2942	1	GASKET - Oil Guard to Base & Spacer
			10	CAPSCREW -- 3/8-16-NC x 1 Lg. -(St.)
			2	CAPSCREW -- 3/8-16-NC x 2 1/2 Lg.-(St.)
			12	LOCKWASHER -- 3/8 SAE Reg. - - (St.)
11		F-2409	1	GUARD - Crankshaft Oil - (Gear End)
12		S-2574	1	GASKET - Guard to Gear Housing Plate
			6	CAPSCREW -- 3/8-16-NC x 1 Lg.-(St.)
			6	LOCKWASHER -- 3/8 SAE Reg. - (St.)
13		S-2575	1	FELT - Oil Guard
14		S-2576	1	PLATE - Oil Guard Felt Retainer
			6	MACHINE SCREW--1/4-20 x 7/16 Lg.-Rnd.Hd.-(St.)
			6	LOCKWASHER -- 1/4 SAE Reg. - (St.)

(Used with Tachometer Drive)

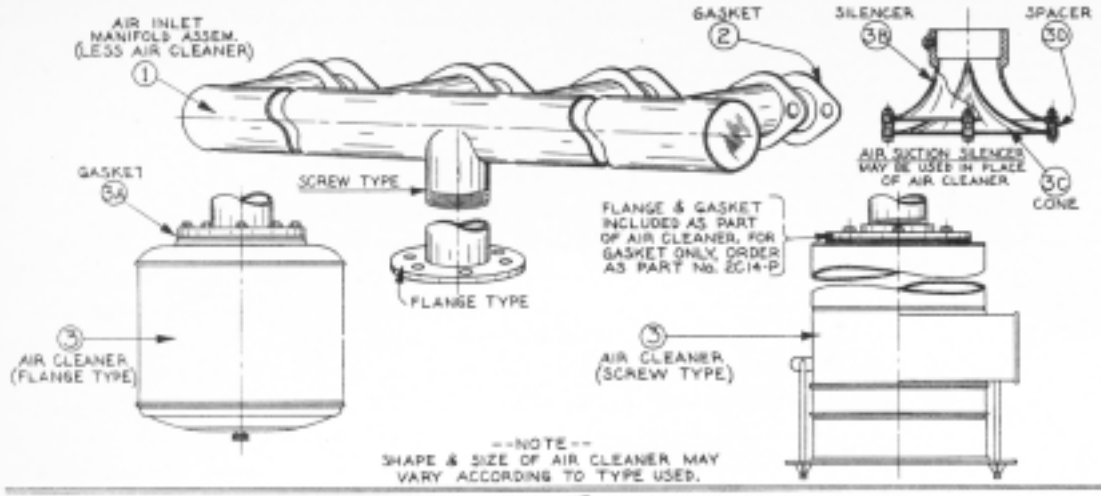
NAME CENTERFRAME, GEAR HOUSING & OIL GUARD GROUP
(USED WITH CRANK. PULLEY) ORIGINALLY ISSUED FOR 6 CYL. 9 x 10½ STAT. - R.H.

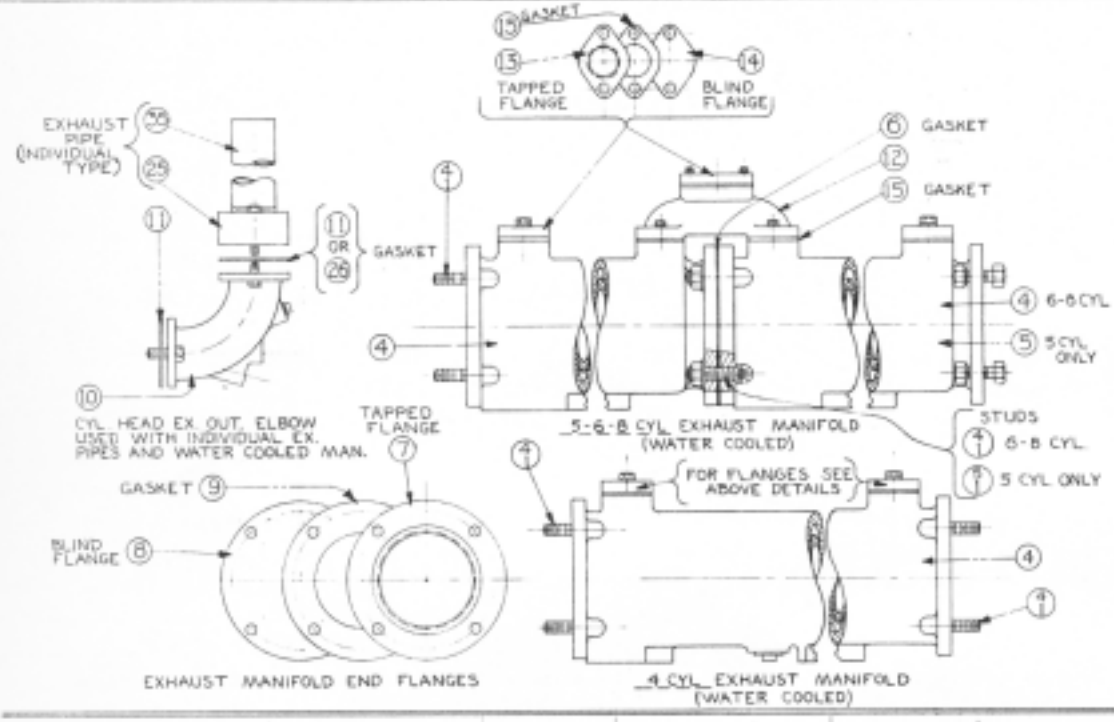
FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

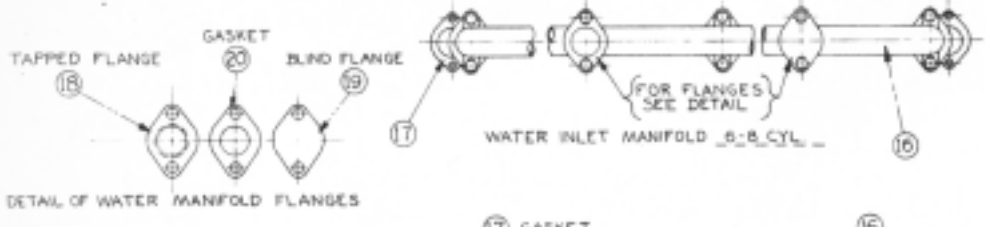
PARTS LIST

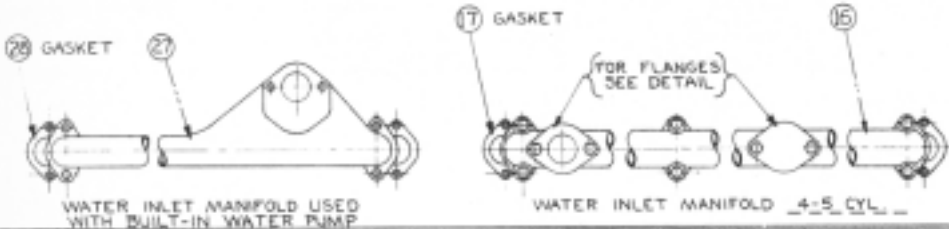
ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

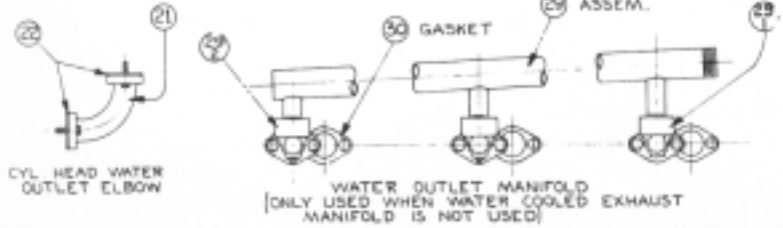
21970











DO NOT ORDER PARTS BY REFERENCE NUMBERS

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FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
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2L974

PLATE NO. K-1966 (Ed 2)

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		X3526	1	MANIFOLD ASSEM. - Air Inlet	
2		S-2337	6	GASKET - Manifold to Cyl. Head	
			12	CAPSCREW -- 5/8-11-NC x 1 1/2 Lg.-(St.)	
			12	LOCKWASHER -- 5/8 SAE Reg. - - (St.)	
3		2C2922-P	2	AIR CLEANER	
3A		2C2929	2	GASKET - Air Cleaner to Manifold	
			16	CAPSCREW -- 5/8-11-NC x 1 1/2 Lg.-(St.)	
			16	LOCKWASHER -- 5/8 SAE Reg. - (St.)	
4		X1752	2	MANIFOLD ASSEM. - Exhaust	
6		S-2645	1	GASKET - Manifold Center Flange	
			4	CAPSCREW -- 3/4-10-NC x 3 Lg. - (St.)	
			4	NUT -- 3/4-10-NC-Hex. - - (St.)	
7		C-5241	1	FLANGE - Manifold End (Ex. Out.)	
8		C-1104	1	FLANGE - Manifold End (Blind)	
9		S-2645	2	GASKET - Flange to Manifold	
			8	NUT -- 3/4-10-NC-Hex. - - (St.)	
10		F-4958	6	ELBOW - Cyl. Head to Manifold Exhaust	
11		S-3286	12	GASKET - Elbow to Cyl. Head & Ex. Man.	
			24	CAPSCREW -- 5/8-11-NC x 1 1/4 Lg.-(St.)	
			6	PIPE PLUG -- 1/2 Std. - (C.I.)	
12		F-3385	1	PIPE - Ex. Man. Section Water By-Pass	
13		787-B	1	FLANGE - Ex. Man. Water Outlet	
14		787	2	FLANGE-Ex. Man. & By-Pass Pipe Water Out.(Blind)	
15		S-1005	5	GASKET - By-Pass Pipe & Flange	
			10	CAPSCREW -- 1/2-13-NC x 1 1/2 Lg. -(St.)	
			10	LOCKWASHER -- 1/2 SAE Reg. - - (St.)	
16		F-5146	1	MANIFOLD - Cyl. Block Water Inlet	
17		S-1042	3	GASKET - Manifold to Cyl. Block	
			6	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg.-(St.)	
			6	LOCKWASHER -- 1/2 SAE Reg. - - (St.)	
18		787-B	1	FLANGE - Manifold Water Inlet	
19		787	1	FLANGE - Manifold Water Inlet (Blind)	
20		S-1005	2	GASKET - Flange to Manifold	
			4	CAPSCREW -- 1/2-13-NC x 1 1/2 Lg.-(St.)	
			4	NUT -- 1/2-13-NC-Hex. - - (St.)	
			4	LOCKWASHER -- 1/2 SAE Reg. - - (St.)	
21		F-4959	6	ELBOW - Cyl. Head Water Out. to Ex. Man.	
22		S-2334	12	GASKET - Elbow to Cyl. Head & Ex. Man.	
			24	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg.-(St.)	
			24	LOCKWASHER -- 1/2 SAE Reg. - - (St.)	

NAME INLET, EXHAUST & WATER MANIFOLD GROUP

ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 STAT.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

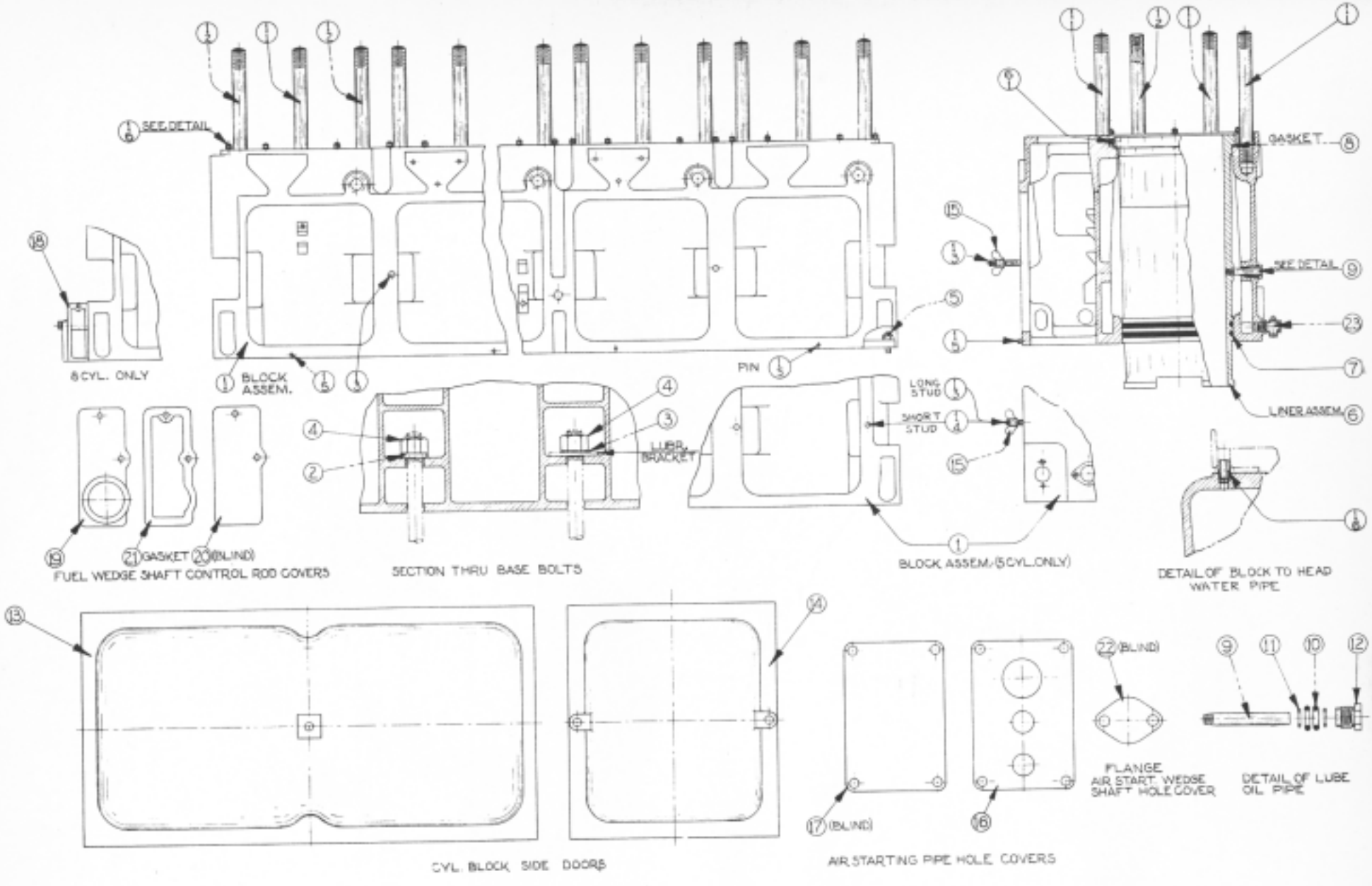
PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L974

PLATE No. K-1968

DO NOT ORDER PARTS BY REF. No.



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* INDICATES PART NOT SERVICED INDIVIDUALLY

2L976

PLATE NO. K-1968

REF. NO.	*	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO.
1		X1964	1	BLOCK ASSEM. - Cylinder
2		727A-KXH	12	WASHER - Base to Cyl. Block Stud
3		2C1822	2	WASHER - Base to Cyl. Block Stud (Thin)
4			14	NUT -- 1 3/8-6-NC-Hex. - (St.)
5		C-3610	2	PIN - Cyl. Block to Centerframe Dowel
			2	CASTLE NUT -- 1/2-20-NF-Hex. - (St.)
			2	COTTER PIN -- 1/8 x 1 Lg. - (St.)
6		X2248	6	LINER ASSEM. - Cylinder
7		604-KXH	12	GROMMET - Cylinder Liner
8		S-800	6	GASKET - Cyl. Liner to Block
9		C-264	6	PIPE - Cylinder Lube Oil
10		610A-RB3	12	GROMMET - Lube Oil Pipe
11		S-2914	12	WASHER - Lube Oil Pipe
12		612-R	6	GLAND - Lube Oil Pipe Packing
13		600A-LXH6	3	DOOR - Cyl. Block Side
15			3	WING NUT -- 1/2-13-NC Std. - - (St.)
16		C-6692	1	COVER - Air Start. Pipe Hole
17		C-6691	1	COVER - Air Start. Pipe Hole (Blind)
			8	CAPSCREW -- 3/8-16-NC x 7/8 Lg.-(St.)
			8	LOCKWASHER -- 3/8 SAE Reg. - - (St.)
19		2C1369	1	COVER - Fuel Wedge Shaft Control Rod
20		C-8266	1	COVER - Fuel Wedge Shaft Control Rod (Blind)
21		C-7574	2	GASKET - Cover to Cyl. Block
			4	CAPSCREW -- 1/4-20-NC x 3/4 Lg.-(St.)
			4	LOCKWASHER -- 1/4 SAE Reg. - - (St.)
22		783	1	FLANGE - Air Start. Wedge Shaft Hole (Blind)
			2	CAPSCREW -- 3/8-16-NC x 7/8 Lg.-(St.)
			2	LOCKWASHER -- 3/8 SAE Reg. - - (St.)
		---- Cylinder Block Water Drain ----		
			1	CLOSE NIPPLE -- 1/2 Std. - - (Brass)
23		C-9053-P 1/2	1	DRAIN COCK
			2	STREET ELL -- 1/2 Std. - (Brass)
			1	NIPPLE -- 1/2 x 7 1/2 Lg. - (Brass)
			1	ELBOW -- 1/2 Std. - - (Brass)
			1	PIPE -- 1/2 x 17 Lg. - (Brass)
23		C-9053-P 1/2	1	DRAIN COCK

NAME CYLINDER BLOCK & COVERS GROUP - -(USED WITH WOOD. GOV.)

ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 STAT.-R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

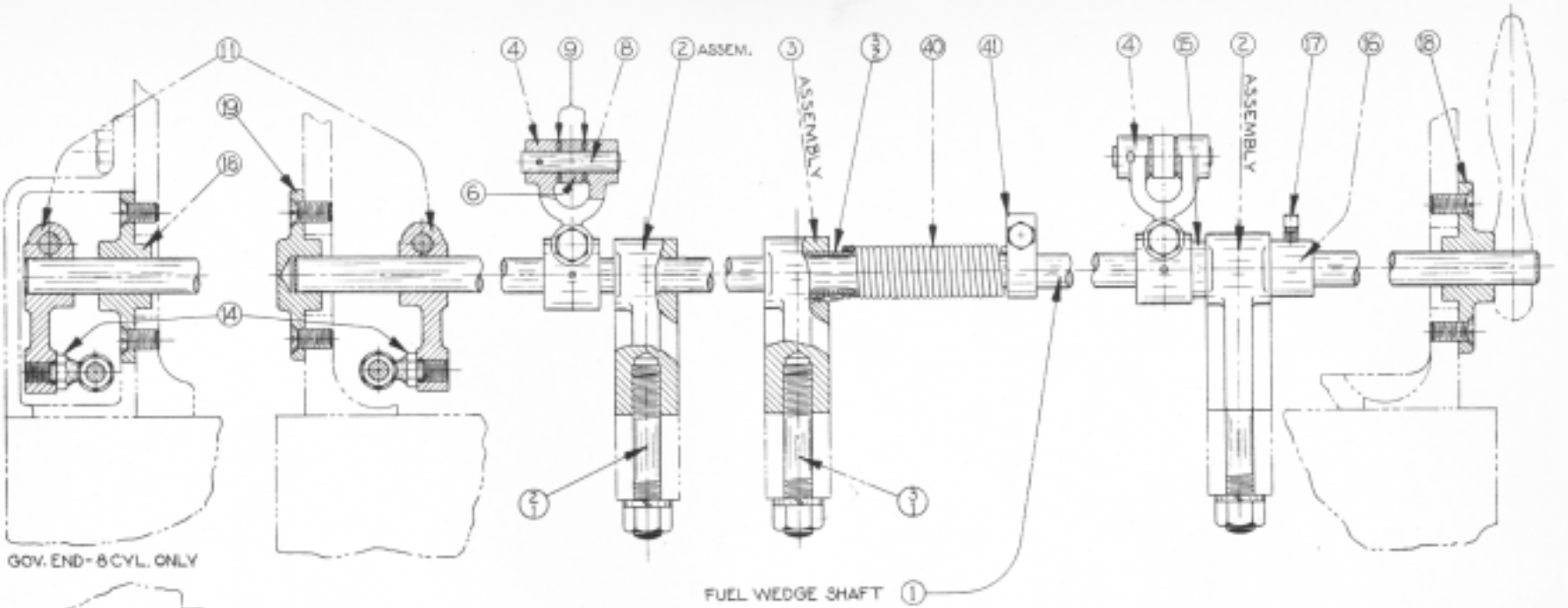
PARTS LIST

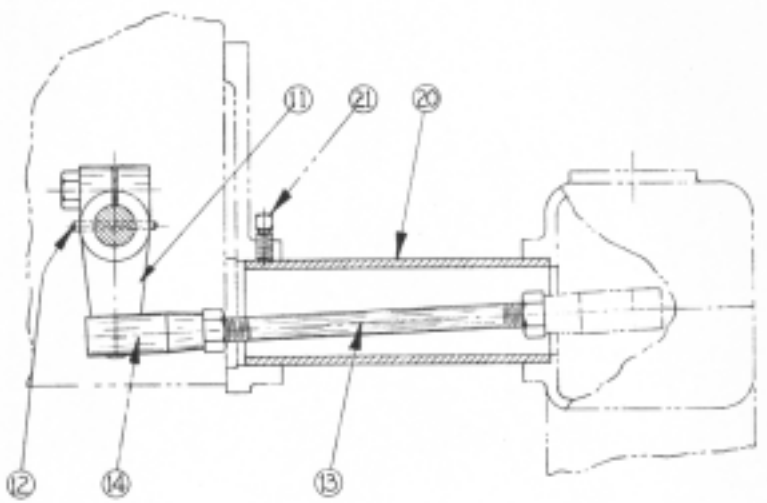
ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

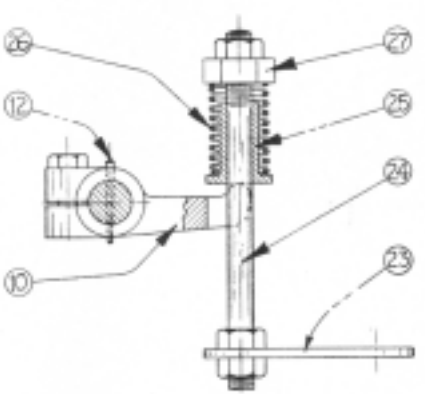
2L976

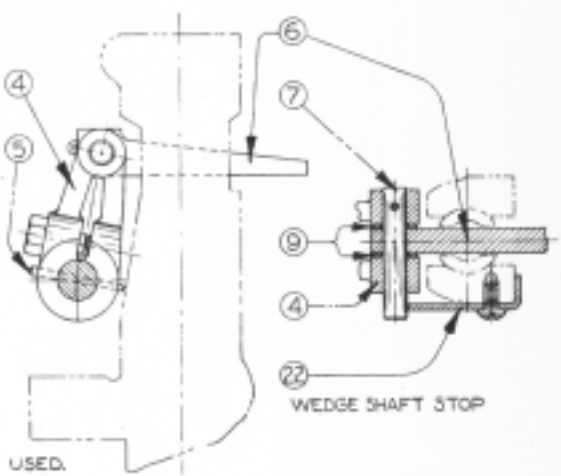
PLATE
No. K-1963

DO NOT ORDER PARTS BY REF. No.









NOTE -- IF ENGINE IS EQUIPPED WITH WOODWARD GOVERNOR - CONTROL LINKAGE & BUMPER SPRING SHOWN ARE NOT USED.
IF ENGINE IS EQUIPPED WITH JAHNS GOVERNOR - - CONTROL LINKAGE SHOWN IS NOT USED.
FOR CORRESPONDING PARTS USED WITH THESE GOVERNORS SEE GOVERNOR OR WEDGE SHAFT CONTROL LINKAGE GROUP - AS NOTED ON INDEX SHEET.

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

21977

PLATE NO. K-1963

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		C-6623L94 5/8	1	SHAFT - Fuel Wedge	
2		X1510	5	BEARING ASSEM. - Fuel Wedge Shaft	
3		X1503	1	BEARING ASSEM. - Fuel Wedge Shaft	
			6	NUT -- 1/2-20-NF-Hex. - (St.)	
			6	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
4		1131-DXC4	6	FORK - Fuel Wedge	
			6	CAPSCREW -- 3/8-16-NC x 1 1/4 Lg.-(St.)	
5			6	TAPER PIN -- #3 x 1 1/2 Lg. - (St.)	
6		1132-JX	6	WEDGE - Fuel	
7		S-3027	1	PIN - Fuel Wedge (Long)	
8		1132A-E	5	PIN - Fuel Wedge	
			6	COTTER PIN -- 1/8 x 1 Lg. - (St.)	
9			12	PLAIN WASHER -- 3/8 SAE Std. - (St.)	
15		S-962	1	COLLAR - Wedge Shaft Spacer (Narrow)	
16		S-862	1	COLLAR - Wedge Shaft Spacer (Wide)	
17			1	SETSCREW--1/4-20-NC x 1/2 Lg.-Sq.Hd.-Cup Pt.(St)	
18		4898	1	BEARING - Fuel Wedge Shaft End	
19		2C2723	1	BEARING - Fuel Wedge Shaft End (Blind)	
			4	CAPSCREW -- 3/8-16-NC x 5/8 Lg.-Flat Hd.(St.)	
22		S-3028	1	STOP - Fuel Wedge	
			1	MACHINE SCREW--1/4-20 x 1/2 Lg.-Rnd. Hd.-(St.)	

NAME FUEL WEDGE SHAFT GROUP - - - - (USED WITH WOOD. GOV.)

ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 STAT.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

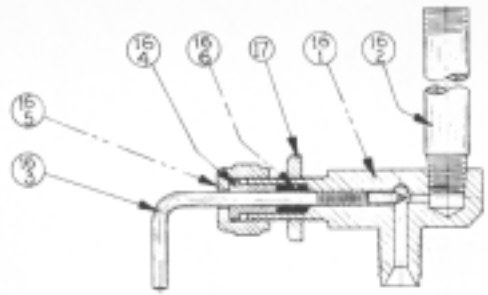
PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

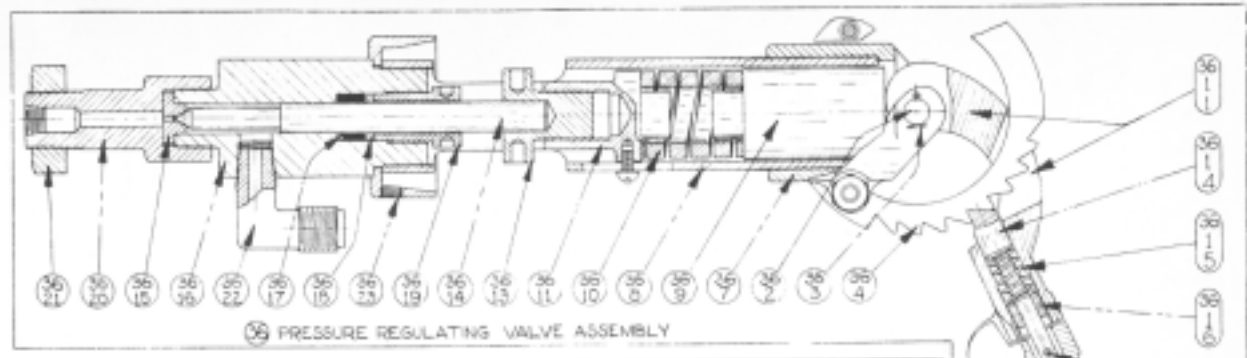
21977

PLATE
No. K-1973

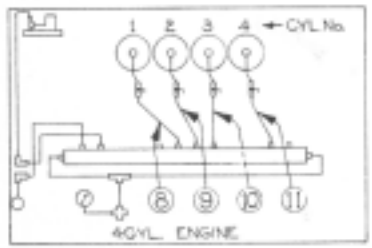
DO NOT ORDER PARTS BY REF. No.



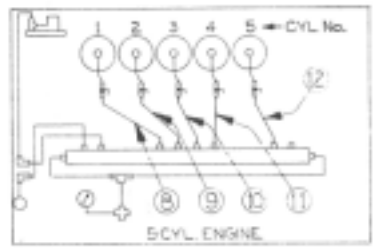
15 ISOLATING VALVE ASSEM.



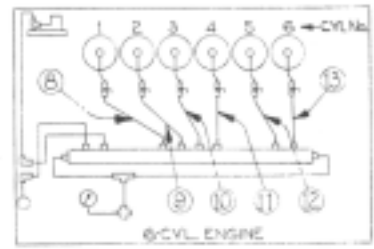
36 PRESSURE REGULATING VALVE ASSEMBLY



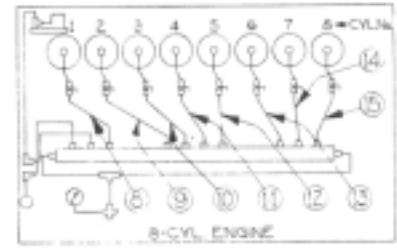
4 CYL. ENGINE



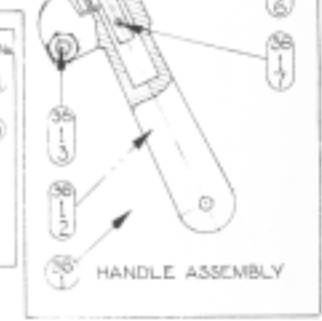
5 CYL. ENGINE



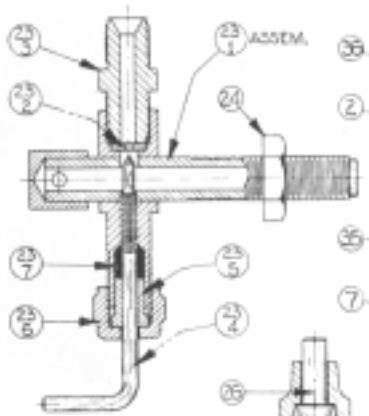
6 CYL. ENGINE



8 CYL. ENGINE

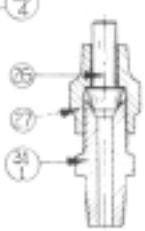


16 HANDLE ASSEMBLY

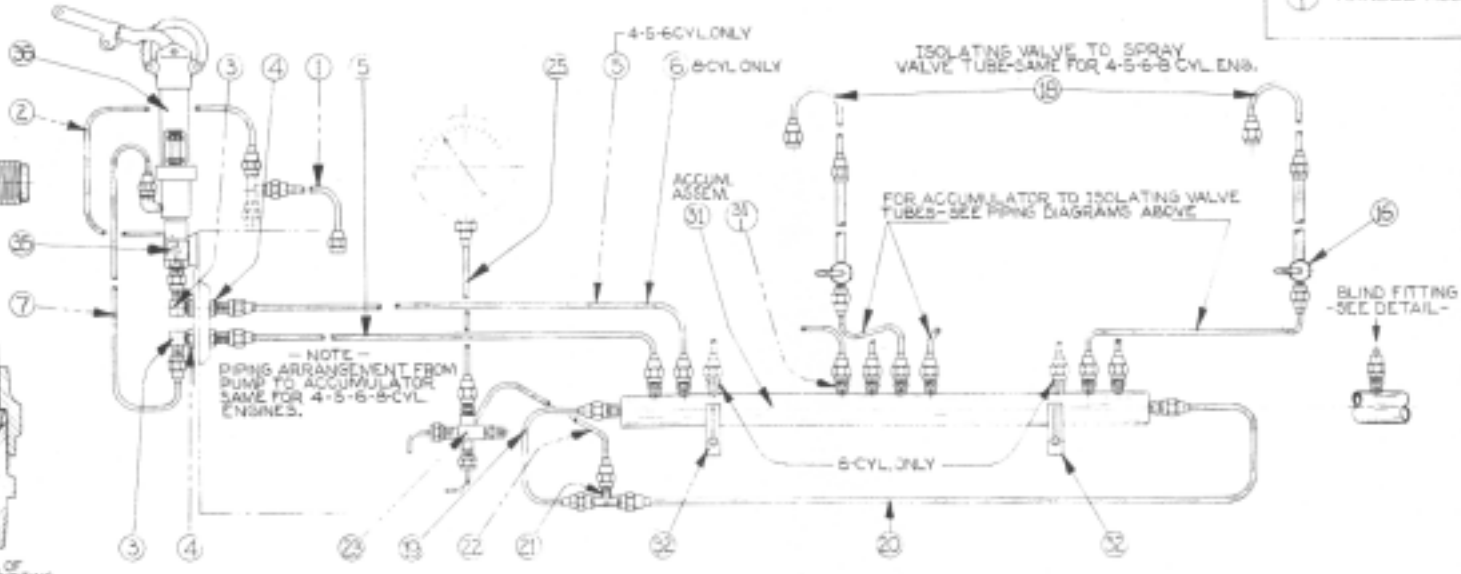


23 TEST VALVE ASSEM.

55 BRACKET (PRESS. REG. VALVE)



DETAIL OF BLIND FITTING



ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

21978

PLATE NO. K-1973

ASSEM. DRWG. NO. F-5501

REF. NO.	*	PART NO.	NO. REQD.	PART NAME
1		X1864	1	TUBE ASSEM. - Pump to Pump - (12")
2		X152	1	TUBE ASSEM.-Pump to Cyl. Block Elbow Conn.-(43")
3		X87	2	ELBOW ASSEM.-Fuel Tube Conn.(Thru Cyl. Block)
4			4	HALF NUT -- 3/4-16-NF-Hex. - (St.)
5		X147	2	TUBE ASSEM.-Elbow Connect. to Accum. - (36")
7		X5100	1	TUBE ASSEM.-Elbow Connect. to Regulat. Val.-(21")
8		X5014	1	TUBE ASSEM.-Accum. to Isolat. Val.-Cyl.#1 -(40")
9		X5134	1	TUBE ASSEM.-Accum. to Isolat. Val.-Cyl.#2 -(30")
10		X6013	1	TUBE ASSEM.-Accum. to Isolat. Val.-Cyl.#3 -(18")
11		X5045	1	TUBE ASSEM.-Accum. to Isolat. Val.-Cyl.#4 -(24")
12		X142	1	TUBE ASSEM.-Accum. to Isolat. Val.-Cyl.#5 -(28")
13		X5014	1	TUBE ASSEM.-Accum. to Isolat. Val.-Cyl.#6 -(40")
16		G1205-FX	6	VALVE ASSEM. - Isolating
17		1205B-FX	6	NUT - Isolating Valve
18		X5134	6	TUBE ASSEM.-Isolat. Valve to Spray Valve-(30")
19		X6008	1	TUBE ASSEM. - Accum. to Tee - (7 1/2")
20		X5097	1	TUBE ASSEM. - Accum. to Tee - (68")
21		F-707	1	TEE - Test Valve Tube
22		X5092	1	TUBE ASSEM. - Tee to Test Valve -(21")
23		X1512	1	VALVE ASSEM. - Test
24			1	HALF NUT -- 3/4-16-NF-Hex. - (St.)
25			1	TUBE ASSEM.-Test Valve to Press. Gage -
31		X2251	1	ACCUMULATOR ASSEM. - Fuel
32		S-509	2	CLAMP - Accum. to Cyl. Block
			2	CAPSCREW -- 3/8-16-NC x 1 1/4 Lg.-(St.)
35		F-5058	1	BRACKET - Fuel Press. Regulat. Valve
			2	CAPSCREW -- 3/8-16-NC x 1 1/4 Lg.-(St.)
			2	LOCKWASHER -- 3/8 SAE Reg. - - (St.)
36		G1230-E1	1	VALVE ASSEM. - Fuel Press. Regulating

NAME HIGH PRESSURE FUEL SYSTEM GROUP - - - (MARITIME)

ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 STAT.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

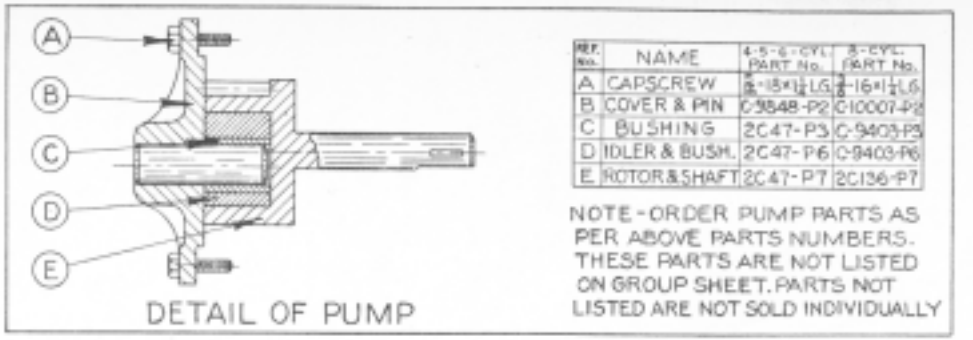
PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

21978

PLATE No. W-2094

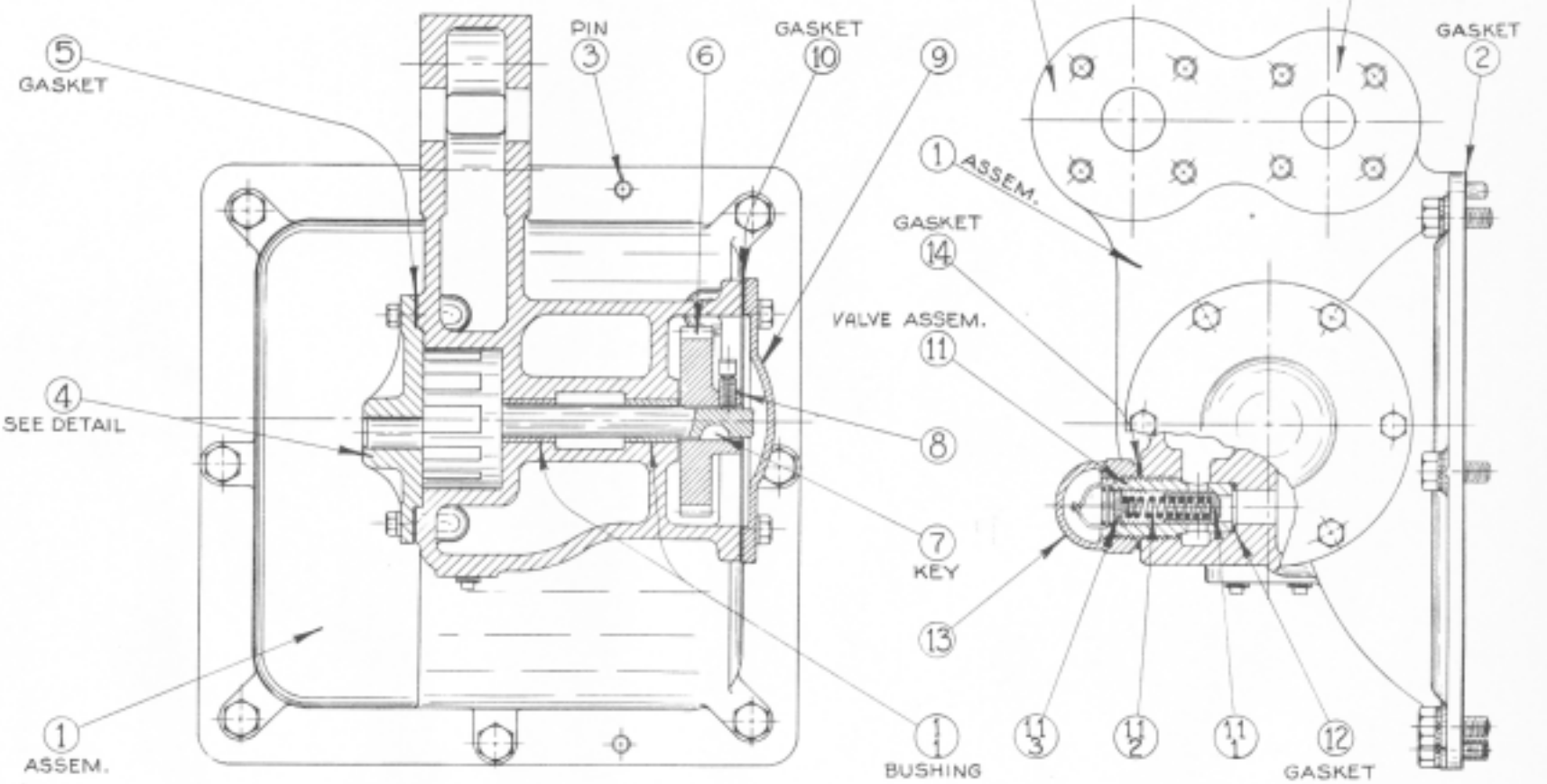
DO NOT ORDER PARTS BY REF. NUMBERS



DETAIL OF PUMP

REF. No.	NAME	4-5-6-CYL. PART No.	3-CYL. PART No.
A	CAPSCREW	$\frac{3}{8}$-18×1$\frac{1}{4}$ LG.	$\frac{3}{8}$-16×1$\frac{1}{2}$ LG.
B	COVER & PIN	C-3548-P2	C-10007-P2
C	BUSHING	2C47-P3	C-9403-P3
D	IDLER & BUSH.	2C47-P6	C-9403-P6
E	ROTOR & SHAFT	2C47-P7	2C136-P7

NOTE - ORDER PUMP PARTS AS PER ABOVE PARTS NUMBERS. THESE PARTS ARE NOT LISTED ON GROUP SHEET. PARTS NOT LISTED ARE NOT SOLD INDIVIDUALLY



ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

21979

PLATE NO. K-2004

REF. NO.	*	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO.
1		X3530	1	HOUSING ASSEM. - Lube Oil Pump
			2	PIPE PLUG -- 1/4 Std. - (C.I.)
2		F-5538	1	GASKET - Housing to Centerframe
3		S-2760	2	PIN - Housing to Centerframe Dowel
			7	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg. - (St.)
			7	LOCKWASHER -- 1/2 SAE Reg. - - (St.)
4		C-9848-P	1	PUMP - Lube Oil Pressure
5		C-9849-P	1	GASKET - Pump to Housing
			8	CAPSCREW -- 5/16-18-NC x 1 1/4 Lg.-(St.)
			8	LOCKWASHER -- 5/16 SAE Reg. - - (St.)
6		F-5142	1	GEAR - Pump Drive
7			1	WOODRUFF KEY -- 3/16 x 3/4 Std. - (St.)
8			1	SETSCREW--3/8-16-NC x 3/4 Lg.-Sq.Hd.Cup Pt.(St.)
9		C-6195	1	COVER - Pump Housing End
10		C-6218	1	GASKET - Cover
			6	CAPSCREW -- 3/8-16-NC x 7/8 Lg.-(St.)
			6	LOCKWASHER -- 3/8 SAE Reg. - - (St.)
11		X1445	1	VALVE ASSEM. - Lube Oil Pressure Relief
12		C-9176-P	1	GASKET - Valve to Housing
13		C-6180	1	CAP - Lube Oil Relief Valve
14		918D-E3	1	GASKET - Cap to Housing
19		2C3120-P1 1/4	1	FLANGE - Pump Suction Port -(Blind)
20		2C3123-P1 1/4	1	GASKET - Flange to Housing
			4	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg.-(St.)
			4	LOCKWASHER -- 1/2 SAE Reg. - - (St.)
22		2C3120-P1	1	FLANGE - Pump Discharge Port -(Blind)
23		2C3123-P1	1	GASKET - Flange to Housing
			4	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg.-(St.)
			4	LOCKWASHER -- 1/2 SAE Reg. - (St.)

NAME LUBE OIL PRESSURE PUMP GROUP

ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 STAT.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

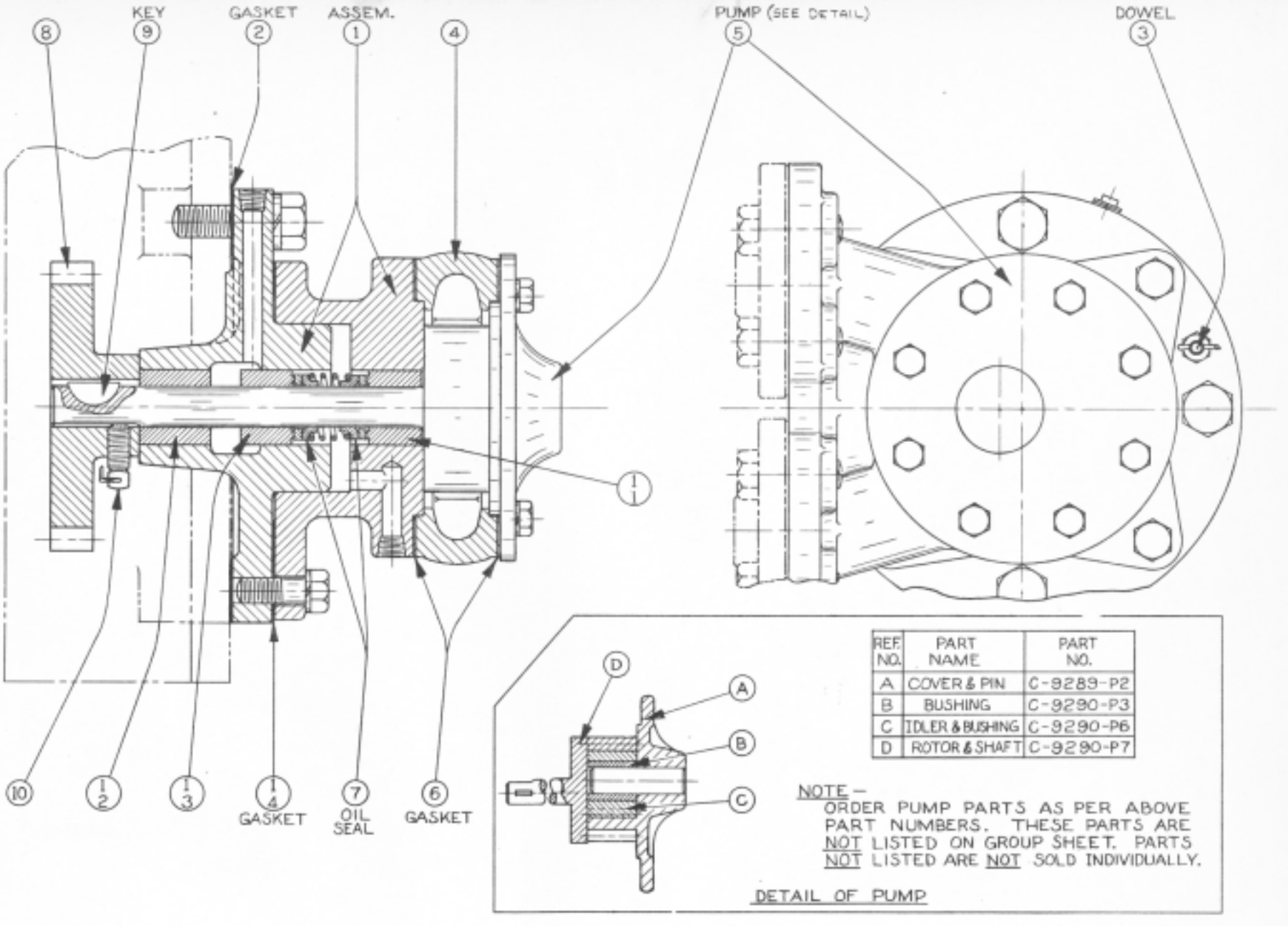
PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

21979

PLATE NO. W-2091

DO NOT ORDER PARTS BY REF. NUMBERS



REF. NO.	PART NAME	PART NO.
A	COVER & PIN	C-9289-P2
B	BUSHING	C-9290-P3
C	IDLER & BUSHING	C-9290-P6
D	ROTOR & SHAFT	C-9290-P7

NOTE –
ORDER PUMP PARTS AS PER ABOVE PART NUMBERS. THESE PARTS ARE NOT LISTED ON GROUP SHEET. PARTS NOT LISTED ARE NOT SOLD INDIVIDUALLY.

DETAIL OF PUMP

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L981

PLATE NO. W-2091

REF. NO.	*	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO.
1		X3361	1	ADAPTOR ASSEM. - Fuel Transfer Pump
2		S-812	1	GASKET - Adaptor to Gear Housing
			4	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg.-(St.)
			4	LOCKWASHER -- 1/2 SAE Reg. - - (St.)
3		C-9992L1 1/4	2	PIN - Adaptor to Gear Housing Dowel
			2	NUT -- 1/4-28-NF-Hex. - (St.)
			2	COTTER PIN -- 1/16 x 1/2 Lg.-(St.)
4		W-2037	1	HOUSING - Pump
5		2C3065-P	1	PUMP - Fuel Transfer
6		C-8193	6	GASKET - Housing to Pump & Adaptor
			8	CAPSCREW -- 1/4-20-NC x 2 1/4 Lg. (St.)
			8	LOCKWASHER -- 1/4 SAE Reg. - - (St.)
7		2C2478-P	1	OIL SEAL
8		C-9881	1	GEAR - Fuel Transfer Pump Drive
9			1	WOODRUFF KEY -- 1/8 x 3/4 Std. - (St.)
10		C-8217	1	SETSCREW - Gear to Shaft
			1	WIRE -- #16 Ga. x 8 Lg. - (St.)

NAME FUEL TRANSFER PUMP GROUP - - - - - - - (MARITIME)

ORIGINALLY ISSUED FOR 9 x 10 1/2 STAT.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L981

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

PLATE NO. 2L985

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
		K-2109	1	BOARD - Gage	
			6	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg.-(St.)	
			6	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
		2C3130-P	1	GAGE - Lube Pressure (6" - 100 Lb.)	
		2C3132-P	1	GAGE - Air Pressure (6" - 500 Lb.)	
		2C3131-P	1	GAGE - Fuel Pressure (6" - 10000 Lb.)	
			9	MACHINE SCREW -- 1/4-20 x 5/8 Lg.-(St.)	
			9	LOCKWASHER -- 1/4 SAE Reg. - - (St.)	
		---- Air Start.		Man. to Air Pressure Gage ----	
			1	CLOSE NIPPLE -- 1/4 Std. - - (W.I.)	
			1	TEE -- 1/4 x 1/4 x 1/8 Std. Reducing -(M.I.)	
			1	CLOSE NIPPLE -- 1/8 Std. - (W.I.)	
		C-9846-P 1/8	1	GLOBE VALVE (Needle Point)	
		C-9804-P 1/4	1	ELBOW - Tube	
			1	TUBE -- 1/4 O.D. x .030 x Lg.(S.D. Cop.)	
		C-9801-P 1/4	1	CONNECTOR - Tube	
			1	ELBOW -- 1/4 x 1/8 Std. Reducing -(M.I.)	
		---- Lube Press.		Gage Connection ----	
		C-9846-P 1/8	1	GLOBE VALVE (Needle Point)	
			1	CLOSE NIPPLE -- 1/8 Std. - (W.I.)	
			1	TEE -- 1/8 x 1/8 x 1/4 Std. Reducing -(M.I.)	
			1	CLOSE NIPPLE -- 1/4 Std. - (W.I.)	

NAME PRESSURE GAGE GROUP - - - - - - - (MARITIME ENGINE)

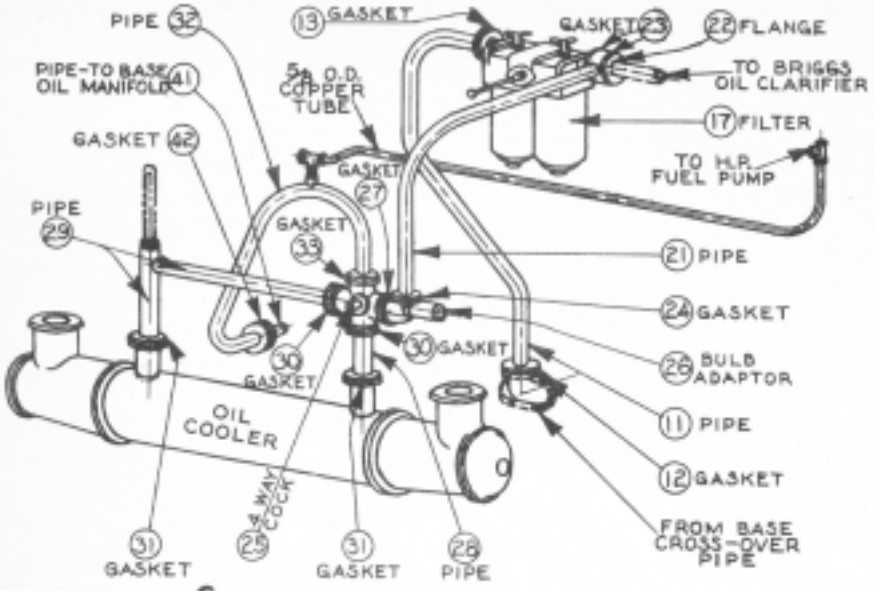
ORIGINALLY ISSUED FOR 6-8 CYL. 9x10½ STAT. - R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

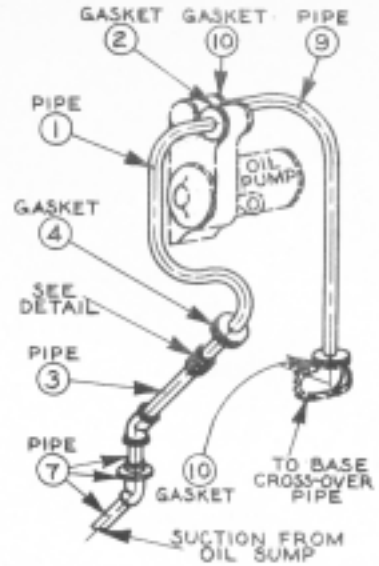
PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

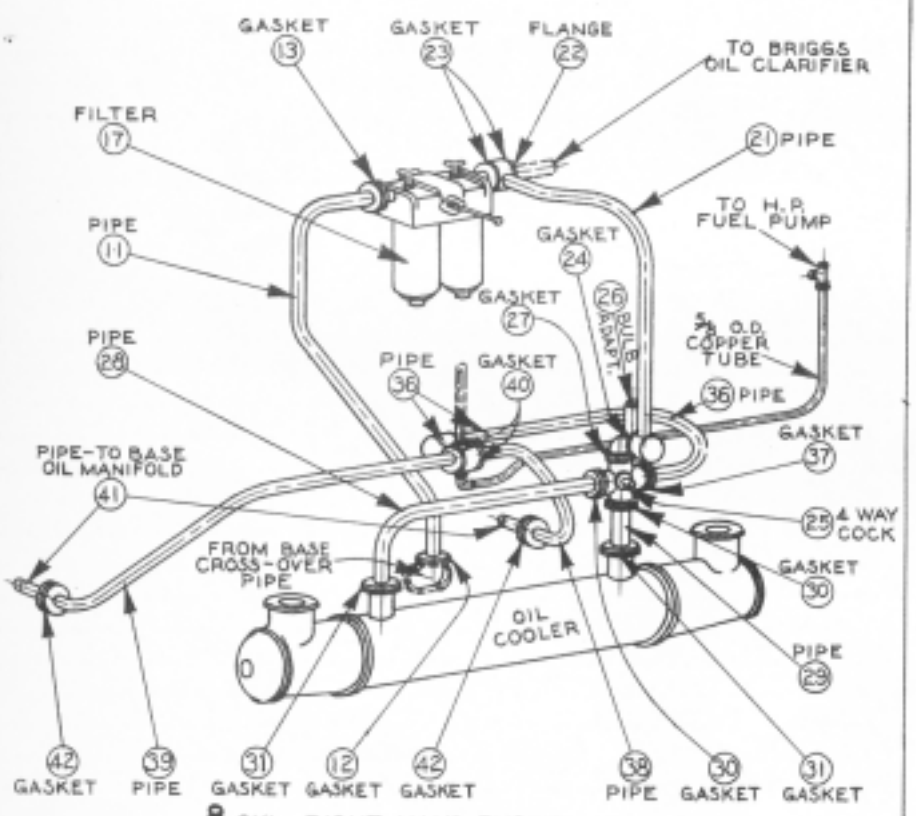
2L985



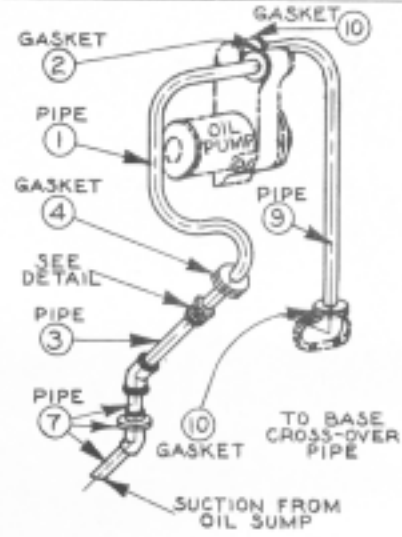
6 CYL. RIGHT HAND ENGINE



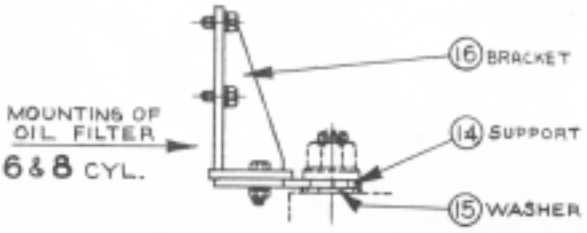
6 & 8 CYL. RIGHT HAND ENG.

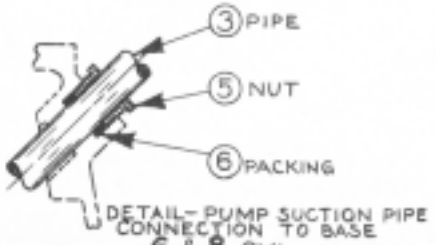


8 CYL. RIGHT HAND ENGINE
8 CYL. L.H. ENG. SIMILAR, ONLY OPPOSITE HAND



8 CYLINDER
LEFT HAND ENGINE





NOTE--ALL PIPES WITH REF. NUMBERS ARE ASSEMBLIES & INCLUDE FLANGES

PLATE NO.
W-2130

DO NOT ORDER PARTS BY REF. NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L987 SHEET 1 OF 2
PLATE NO. W-2130

REF. NO.	*	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO.
		---- Pump Suction Line to Sump ----		
1		X3534	1	PIPE ASSEMBLY
2		2C3121-P1 1/4	1	GASKET - Pipe to Pump Housing
			4	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg.-(St.)
			4	LOCKWASHER -- 1/2 SAE Reg. - - (St.)
3		X3535	1	PIPE ASSEMBLY
4		2C3121-P1 1/4	1	GASKET - Pipe Flange
			4	CAPSCREW -- 1/2-13-NC x 1 3/4 Lg.-(St.)
			4	NUT -- 1/2-13-NC-Hex. - - (St.)
			4	LOCKWASHER -- 1/2 SAE Reg. - - (St.)
5		C-8115	1	NUT - Suction Pipe Packing
6			1	PACKING -- 1/4 Dia. x 38 Lg. - Flax
7		X2886	1	PIPE ASSEM. - Lube Pump Suction
8		C-2406L1 1/4	4	CAPSCREW -- Suct. Pipe Elbow to Base
			4	PLAIN WASHER -- 3/8 SAE Std. - (St.)
			1	WIRE -- #16 Ga. x 36 Lg.-(St.)
			1	ELBOW -- 1 1/4 Std. - 45° - (M.I.)
		---- Pump Discharge to Base Cross-over Pipe ----		
9		X3536	1	PIPE ASSEMBLY
10		2C3121-P1	2	GASKET - Pipe Flange
			8	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg.-(St.)
			8	LOCKWASHER -- 1/2 SAE Reg. - - (St.)
		---- Lube Cross-over Pipe to Filter ----		
11		X3539	1	PIPE ASSEMBLY
12		2C3121-P1	1	GASKET - Pipe to Cross-over Pipe Cover
			4	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg.-(St.)
			4	LOCKWASHER -- 1/2 SAE Reg. - - (St.)
13		2C3121-P1 1/4	1	GASKET - Pipe to Filter
			4	CAPSCREW -- 1/2-13-NC x 1 3/4 Lg.-(St.)
			4	NUT -- 1/2-13-NC-Hex. - - (St.)
			4	LOCKWASHER -- 1/2 SAE Reg. - (St.)
14		2C3088	1	SUPPORT - Filter Bracket(On Cyl. Block Stud)
15		2C3111	1	WASHER - Spacer
16		2C3087	1	BRACKET - Filter
			2	CAPSCREW -- 1/2-13-NC x 1 1/2 Lg.-(St.)
			2	NUT -- 1/2-13-NC-Hex. - (St.)
			2	LOCKWASHER -- 1/2 SAE Reg. - - (St.)
17		F-6836-P	1	FILTER - Lube Oil
			4	CAPSCREW -- 1/2-13-NC x 1 Lg. - (St.)
			4	LOCKWASHER -- 1/2 SAE Reg. - (St.)

---- CONTINUED ON SHEET NO. 2 ----

NAME LUBE OIL PRESSURE PIPING GROUP - - - (MARITIME ENGINE)
ORIGINALLY ISSUED FOR 6 CYL. 9 x 10½ STAT. - R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L987 SHEET 1 OF 2

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L987 SHEET 2 OF 2
PLATE NO. W-2130

REF. NO.	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
			---- CONTINUED FROM SHEET NO. 1 ----	
			---- Filter to Bulb Adaptor (At Four Way Cock) ----	
21	X3578	1	PIPE ASSEM.	
22	2C3201	1	FLANGE - Pipe	
23	2C3121-P1 1/4	2	GASKET - Pipe & Flange to Filter	
		4	CAPSCREW -- 1/2-13-NC x 4 3/4 Lg.-(St.)	
		4	NUT -- 1/2-13-NC-Hex. - (St.)	
		4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
24	2C3121-P1 1/4	1	GASKET - Pipe to Bulb Adaptor	
		4	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg. -(St.)	
		4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
			---- Four Way Cock to Cooler (Cool. In. & Out.) ----	
25	F-6285-P	1	COCK - Four Way	
26	W-2057	1	ADAPTOR - Dial Thermometer Bulb	
27	2C3121-P1 1/2	1	GASKET - Adaptor to Cock	
		2	CAPSCREW -- 1/2-13-NC x 2 Lg.-(St.)	
		2	CAPSCREW -- 1/2-13-NC x 4 Lg. -(St.)	
		4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
28	X3542	1	PIPE ASSEM. - Cock to Cooler (Cool. In.)	
29	X3541	1	PIPE ASSEM. - Cooler to Cock - (Cool. Out.)	
30	2C3121-P1 1/2	2	GASKET - Pipe to Cock	
		8	CAPSCREW -- 1/2-13-NC x 2 1/4 Lg.-(St.)	
		8	NUT -- 1/2-13-NC-Hex. - (St.)	
		8	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
31	2C3121-P2	2	GASKET - Pipe to Cooler	
		8	CAPSCREW -- 5/8-11-NC x 2 1/4 Lg. -(St.)	
		8	NUT -- 5/8-11-NC-Hex. - (St.)	
		8	LOCKWASHER -- 5/8 SAE Reg. - (St.)	
			---- Four Way Cock Outlet to Man. Connect. at Base ----	
32	X3544	1	PIPE ASSEM.	
33	2C3121-P1 1/2	1	GASKET - Pipe to Cock	
		4	CAPSCREW -- 1/2-13-NC x 2 1/4 Lg.-(St.)	
		4	NUT -- 1/2-13-NC-Hex. - (St.)	
		4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
41	X3549	1	PIPE ASSEM. - (Base Connection)	
42	2C3121-P1	1	GASKET	
		4	CAPSCREW -- 1/2-13-NC x 1 3/4 Lg.-(St.)	
		4	NUT -- 1/2-13-NC-Hex. - (St.)	
		4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
			---- Four Way Cock Out. Line H.P. Fuel Pump Connections ----	
		1	CLOSE NIPPLE -- 1/2 Std. - (W.I.)	
		1	TEE -- 1/2 Std. - (M.I.)	
		1	REDUCING BUSHING -- 1/2 x 1/8 Std.-(C.I.)	
	C-9804-P 5/8	1	ELBOW - Tube	
		1	TUBE -- 5/8 O.D.x .049x 65 Lg.(H.D. Cop.)	
	C-9801-P 5/8	1	CONNECTOR - Tube	
		1	TEE -- 1/4 x 1/4 x 1/2 Std.-Reducing-(M.I.)	

NAME LUBE OIL PRESSURE PIPING GROUP - - - - (MARITIME ENGINE)
ORIGINALLY ISSUED FOR 6 CYL. 9 x 10½ STAT.-R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR GROUP GIVEN ON INDEX SHEET

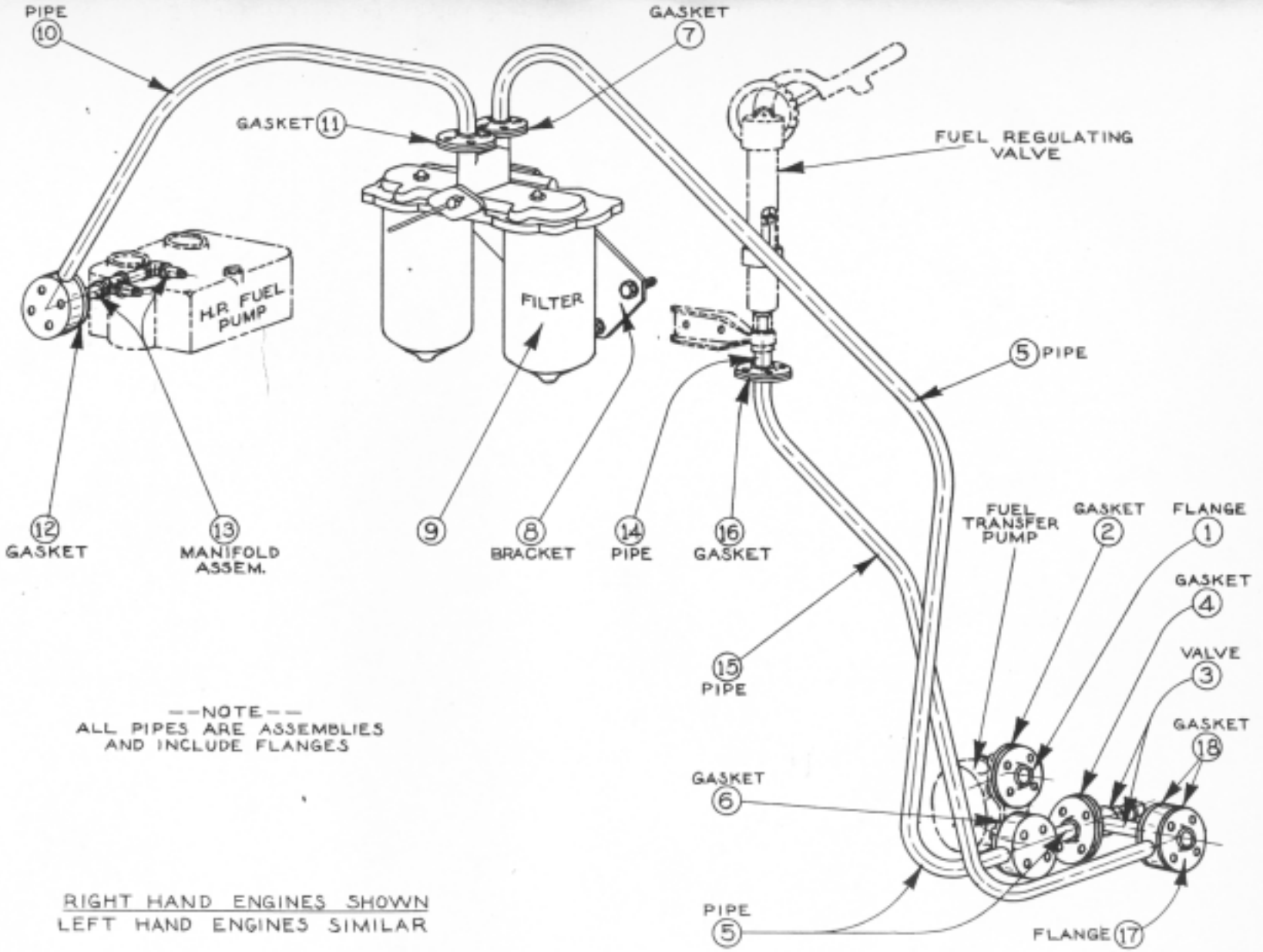
PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L987 SHEET 2 OF 2

PLATE NO.
W-2131

DO NOT ORDER PARTS BY REF. NUMBERS



--NOTE--
ALL PIPES ARE ASSEMBLIES AND INCLUDE FLANGES

RIGHT HAND ENGINES SHOWN
LEFT HAND ENGINES SIMILAR

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L990

PLATE NO. W-2131

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		2C3078-P 1/2	1	FLANGE - Transfer Pump Suction Pipe	
2		2C3121-P 1/2	1	GASKET - Flange to Pump Housing	
			4	CAPSCREW -- 1/2-13-NC x 1 Lg. - (St.)	
			4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
3		F-6829-P	1	VALVE - Pressure Relief - (10 Lb.)	
4		2C3121-P 1/2	1	GASKET - Valve to Pump Disch. Pipe	
			4	CAPSCREW -- 1/2-13-NC x 1 3/4 Lg.-(St.)	
			4	NUT -- 1/2-13-NC-Hex. - (St.)	
			4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
5		X3550	1	PIPE ASSEM. - Pump to Filter	
6		2C3121-P 1/2	1	GASKET - Pipe to Pump Housing	
			4	CAPSCREW -- 1/2-13-NC x 2 1/4 Lg.-(St.)	
			4	LOCKWASHER -- 1/2 SAE Reg. - - (St.)	
7		2C3121-P 1/2	1	GASKET - Pipe to Filter	
			4	CAPSCREW -- 1/2-13-NC x 1 3/4 Lg.-(St.)	
			4	NUT -- 1/2-13-NC-Hex. - (St.)	
			4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
8		2C3106	1	BRACKET - Fuel Filter	
			3	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg.-(St.)	
			3	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
9		F-6845-P	1	FILTER - Fuel	
			2	CAPSCREW -- 1/2-13-NC x 1 1/2 Lg.-(St.)	
			2	NUT -- 1/2-13-NC-Hex. - (St.)	
			2	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
10		X3553	1	PIPE ASSEM. - Filter to H.P. Pump	
11		2C3121-P 1/2	1	GASKET - Pipe to Filter	
			4	CAPSCREW -- 1/2-13-NC x 1 3/4 Lg.-(St.)	
			4	NUT -- 1/2-13-NC-Hex. - (St.)	
			4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
12		2C3121-P 1/2	1	GASKET-Pipe to H.P. Pump Inlet Manifold	
			4	CAPSCREW -- 1/2-13-NC x 2 1/4 Lg.-(St.)	
			4	NUT -- 1/2-13-NC-Hex. - (St.)	
			4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
13		X3556	1	MANIFOLD ASSEM. - H.P. Fuel Pump Inlet	
14		X3557	1	PIPE ASSEM.- Fuel Reg. Valve Outlet	
15		X3558	1	PIPE ASSEM.-Reg. Valve Out. to 10 Lb. Relief Val.	
16		2C3121-P 1/2	1	GASKET - Pipe to Pipe	
			4	CAPSCREW--1/2-13-NC x 1 1/2 Lg.-(St.)	
			4	NUT -- 1/2-13-NC-Hex. - (St.)	
			4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
17		2C3078-P 1/2	1	FLANGE - 10 Lb. Relief Valve Outlet Pipe	
18		2C3121-P 1/2	2	GASKET-Pipe & Flange to Relief Valve	
			4	CAPSCREW -- 1/2-13-NC x 3 1/4 Lg.-(St.)	
			4	NUT -- 1/2-13-NC-Hex. - (St.)	
			4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	

NAME LOW PRESSURE FUEL PIPING & FILTER GROUP--(MARITIME ENGINE)

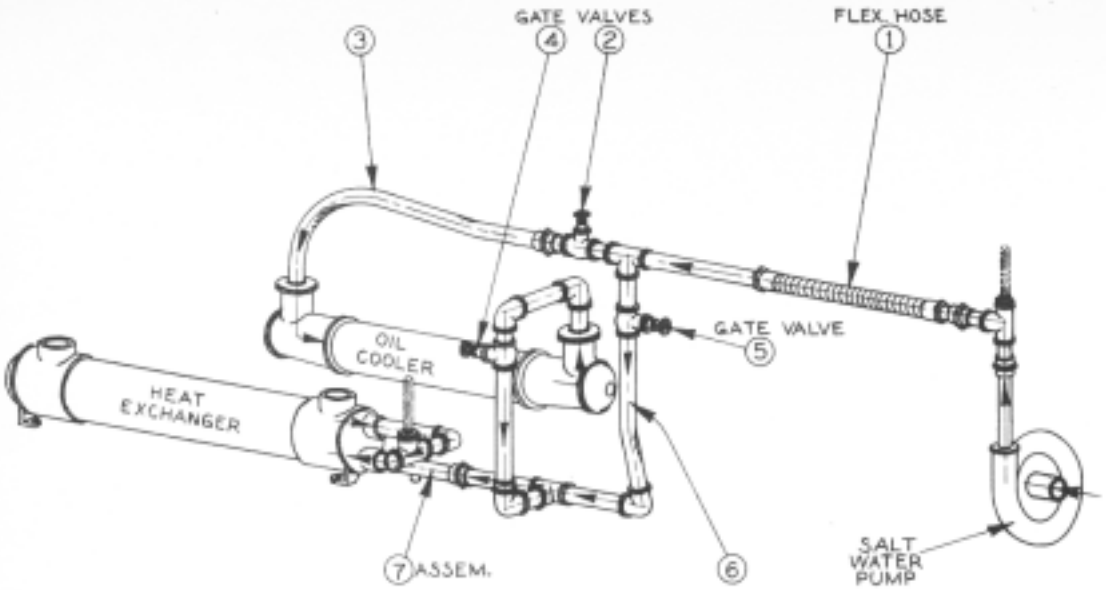
ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 STAT. - R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

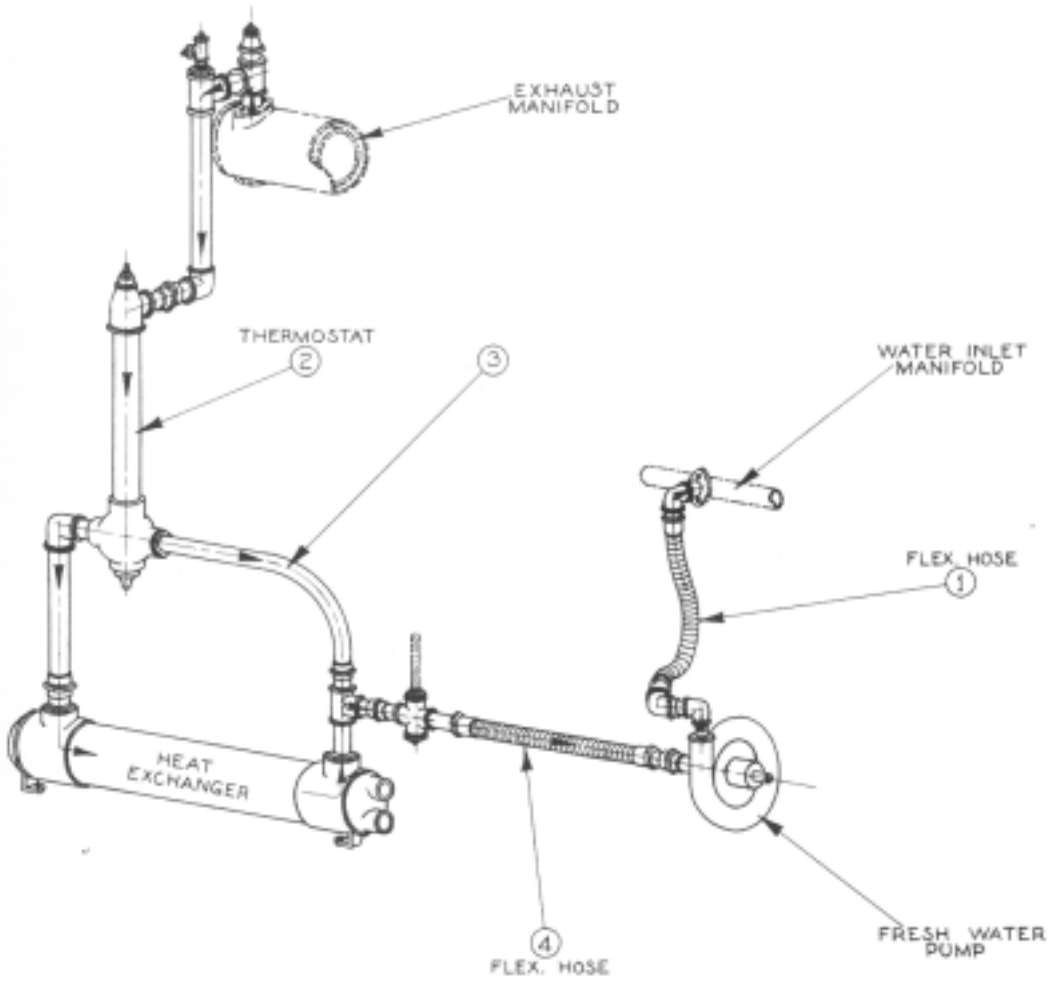
PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

21990



SALT WATER PIPING
6 CYL. R.H. ENG.



FRESH WATER PIPING
6 CYL. R.H. ENG.

WHEN ORDERING -- PIPE OR NIPPLES (EXCEPT THOSE PARTS WITH REF. NO'S.) ALWAYS CHECK LENGTH GIVEN ON GROUP LIST SHEET WITH ACTUAL PART ON ENGINE. VARIATIONS IN PIPE FITTINGS SOMETIMES REQUIRE CHANGES IN PIPE OR NIPPLE LENGTHS.

PLATE NO.
K-2157

DO NOT ORDER PARTS BY REF. NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L993 SHEET 1 OF 2
PLATE NO. K-2157

REF. NO.	*	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO.]
		---- Pump to	Water Inlet Manifold ----	
			1	NIPPLE -- 1 1/2 x 2 1/2 Lg.-(Brass)
			1	ELBOW -- 2 x 1 1/2 Std. Reducing -(Brass)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
			1	UNION ELBOW--2 Std.(Crane #524 1/2 or Eq)(Brass)
			1	CLOSE NIPPLE -- 2 Std. - (Brass)
1		2C3188	1	HOSE - Flexible (Metal)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
			1	ELBOW -- 2 Std. - (Brass)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
		---- Exhaust	Manifold Outlet to Heat Exchanger (Exchang. Inl.)--	
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
			1	TEE -- 2 x 2 x 2 1/2 Std. Reducing -(Brass)
			1	NIPPLE -- 2 x 2 1/2 Lg. - (Brass)
			1	REDUCER -- 2 x 1 Std. - (Brass)
			1	REDUCING BUSHING -- 1 x 1/2 Std. - (Brass)
			1	PIPE PLUG -- 1/2 Std. - (C.I.)
			1	NIPPLE -- 2 1/2 x 2 1/2 Lg.-(Brass)
			1	TEE -- 2 1/2 Std. - (Brass)
			1	REDUCING BUSHING -- 2 1/2 x 1 Std. - (Brass)
			1	REDUCING BUSHING -- 1 x 3/4 Std. - (Brass)
			1	NIPPLE -- 3/4 x 2 Lg.-(Brass)
			1	TEE -- 3/4 x 3/4 x 3/8 Std. Reducing -(Brass)
			1	PIPE PLUG -- 3/4 Std. - (C.I.)
			1	PIPE PLUG -- 3/8 Std. - (C.I.)
			1	PIPE -- 2 1/2 x 20 3/8 Lg.(Thr'd. 2 Ends)-(Brass)
			1	ELBOW -- 2 1/2 Std. - (Brass)
			1	NIPPLE -- 2 1/2 x 2 1/2 Lg.-(Brass)
			1	UNION -- 2 1/2 Std.(Crane #521 1/2 or Eq)(Brass)
			1	NIPPLE -- 2 1/2 x 2 1/2 Lg.-(Brass)
2		2C3064-P	1	THERMOSTAT - Temperature Control
			1	NIPPLE -- 2 1/2 x 3 1/4 Lg.-(Brass)
			1	ELBOW -- 2 1/2 Std. - (Brass)
			1	PIPE -- 2 1/2 x 17 3/8 Lg.(Thr'd. 2 Ends)-(Brass)
			1	UNION--2 1/2 Std.(Crane #521 1/2 or Eq)(Brass)
			1	NIPPLE -- 2 1/2 x 3 Lg.-(Brass)
			1	REDUCING BUSHING -- 3 x 2 1/2 Std.-(Brass)

---- CONTINUED ON SHEET NO. 2 ----

NAME FRESH WATER PIPING GROUP - - - - - - (MARITIME ENGINE)
ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 STAT. - R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L993 SHEET 1 OF 2

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

PLATE NO. K-2157

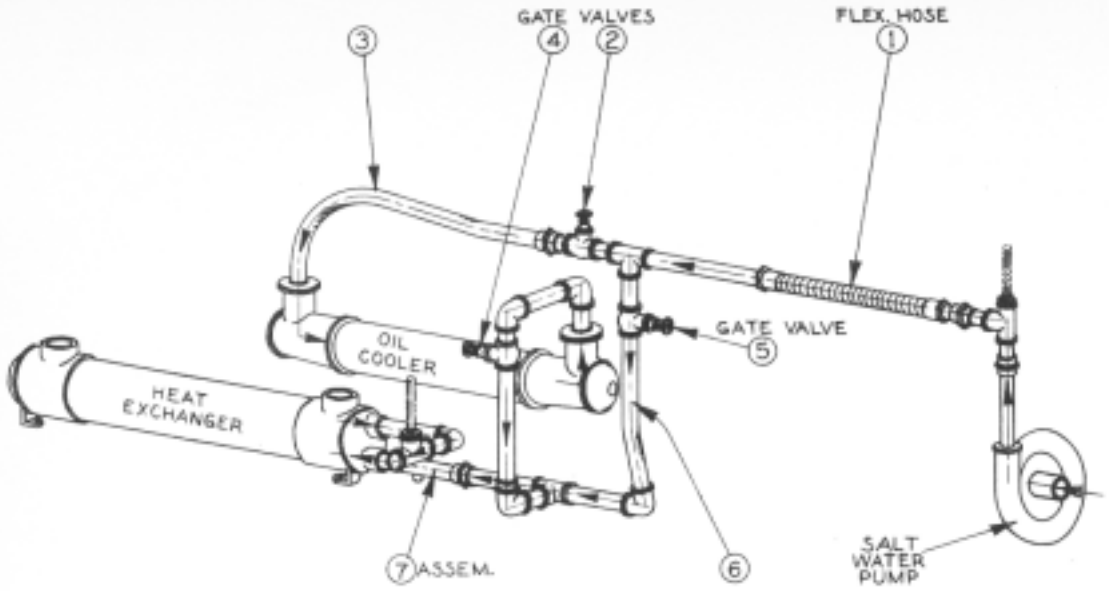
REF. NO.	*	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO.]
				---- CONTINUED FROM SHEET NO. 1 ----
		---- Thermostat		to Pump Suction ----
			1	REDUCING BUSHING -- 2 1/2 x 2 Std. - (Brass)
3		2C3127	1	PIPE - Thermostat Outlet
			1	UNION -- 2 Std. (Crane #521 1/2 or Eq)(Brass)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
			1	TEE -- 2 Std. - - (Brass)
			1	NIPPLE(To Heat Exch.)--2 x 5 Lg.-(Brass)
			1	REDUCING BUSHING(Heat Exch.)--3 x 2 Std.(Brass)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
			1	UNION -- 2 Std.(Crane #521 1/2 or Eq.)(Brass)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
			1	CROSS -- 2 Std. - (Brass)
			2	REDUCING BUSHING -- 2 x 3/4 Std.-(Brass)
			2	PIPE PLUG -- 3/4 Std. - (C.I.)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
4		2C3189	1	HOSE - Flexible (Metal)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
			1	UNION -- 2 Std. (Crane #521 1/2 or Eq)-(Brass)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)

NAME FRESH WATER PIPING GROUP - - - - - - (MARITIME ENGINE)
ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 STAT. - R.H.

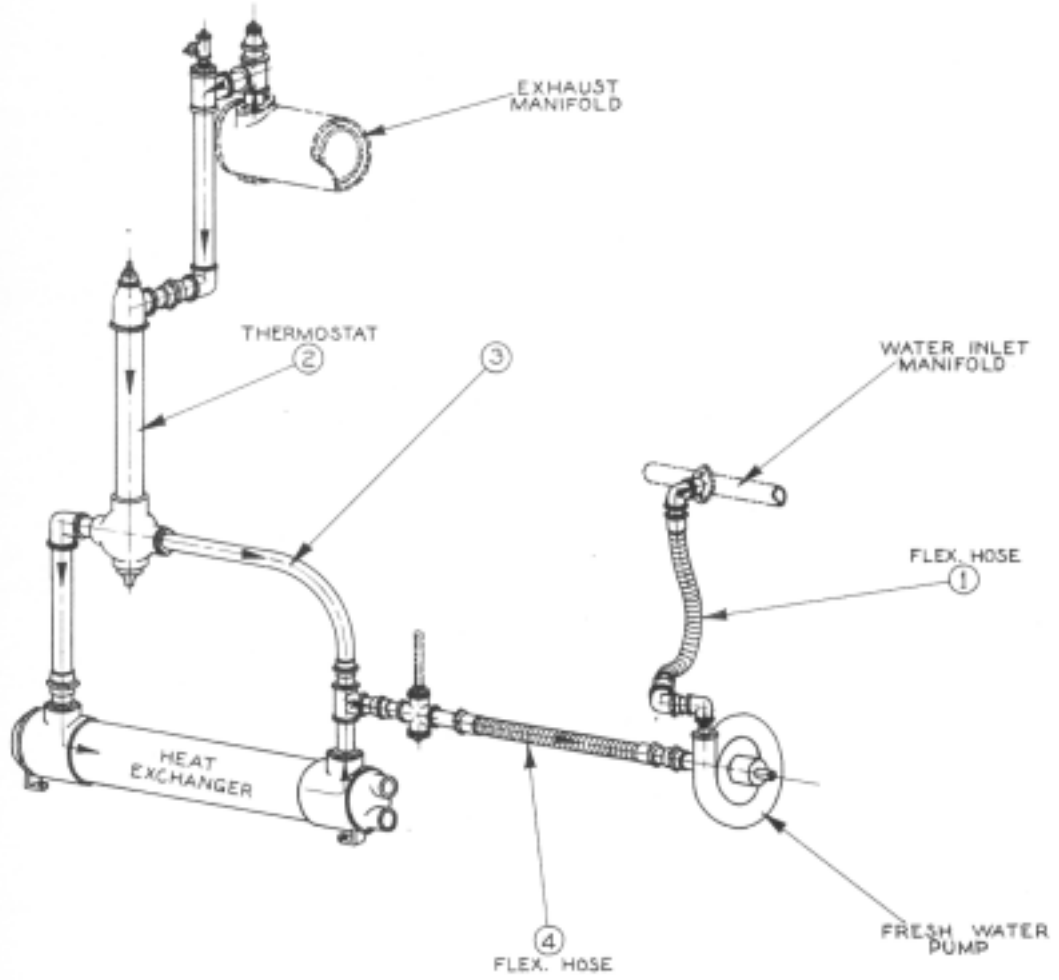
FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.



SALT WATER PIPING
6 CYL. R.H. ENG.



FRESH WATER PIPING
6 CYL. R.H. ENG.

WHEN ORDERING -- PIPE OR NIPPLES (EXCEPT THOSE PARTS WITH REF. NO'S.) ALWAYS CHECK LENGTH GIVEN ON GROUP LIST SHEET WITH ACTUAL PART ON ENGINE. VARIATIONS IN PIPE FITTINGS SOMETIMES REQUIRE CHANGES IN PIPE OR NIPPLE LENGTHS.

PLATE NO.
K-2157

DO NOT ORDER PARTS BY REF. NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L996

PLATE NO. K-2157

REF. NO.	*	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO.
		---- Pump Discharge to Oil Cooler (Cool. Inlet) ----		
			1	NIPPLE -- 1 1/2 x 8 1/2 Lg.-(Brass)
			1	UNION--1 1/2 Std.(Crane #521 1/2 or Eq)(Brass)
			1	NIPPLE -- 1 1/2 x 3 Lg.-(Brass)
			1	TEE--1 1/2 x 1 1/2 x 2 Std. Reducing -(Brass)
			1	REDUCING BUSHING--1 1/2 x 3/4 Std. - (Brass)
			1	PIPE PLUG -- 3/4 Std. - (C.I.)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
			1	UNION -- 2 Std.(Crane #521 1/2 or Eq)(Brass)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
1		2C3189	1	HOSE - Flexible (Metal)
			1	PIPE -- 2 x 18 1/2 Lg.(Thr'd. 2 Ends)-(Brass)
			1	TEE -- 2 Std. - (Brass)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
2		2C3133-P2	1	GATE VALVE
			1	NIPPLE -- 2 x 5 Lg.-(Brass)
			1	UNION--2 Std.(Crane #521 1/2 or Eq.)-(Brass)
3		F-6840	1	PIPE - Cooler Inlet
		---- Oil Cooler Outlet to Heat Exchanger Inlet Line ----		
			1	NIPPLE -- 2 x 4 Lg.-(Brass)
			1	ELBOW -- 2 Std. - - (Brass)
			1	NIPPLE -- 2 x 9 1/2 Lg.-(Brass)
			1	ELBOW -- 2 Std. - - (Brass)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
4		2C3133-P2	1	GATE VALVE
			1	PIPE -- 2 x 18 Lg.(Thr'd. 2 Ends)-(Brass)
			1	UNION ELBOW--2 Std.(Crane #524 1/2 or Eq)(Brass)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
		---- Heat Exchanger Inlet Line (From Oil Cooler Inlet Line) ----		
			1	NIPPLE -- 2 x 4 Lg.-(Brass)
5		2C3133-P2	1	GATE VALVE
6		F-6844	1	PIPE - Heat Exchanger Inlet
			1	ELBOW -- 2 Std. - (Brass)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
			1	TEE -- 2 Std. - (Brass)
			1	NIPPLE -- 2 x 6 Lg.-(Brass)
			1	UNION--2 Std. (Crane #521 1/2 or Eq.)(Brass)
7		X3563	1	NIPPLE ASSEM. - Heat Exchanger Inlet
			1	PIPE PLUG -- 1/2 Std. - - (Brass)
		---- Heat Exchanger Outlet ----		
			1	NIPPLE -- 2 x 7 1/2 Lg.-(Brass)
			1	ELBOW -- 2 Std. - (Brass)
			1	NIPPLE -- 2 x 2 1/2 Lg.-(Brass)
			1	TEE--2 1/2 x 2 x 2 Std. Reducing -(Brass)
			1	REDUCING BUSHING--2 x 3/4 Std.(Brass)
			1	PIPE PLUG -- 3/4 Std. - (C.I.)

NAME SALT WATER PIPING GROUP - - - - - (MARITIME ENGINE)

ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 STAT. - R.H.

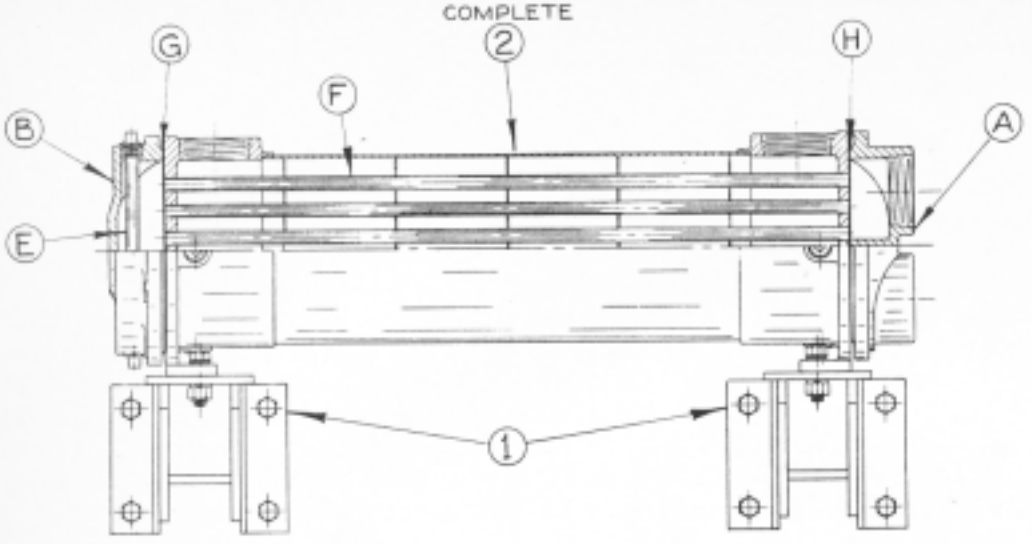
FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L996

HEAT EXCHANGER COMPLETE



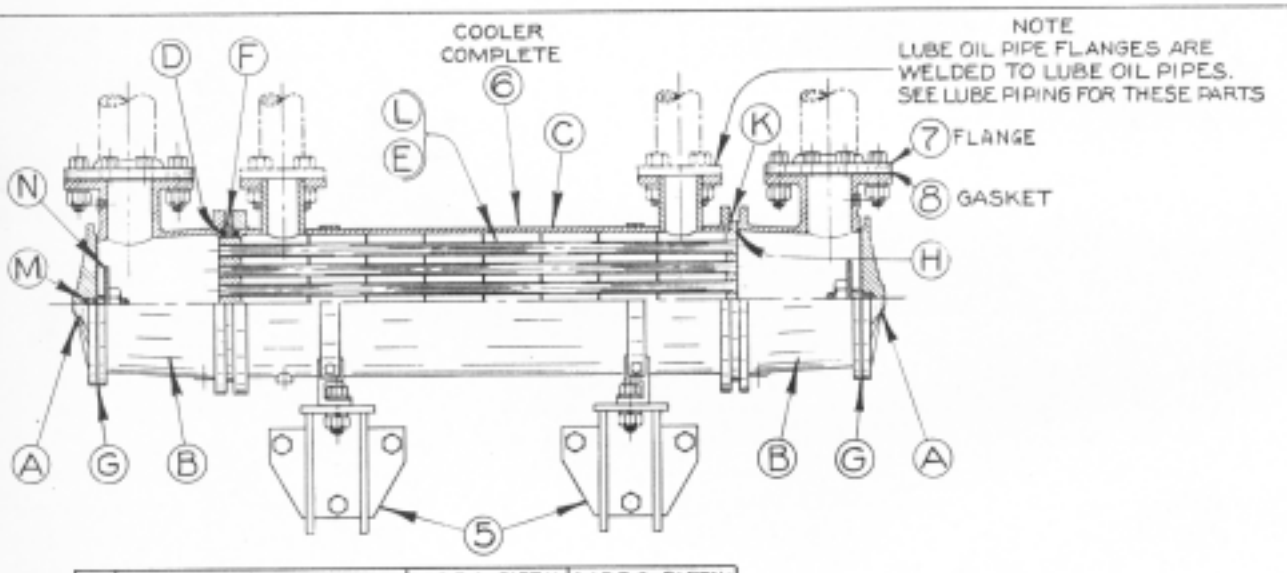
REF No.	PART NAME	A.I.D.E. Co. PART No. 6 CYL. ENGINE	A.I.D.E. Co. PART No. 8 CYL. ENGINE
A	INLET & OUTLET BONNET	F-6825-P1	F-6825-P1
B	REVERSING BONNET	F-6825-P2	F-6825-P2
E	ZINC ROD	F-6825-P3	F-6825-P3
F	TUBE	F-6825-P4	F-6830-P4
G	REVERSING BONNET GASKET	F-6825-P5	F-6825-P5
H	INLET & OUTLET BONNET GASKET	F-6825-P6	F-6825-P6

(THESE PART NOS. ARE NOT SHOWN ON ANY GROUP SHEETS)

ORDER PARTS FOR THE HEAT EXCHANGER AS PER PARTS NUMBERS SHOWN ABOVE

COOLER COMPLETE

NOTE
LUBE OIL PIPE FLANGES ARE WELDED TO LUBE OIL PIPES. SEE LUBE PIPING FOR THESE PARTS



REF No.	PART NAME	A.I.D.E. Co. PART No. 6 CYL. ENGINE	A.I.D.E. Co. PART No. 8 CYL. ENGINE
A	CHANNEL COVER	F-6824-P1	F-6824-P1
B	CHANNEL	F-6824-P2	F-6824-P2
C	SHELL	F-6832-P3	F-6824-P3
D	FLOATING HEAD PACKING	F-6824-P4	F-6824-P4
E	TUBE BUNDLE ASSEM.	F-6832-P5	F-6824-P5
F	LANTERN GLAND	F-6824-P6	F-6824-P6
G	CHANNEL COVER GASKET	F-6824-P7	F-6824-P7
H	CHANNEL TUBE SHEET GASKET	F-6824-P8	F-6824-P8
K	TUBE SHEET SHELL GASKET	F-6824-P9	F-6824-P9
L	TUBE	F-6832-P10	F-6824-P10
M	PROTECTOR BOLT	F-6824-P11	F-6824-P11
N	ZINC PLATE	F-6824-P12	F-6824-P12

(THESE PART NOS. ARE NOT SHOWN ON ANY GROUP SHEETS)

ORDER PARTS FOR THE LUB. OIL COOLER AS PER PARTS NUMBERS SHOWN ABOVE

PLATE No.
W-2138

DO NOT ORDER PARTS BY REF. NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

21999

PLATE NO. W-2138

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		2C3085	2	BRACKET - Heat Exchanger	
			8	CAPSCREW -- 1/2-13-NC x 1 Lg. - (St.)	
			8	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
2		F-6825-P	1	HEAT EXCHANGER	
			4	CAPSCREW -- 1/2-13-NC x 2 Lg.-(St.)	
			4	NUT -- 1/2-13-NC-Hex. - (St.)	
			8	PLAIN WASHER -- 1/2 SAE Std. - (St.)	
			4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
5		2C3086	2	BRACKET - Oil Cooler	
			6	CAPSCREW -- 1/2-13-NC x 1 Lg. - (St.)	
			6	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
6		F-6832-P	1	OIL COOLER	
			4	CAPSCREW -- 1/2-13-NC x 2 Lg.-(St.)	
			4	NUT -- 1/2-13-NC-Hex. - (St.)	
			4	PLAIN WASHER -- 1/2 SAE Std. - (St.)	
			4	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
7		2C3093	2	FLANGE - Water Inlet & Outlet Pipe	
8		2C3129-P4	2	GASKET - Flange to Cooler	
			16	CAPSCREW -- 5/8-11-NC x 2 3/4 Lg.-(St.)	
			16	NUT -- 5/8-11-NC-Hex. - (St.)	
			16	LOCKWASHER -- 5/8 SAE Reg. - (St.)	

21999

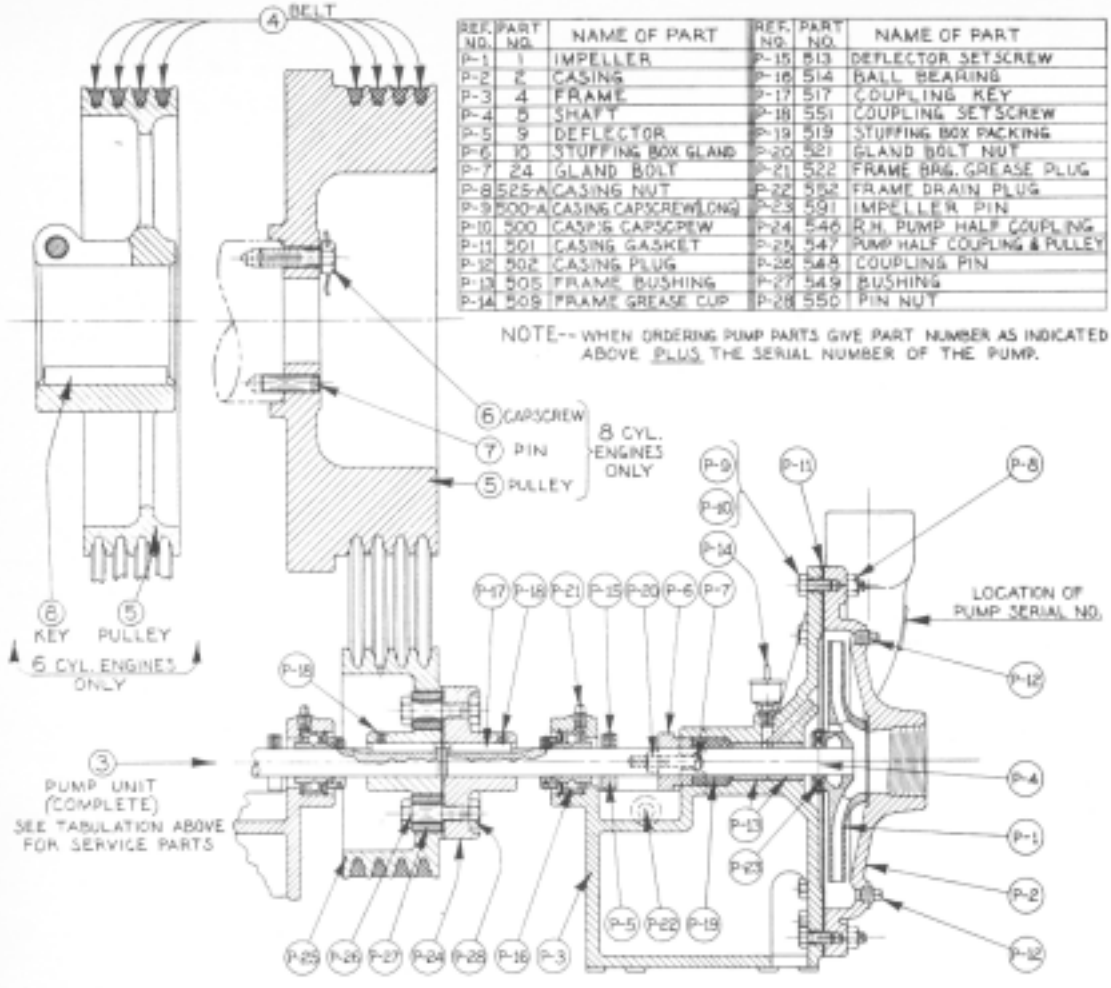
NAME OIL COOLER & HEAT EXCHANGER GROUP - - - (MARITIME ENGINE)

ORIGINALLY ISSUED FOR 6 CYL. 9 x 10½ STAT. - R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

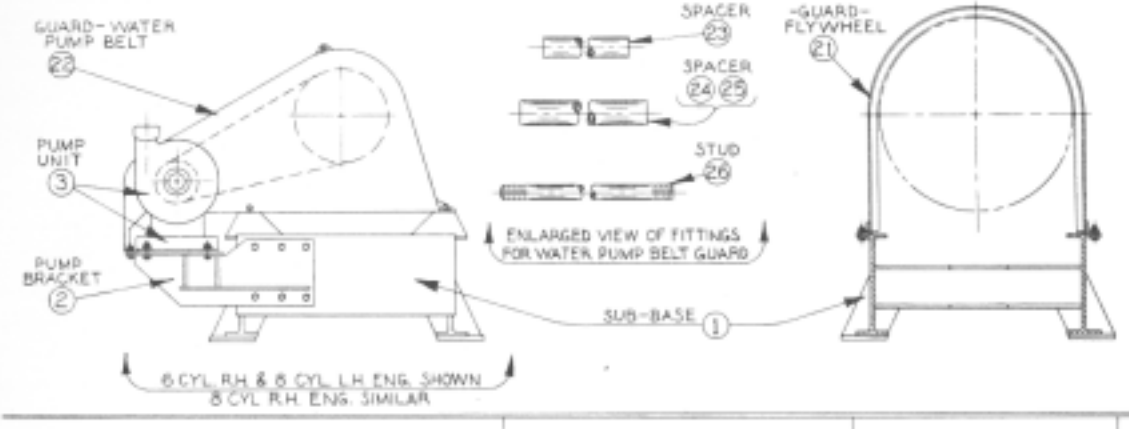
PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.



REF. NO.	PART NO.	NAME OF PART	REF. NO.	PART NO.	NAME OF PART
P-1	1	IMPELLER	P-15	513	DEFLECTOR SETSCREW
P-2	2	CASING	P-16	514	BALL BEARING
P-3	4	FRAME	P-17	517	COUPLING KEY
P-4	5	SHAFT	P-18	551	COUPLING SETSCREW
P-5	9	DEFLECTOR	P-19	519	STUFFING BOX PACKING
P-6	10	STUFFING BOX GLAND	P-20	521	GLAND BOLT NUT
P-7	24	GLAND BOLT	P-21	522	FRAME BRG. GREASE PLUG
P-8	525-A	CASING NUT	P-22	552	FRAME DRAIN PLUG
P-9	500-A	CASING CAPSCREW LONG	P-23	591	IMPELLER PIN
P-10	500	CASING CAPSCREW	P-24	546	R.H. PUMP HALF COUPLING
P-11	501	CASING GASKET	P-25	547	PUMP HALF COUPLING & PULLEY
P-12	502	CASING PLUG	P-26	548	COUPLING PIN
P-13	505	FRAME BUSHING	P-27	549	BUSHING
P-14	509	FRAME GREASE CUP	P-28	550	PIN NUT

NOTE-- WHEN ORDERING PUMP PARTS GIVE PART NUMBER AS INDICATED ABOVE PLUS THE SERIAL NUMBER OF THE PUMP.



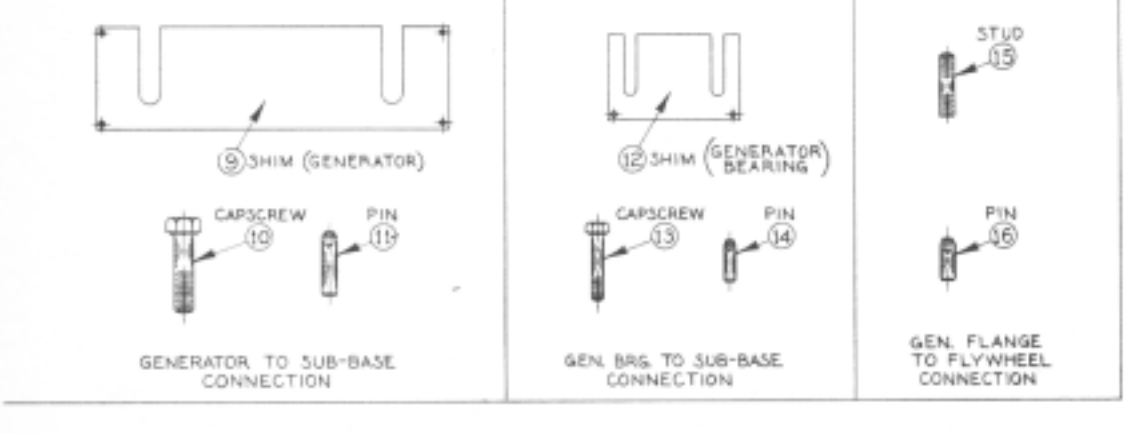


PLATE NO. K-2163

DO NOT ORDER PARTS BY REF. NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L1001

PLATE NO. K-2163

REF. NO.	*	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO.
1		K-2097	1	SUB-BASE - Engine
2		K-2120	1	BRACKET - Water Pump
			6	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg.-(St.)
			6	LOCKWASHER -- 1/2 SAE Reg. - (St.)
3		F-6820-P	1	PUMP UNIT -- (Salt & Fresh Water Pump & Drive)
			4	CAPSCREW -- 5/8-11-NC x 2 Lg.-(St.)
			4	NUT -- 5/8-11-NC-Hex. - (St.)
			4	PLAIN WASHER -- 5/8 SAE Std. - (St.)
			4	LOCKWASHER -- 5/8 SAE Reg. - (St.)
4			4	BELT - Water Pump Drive -- Texrope #B105
5		W-2049	1	PULLEY - Water Pump Drive (On Crankshaft)
			1	CAPSCREW -- 5/8-11-NC x 4 1/4 Lg.-(St.)
			1	NUT -- 5/8-11-NC-Hex. - (St.)
8		C-6714L4 1/2	1	KEY - Pulley to Crankshaft
9		2C2517-B	4	SHIM - Generator to Sub-Base (1/32)
9		2C2517-D	10	SHIM - Generator to Sub-Base (.010)
9		2C2517-E	8	SHIM - Generator to Sub-Base (.003)
			8	CAPSCREW -- 1/4-20-NC x 1/2 Lg.-(St.)
			8	LOCKWASHER -- 1/4 SAE Reg. - (St.)
10		2C1420L5 1/4	4	CAPSCREW - Generator to Sub-Base
			4	NUT -- 1 1/4-7-Hex. - (St.)
			4	LOCKWASHER -- 1 1/4 SAE Reg. - (St.)
11		C-6386L3 1/4	2	PIN - Gen. to Sub-Base Dowel
12		2C2518-B	4	SHIM - Gen. Brg. to Sub-Base (1/32)
12		2C2518-D	10	SHIM - Gen. Brg. to Sub-Base (.010)
12		2C2518-E	8	SHIM - Gen. Brg. to Sub-Base (.003)
			4	CAPSCREW -- 1/4-20-NC x 1/2 Lg.-(St.)
			4	LOCKWASHER -- 1/4 SAE Reg. - (St.)
13		C-8521L4 1/4	4	CAPSCREW - Gen. Brg. to Sub-Base
			4	NUT -- 3/4-10-NC-Hex. - (St.)
			4	LOCKWASHER -- 3/4 SAE Reg. - (St.)
14		C-6699L2 1/2	2	PIN - Gen. Brg. to Sub-Base Dowel
15		C-2116L4	6	STUD - Gen. Flange to Flywheel
			6	CASTLE NUT -- 1-14-NF-Hex. - (St.)
			6	COTTER PIN -- 1/8 x 1 3/4 Lg.-(St.)
16		C-6386L2 3/4	3	PIN - Gen. Flange to Flywheel Dowel

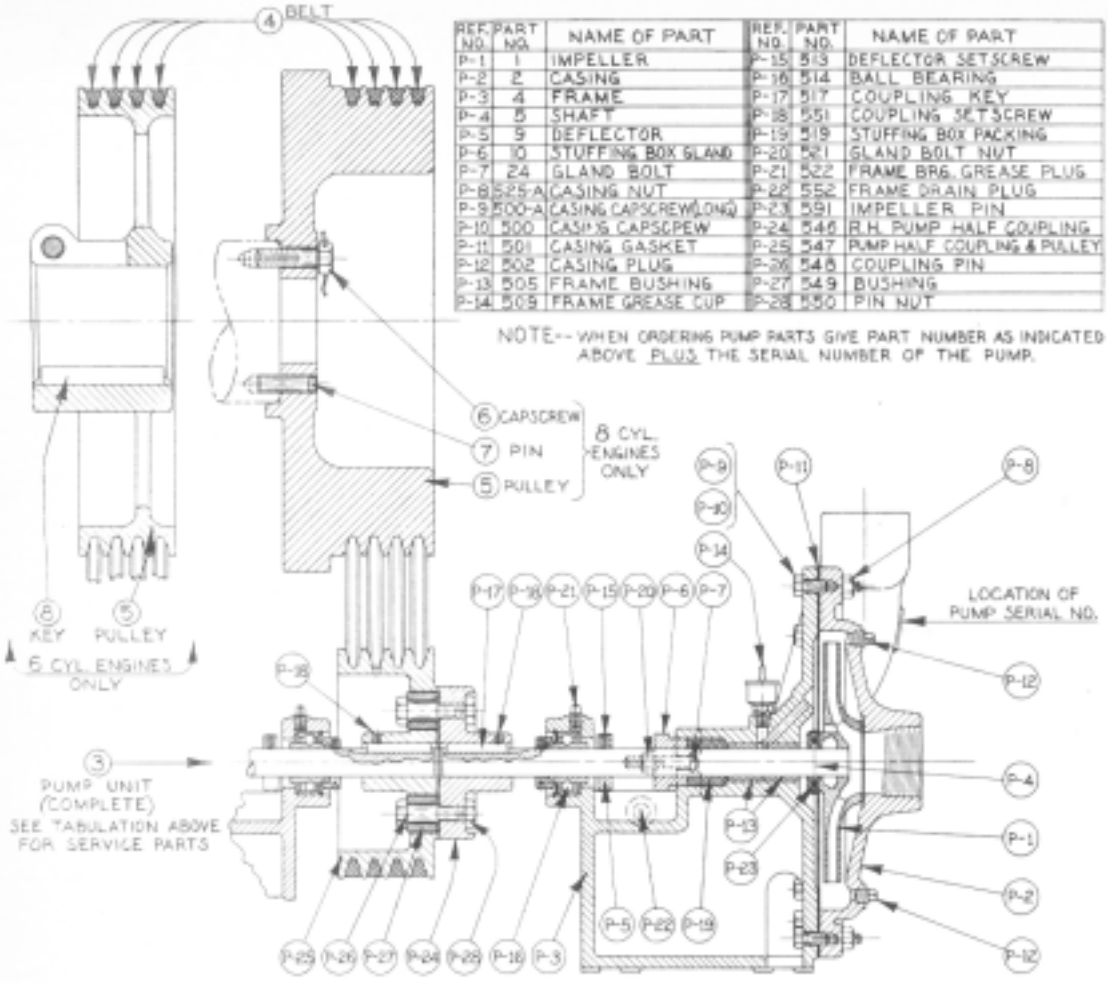
NAME SUB-BASE, WATER PUMP & GENERATOR CONNECTION GROUP - - -
(MARITIME ENGINE)
ORIGINALLY ISSUED FOR 6 CYL. 9 x 10½ STAT. - R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GR. UP GIVEN ON INDEX SHEET

PARTS LIST

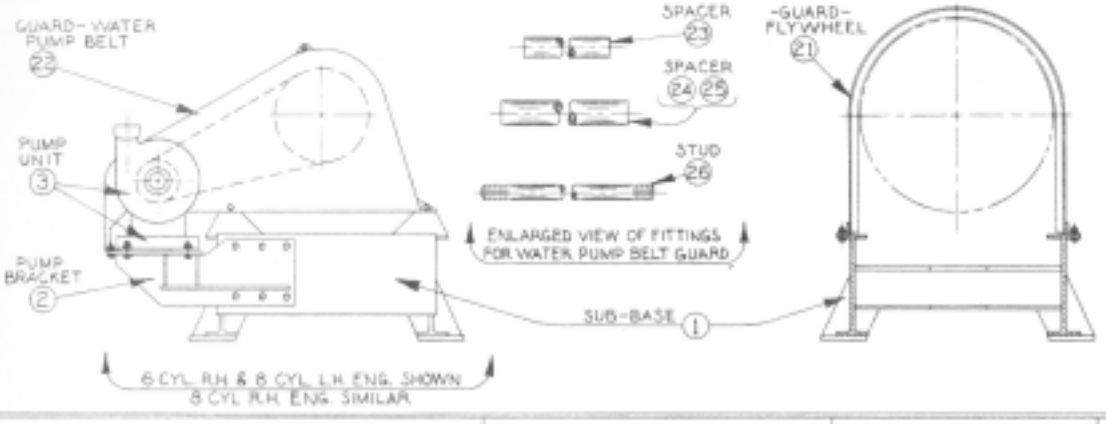
ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L1001



REF. NO.	PART NO.	NAME OF PART	REF. NO.	PART NO.	NAME OF PART
P-1	1	IMPELLER	P-15	513	DEFLECTOR SETSCREW
P-2	2	CASING	P-16	514	BALL BEARING
P-3	4	FRAME	P-17	517	COUPLING KEY
P-4	5	SHAFT	P-18	551	COUPLING SETSCREW
P-5	9	DEFLECTOR	P-19	519	STUFFING BOX PACKING
P-6	10	STUFFING BOX GLAND	P-20	521	GLAND BOLT NUT
P-7	24	GLAND BOLT	P-21	522	FRAME BRG. GREASE PLUG
P-8	525-A	CASING NUT	P-22	552	FRAME DRAIN PLUG
P-9	500-A	CASING CAPSCREW (LONG)	P-23	591	IMPELLER PIN
P-10	500	CASING CAPSCREW	P-24	546	R.H. PUMP HALF COUPLING
P-11	501	CASING GASKET	P-25	547	PUMP HALF COUPLING & PULLEY
P-12	502	CASING PLUG	P-26	548	COUPLING PIN
P-13	505	FRAME BUSHING	P-27	549	BUSHING
P-14	509	FRAME GREASE CUP	P-28	550	PIN NUT

NOTE-- WHEN ORDERING PUMP PARTS GIVE PART NUMBER AS INDICATED ABOVE PLUS THE SERIAL NUMBER OF THE PUMP.



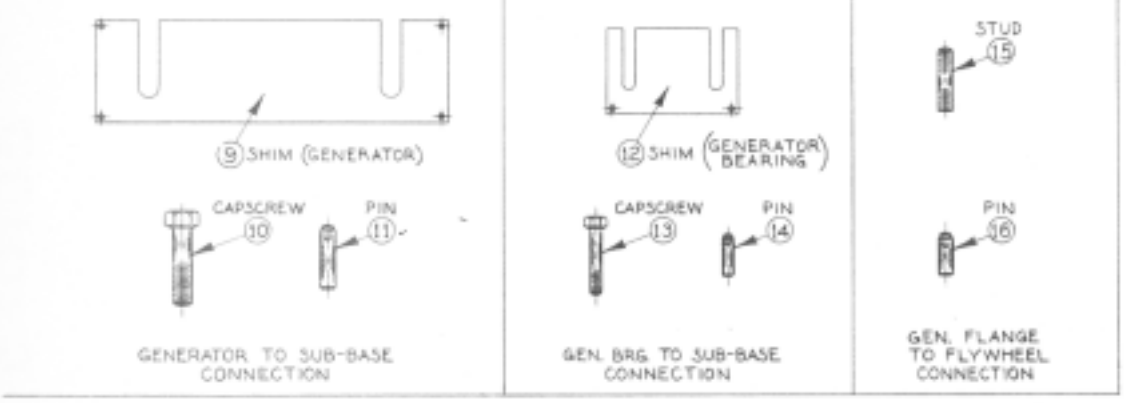


PLATE NO.
K-2163

DO NOT ORDER PARTS BY REF. NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L1013

PLATE NO. K-2163

REF. NO.	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
21	W-2076	1	GUARD - Flywheel	
		6	CAPSCREW -- 1/2-13-NC x 1 Lg. - (St.)	
		6	LOCKWASHER -- 1/2 SAE Reg. - - (St.)	
22	K-2127	1	GUARD - Water Pump Belt	
23	2C3158L2	1	SPACER - Guard to Int. Gear End Cover	
		1	CAPSCREW -- 3/8-16-NC x 2 3/4 Lg.-(St.)	
		1	LOCKWASHER -- 3/8 SAE Reg. - (St.)	
24	2C3157L4 3/8	1	SPACER - Guard to Sub-base Stud (Inner)	
25	2C3157L5 1/8	1	SPACER - Guard to Sub-base	
26	C-2008L11 1/2	1	STUD - Guard to Sub-base	
		1	NUT -- 1/2-13-NC-Hex. - (St.)	
		1	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
		2	CAPSCREW(To Pump Bracket)--1/2-13-NC x 1 1/2 Lg (St.)	
		2	NUT -- 1/2-13-NC-Hex. - (St.)	
		1	CAPSCREW(To Sub-base)--1/2-13-NC x 7/8 Lg.-(St.)	
		3	LOCKWASHER -- 1/2 SAE Reg. - (St.)	

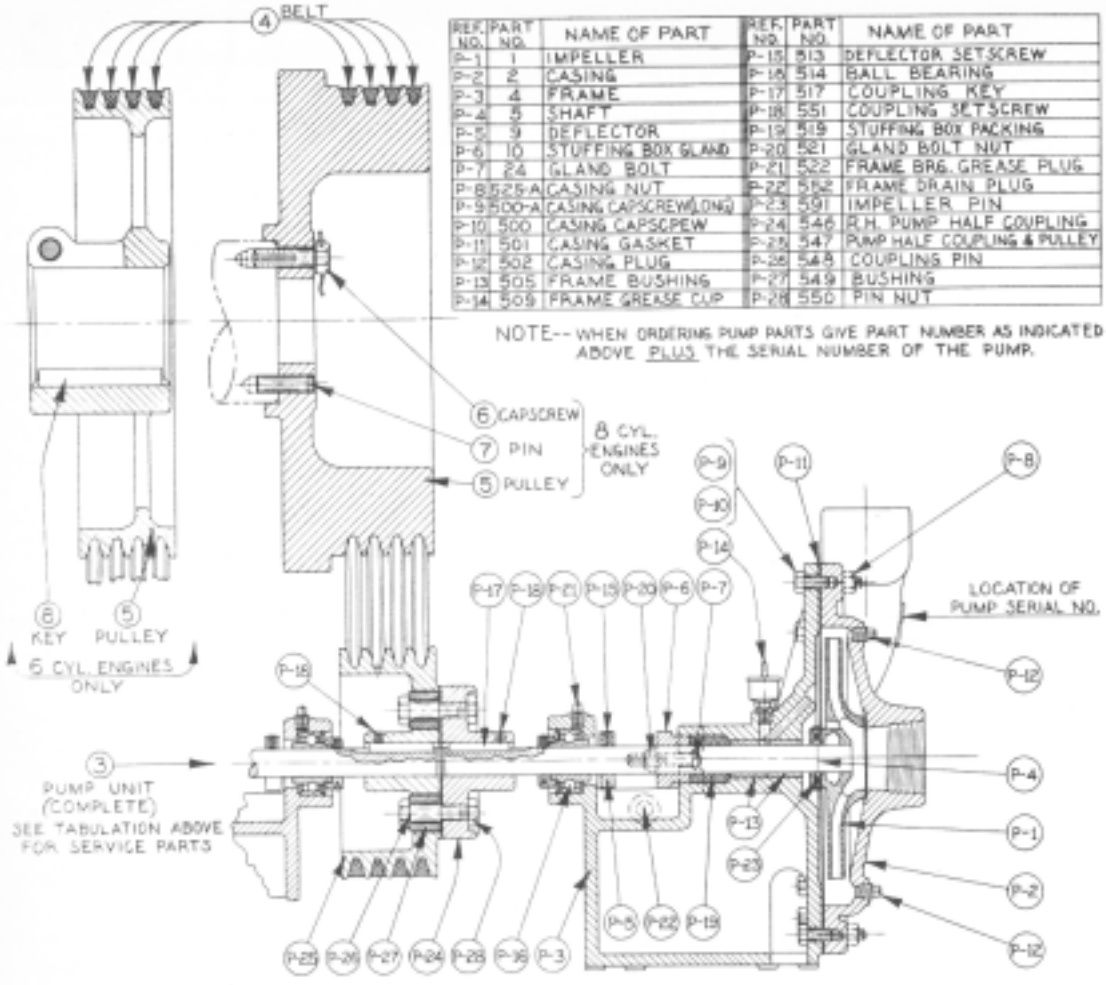
NAME FLYWHEEL & WATER PUMP BELT GUARD GROUP - (MARITIME)
ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 STAT.-R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR GROUP GIVEN ON INDEX SHEET

PARTS LIST

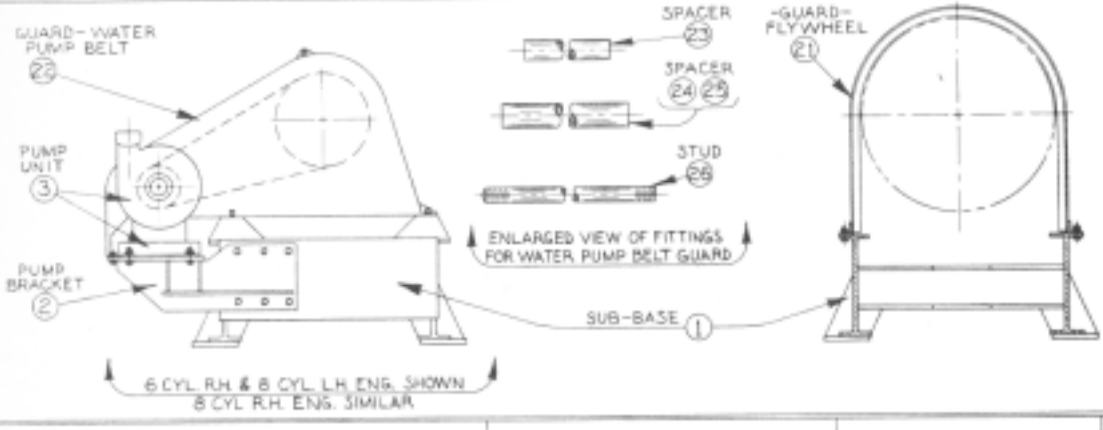
ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L1013



REF. NO.	PART NO.	NAME OF PART	REF. NO.	PART NO.	NAME OF PART
P-1	1	IMPELLER	P-15	513	DEFLECTOR SETSCREW
P-2	2	CASING	P-16	514	BALL BEARING
P-3	4	FRAME	P-17	517	COUPLING KEY
P-4	5	SHAFT	P-18	551	COUPLING SETSCREW
P-5	9	DEFLECTOR	P-19	519	STUFFING BOX PACKING
P-6	10	STUFFING BOX GLAND	P-20	521	GLAND BOLT NUT
P-7	24	GLAND BOLT	P-21	522	FRAME BRG. GREASE PLUG
P-8	525-A	CASING NUT	P-22	582	FRAME DRAIN PLUG
P-9	500-A	CASING CAPSCREW (LONG)	P-23	591	IMPELLER PIN
P-10	500	CASING CAPSCREW	P-24	546	R.H. PUMP HALF COUPLING
P-11	501	CASING GASKET	P-25	547	PUMP HALF COUPLING & PULLEY
P-12	502	CASING PLUG	P-26	548	COUPLING PIN
P-13	505	FRAME BUSHING	P-27	549	BUSHING
P-14	509	FRAME GREASE CUP	P-28	550	PIN NUT

NOTE-- WHEN ORDERING PUMP PARTS GIVE PART NUMBER AS INDICATED ABOVE PLUS THE SERIAL NUMBER OF THE PUMP.



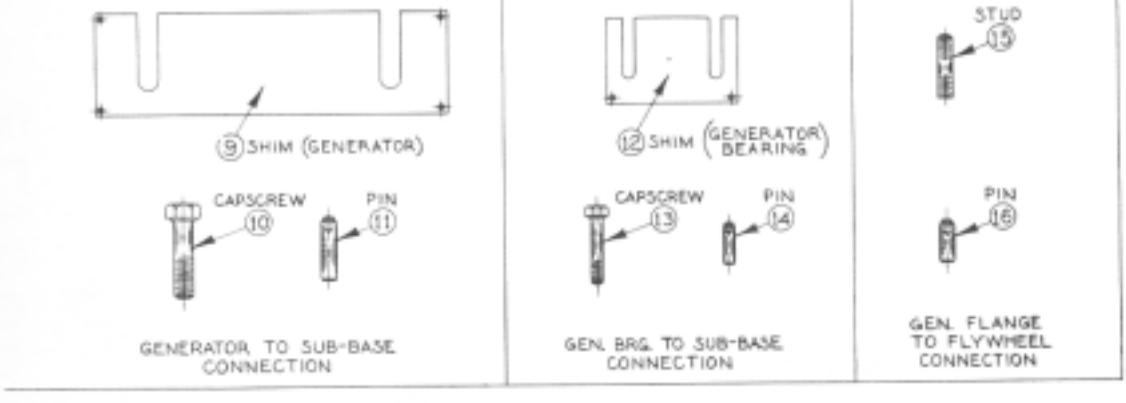


PLATE NO. K-2163

DO NOT ORDER PARTS BY REF. NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

2L1060

PLATE NO. K-2163

REF. NO.	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1	K-2097	1	SUB-BASE - Engine	
2	K-2120	1	BRACKET - Water Pump	
		6	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg.-(St.)	
		6	LOCKWASHER -- 1/2 SAE Reg. - (St.)	
3	F-6890	1	PUMP UNIT - (Salt & Fresh Water Pump & Drive)	
		4	CAPSCREW -- 5/8-11-NC x 2 Lg.-(St.)	
		4	NUT -- 5/8-11-NC-Hex. - (St.)	
		4	PLAIN WASHER -- 5/8 SAE Std. - (St.)	
		4	LOCKWASHER -- 5/8 SAE Reg. - (St.)	
4		4	BELT - Water Pump Drive -- Texrope #B105	
5	W-2049	1	PULLEY - Water Pump Drive (On crankshaft)	
		2	CAPSCREW -- 5/8-11-NC x 4 1/4 Lg.-(St.)	
		2	NUT -- 5/8-11-NC-Hex. - (St.)	
8	C-6714L4 1/2	1	KEY - Pulley to crankshaft	
9	2C2517-B	4	SHIM - Generator to Sub-base (1/32)	
9	2C2517-D	10	SHIM - Generator to Sub-base (.010)	
9	2C2517-E	8	SHIM - Generator to Sub-base (.003)	
		8	CAPSCREW -- 1/4-20-NC x 1/2 Lg.-(St.)	
		8	LOCKWASHER -- 1/4 SAE Reg. - (St.)	
10	2C1420L5 1/4	4	CAPSCREW - Generator to Sub-Base	
		4	NUT -- 1 1/4-7-Hex. - (St.)	
		4	LOCKWASHER -- 1 1/4 SAE Reg. - (St.)	
11	C-6386L3 1/4	2	PIN - Gen. to Sub-base Dowel	
12	2C2518-B	4	SHIM - Gen. Brg. to Sub-base (1/32)	
12	2C2518-D	10	SHIM - Gen. Brg. to Sub-base(.010)	
12	2C2518-E	8	SHIM - Gen. Brg. to Sub-base(.003)	
		4	CAPSCREW -- 1/4-20-NC x 1/2 Lg.-(St.)	
		4	LOCKWASHER -- 1/4 SAE Reg. - (St.)	
13	C-8521L4 1/4	4	CAPSCREW - Gen. Brg. to Sub-base	
		4	NUT -- 3/4-10-NC-Hex - (St.)	
		4	LOCKWASHER -- 3/4 SAE Reg. - (St.)	
14	C-6699L2 1/2	2	PIN - Gen. Brg. to Sub-base Dowel	
15	C-2116L4	6	STUD - Gen. Flange to Flywheel	
		6	CASTLE NUT -- 1-14-NF-Hex. - (St.)	
		6	COTTER PIN -- 1/8 x 1 3/4 Lg. - (St.)	
16	C-6386L2 3/4	3	PIN - Gen. Flange to Flywheel Dowel	

NAME SUB-BASE, WATER PUMP & GENERATOR CONNECTION GROUP - - - -
(MARITIME ENGINE)
ORIGINALLY ISSUED FOR 6 CYL. 9 x 10½ STAT. - R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L1060

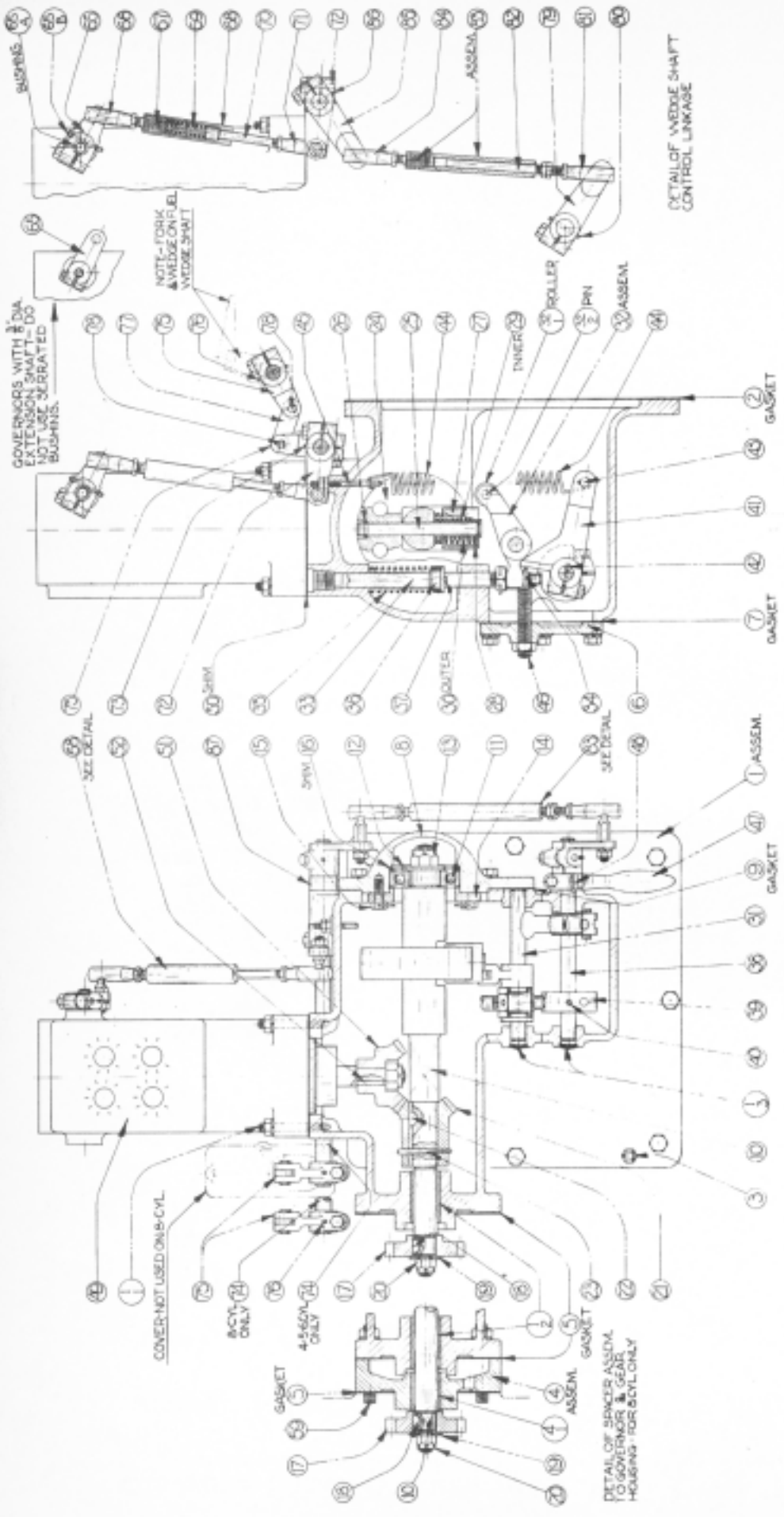


PLATE
No. K-1882

DO NOT ORDER PARTS BY REF NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

PLATE NO. K-1882

REF. NO.	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO.
1	X3008	1	HOUSING ASSEM. - Governor Drive
2	F-1099	1	GASKET - Housing to Centerframe
		8	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg. - (St.)
		8	LOCKWASHER -- 1/2 SAE Reg. - (St.)
3	C-7950L1 1/2	2	PIN - Housing to Centerframe Dowel
		2	HALF NUT -- 3/8-24-NF-Hex. - (St.)
		2	COTTER PIN -- 3/32 x 3/4 Lg. - (St.)
5	2C1387	1	GASKET - Housing to Gear Housing
		4	CAPSCREW -- 1/2-13-NC x 1 1/2 Lg. - (St.)
		4	LOCKWASHER -- 1/2 SAE Reg. - (St.)
6	2C1347	1	COVER - Gov. Drive Housing Front
7	2C1343	1	GASKET - Cover to Housing
		4	CAPSCREW -- 3/8-16-NC x 1 1/4 Lg.-(St.)
		4	LOCKWASHER -- 3/8 SAE Reg. - (St.)
8	F-5955	1	CAGE - Gov. Drive Shaft Bearing
9	C-9761	1	GASKET - Brg. Cage to Housing
		4	CAPSCREW -- 3/8-16-NC x 1 Lg. - (St.)
		4	LOCKWASHER -- 3/8 SAE Reg. - (St.)
10	W-1374	1	SHAFT - Gov. Drive
11	4956	1	BALL BEARING
12	C-6067	1	WASHER - Ball Brg. Retainer
13		1	CASTLE NUT -- 3/4-16-NF-Hex. - (St.)
		1	COTTER PIN -- 1/8 x 1 1/4 Lg. - (St.)
14	2C1344	1	RETAINER - Ball Bearing
15	C-2406L 7/8	3	CAPSCREW - Retainer to Brg. Cage
		1	WIRE -- #16 Ga. x 13 Lg. - (St.)
16	2C1363-B	2	SHIM - Ball Brg. to Cage & Retainer (1/32)
16	2C1363-D	4	SHIM - Ball Brg. to Cage & Retainer (.010)
16	2C1363-E	8	SHIM - Ball Brg. to Cage & Retainer (.003)
17	S-2589	1	GEAR - Gov. Drive Shaft Drive
18		1	WOODRUFF KEY -- 3/16 x 3/4 Std. - (St.)
19	C-7567	1	WASHER - Gear Retainer
20		1	CASTLE NUT -- 1/2-20-NF-Hex. - (St.)
		1	COTTER PIN -- 3/32 x 1 Lg. - (St.)
21	F-6154	1	GEAR - Governor Drive (Bevel)
22		1	WOODRUFF KEY -- 3/16 x 3/4 Std. - (St.)
23		1	TAPER PIN -- #3 x 2 1/4 Lg. - (St.)
24	F-6354	1	WEIGHT - Overspeed Governor
25	C-9763	1	PIN - Overspeed Gov. Weight Guide
26	C-9768	2	LOCK - Overspeed Gov. Weight Guide Pin
27	C-9765	1	GUIDE - Overspeed Gov. Weight Spring
28	C-9764	8	WASHER - Overspeed Gov. Weight Spr. Adjust.
29	C-9767	1	SPRING - Overspeed Gov. Weight (Inner)
30	C-9766	1	SPRING - Overspeed Gov. Weight (Outer)

---- CONTINUED ON SHEET NO. 2 ----

(For 600 R.P.M.)

NAME GOVERNOR & DRIVE GROUP - - - - (WOODWARD & OVERSPEED)
(HAND CONTROL GOVERNOR) ORIGINALLY ISSUED FOR 4-5-6 CYL. 9x10½ STAT. - R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L1084 SHEET 1 OF 2

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

PLATE NO. K-1882

REF. NO.	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
			---- CONTINUED FROM SHEET NO. 1 ----	
31	C-6623L6 3/8	1	SHAFT - Over. Gov. Latch Cont. Lever	
32	X3004	1	LEVER ASSEM. - Over. Gov. Latch Control	
33	C-9778	1	STUD - Over. Gov. Latch Cont. Collar	
34	C-9754	1	COLLAR - Over. Gov. Latch Control	
		1	COTTER PIN -- 1/8 x 1 1/2 Lg. - (St.)	
35	C-9098	1	SPRING - Over. Gov. Latch Cont. Stud	
36	C-9755	1	GUIDE - Spring	
37		1	COTTER PIN -- 1/8 x 7/8 Lg. - (St.)	
		1	PIPE PLUG -- 1/2 Std. - C't's'k. Hd.-(C.I.)	
38	2C1368	1	SHAFT - Overspeed Gov. Latch Collar	
39	C-9777	1	COLLAR - Over. Gov. Latch	
		1	CAPSCREW -- 3/8-16-NC x 1 1/4 Lg. - (St.)	
		1	LOCKWASHER -- 3/8 SAE Reg. - (St.)	
40		1	TAPER PIN -- #2 x 2 1/4 Lg. - (St.)	
41	2C1348	1	LEVER - Over. Gov. Latch Spring	
42		1	WOODRUFF KEY -- 1/8 x 1/2 Std. - (St.)	
		1	CAPSCREW -- 3/8-16-NC x 1 1/4 Lg. - (St.)	
43	C-9771	1	PIN - Latch Spring Lever Spring Anchor	
		2	COTTER PIN -- 3/32 x 5/8 Lg. - (St.)	
44	C-9757	1	SPRING - Over. Gov. Latch	
45	C-9758	1	EYE-BOLT - Over. Gov. Latch Spring	
		2	NUT -- 1/4-20-NC-Hex. - (St.)	
46		1	SETSCREW--1/2-13-NC x 3 Lg.-Headless Cup Pt.(St.)	
		1	HALF NUT -- 1/2-13-NC-Hex. - (St.)	
47	S-819	1	LEVER - Overspeed Gov. Re-set	
48	C-7104L 5/8	1	KEY - Lever to Shaft	
		1	CAPSCREW -- 5/16-18-NC x 1 1/4 Lg. - (St.)	
49	2C143-P	1	GOVERNOR (Woodward)	
50	2C1346-B	2	SHIM - Governor to Housing - (1/32)	
50	2C1346-D	5	SHIM - Governor to Housing - (.010)	
50	2C1346-E	4	SHIM - Governor to Housing - (.003)	
		4	NUT -- 3/8-24-NF-Hex. - (St.)	
		4	LOCKWASHER -- 3/8 SAE Reg. - (St.)	
51	F-6155	1	GEAR - Governor Spindle Drive (Bevel)	
52	C-8898L1	1	KEY - Gear to Gov. Shaft	

(For 600 R.P.M.)

NAME GOVERNOR & DRIVE GROUP - - - - - - - (WOODWARD & OVERSPEED)
(HAND CONTROL GOVERNOR) ORIGINALLY ISSUED FOR 4-5-6 CYL. 9x10½ STAT. - R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

2L1084 SHEET 2 OF 2

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

L-7001

PLATE NO. SEE CAMSHAFT PLATE

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
51		F-4246	1	Cam - Inlet & Air Starting	
57		2C1432L5 1/2	1	Key - Cam to Camshaft	
58		F-4248	1	Cam - Exhaust	
66		2C1432L4 1/2	1	Key - Cam to Camshaft	
61		881-E	1	Disc - Spray Valve Cam	
62		C-2408L1 1/8	2	Capscrew - Disc to Ex. Cam	
63		881A-E	2	Washer - Disc to Cam Capscrew	
64		880-E	1	Toe - Spray Valve Cam Disc	
65		C-2406L3/4	1	Capscrew - Toe to Cam Disc	
			1	Wire -- #16 Ga. x 12 Lg. - - (Steel)	

L-7001

NAME CAM GROUP - - - (INBOARD ROTATION)

ORIGINALLY ISSUED FOR

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

L-7002

PLATE NO. SEE CAMSHAFT PLATE

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
51		F-4247	1	Cam - Inlet & Air Starting	
57		2C1432L5 1/2	1	Key - Cam to Camshaft	
58		F-4249	1	Cam - Exhaust	
66		2C1432L4 1/2	1	Key - Cam to Camshaft	
61		881-E	1	Disc - Spray Valve Cam	
62		C-2408L1 1/2	2	Capscrew - Disc to Ex. Cam	
63		881A-E	2	Washer - Disc to Cam Capscrew	
64		880-E	1	Toe - Spray Valve Cam	
65		C-2406L3/4	1	Capscrew - Toe to Cam Disc	
			1	Wire -- #16 Ga. x 12 Lg. - - - (Steel)	

NAME CAM GROUP - - - (OUTBOARD ROTATION)

ORIGINALLY ISSUED FOR

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

L-7002

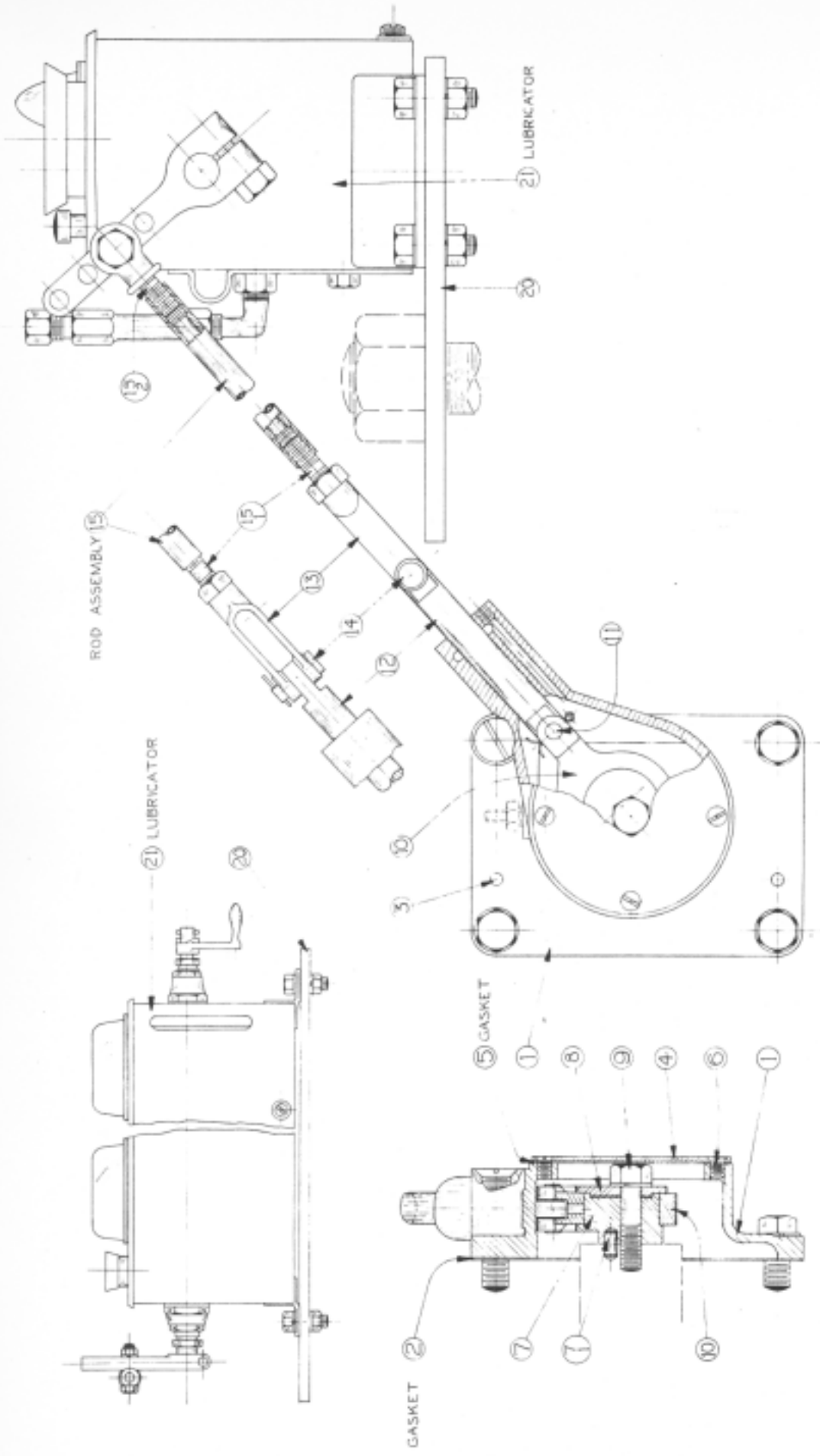


PLATE No.
K-1971

DO NOT ORDER PARTS BY REFERENCE NUMBERS

L-7817

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

PLATE NO. K-1971

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		W-546	1	HOUSING - Lubricator Drive	
2		C-6233	1	GASKET - Housing	
			3	CAPSCREW -- 1/2-13-NC x 1 Lg. - (St.)	
			3	LOCKWASHER -- 1/2 SAE Reg. - - (St.)	
			1	CAPSCREW -- 1/2-13-NC x 2 1/2 Lg.-Flat Hd.(St.)	
3		S-2392	2	PIN - Housing to Centerframe Dowel	
4		C-69	1	COVER - Lubricator Drive Housing	
5		C-70	1	GASKET	
6			4	MACHINE SCREW--1/4-20 x 1/2 Lg.-Flat Hd.-(St.)	
7		X1493	1	ECCENTRIC ASSEM. - Lubricator Drive	
8		C-64	1	WASHER - Eccentric Strap Retainer	
9			1	CAPSCREW -- 3/8-24-NF x 1 3/4 Lg. - (St.)	
			1	LOCKWASHER -- 3/8 SAE Reg. - - (St.)	
10		C-66	1	STRAP - Eccentric	
11		C-67	1	PIN - Plunger to Strap	
			1	COTTER PIN -- 1/8 x 7/8 Lg. - (St.)	
12		C-6364	1	PLUNGER - Lubricator Drive	
13		C-6366	1	ROD-END - Drive Rod	
			1	NUT -- 3/8-24-NF-Hex. - - (St.)	
14		C-6365	1	PIN - Rod-End to Plunger	
			1	COTTER PIN -- 3/32 x 1/2 Lg. - (St.)	
15		X1492	1	ROD ASSEM. - Lubricator Drive	

L-7817

NAME LUBRICATOR DRIVE GROUP

ORIGINALLY ISSUED FOR 8 CYL. 9 x 10 1/2 STAT.-R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

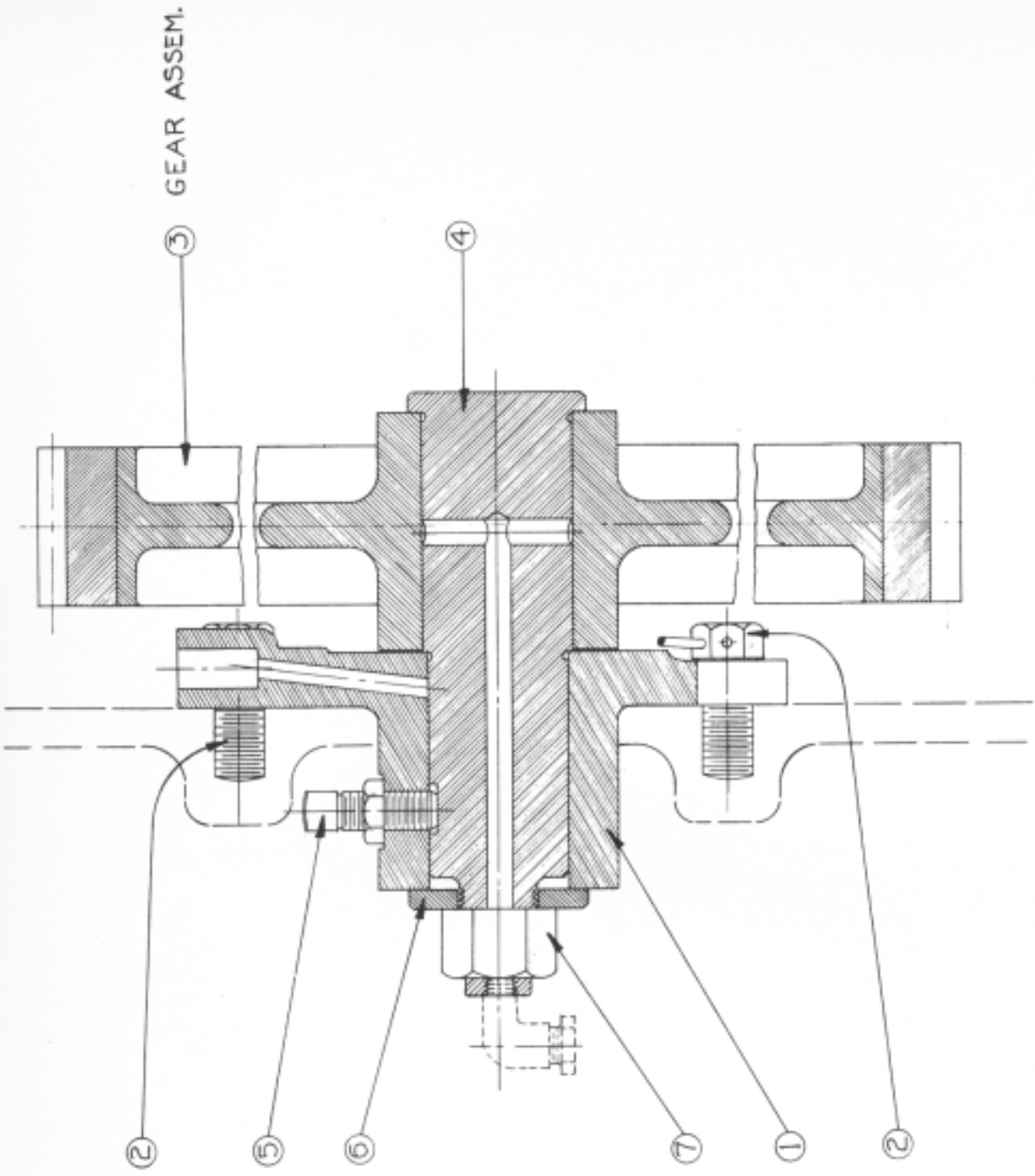


PLATE NO
W-1815

DO NOT ORDER PARTS BY REF. No.

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

L-8158

PLATE NO. W-1815

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		666-1XH6-RH	1	Bearing - Intermediate Gear	
2		C-2410L1⅛	4	Capscrew - Bearing to Centerframe	
			1	Wire -- #16 Ga. x 28 Long - - (Steel)	
3		GF-794	1	Gear Assembly - Intermediate	
4		C-3864	1	Pin - Intermediate Gear	
5			1	Setscrew -- 1/2-13-NC x 1⅛ Lg. - Sq. Hd. - Cup Point - - (Steel)	
			1	Half Nut -- 1/2-13-NC-Hex. - - (Steel)	
6		C-3731	1	Washer - Int. Gear Pin Retainer	
7			1	Nut -- 1-14-NF-Hex. - - (Steel)	

NAME INTERMEDIATE GEAR & BEARING GROUP

ORIGINALLY ISSUED FOR 8 1/2-9 x 10 1/2 IND. - R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

L-8158

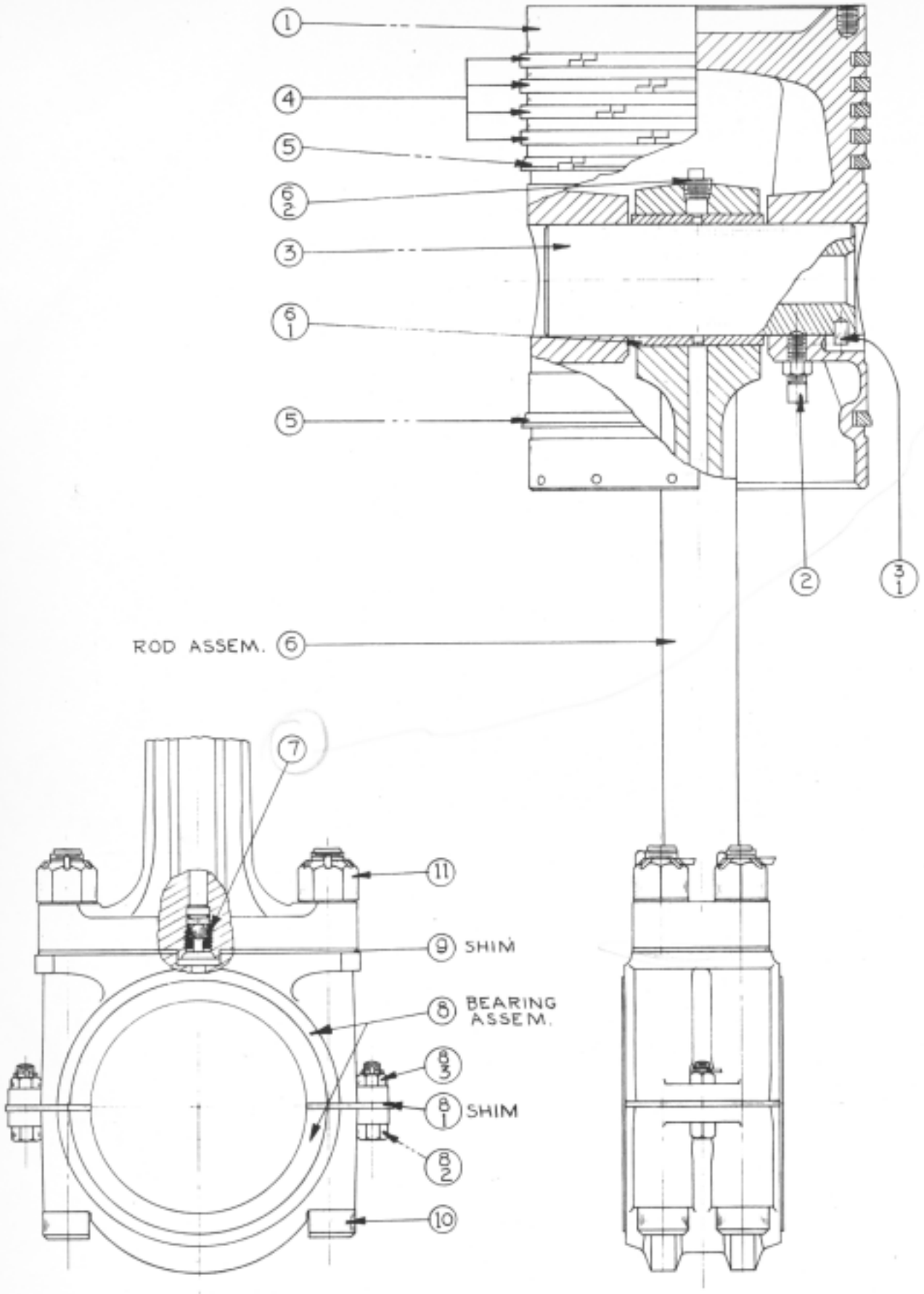


PLATE No
W-1818

DO NOT ORDER PARTS BY REF. No.

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

L-8165

PLATE NO. W-1618

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		K-1067	1	Piston	
2			1	Setscrew -- 1/2-13-NC x 1 1/2 Lg. - Sq. Hd. Cup Point-(Steel)	
			1	Nut -- 1/2-13-NC-Hex. - - (Steel)	
3		G621-LXH	1	Pin Assembly - Piston	
4		C-2155L9	4	Ring - Piston - (Compression)	
5		C-2355L9	2	Ring - Piston - (Oil Control)	
6		X1862	1	Rod Assembly - Connecting	
7		G632-C	1	Valve Assembly - Connect. Rod Oil Check	
8		X1955	1	Bearing Assembly - Connect. Rod Crank Pin	
9		C-7562-A	1	Shim - Connect. Rod to Bearing - (1/16)	
9		C-7562-B	1	Shim - Connect. Rod to Bearing - (1/32)	
9		C-7562-C	2	Shim - Connect. Rod to Bearing - (1/64)	
10		C-7564	4	Bolt - Connect. Rod to Bearing	
11		S-2714	4	Nut - Connect. Rod to Bearing Bolt	
			4	Cotter Pin -- 1/8 x 1 3/4 Long - - (Steel)	

NAME PISTON & CONNECTING ROD GROUP

ORIGINALLY ISSUED FOR 6-8 CYL. 9 x 10 1/2 IND.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND CALIF. MATTOON, ILL.

L-8165

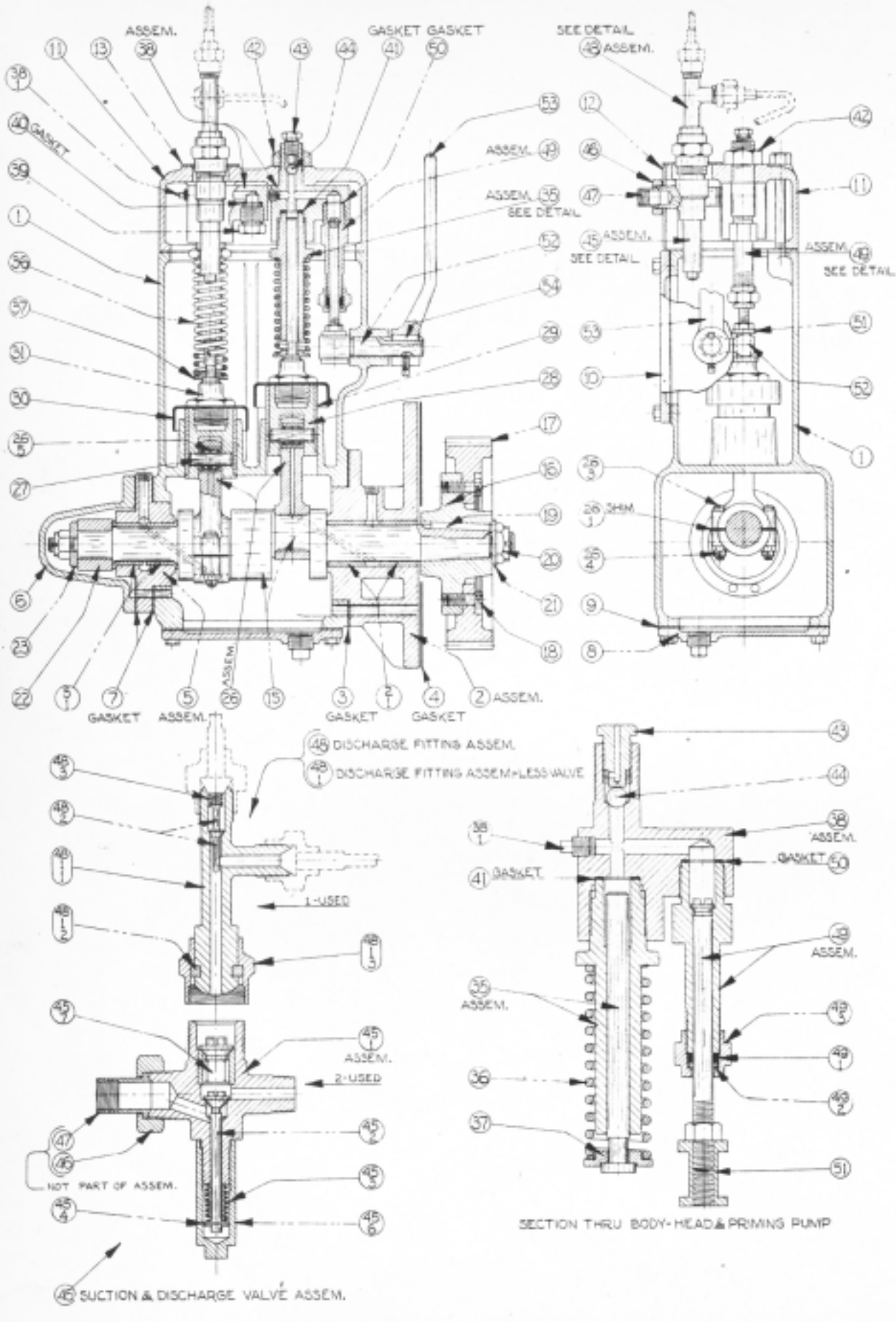


PLATE
No. K-1977

DO NOT ORDER PARTS BY REF. No.

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

L-8177
PLATE NO. K-1977

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		K-1215	1	HOUSING - H.P. Fuel Pump	
2		X1865	1	BEARING ASSEM. - Fuel Pump Crankshaft (Gear End)	
3		C-7465	1	GASKET - Bearing to Pump Housing	
			5	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg. - (St.)	
			5	LOCKWASHER -- 1/2 SAE Reg. - - (St.)	
4		F-1104	1	GASKET - Bearing to Timing Gear Housing	
			6	CAPSCREW -- 1/2-13-NC x 1 1/4 Lg. - (St.)	
			6	LOCKWASHER -- 1/2 SAE Reg. - - (St.)	
5		X1864	1	BEARING ASSEM. - Fuel Pump Crankshaft End	
6		F-5084	1	COVER - Crankshaft Bearing End	
7		F-5092	2	GASKET - Bearing & Cover	
			4	CAPSCREW -- 1/2-13-NC x 2 Lg. - (St.)	
			4	LOCKWASHER -- 1/2 SAE Reg. - - (St.)	
8		F-5093	1	COVER - Fuel Pump Housing Bottom	
9		F-1103	1	GASKET - Cover	
			8	CAPSCREW -- 3/8-16-NC x 1 Lg. - (St.)	
			8	LOCKWASHER -- 3/8 SAE Reg. - (St.)	
			1	PIPE PLUG -- 3/4 Std. - - (C.I.)	
10		847-FXH6	1	COVER - Fuel Pump Housing Side	
			2	CAPSCREW -- 3/8-16-NC x 1 Lg. - (St.)	
			2	LOCKWASHER -- 3/8 SAE Reg. - - (St.)	
11		K-1218	1	COVER - Fuel Pump Housing Top	
			6	CAPSCREW -- 1/2-13-NC x 4 1/2 Lg. - (St.)	
			6	LOCKWASHER -- 1/2 SAE Reg. - - (St.)	
12		S-889	2	COVER - Fuel Pump Suction Fitting	
13		S-1255	2	COVER - Fuel Pump Discharge Fitting	
			10	MACHINE SCREW--10-24 x 3/8 Lg.-Rnd. Hd.-(St.)	

L-8177

NAME H.P. FUEL PUMP HOUSING & COVERS GROUP - - (FOR USE WITHOUT WATER PUMP)
ORIGINALLY ISSUED FOR 9 x 10 1/2 STAT. - R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

L-8204
PLATE NO. SEE WEDGE SHAFT

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
40		1135-E	1	SPRING - Fuel Wedge Shaft	
41		1136-E	1	CLAMP - Wedge Shaft Spring	
			1	CAPSCREW -- 1/4-20-NC x 1 Lg. - (St.)	

L-8204

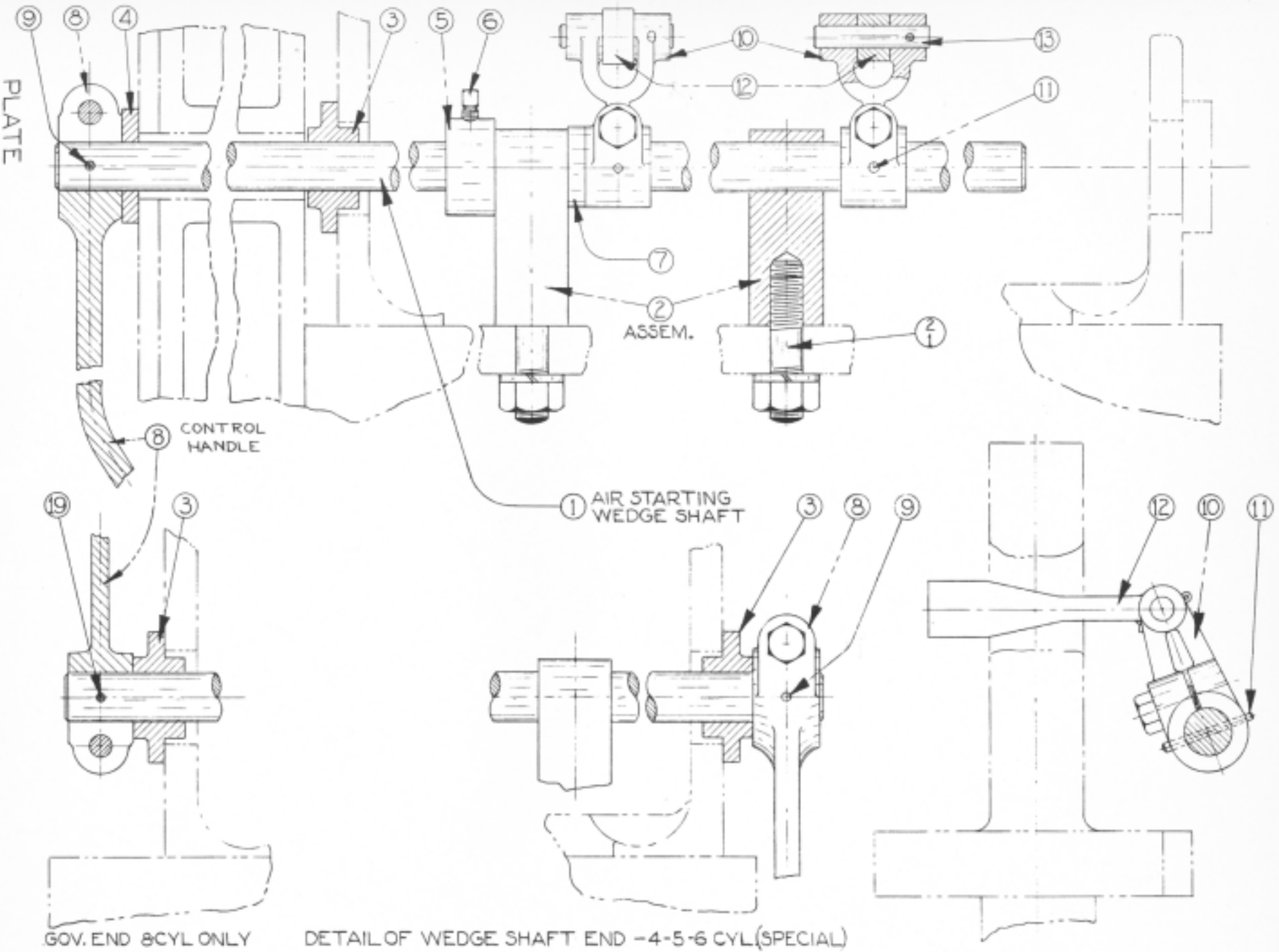
NAME FUEL WEDGE SHAFT SPRING GROUP
ORIGINALLY ISSUED FOR

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

PLATE
No. W-1823



DO NOT ORDER PARTS BY REF. No.

L-8297

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

PLATE NO. W-1823

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		C-7573L89	1	Shaft - Air Starting Wedge	
2		X2371	6	Bearing Assembly - Air Start. Wedge Shaft	
			6	Nut -- 1/2-20-NF-Hex. -- - (Steel)	
			6	Lockwasher -- 1/2 SAE Reg. - - (Steel)	
3		C-1187	1	Bearing - Air Start. Wedge Shaft (End)	
			2	Capscrew -- 3/8-16-NC x 3/4 Lg. - Flat Head - (Steel)	
4		C-3862	1	Bearing - Air Start. Wedge Shaft (Gear Hous. Plate)	
			2	Capscrew -- 3/8-16-NC x 1 Lg. - Flat Head - (Steel)	
5		C-7549	1	Collar - Wedge Shaft Retainer	
6			1	Setscrew -- 1/4-20-NC x 1/2 Lg. - Sq. Hd. - Cup Point -- - (Steel)	
7		S-965	1	Collar - Wedge Shaft Spacer	
8		A-1388	1	Handle - Air Starting Wedge Shaft Control	
			1	Capscrew -- 3/8-16-NC x 1 1/2 Lg. - - (Steel)	
9			1	Taper Pin -- #2 x 1 3/4 Lg. - (Steel)	
10		F-685	6	Fork - Air Start. Wedge	
			6	Capscrew -- 3/8-16-NC x 1 1/4 Lg. - - (Steel)	
11			6	Taper Pin -- #2 x 1 1/4 Lg. - - (Steel)	
12		594D-KXH	6	Wedge - Air Starting	
13		1132A-2	6	Pin - Wedge to Fork	
			6	Cotter Pin -- 1/8 x 1 1/4 Long - - (Steel)	

NAME AIR STARTING WEDGE SHAFT GROUP

ORIGINALLY ISSUED FOR 6 CYL. 8 1/2-9 x 10 1/2 IND. - RH

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

L-8297

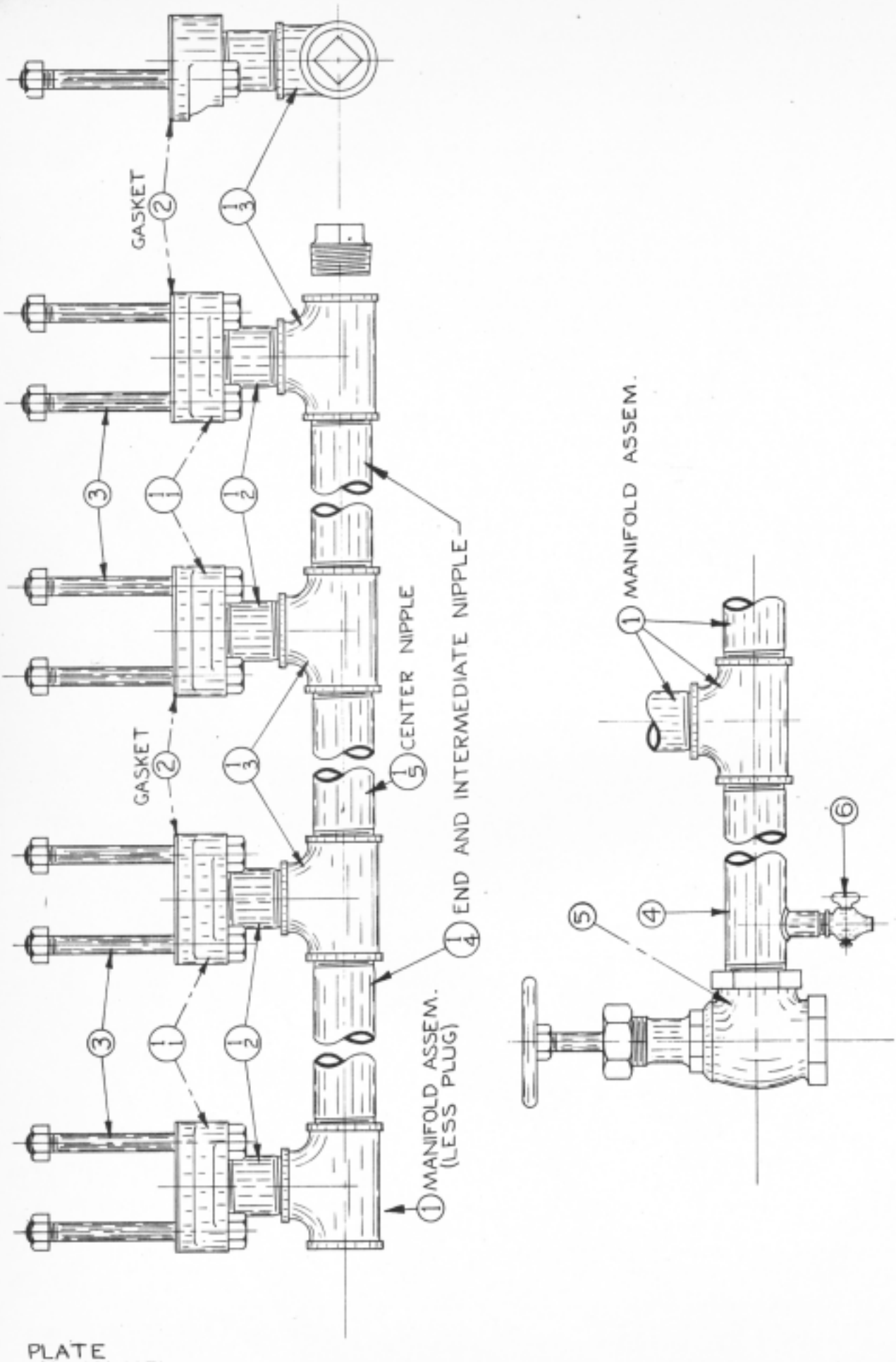


PLATE
No. W-1871

DO NOT ORDER PARTS BY REFERENCE NUMBERS

L-8320

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

PLATE NO. W-1871

REF. NO.	*	PART NO.	NO REQD.	PART NAME	ASSEM. DRWG. NO.
1		X1821	1	Manifold Assembly - Air Starting	
2		577A-C4	6	Gasket - Manifold to Cyl. Head	
3			12	Capscrew -- 1/2-13-NC x 5 1/2 Lg. - - (Steel)	
			12	Nut -- 1/2-13-NC-Hex. - - (Steel)	
			1	Pipe Plug -- 1 1/4 Std. - - (Brass)	
4		X1820	1	Pipe Assembly - Manifold Inlet	
5		C-9047-P1½	1	Valve - Angle Globe	
6		C-9045-P½	1	Cock - Tee Handle Air	

L-8320

NAME AIR STARTING MANIFOLD GROUP

ORIGINALLY ISSUED FOR 6C.8½-9x10½ Ind.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

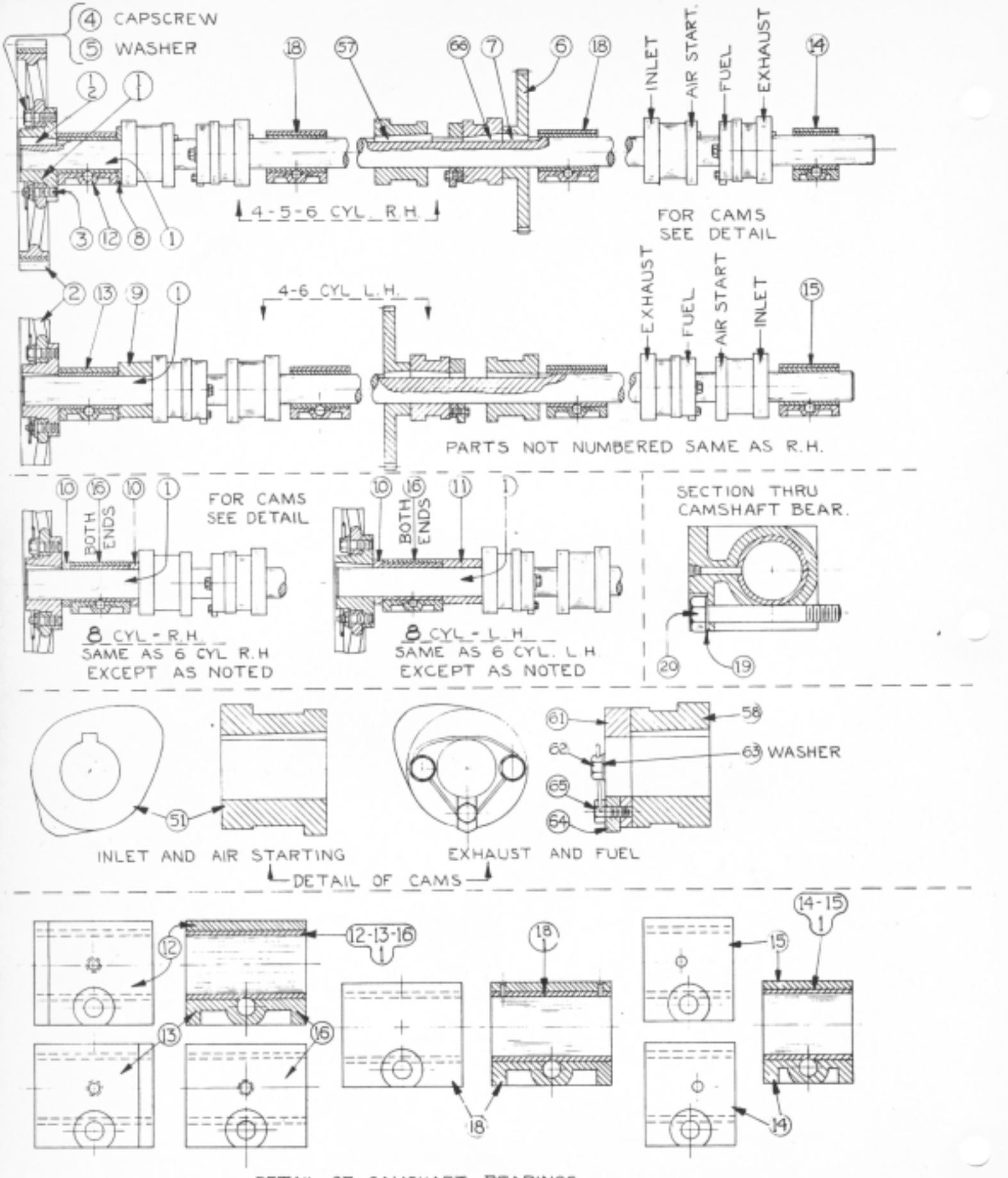


PLATE NO. W-1833

DO NOT ORDER PARTS BY REFERENCE NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

L-8326

PLATE NO. W-1833

ASSEM. DRWG. NO. K-1216

REF. NO.	*	PART NO.	NO. REQD.	PART NAME
1		X1844	1	Camshaft Assembly
2		GF-562	1	Gear Assembly - Camshaft Drive
3		C-7950L2	1	Pin - Gear to Hub Dowel
			1	Nut -- 3/8-24-NF-Hex. - (Stee.)
4		C-2510L1 1/2	4	Capscrew - Gear to Hub
5		S-2474	4	Washer - Gear to Hub Capscrew
			1	Wire -- #16 Ga. x 20 Lg. - (Steel)
6		F-4921	1	Gear - Lube Oil Pump Drive
7		5353	1	Key - Gear to Shaft
8		S-3352	1	Washer - Camshaft Thrust
12		GF-839	1	Bearing Assembly - Camshaft (Gear End)
14		X1834	1	Bearing Assembly - Camshaft (Fly. End)
18		X2223	5	Bearing Assembly - Camshaft (Center)
19		C-4921	7	Washer - Camshaft Bearing Capscrew Seal
20			7	Capscrew -- 5/8-11-NC x 4½ Long - - (Steel)

NAME CAMSHAFT & BEARINGS GROUP

ORIGINALLY ISSUED FOR 6 CYL. 9 x 10 1/2 IND. - R.H.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

L-8326

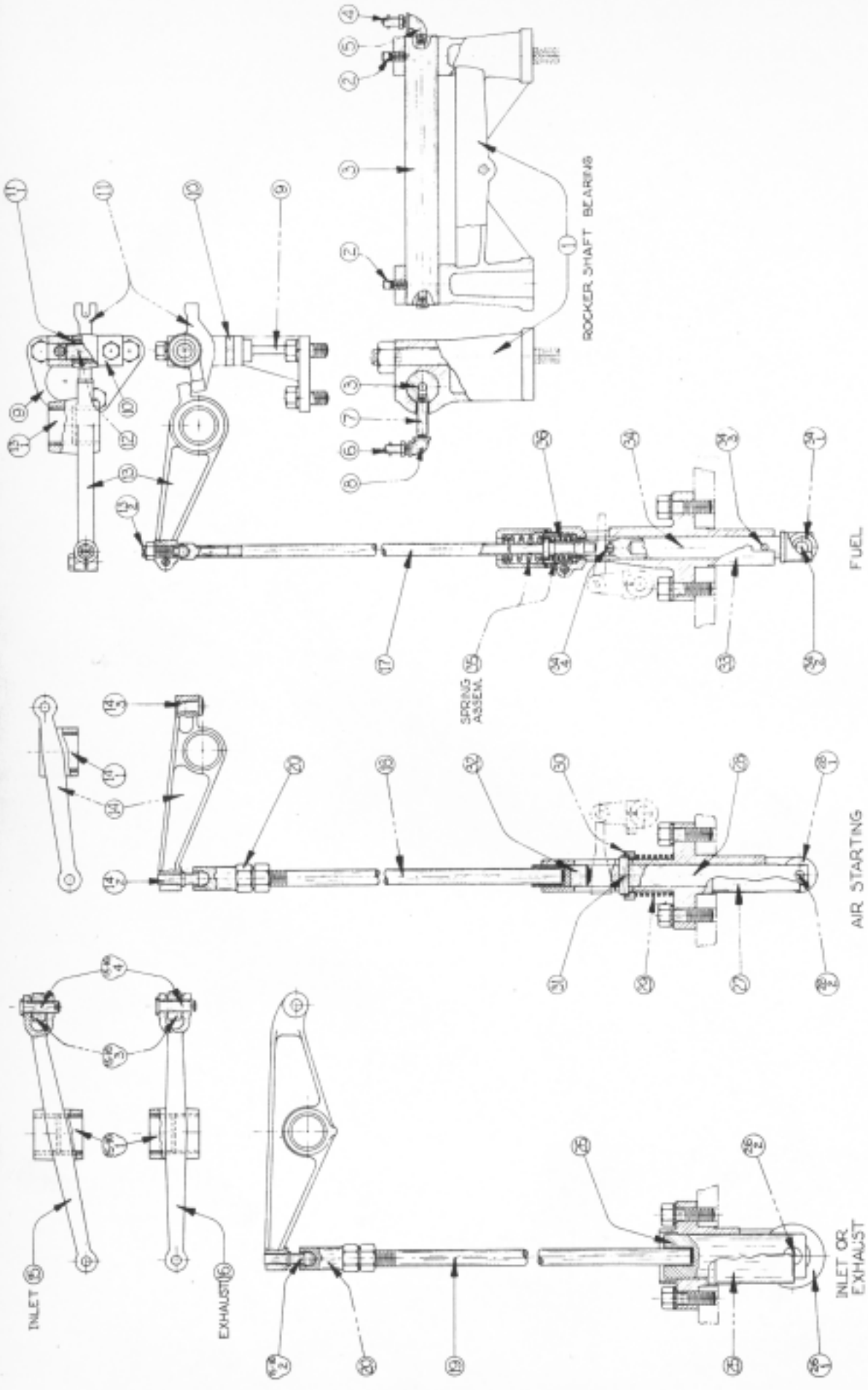


PLATE
No. K-1953

DO NOT ORDER PARTS BY REF. NUMBERS

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
* INDICATES PART NOT SERVICED INDIVIDUALLY

L-9398

PLATE NO. K-1953

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		K-1182	1	Bearing - Rocker Shaft	
			2	Nut -- 3/4-10-NC-Hex. - - (Steel)	
2			2	Setscrew--3/8-16-NC x 3/8 Lg. - Sq. Hd. Cup Point - (Steel)	
3		F-4962	1	Shaft - Valve Rocker	
			1	Pipe Plug -- 1/8 Std. - - (Cast Iron)	
4		PG 17	1	Fitting - Alemite Straight	
5			1	Street Ell -- 1/8 Std. - - (Mall. Iron)	
6		PG 17	1	Fitting - Alemite Straight	
7			1	Nipple -- 1/8 x 2 Lg. - - (W.I.)	
8			1	Elbow -- 1/8 Std. - - (Mall. Iron)	
9		F-4965	1	Stand - Fuel Spray Valve Short Rocker	
			3	Capscrew -- 5/8-11-NC x 1 1/4 Lg. - - (Steel)	
10		F-680	1	Bearing - Fuel Spray Valve Short Rocker Pin	
			2	Capscrew -- 1/2-13-NC x 3 3/4 Lg. - - - (Steel)	
11		X5343	1	Rocker Assembly - Fuel Spray Valve (Short)	
12		C-394	1	Pin - Fuel Spray Valve Short Rocker	
13		X5167	1	Rocker Assembly - Fuel Spray Valve (Long)	
14		3590-XXH	1	Rocker Assembly - Air Starting Valve	
15		X1758	1	Rocker Assembly - Air Inlet Valve	
16		X1757	1	Rocker Assembly - Exhaust Valve	
17		X111	1	Push-Rod Assembly - Fuel Spray Valve	
18		503-LX	1	Push-Rod - Air Starting Valve	
19		525-LX	2	Push-Rod - Inlet & Exhaust Valve	
20		526-FB4	3	Socket - Push-Rod Upper	
			3	Nut -- 3/4-16-NF-Hex.- - - (Steel)	

L-9398

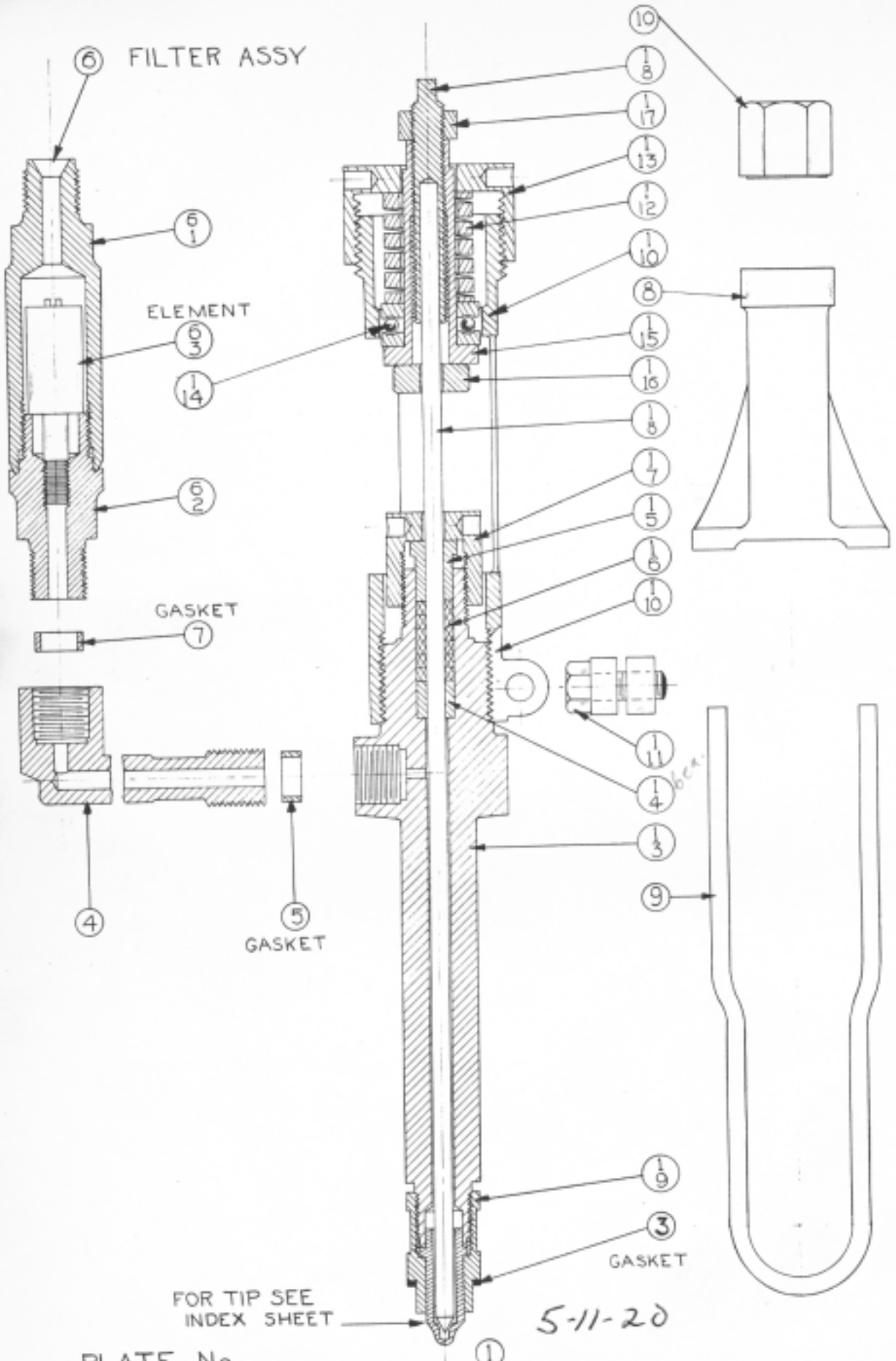
NAME VALVE ROCKERS & PUSH-RODS GROUP

ORIGINALLY ISSUED FOR 6-8 CYL. 8 1/2-9 x 10 1/2 IND.

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.



5-11-20

PLATE No. W-1817

SPRAY VALVE ASSY. LESS TIP

DO NOT ORDER PARTS BY REF. No.

L-9399

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
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PLATE NO. W-1817

REF. NO.	*	PART NO.	NO. REQD.	PART NAME	ASSEM. DRWG. NO.
1		X260	1	Valve Assembly - Fuel Spray	
3		860-L	1	Gasket - Fuel Spray Valve to Cyl. Head	
4		861-GX8	1	Connection - Spray Valve Fuel Filter	
5		861A-E	1	Gasket - Filter Connection to Spray Valve	
6		X71	1	Filter Assembly - Spray Valve Fuel	
7		861A-E	1	Gasket - Fuel Filter to Connection	
8		855-R	1	Bridge - Fuel Spray Valve Retainer	
9		F-4966	1	Clamp - Fuel Spray Valve Bridge	
10		855A-FXC4	1	Nut - Fuel Spray Valve Bridge Clamp Retainer	

NAME FUEL SPRAY VALVE GROUP

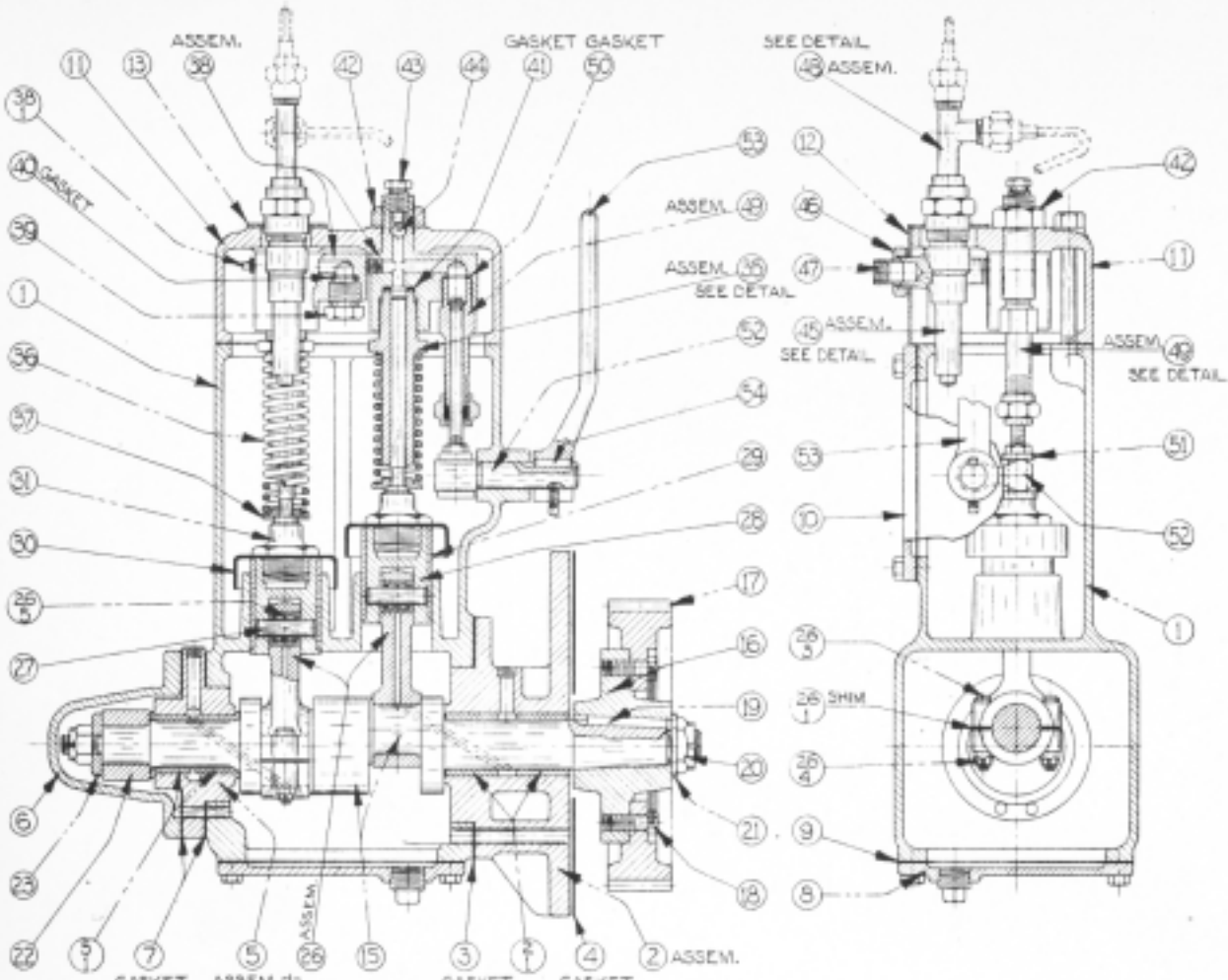
ORIGINALLY ISSUED FOR 6-8 CYL. 9 1/2-9 x 10 1/2 I.D.

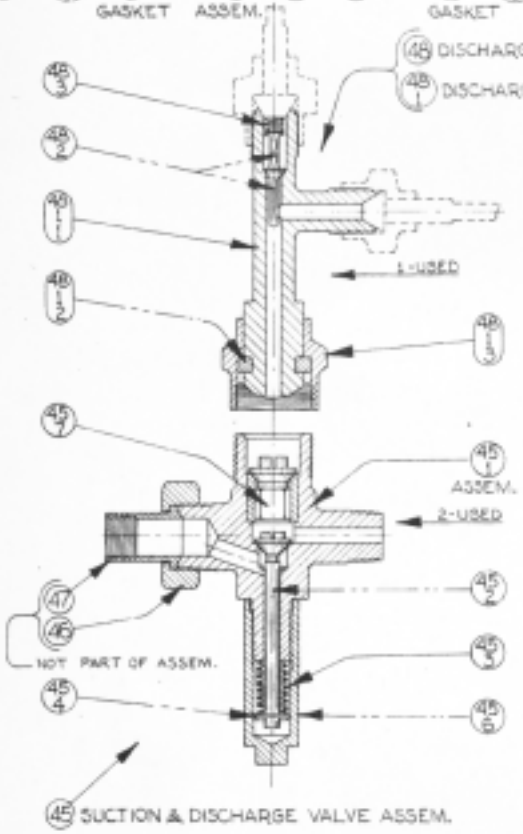
FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

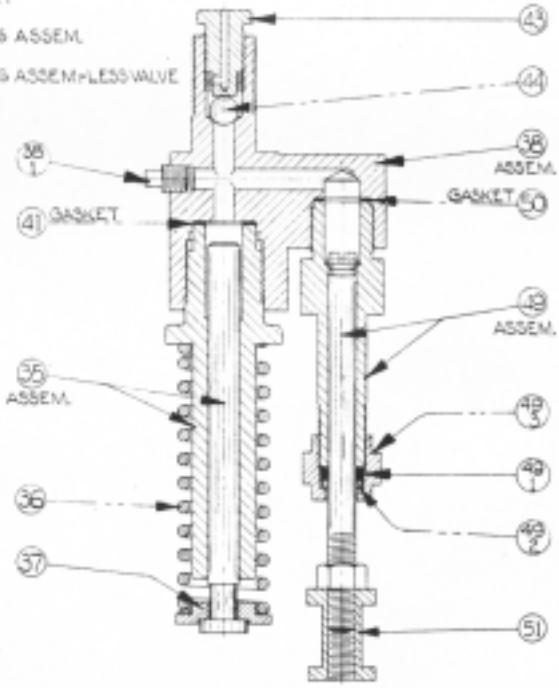
PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

L-9399







SECTION THRU BODY-HEAD & PRIMING PUMP

PLATE
No. K-1977

DO NOT ORDER PARTS BY REF. No.

L-9589

ALWAYS GIVE PART NUMBER—PART NAME—ENGINE NUMBER
FOR STD. HARDWARE WITHOUT PART NUMBER GIVE DESCRIPTION AND SIZE
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PLATE NO. K-1977

REF. NO.	*	PART NO.	NO. REQD.	PART NAME [ASSEM. DRWG. NO.
15		A-751	1	Crankshaft - H.P. Fuel Pump
16		F-5632	1	Hub - Pump Drive Gear
17		F-5633	1	Gear - Pump Drive
18		C-2408L1 1/2	4	Capscrew - Gear to Hub
			1	Wire -- #16 Ga. x 17 Lg. - - (Steel)
19		C-670613	1	Key - Gear Hub to Crankshaft
20		C-20	1	Nut - Gear Hub Retainer
21			1	Plain Washer -- 1 SAE Std. - - (Steel)
			1	Cotter Pin -- 1/8 x 1 3/4 Lg. - - (Steel)
22		C-3062	1	Spacer - Crankshaft End
23		C-3063	1	Washer - Crankshaft Spacer Retainer
			1	Castle Nut -- 5/8-18-NF-Hex. - - (Steel)
			1	Cotter Pin -- 1/8 x 1 1/4 Lg. - - (Steel)

NAME H.P. FUEL PUMP CRANKSHAFT GROUP (USED WITHOUT WATER PUMP)

ORIGINALLY ISSUED FOR 6-8 CYL. 8 1/8-9x10 1/8 INDUSTRIAL

FOR TOTAL REQUIREMENTS PER ENGINE MULTIPLY NO. REQ'D GIVEN ABOVE BY NO. REQ'D FOR THIS GROUP GIVEN ON INDEX SHEET

PARTS LIST

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIF. MATTOON, ILL.

L-9589

ASSEM. LIST NEGATIVE NO. AL 61

ATLAS IMPERIAL DIESEL ENGINE CO.

SUB-ASSEMBLY LIST

ALWAYS GIVE--ENGINE NO.--PART NAME--PART NO. OR COMPLETE DESCRIPTION AND SIZE
DO NOT ORDER PARTS BY REFERENCE NUMBERS
* INDICATES PARTS NOT SERVICED INDIVIDUALLY

REF NO.	PART NO.	NO. REQD	DESCRIPTION
	X71		FILTER ASSEM. - HIGH PRESSURE FUEL Includes
1	F-1982	1	BODY
2	S-1686	1	CAP
3	PG 25	1	ELEMENT
	X87		ELBOW ASSEM.-H.P. FUEL TUBE CONNECTION Includes
*		1	BODY
*		1	FITTING
	X111		PUSH-ROD ASSEM. - SPRAY VALVE Includes
*		1	TUBE - Push-Rod
*		1	SOCKET
*		1	BUTTON
	X113		LIFTER ASSEM. - FUEL SPRAY VALVE Includes
*		1	LIFTER
1	884-E	1	ROLLER
2	S-3032	1	PIN - Roller to Lifter
3	S-3026	1	PIN - Lifter Guide — ⅜ x 1 ⅜"
4	S-3025	1	PIN - Fuel Wedge
	X142		TUBE ASSEM.-H.P. FUEL(1/4 O.D. x 25 LG.) Includes
*		1	TUBE
*		2	SLEEVE
*		2	NUT
	X147		TUBE ASSEM.-H.P. FUEL(1/4 O.D. x 36 LG.) Includes
*		1	TUBE
*		2	SLEEVE
*		2	NUT
	X152		TUBE ASSEM.-H.P. FUEL(1/4 O.D. x 43 LG.) Includes
*		1	TUBE
*		2	SLEEVE
*		2	NUT
	X158		TUBE ASSEM.-H.P. FUEL(1/4 O.D. x 48 LG.) Includes
*		1	TUBE
*		2	SLEEVE
*		2	NUT
	X167		TUBE ASSEM.-H.P. FUEL(1/4 O.D. x 56 LG.) Includes
*		1	TUBE
*		2	SLEEVE
*		2	NUT
	X204		VALVE ASSEM.-COMPRESSION RELIEF SAFETY Includes
1	F-2798	1	BODY
2	X541	1	STEM ASSEMBLY
3	S-3339	1	SPRING
4	S-3337	2	WASHER
5	S-3338	1	CAP - Valve Body
6		1	SETSCREW--1/4-20 x 1 Lg.-Headless - Cup Pt.
7		1	HALF NUT -- 1/4-20-NC-Hex.
	X214		CLAMP ASSEM. - SPRAY VALVE TEST Includes
*		1	CLAMP
*		1	CAP - Test Clamp
		2	CAPSCREW -- 1/2-13-NC x 1 1/2 Lg.
	X228		SPRING ASSEM.-FUEL SPRAY VALVE PUSH-ROD BUFFER Includes
*		1	CAGE
*		1	SPRING
*		1	SLEEVE
	X234		TUBE ASSEM. - SPRAY VALVE TEST Includes
*		1	TUBE
*		2	SLEEVE
*		2	NUT
	X260		VALVE ASSEM. - FUEL SPRAY Includes
3	851-E	1	BODY
4	S-2787	1	GLAND - Packing (Lower)
5	866-E	1	GLAND - Packing (Upper)
6		6	PACKING RING -- 1/4 I.D. x 1/2 O.D. x 1/4 Th. - Garlock #333
7	865-E	1	NUT - Packing Gland
8	G850-KXH	1	SPINDLE ASSEMBLY
9	856-E	1	NUT - Valve Seat
10	853-FX	1	CASING - Valve Spring
11		1	CAPSCREW -- 3/8-16-NC x 3/4 Lg.
12	858-E	1	SPRING
13	857-JX	1	NUT - Retainer
14	5686	1	BALL BEARING -- 11/16 Bantam Thrust - Code "Kangaroo"
15	868B-KXH	1	SLEEVE - Spindle
16	868A-KXH	1	COLLAR - Spindle
17		1	NUT -- 7/16-20-NF-Hex.

REF NO.	PART NO.	NO. REQD	DESCRIPTION
	X270		WEIGHT ASSEM. - GOVERNOR Inclu
*		1	WEIGHT
1	C-544	1	ROLLER
2	S-2999	1	PIN - Roller to Weight
	X453		HOUSING ASSEM. - GOVERNOR Inclu
*		1	HOUSING
*		1	COVER - Top
1	S-868	1	GASKET - Cover to Housing
		4	CAPSCREW -- 1/4-20-NC x 2 1/2 Lg.
		1	PIPE PLUG -- 1/4 Std.
	X454		HOUSING ASSEM. - GOVERNOR Inclu
*		1	HOUSING
*		1	COVER - Top
1	S-868	1	GASKET - Cover to Housing
		4	CAPSCREW -- 1/4-20-NC x 2 1/2 Lg.
		1	PIPE PLUG -- 1/4 Std.
	X511		VENT ASSEM. - FUEL OIL DAY TANK Includ
*		1	BODY
1		1	TUBE -- 1/4 O.D. x 3 Lg. - (Cop.)
	X541		STEM ASSEM.-COMPRESSION RELIEF SAFETY VALVE Includ
*		1	VALVE
*		1	STEM
	GF-562		GEAR ASSEM. - CAMSHAFT Includ
*		1	HUB
*		1	RING
*		2	PIN - Dowel
	G590-KXH		ROCKER ASSEM. - AIR STARTING Includ
*		1	ROCKER
1	5910	1	BUSHING
2	527-BB3	1	BALL
3	548-PB4	1	BUTTON
	G594-RB3		LIFTER ASSEM. - AIR STARTING VALVE Include
*		1	LIFTER
1	596-E	1	ROLLER
2	598-E	1	PIN - Roller to Lifter
	G621-LXH		PIN ASSEM. - PISTON Include
*		1	PIN
1	S-986	1	PIN - Dowel
	G632-E		VALVE ASSEM. - BALL CHECK Include
*		1	BODY
*		1	STEEL BALL
*		1	PIN - Ball Retainer
	X645		STRAINER ASSEM. - LUBE OIL Include
*		1	BODY
*		1	SCREEN
	X646		STRAINER ASSEM. - LUBE OIL Include
*		1	BODY
*		1	SCREEN (Side)
*		1	SCREEN (Bottom)
	GF-794		GEAR ASSEM. - INTERMEDIATE Include
*		1	HUB
*		1	RING
*		2	PIN - Dowel
	G796-E		FITTING ASSEM.-H.P. FUEL PUMP DISCHARGE -Include
1	796-EB32	1	FITTING
2	796A-E	2	RING
3	797-EB3	1	NUT
	G796-EB32		FITTING ASSEM.-H.P. FUEL PUMP DISCHARGE -Include
1	G796-E	1	FITTING ASSEMBLY
2	796C-E1	1	VALVE - Check
3	796D-E1	1	SPRING - Check Valve
	X827		HOUSING ASSEM. - WATER PUMP GEAR Include
*		1	HOUSING
1	C-1130	2	BUSHING

ATLAS IMPERIAL DIESEL ENGINE CO.

SUB-ASSEMBLY LIST

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REF NO.	PART NUMBER	NO. REQ'D	DESCRIPTION
X835			IMPELLER ASSEM. - 2 x 5 1/4 CENTRIFUGAL PUMP Includes
*		1	IMPELLER
1	P-3966	1	SHAFT
2	C-3952	3	PIN - Impeller to Shaft Dowel
3	S-3128	1	WASHER - Impeller Retainer
4		1	HALF NUT -- 5/8-18-NF-Hex.
5	C-3995	1	PIN - Ball Bearing Sleeve Drive
GF-839			BEARING ASSEM. - CAMSHAFT Includes
*		1	BEARING
1	668-C	1	BUSHING
G850-KXH			SPINDLE ASSEM. - SPRAY VALVE Includes
			Spindle & Extension (No Service Parts)
X850			PUMP ASSEM. - CENTRIFUGAL WATER Includes
1	5479	1	BRACKET - Pump
2	5477	1	CASING - Impeller
3	5478	1	COVER - Pump Suction
4	5491	2	GASKET - Casing to Cover & Bracket
		16	CAPSCREW -- 3/8-16-NC x 1 Lg.
		16	LOCKWASHER -- 3/8 SAE Reg.
5	5483	1	BUSHING - Impeller Shaft
		3	MACHINE SCREW--1/4-20 x 1/2 Lg.-Flat Hd.(Brass)
6	X835	1	IMPELLER & SHAFT ASSEM.
7A		2	PACKING - Pump -- 1/4 Sq. x 6 1/4 Lg.(Flax)
7B	X3086	1	GLAND ASSEM. - Packing
8	5489	8	EYE-BOLT - Packing Gland
		2	CAPSCREW -- 1/4-20-NC x 1 1/2 Lg.
		4	NUT -- 1/4-20-NC-Hex.
9	5490	1	GREASE CUP - Hunter #00 - 1/8"
		1	PIPE PLUG -- 1/8 Std. - (Brass)
10	5496	1	SLEEVE - Ball Bearing
11	5475	1	BEARING - Ball
12	5497	1	RETAINER - Ball Bearing
		4	MACHINE SCREW--1/4-20 x 1/2 Lg.-Flat Hd.
13	S-3056	1	SPACER - Gear
14	C-12	1	THROWER - Oil
15	S-3065	1	GEAR - Impeller Shaft
16		1	WOODRUFF KEY -- 5/32 x 3/4
17	S-3276	1	NUT - Gear Retainer
		1	COTTER PIN -- 3/32 x 1 1/4 Lg.
G1197-KXH			VALVE ASSEM. - SNIFTER Includes
1	1197-KXH	1	BODY
2	G1198-KXH	1	STEM ASSEMBLY
G1198-KXH			STEM ASSEM. - SNIFTER VALVE Includes
			Stem & Handle (No Service Parts)
G1205-FX			VALVE ASSEM. - ISOLATING Includes
1	1205-FX	1	BODY
2	1206A-FX	1	EXTENSION
3	1206-C31	1	STEM - Valve
4	666-E	1	GLAND - Packing
5	1208-C3	1	NUT - Gland
6		1	PACKING -- 1/8 Sqd. x 10 Lg.-(Palmetto)
X1211			LIFTER ASSEM. - INLET OR EXHAUST VALVE Includes
*		1	LIFTER
1	530-E	1	ROLLER
2	531-E	1	PIN - Roller to Lifter
G1230-E1			VALVE ASSEM.-FUEL PRESSURE REGULATING Includes
1	G1243-E	1	HANDLE ASSEMBLY
2	1233A-E	1	PIN - Handle to Bearing
3		2	COTTER PIN -- 3/32 x 3/4 Lg.
4	1244-E	1	SECTION
		2	CAPSCREW -- 5/16-18-NC x 1 1/4 Lg.
		2	NUT -- 5/16-18-NC-Hex.
7	1235-E	1	BEARING - Handle
8	1237-E1	1	CASE - Spring
9	1245-E1	1	PLUG - Spring (Upper)
10	1236-E	1	SPRING - Regulat. Valve
11	1240-E	1	NUT - Spring Adjust. Screw
		1	MACHINE SCREW--1/4-20 x 1/2 Lg.-Rnd. Hd.(Brass
13	1239-E	1	SCREW - Spring Adjusting
14	1233-E	1	STEM - Regulat. Valve
15	1234-E	1	SEAT - Valve Stem
16	1230-E1	1	BODY - Regulat. Valve
17		3	PACKING RING --13/16 O.D. x 1/2 I.D. x 5/16 Wide - Garlock #333
18	1231A-E	1	RING - Packing Retainer
19	1231-E2	1	GLAND - Packing
20	1232-E1	1	STUD - Adaptor
21		1	HALF NUT -- 1-8-NC-Hex.
22	1242-E	1	ELBOW - Fuel Inlet
23	1237A-E	1	CUP - Drain

REF NO.	PART NUMBER	NO. REQ'D	DESCRIPTION
G1243-E			HANDLE ASSEM.-FUEL PRESS. REGULAT. VALVE -Includes
1	1243-E	1	CAM - Spring Control
2	1117-E	1	EXTENSION - Handle
3	1249-E	1	SCREW - Handle
4	1118-E1	1	PAWL
5	1124-E	1	SPRING - Pawl
6	1125-E	1	SCREW - Spring Adjust.
7		1	TAPER PIN -- #1 x 1 Lg.
		1	HALF NUT -- 1/4-20-NC-Hex.
X1445			VALVE ASSEM. - LUBE OIL PRESSURE RELIEF Includes
*		1	BODY
1	C-4334	1	VALVE
2	C-4331	1	SPRING - Valve
3	C-4332	1	PLUG - Press. Adjust.
		1	WIRE -- #16 Ga. x 3 Lg.
X1447			BEARING ASSEM. - CAMSHAFT END Includes
*		1	BEARING
1		1	BUSHING -- Bunting #NZ734
X1450			CLAMP ASSEM. - CRANKSHAFT GEAR Includes
*		2	CLAMP
1	C-2610L6	2	BOLT
		2	CASTLE NUT -- 5/8-18-NF-Hex.
		2	COTTER PIN -- 1/8 x 1 1/4 Lg.
X1454			GEAR ASSEM. - CRANKSHAFT Includes
*		1	GEAR
1	S-2291	2	PIN - Dowel
X1476			HOUSING ASSEM. - LUBE OIL PUMP Includes
*		1	HOUSING
1		2	BUSHING -- Bunting No. B464
X1492			ROD ASSEM. - LUBRICATOR DRIVE Includes
*		1	ROD
1	C-6225	1	STUD
2	C-2006L1 1/4	1	STUD
X1493			ECCENTRIC ASSEM. - LUBRICATOR DRIVE Includes
*		1	ECCENTRIC
1	C-66	2	PIN - Dowel
X1503			BEARING ASSEM. - FUEL WEDGE SHAFT Includes
*		1	BEARING
1	C-2206L3	1	STUD
2	S-961	1	BUSHING
X1510			BEARING ASSEM. - FUEL WEDGE SHAFT Includes
*		1	BEARING
1	C-2206L3	1	STUD
X1511			BODY ASSEM. - SPRAY VALVE TEST Includes
*		1	CONNECTOR
*		1	BODY
*		1	BODY
X1512			VALVE ASSEM. - TEST Includes
1	X1511	1	BODY ASSEMBLY
2	1205D-E	2	SEAT - Valve
3	1205D-E	2	PLUG - Isolating Valve
4	1206-C31	2	STEM - Isolating Valve
5	666-E	2	GLAND - Packing
6	1208-C3	2	NUT - Packing Gland
7		6	RING - Packing -- 1/4 I.D. x 1/2 O.D. x 1/4 Th. - Garlock #333
X1639			CAMSHAFT ASSEMBLY Includes
*		1	CAMSHAFT
1	6708-KXH	1	COUPLING - Gear
2	5356	1	KEY - Coupling
X1752			MANIFOLD ASSEM. - EXHAUST Includes
*		1	MANIFOLD
1	C-2012L3	4	STUD - End Flange
		1	PIPE PLUG -- 1 1/4 Std.
X1753			MANIFOLD ASSEM. - EXHAUST Includes
*		1	MANIFOLD
1	C-2012L3	4	STUD - End Flange
		2	PIPE PLUG -- 1 1/4 Std.

ASSEM'L LIST NEGATIVE NO. AL 63

ATLAS IMPERIAL DIESEL ENGINE CO. SUB-ASSEMBLY LIST

ALWAYS GIVE--ENGINE NO.--PART NAME--PART NO. OR COMPLETE DESCRIPTION AND SIZE
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* INDICATES PARTS NOT SERVICED INDIVIDUALLY

REF NO.	PART NO.	NO. REQD.	DESCRIPTION	
	X1754		HEAD ASSEM. - CYLINDER	Includes
*		1	HEAD	
		12	PIPE PLUG -- 1 Std.	
		2	PIPE PLUG -- 1 1/2 Std.	
1	C-6453	2	BUSHING - Inlet & Exhaust Valve	
2	654A-E	1	STUD - Spray Valve Clamp	
3	C-2012L8 1/4	2	STUD - Rocker Shaft Bearing	
	X1755		HEAD ASSEM. - CYLINDER	Includes
1	X1754	1	HEAD ASSEMBLY	
2	P-4961	1	VALVE - Inlet	
3	P-4960	1	VALVE - Exhaust	
4	C-6460	2	SPRING - Valve (Inner)	
5	513-E	2	SPRING - Valve (Outer)	
6	C-6462	2	RETAINER - Valve Spring	
7	C-6461	4	LOCK - Valve Spring Retainer	
8	580-KHN6	1	VALVE - Air Starting	
9	586-E3	1	BUSHING - Valve	
10	C-2182L1 1/2	2	RING - Piston	
11	C-6468	1	BUSHING - Spring	
12	582-E	1	SPRING	
13	583-FED4	1	WASHER - Spring (Top)	
14	588-KHN6	1	WASHER - Air Starting Valve Spring (Lower)	
15		1	NUT -- 5/8-18-NF-Hex.	
	X1757		ROCKER ASSEM. - EXHAUST	Includes
*		1	ROCKER	
1	S-2070	2	BUSHING	
2	527-RB5	1	BALL	
3	894-E	1	ROLLER	
4	C-6464	1	PIN	
		1	COTTER PIN -- 1/8 x 1 Lg.	
	X1758		ROCKER ASSEM. - INLET	Includes
*		1	ROCKER	
1	S-2070	2	BUSHING	
2	527-RB5	1	BALL	
3	894-E	1	ROLLER	
4	C-6464	1	PIN	
		1	COTTER PIN -- 1/8 x 1 Lg.	
	X1785		VALVE ASSEM. - SNIFTER	Includes
1	C-6444	1	BODY	
2	X5390	1	STEM ASSEMBLY	
	X1820		PIPE ASSEM. - AIR STARTING MANIFOLD	Includes
*		1	PIPE	
*		1	COUPLING	
	X1821		MANIFOLD ASSEM. - AIR STARTING	Includes
1	C-7412	6	FLANGE - Man. to Head	
2		6	NIPPLE-Man. to Flange--1 1/4 x 2 1/2 Lg.	
3		6	TEE - Manifold -- 1 1/4 Std. Pipe	
4		4	NIPPLE -- 1 1/4 x 12 3/4 Lg.	
5		1	NIPPLE (Center) -- 1 1/4 x 13 3/4 Lg.	
	X1822		MANIFOLD ASSEM. - AIR STARTING	Includes
1	C-7412	8	FLANGE - Man. to Head	
2		8	NIPPLE-Man. to Flange--1 1/4 x 2 1/2 Lg.	
3		8	TEE - Manifold -- 1 1/4 Std. Pipe	
4		6	NIPPLE -- 1 1/4 x 12 3/4 Lg.	
5		1	NIPPLE (Center)--1 1/4 x 13 3/4 Lg.	
	X1834		BEARING ASSEM. - CAMSHAFT END	Includes
*		1	BEARING	
1	C-308	1	BUSHING	
	X1844		CAMSHAFT ASSEMBLY	Includes
*		1	CAMSHAFT	
1	6708-KXH	1	COUPLING	
2	5386	1	KEY - Coupling	
	X1861		BLOCK ASSEM. - CYLINDER	Includes
*		1	BLOCK	
1	C-6466	32	STUD - Cyl. Head	
2	C-6465	16	STUD - Cyl. Head (Tapped)	
3	C-2008L3 3/4	4	STUD - Cyl. Block Side Door	
5	S-2392	8	PIN - Side Door Dowel	
6	610-RB5.	48	PIPE - Cyl. to Head Water By-Pass	
	X1862		ROD ASSEM. - CONNECTING	Includes
*		1	ROD	
1	P-891	1	BUSHING	
2		1	PIPE PLUG -- 3/8 Std.	
	X1864		BEARING ASSEM.-FUEL PUMP CRANKSHAFT END	Includes
*		1	BEARING	
1	C-1130	2	BUSHING	
	X1865		BEARING ASSEM.-FUEL PUMP CRANKSHAFT (GEAR END)	Includes
*		1	BEARING	
1	C-4067	2	BUSHING	
	X1884		TUBE ASSEM.-H.P. FUEL(1/4 O.D. x 12 LG.)	Includes
*		1	TUBE	
*		1	SLEEVE	
*		1	NUT	
*		1	SLEEVE	
*		1	NUT	
	X1887		BEARING ASSEM.-FUEL PUMP CRANKSHAFT (GEAR END)	Includes
*		1	BEARING	
1	C-4067	2	BUSHING	
	X1955		BEARING ASSEM. - CONNECTING ROD	Includes
*		1	BEARING (Foot)	
*		1	BEARING (Cap)	
1	C-7861-A	2	SHIM (1/16)	
1	C-7861-B	2	SHIM (1/32)	
1	C-7861-D	4	SHIM (.010)	
1	C-7861-E	8	SHIM (.005)	
2	C-2506L1 1/2	2	CAPSCREW	
3		2	CASTLE NUT -- 3/8-24-NF-Hex.	
		2	COTTER PIN -- 3/32 x 1 Lg.	
	X1957		COLUMN ASSEM. - JAHN'S GOVERNOR	Includes
*		1	COLUMN	
1	S-1106	2	STUD - Speed. Regulat. Bracket	
	X1958		DASH-POT ASSEM. - JAHN'S GOVERNOR	Includes
1	X1959	1	CYLINDER ASSEM. - Dash-Pot	
2	S-562	1	PISTON - Dash-Pot	
3	S-560	1	ROD-END - Piston Rod	
4		1	MACHINE SCREW -- 1/4-20 x 5/8 Lg.-Flat Hd.	
5	S-626	1	ROD - Piston	
6	S-561	1	PIN - Rod-End to Piston Rod	
7	S-646	1	COVER - Dash-Pot Cylinder	
8		4	CLOSE NIPPLE -- 1/8 Std. - (Brass)	
9		1	ELBOW -- 1/8 Std. - - (Brass)	
10	C-9847-P 1/8	1	ANGLE VALVE - Needle Point	
11		1	UNION -- 1/8 Std.	
	X1959		CYLINDER ASSEM.-JAHN'S GOV. DASH-POT	Includes
*		1	CYLINDER	
1	S-1108	1	STUD	
	X1960		LOCK ASSEM.-JAHN'S GOV. REGULATOR DISC	Includes
*		1	LOCK	
*		1	BUTTON	
	X1961		HOUSING ASSEM.-JAHN'S GOV. DRIVE GEAR	Includes
*		1	HOUSING	
1	C-2010L2 1/4	4	STUD - Gov. Column	
2		1	BUSHING - Drive Shaft--Bunting #E-422	
		1	PIPE PLUG -- 1/2 Std.	
	X1962		HOUSING ASSEM.-JAHN'S GOV. DRIVE GEAR	Includes
*		1	HOUSING	
1	C-2010L2 1/4	4	STUD - Gov. Column	
2		1	BUSHING-Drive Shaft--Bunting #E-422	
		1	PIPE PLUG -- 1/2 Std.	
	X1964		BLOCK ASSEM. - CYLINDER	Includes
*		1	BLOCK	
1	C-6466	24	STUD - Cyl. Head	
2	C-6465	12	STUD - Cyl. Head (Tapped)	
3	C-2008L3 3/4	3	STUD - Side Door	
5	S-2392	6	PIN - Side Door Dowel	
6	610-RB3	36	PIPE - Cyl. to Head Water By-Pass	
	X1967		COVER ASSEM.-JAHN'S GOV. COLUMN UPPER BEARING	Includes
*		1	COVER	
1		1	OIL SEAL -- National Motor Brg. Co. #60151	
	X1968		HOUSING ASSEM. - LUBE OIL PUMP	Includes
*		1	HOUSING	
1		2	BUSHING -- Bunting No. D262	
	X2223		BEARING ASSEM. - CAMSHAFT	Includes
*		1	BEARING	
1	685-C	1	BUSHING	

NEG. NO. AL64
ISSUE NO. 2
ENG. SIZE 9 x 10 1/2

ATLAS IMPERIAL
DIESEL ENGINE CO.

SUB-ASSEMBLY LIST

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REF. NO.	PART NUMBER	NO. REQD	DESCRIPTION
	X2247		BRACKET ASSEM. - FAN BEARING — Includes
*		1	BRACKET
1	C-2010L2 5/8	4	STUD - Fan Bearing
	X2248		LINER ASSEM. - CYLINDER — Includes
*		1	LINER
1	S-2760	1	PIN - Dowel
	X2251		ACCUMULATOR ASSEM. - FUEL OIL — Includes
*		1	TUBE
*		2	PLUG (End)
1	1170-RB3	10	FITTING
	X2252		ACCUMULATOR ASSEM. - FUEL OIL — Includes
*		1	TUBE
*		2	PLUG (End)
1	1170-RB3	12	FITTING
	X2281		MANIFOLD ASSEM. - AIR INLET — Includes
*		1	MANIFOLD
*		4	FLANGE
	X2282		MANIFOLD ASSEM. - AIR INLET — Includes
*		1	MANIFOLD
*		6	FLANGE
	X2371		BEARING ASSEM.-AIR START. WEDGE SHAFT — Includes
*		1	BEARING
1	C-2206L2 1/4	1	STUD
	X2506		CRANKSHAFT ASSEMBLY — Includes
*		1	CRANKSHAFT
*		20	STUD - Counter-weight
*		10	COUNTERWEIGHT
*		20	NUT -- 7/8-14-NF-Hex.
*		10	CAPSCREW(Babbitt Retain.)--1/2-13-NC x 3/4 Lg.
1	660-KXH6	1	GEAR - Crankshaft
2	S-1196	1	PIN - Gear to Crankshaft Dowel
3	C-3884	6	STUD - Flywheel
4	4842	1	THROWER - Oil (Flywheel End)
5		1	MACHINE SCREW--1/4-20 x 1/2 Lg.-Flat Hd.
6	P-2408	1	THROWER - Oil (Gear Case End)
	X2507		BLOCK ASSEM. - CYLINDER — Includes
*		1	BLOCK
1	C-6466	20	STUD - Cyl. Head
2	C-6465	10	STUD - Cyl. Head (Tapped)
3	C-2006L3 3/4	2	STUD - Side Door (Large Door)
4	C-2006L2	2	STUD - Side Door (Small Door)
5	S-2592	4	PIN - Side Door Dowel
6	610-RB3	30	PIPE - Cyl. to Head Water By-Pass
	X2508		MANIFOLD ASSEM. - AIR INLET — Includes
			Manifold & Flanges (No Service Parts)
	X2509		MANIFOLD ASSEM. - AIR STARTING — Includes
1	C-7412	5	FLANGE - Man. to Cylinder Head
2		5	NIPPLE - Man. to Flange--1 1/4 x 2 1/2 Lg.
3		5	TEE -- 1 1/4 Std. Pipe
4		5	NIPPLE -- 1 1/4 x 12 3/4 Lg.
5		1	NIPPLE (Center)--1 1/4 x 13 3/4 Lg.
	X2512		CAMSHAFT ASSEMBLY — Includes
*		1	CAMSHAFT
1	670B-KXH	1	COUPLING
2	5356	1	KEY - Coupling
	X2605		VALVE & CAGE ASSEM. - PUMP SUCTION & DISCHARGE — Includes
1	X2608	1	CAGE ASSEMBLY
2	S-579	1	VALVE - Suction
3	S-581	1	SPRING - Suction Valve
4	S-583	1	WASHER - Spring Retainer
		1	COTTER PIN -- 1/16 x 1/2 Lg.
6	C-9585	1	CAP - Suction Valve Stem
7	C-9534	1	VALVE - Discharge
	X2608		CAGE ASSEM.-FUEL PUMP SUCTION & DISCHARGE VALVE — Includes
			Cage & Seat (No Service Parts)
	X2640		COVER ASSEM. - CENTERFRAME & BASE END — Includes
*		1	COVER
1		1	OIL SEAL -- National Motor Brg. Co. No. 65107
	X2641		CRANKSHAFT ASSEMBLY — Includes
*		1	CRANKSHAFT
1	F-5623	1	THROWER - Oil (Flywheel End)
2		1	MACHINE SCREW--1/4-20 x 1/2 Lg.-Flat Hd.
3	C-6272	6	STUD - Flywheel
	X2707		MANIFOLD ASSEM. - AIR INLET — Includes
			Manifold & Flanges (No Service Parts)
	X2709		MANIFOLD ASSEM. - WATER OUTLET — Includes
*		1	MANIFOLD
1	T88-KXH6	4	ELBOW
2	C-7571	2	ELBOW
3		2	PIPE PLUG -- 3/8 Std.
	X2710		MANIFOLD ASSEM. - WATER OUTLET — Includes
*		1	MANIFOLD
1	T88-KXH6	3	ELBOW
2	C-7571	2	ELBOW
		2	PIPE PLUG -- 3/8 Std.
	X2738		BEARING ASSEM.-CAMSHAFT(GEAR CASE END) — Includes
*		1	BEARING
1	688-C	1	BUSHING
	X2739		BEARING ASSEM. - CAMSHAFT (FLY. END) — Includes
*		1	BEARING
1	C-308	1	BUSHING
	X2765		MANIFOLD ASSEM. - LUBE OIL — Includes
			Pipe & Tees (No Service Parts)
	X2766		CAMSHAFT ASSEMBLY — Includes
*		1	CAMSHAFT
1	670B-KXH	1	COUPLING
2	5356	1	KEY - Coupling
	X2767		MANIFOLD ASSEM. - AIR STARTING — Includes
1	C-7412	4	FLANGE
2		4	NIPPLE (Vertical) -- 1 1/4 x 2 1/2 Lg.
3		4	TEE -- 1 1/4 Std. Pipe
4		2	NIPPLE -- 1 1/4 x 12 3/4 Lg.
5		1	NIPPLE (Center) -- 1 1/4 x 13 3/4 Lg.
	X2773		ROD ASSEM. - FUEL PUMP CONNECTING — Includes
*		1	ROD
*		1	CAP
1	C-4068-D	4	SHIM - Cap to Rod - (.010)
1	C-4068-S	8	SHIM - Cap to Rod - (.003)
3	C-4069	2	BOLT
4		2	CASTLE NUT -- 3/8-24-NF-Hex.
4		2	COTTER PIN -- 3/32 x 3/4 Lg.
5	2045-F	1	BEARING - Crosshead Pin
	X2824		CRANKSHAFT ASSEMBLY — Includes
*		1	CRANKSHAFT
1	660-KXH6	1	GEAR
2	S-1196	1	PIN - Gear to Crankshaft Dowel
3	C-6272	6	STUD - Flywheel
4	4842	1	THROWER - Oil (Fly. End)
5		1	MACHINE SCREW--1/4-20-NC x 1/2 Lg.-Flat Hd.
6	P-2408	1	THROWER - Oil (Gear End)
	X2843		BASE ASSEMBLY — Includes
*		1	BASE
1	C-9879	5	CONNECTOR - Crank. Bear. Oil Tube
2	S-3280	14	STUD - Crank. Bear. Cap
3	C-5522L25	10	STUD - Base, Centerframe & Cyl. Block
4	S-2918	5	PIN - Crank. Bear. Shell Dowel
5	T13-KXH	3	CAP - Crank. Bearing
6	T12-KXH	2	CAP - Crank. Bear. (Center & Fly. End)
7	C-30	14	NUT - Bearing Cap
7		14	COTTER PIN -- 1/8 x 1 1/2 Lg.
	X2844		BASE ASSEMBLY (DRY SUMP) — Includes
*		1	BASE
1	C-9879	5	CONNECTOR - Crank. Bear. Oil Tube
2	S-3280	14	STUD - Crankshaft Bear. Cap
3	C-5522L25	10	STUD - Base, Centerframe & Cyl. Block
4	S-2918	5	PIN - Crank. Bear. Shell Dowel
5	T13-KXH	3	CAP - Crank. Bearing
6	T12-KXH	2	CAP - Crank. Bear. (Center & Fly. End)
7	C-30	14	NUT - Bearing Cap
7		14	COTTER PIN -- 1/8 x 1 1/2 Lg.

ASSEM. LIST NEGATIVE NO. AL 65

ATLAS IMPERIAL DIESEL ENGINE CO. SUB-ASSEMBLY LIST

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REF. NO.	PART NO.	NO. REQD.	DESCRIPTION	
	X2845		CRANKSHAFT ASSEMBLY	Includes
*		1	CRANKSHAFT	
1	660-KX86	1	GEAR - Crankshaft	
2	S-1196	1	PIN - Gear to Crank. Dowel	
3	C-6272	6	STUD - Flywheel	
4	4842	1	THROWER - Oil (Fly. End)	
5		1	MACHINE SCREW--1/4-20-NC x 1/2 Lg.-Flat Hd.	
6	F-2408	1	THROWER - Oil (Gear End)	
	X2846		BLOCK ASSEM. - CYLINDER	Includes
*		1	BLOCK	
1	C-6486	16	STUD - Cyl. Head	
2	C-6485	8	STUD - Head (Tapped)	
3	C-2006L3 3/4	2	STUD - Side Door	
5	S-2392	4	PIN - Side Door Dowel	
6	610-883	24	PIPE - Cyl. to Head Water By-Pass	
	X2847		MANIFOLD ASSEM. - EXHAUST	Includes
*		1	MANIFOLD	
1	C-2012L3	8	STUD - End Flange	
		5	PIPE PLUG -- 1 1/4 Std.	
	X2886		PIPE ASSEM. - LUBE OIL SUCTION	Includes
*		1	ELBOW	
*		1	PIPE (Upper)	
*		1	PIPE (Lower)	
	X2887		GAGE ASSEM. - LUBE OIL LEVEL	Includes
*		1	ADAPTOR	
*		1	ROD	
*		1	PIN - Rod to Adaptor	
*		1	PIN - Handle	
	X2888		BASE ASSEMBLY -- (SEPARATE SUMP)	Includes
*		1	BASE	
1	C-9879	5	CONNECTOR - Crank. Bear. Oil Tube	
2	S-3280	14	STUD - Crank. Bear. Cap	
3	C-6522L25	10	STUD - Base, Centerframe & Cyl. Block	
4	S-2918	5	PIN - Crank. Bear. Shell Dowel	
5	713-KXH	3	CAP - Crank. Bearing	
6	712-KXH	2	CAP - Crank. Bear. -(Center & Fly. End)	
7	C-30	14	NUT - Crank. Bearing Cap	
7		14	COTTER PIN -- 1/8 x 1 1/2 Lg.	
	X2889		BASE ASSEMBLY -- (SEPARATE SUMP)	Includes
*		1	BASE	
1	C-9879	5	CONNECTOR - Crank. Bear. Oil Tube	
*2	S-3280	14	STUD - Crank. Bear. Cap	
3	C-6522L25	10	STUD - Base, Centerframe & Cyl. Block	
4	S-2918	5	PIN - Crank. Bear. Shell Dowel	
5	713-KXH	3	CAP - Crank. Bearing	
6	712-KXH	2	CAP - Crank. Bear. - (Center & Fly. End)	
7	C-30	14	NUT - Crank. Bearing Cap	
7		14	COTTER PIN -- 1/8 x 1 1/2 Lg.	
	X3004		LEVER ASSEM. - OVERSPEED GOV. LATCH CONTROL	Includes
*		1	LEVER	
1	2C1359	1	ROLLER	
2	C-3190	1	PIN - Roller to Lever	
	X3008		HOUSING ASSEM. - GOVERNOR DRIVE	Includes
*		1	HOUSING	
1	C-2106L2 3/4	4	STUD - Governor	
2	5981	1	BUSHING - Gov. Drive Shaft	
3		2	WELCH PLUG -- 3/4 Std.	
	X3009		SPACER ASSEM. - GOV. DRIVE HOUSING	Includes
*		1	SPACER	
1	5934	1	BUSHING - Gov. Drive Shaft	
	X3010		SLEEVE ASSEM. - WEDGE SHAFT THROW-OUT	Includes
*		1	SLEEVE	
*		1	STUD	
	X3017		HOUSING ASSEM. - GOVERNOR DRIVE	Includes
*		1	HOUSING	
1	C-2106L2 3/4	4	STUD - Governor	
2	5981	1	BUSHING - Gov. Drive Shaft	
3		2	WELCH PLUG -- 3/4 Std.	
	X3024		ADAPTOR ASSEM. - FUEL TRANSFER PUMP	Includes
*		1	ADAPTOR	
1	2C1450	1	BUSHING	
*		1	BEARING - Pump Shaft	
2	C-9882	2	BUSHING - Pump Shaft Bearing	
3	2087-P	2	OIL SEAL	
4	2C1449	1	GASKET - Bearing to Adaptor	
		3	CAPSCREW -- 3/8-16-NC x 1 Lg.	
		3	LOCKWASHER -- 3/8 SAE Reg.	

REF. NO.	PART NO.	NO. REQD	DESCRIPTION	
	X3026		BASE ASSEM.-(WET OR DRY BASE - NO SUMP)	Includes
*		1	BASE	
8	C-3106	1	CONNECTOR - Crank. Brg. Oil (Fly. End)	
1	C-9879	9	CONNECTOR - Crank. Brg. Oil Tube	
2	S-3280	22	STUD - Crank. Bear. Cap	
3	C-6522L25	18	STUD - Base, Centerframe & Cyl. Block	
4	S-2918	10	PIN - Crank. Bear. Shell Dowel	
5	713-KXH	9	CAP - Crank. Bearing	
6	712-KXH	1	CAP - Crank. Bearing (Center)	
7	C-30	22	NUT - Crank. Bearing Cap	
7		22	COTTER PIN -- 1/8 x 1 1/2 Lg.	
	X3027		MANIFOLD ASSEM. - LUBE OIL	Includes
*		1	PIPE	
*		2	TEE (End)	
*		2	TEE (Inlet)	
*		8	TEE (Outlet)	
	X3049		STRAINER ASSEM. - LUBE OIL	Includes
*		1	BODY	
*		1	SCREEN (Side)	
*		1	SCREEN (Bottom)	
	X3050		MANIFOLD ASSEM. - LUBE OIL	Includes
*		1	PIPE	
*		1	TEE (End)	
*		1	TEE (End)(Man. In.)	
*		4	TEE - (Outlet	
	X3051		MANIFOLD ASSEM. - LUBE OIL	Includes
*		1	PIPE	
*		2	TEE (End)	
*		1	TEE (Inlet)	
*		4	TEE (Outlet)	
	X3052		CRANKSHAFT ASSEMBLY	Includes
*		1	CRANKSHAFT	
*		20	STUD - Counter-weight	
*		10	COUNTER-WEIGHT	
*		20	NUT -- 7/8-14-NF-Hex.	
*		10	CAPSCREW(Babbitt Retain.)-1/2-13 x 3/4 Lg.	
1	660-KX86	1	GEAR - Crankshaft	
2	S-1196	1	PIN - Gear to Crank. Dowel	
3	C-6272	6	STUD - Flywheel	
4	4842	1	THROWER - Oil (Flywheel End)	
5		1	MACHINE SCREW--1/4-20 x 1/2 Lg.-Flat Hd.	
6	F-2408	1	THROWER - Oil (Gear Case End)	
	X3053		BASE ASSEM.-(WET OR DRY BASE - NO SUMP)	Includes
*		1	BASE	
1	C-9879	6	CONNECTOR - Crank. Brg. Oil Tube	
2	S-3280	16	STUD - Crank. Bear. Cap	
3	C-6522L25	12	STUD - Base, Centerframe & Cyl. Block	
4	S-2918	6	PIN - Crank. Bear. Shell Dowel	
5	713-KXH	4	CAP - Crank. Bearing	
6	712-KXH	2	CAP - Crank. Bearing (Center)	
7	C-30	16	NUT - Crank. Bearing Cap	
7		16	COTTER PIN -- 1/8 x 1 1/2 Lg.	
	X3056		MANIFOLD ASSEM. - EXHAUST	Includes
*		1	MANIFOLD	
1	C-2012L3	4	STUD - End	
		2	PIPE PLUG -- 1 1/4 Std.	
	X3061		BASE ASSEM.-(WET OR DRY BASE - NO SUMP)	Includes
*		1	BASE	
1	C-9879	7	CONNECTOR - Crank. Brg. Oil Tube	
2	S-3280	18	STUD - Crank. Bear. Cap	
3	C-6522L25	14	STUD - Base, Centerframe & Cyl. Block	
4	S-2918	7	PIN - Crank. Bear. Shell Dowel	
5	713-KXH	5	CAP - Crank. Bearing	
6	712-KXH	2	CAP - Crank. Bearing (Center)	
7	C-30	18	NUT - Crank. Bearing Cap	
7		18	COTTER PIN -- 1/8 x 1 1/2 Lg.	
	X3068		BODY ASSEM. - GOVERNOR	Includes
*		1	BODY	
1	S-905	1	PINION	
2		1	WOODRUFF KEY -- 1/8 x 5/8 Std.	
	X3086		GLAND ASSEM.-WATER PUMP SHAFT PACKING	Includes
*		2	GLAND - Packing	
	X3090		LEVER ASSEM.-OVERSPEED GOV. LATCH CONTROL-	Includes
*		1	LEVER	
1	2C1359	1	ROLLER	
2	C-3190	1	PIN - Roller to Lever	

NEG. No. AL66 3
ISSUE No.
ENG. SIZE 9 x 10 1/2

ATLAS IMPERIAL DIESEL ENGINE CO.

SUB-ASSEMBLY LIST

ALWAYS GIVE - ENGINE NO. - PART NAME - PART NUMBER OR COMPLETE DESCRIPTION AND SIZE
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REF No.	PART NUMBER	No. REQ'D	DESCRIPTION
	X3092		GAGE ASSEM. - LUBE OIL LEVEL Includes
			Adaptor, Rod & Pins (No Service Parts)
	X3180		BASE ASSEM. - (SEPARATE OIL SUMP) Includes
*		1	BASE
1	C-9879	6	CONNECTOR - Crank. Brg. Oil Tube
2	S-3280	16	STUD - Crank. Brg. Cap
3	C-5522L25	12	STUD - Base, Centerframe & Cyl. Block
4	S-2918	6	PIN - Crank. Brg. Shell Dowel
5	713-KXH	4	CAP - Crank. Bearing
6	712-KXH	2	CAP - Crank. Bearing (Center)
7	C-30	16	NUT - Crank. Bearing Cap
7		16	COTTER PIN -- 1/8 x 1 1/2 Lg.
	X3189		COVER ASSEM. - CYLINDER HEAD Includes
1	K-534	1	COVER (Lower)
2	K-535	1	COVER (Upper)
3		2	HINGES -- Stanley #936 (2 1/8 x 4 7/8 Open) Tight Pin
		12	MACHINE SCREW--1/4-20 x 3/4 Lg.-Flat Hd.
		12	NUT -- 1/4-20-Hex.
		12	LOCKWASHER -- 1/4 SAE Reg.
	X3195		BLOCK ASSEM. - GOVERNOR SPRING Includes
1	F-6391	1	BLOCK
2	C-543	1	PIN - Yoke
3	C-549	1	QUILL
4	C-4351	1	PIN - Quill to Block
	X3203		QUILL ASSEM. - GOVERNOR THRUST Includes
*		1	QUILL
1	C-545	1	PLATE - Thrust Quill
	X3204		GOVERNOR ASSEMBLY Includes
1	X5065	1	BODY ASSEM.
2	X270	2	WEIGHT ASSEM.
3	2C1820	2	PIN - Weight to Body
		4	CASTLE NUT -- 3/8-24-Hex.
		4	COTTER PIN -- 3/32 x 3/4 Lg.
4	X3203	1	QUILL ASSEM. - Thrust
5	C-548	1	KEY - Thrust Quill
6	5721	1	THRUST BEARING -- Bantam "OILITE"
7	2C1757	1	RETAINER - Bearing
8	2C2846L 7/8	1	SETSCREW
	X3205		STUD ASSEM. - CYLINDER HEAD COVER Includes
			Stud & Wing Nut (No Service Parts)
	X3225		HEAD ASSEM. - H.P. FUEL PUMP Includes
*		1	HEAD
1	2C1833L 1/8	1	PIPE PLUG
	X3226		HEAD ASSEM. - H.P. FUEL PUMP Includes
*		1	HEAD
1	2C1833L 1/8	1	PIPE PLUG
	X3227		PUMP ASSEM. - FUEL PRIMING Includes
*		1	BODY
*		1	PLUNGER
1		1	PACKING -- 1/8 Rd. x 7 Lg. - (Felro)
2	S-2065	1	WASHER - Packing
3	S-2064	1	NUT - Packing
	X3259		BASE ASSEM.-(DRY BASE - SEPARATE SUMP) Includes
*		1	BASE
1	C-9879	9	CONNECTOR - Crank. Brg. Oil Tube
2	S-3280	22	STUD - Crank. Bear. Cap
3	C-5522L25	18	STUD - Base, Centerframe & Cyl. Block
4	S-2918	10	PIN - Crank. Bear. Shell Dowel
5	713-KXH	9	CAP - Crank. Bearing
6	712-KXH	1	CAP - Crank. Bearing (Center)
7	C-30	22	NUT - Crank. Bearing Cap
7		22	COTTER PIN -- 1/8 x 1 1/2 Lg.
8	C-3106	1	CONNECTOR - Crank. Brg. Oil (Fly. End)
	X3266		BASE ASSEM. - (SEPARATE SUMP) Includes
*		1	BASE
1	C-9879	7	CONNECTOR - Crank. Brg. Oil Tube
2	S-3280	18	STUD - Crank. Bear. Cap
3	C-5522L25	14	STUD - Base, Centerframe & Cyl. Block
4	S-2918	7	PIN - Crank. Bear. Shell Dowel
5	713-KXH	5	CAP - Crank. Bearing
6	712-KXH	2	CAP - Crank. Bearing
7	C-30	18	NUT - Crank. Bearing Cap
7		18	COTTER PIN -- 1/8 x 1 1/2 Lg.

REF No.	PART NUMBER	No. REQ'D	DESCRIPTION
	X3279		BASE ASSEM.-(WET OR DRY BASE - NO SUMP) Includes
*		1	BASE
1	C-9879	7	CONNECTOR - Crank. Brg. Oil Tube
2	S-3280	18	STUD - Crank. Bear. Cap
3	C-5522L25	14	STUD - Base, Centerframe & Cyl. Block
4	S-2918	7	PIN - Crank. Bear. Shell Dowel
5	713-KXH	5	CAP - Crank. Bearing
6	712-KXH	2	CAP - Crank. Bearing - (Center)
7	C-30	18	NUT - Crank. Bearing Cap
7		18	COTTER PIN -- 1/8 x 1 1/2 Lg.
	X3280		BASE ASSEM. - (SEPARATE SUMP) Includes
*		1	BASE
1	C-9879	7	CONNECTOR - Crank. Brg. Oil Tube
2	S-3280	18	STUD - Crank. Bear. Cap
3	C-5522L25	14	STUD - Base, Centerframe & Cyl. Block
4	S-2918	7	PIN - Crank. Bear. Shell Dowel
5	713-KXH	5	CAP - Crank. Bearing
6	712-KXH	2	CAP - Crank. Bearing
7	C-30	18	NUT - Crank. Bearing Cap
7		18	COTTER PIN -- 1/8 x 1 1/2 Lg.
	X3334		WEIGHT ASSEM. - GOVERNOR Includes
*		1	WEIGHT
1	C-544	1	ROLLER
2	S-2899	1	PIN - Roller to Weight
	X3335		MANIFOLD ASSEM. - EXHAUST
			Includes Manifold & Retainer (No Service Parts)
	X3339		MANIFOLD ASSEM. - WATER OUTLET Includes
*		1	MANIFOLD
1	786-KXH6	8	ELBOW - Man. to Cyl. Head
	X3344		BASE ASSEM.-(WET OR DRY BASE - NO SUMP) Includes
*		1	BASE
8	C-3106	1	CONNECTOR - Crank. Brg. Oil (Fly. End)
1	C-9879	9	CONNECTOR - Crank. Brg. Oil Tube
2	S-3280	22	STUD - Crank. Bear. Cap
3	C-5522L25	18	STUD - Base, Centerframe & Cyl. Block
4	S-2918	10	PIN - Crank. Bear. Shell Dowel
5	713-KXH	9	CAP - Crank. Bearing
6	712-KXH	1	CAP - Crank. Bearing - (Center)
7	C-30	22	NUT - Crank. Bearing Cap
7		22	COTTER PIN -- 1/8 x 1 1/2 Lg.
	X3346		MANIFOLD ASSEM. - EXHAUST Includes
			Manifold & Ring Retainer (No Service Parts)
	X3348		BASE ASSEM.-(DRY BASE - SEPARATE SUMP) Includes
*		1	BASE
1	C-9879	9	CONNECTOR - Crank. Brg. Oil Tube
2	S-3280	22	STUD - Crank. Bear. Cap
3	C-5522L25	18	STUD - Base, Centerframe & Cyl. Block
4	S-2918	10	PIN - Crank. Bear. Shell Dowel
5	713-KXH	9	CAP - Crank. Bearing
6	712-KXH	1	CAP - Crank. Bearing - (Center)
7	C-30	22	NUT - Crank. Bearing Cap
7		22	COTTER PIN -- 1/8 x 1 1/2 Lg.
8	C-3106	1	CONNECTOR - Crank. Brg. Oil (Fly. End)
	X3361		ADAPTOR ASSEM. - FUEL TRANSFER PUMP Includes
*		1	ADAPTOR
1	2C2477	1	BUSHING
*		1	BEARING - Pump Shaft
2	C-9882	1	BUSHING - Pump Shaft Bearing (Gear End)
3	2C2477	1	BUSHING - Pump Shaft Bearing - (Seal End)
4	2C1449	1	GASKET - Bearing to Adaptor
		4	CAPSCREW -- 3/8-16-NC x 1 Lg.
		4	LOCKWASHER -- 3/8 SAE Reg.
	X3410		MANIFOLD ASSEM. - AIR INLET
			Includes Manifold & Flanges(No Service Parts)
	X3464		HOUSING ASSEM. - GOVERNOR Includes
*		1	HOUSING
*		1	COVER - Top
1	S-868	1	GASKET - Cover
		4	CAPSCREW -- 1/4-20-NC x 2 1/2 Lg.
	X3465		HOUSING ASSEM. - GOVERNOR Includes
*		1	HOUSING
*		1	COVER - Top
1	S-868	1	GASKET - Cover
		4	CAPSCREW -- 1/4-20-NC x 2 1/2 Lg.

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NEG. No. AL67
ISSUE No. 3
ENG. SIZE 9 x 10½

REF. No.	PART NUMBER	No. REQ.	DESCRIPTION	
	X3467		GOVERNOR ASSEMBLY	Includes
1	X3068	1	BODY ASSEM.	
2	X270	2	WEIGHT ASSEM.	
3	2C1820	2	PIN - Weight to Body	
		4	CASTLE NUT -- 3/8-24-NF-Hex.	
		4	COTTER PIN -- 3/32 x 3/4 Lg.	
4	X3203	1	QUILL ASSEM. - Thrust	
5	C-548	1	KEY - Thrust Quill	
6	5721	1	THRUST BEARING -- Bantam "OBLIQUE"	
7	2C1757	1	RETAINER - Bearing	
8	2C2846L 7/8	1	SETSCREW	
	X3501		GOVERNOR ASSEMBLY	Includes
1	X3068	1	BODY ASSEM.	
2	X3334	2	WEIGHT ASSEM.	
3	2C1820	2	PIN - Weight to Body	
		4	CASTLE NUT -- 3/8-24-Hex.	
		4	COTTER PIN -- 3/32 x 3/4 Lg.	
4	X3203	1	QUILL ASSEM. - Thrust	
5	C-548	1	KEY - Thrust Quill	
6	5721	1	THRUST BEARING -- Bantam "OBLIQUE"	
7	2C1757	1	RETAINER - Bearing	
8	2C2846L 7/8	1	SETSCREW	
	X3526		MANIFOLD ASSEM. - AIR INLET	Includes
			Manifold & Flanges (No Service Parts)	
	X3527		MANIFOLD ASSEM. - AIR INLET	Includes
			Manifold & Flanges (No Service Parts)	
	X3528		CRANKSHAFT ASSEMBLY	Includes
*		1	CRANKSHAFT	
1	660-KXH6	1	GEAR	
2	S-1196	1	PIN - Gear to Crankshaft Dowel	
3	C-3884	6	STUD - Flywheel	
4	4842	1	THROWER - Oil - (Fly. End)	
5		1	MACHINE SCREW--1/4-20-NC x 1/2 Lg.-Flat Hd.	
6	F-2408	1	THROWER - Oil - (Gear End)	
	X3529		CRANKSHAFT ASSEMBLY	Includes
*		1	CRANKSHAFT	
1	F-5623	1	THROWER - Oil (Fly. End)	
2		1	MACHINE SCREW--1/4-20 x 1/2 Lg.-Flat Hd.	
3	C-3884	6	STUD - Flywheel	
	X3530		HOUSING ASSEM. - LUBE OIL PUMP	Includes
*		1	HOUSING	
1		2	BUSHING - Bunting No. B252 -(Bronze)	
	X3531		HOUSING ASSEM. - LUBE OIL PUMP	Includes
*		1	HOUSING	
1		2	BUSHING - Bunting No. B464 - (Bronze)	
	X3532		PIPE ASSEM. - LUBE PUMP SUCTION	Includes
			Pipe & Flanges (No Service Parts)	
	X3533		PIPE ASSEM. - LUBE PUMP SUCTION	Includes
			Pipe & Flanges (No Service Parts)	
	X3534		PIPE ASSEM. - LUBE PUMP SUCTION	Includes
			Pipe & Flanges (No Service Parts)	
	X3535		PIPE ASSEM. - LUBE PUMP SUCTION	Includes
			Pipe & Flange (No Service Parts)	
	X3536		PIPE ASSEM. - LUBE PUMP DISCHARGE	Includes
			Pipe & Flanges (No Service Parts)	
	X3537		PIPE ASSEM. - LUBE PUMP DISCHARGE	Includes
			Pipe & Flanges (No Service Parts)	
	X3538		PIPE ASSEM. - LUBE PUMP DISCHARGE	Includes
			Pipe & Flanges (No Service Parts)	
	X3539		PIPE ASSEM. - FILTER INLET (LUBE)	Includes
			Pipe & Flanges (No Service Parts)	
	X3540		PIPE ASSEM. - COOLER INLET (LUBE)	Includes
			Pipe & Flanges (No Service Parts)	
	X3541		PIPE ASSEM. - COOLER INLET (LUBE)	Includes
			Pipe & Flanges (No Service Parts)	
	X3542		PIPE ASSEM. - COOLER OUTLET (LUBE)	Includes
			Pipe & Flanges (No Service Parts)	
	X3543		PIPE ASSEM. - LUBE OIL	Includes
			Pipe, Flange & Adaptor (No Service Parts)	
	X3544		PIPE ASSEM. - BASE INLET (LUBE)	Includes
			Pipe, Flanges & Coupling (No Service Parts)	
	X3545		PIPE ASSEM. - BASE INLET (LUBE)	Includes
			Pipe & Flanges (No Service Parts)	
	X3546		PIPE ASSEM. - BASE INLET (LUBE)	Includes
			Pipe & Flanges (No Service Parts)	
	X3547		PIPE ASSEM. - BASE INLET (LUBE)	Includes
			Pipe & Flanges (No Service Parts)	
	X3548		PIPE ASSEM. - BASE INLET (LUBE)	Includes
			Pipe & Flanges (No Service Parts)	
	X3549		PIPE ASSEM. - BASE INLET (LUBE)	Includes
			Nipple & Flange (No Service Parts)	
	X3550		PIPE ASSEM. - PUMP TO FILTER (FUEL)	Includes
			Pipe & Flanges (No Service Parts)	
	X3551		PIPE ASSEM. - PUMP TO FILTER (FUEL)	Includes
			Pipe & Flanges (No Service Parts)	
	X3552		PIPE ASSEM. - PUMP TO FILTER (FUEL)	Includes
			Pipe & Flanges (No Service Parts)	
	X3553		PIPE ASSEM.-FILTER TO H.P. PUMP (FUEL)	Includes
			Pipe & Flanges (No Service Parts)	
	X3554		PIPE ASSEM.-FILTER TO H.P. PUMP (FUEL)	Includes
			Pipe & Flanges (No Service Parts)	
	X3555		PIPE ASSEM.-FILTER TO H.P. PUMP (FUEL)	Includes
			Pipe & Flanges (No Service Parts)	
	X3556		MANIFOLD ASSEM. - H.P. FUEL PUMP INLET	Includes
			Nipples, Tee, Elbow & Flange(No Service Parts)	
	X3557		PIPE ASSEM. - FUEL REG. VALVE OUTLET	Includes
			Nipple & Flange (No Service Parts)	
	X3558		PIPE ASSEM. - FUEL REG. VALVE OUTLET	Includes
			Pipe & Flanges (No Service Parts)	
	X3559		PIPE ASSEM. - FUEL REG. VALVE OUTLET	Includes
			Pipe & Flanges(No Service Parts)	
	X3560		PIPE ASSEM. - FUEL REG. VALVE OUTLET	Includes
			Pipe & Flanges (No Service Parts)	
	X3561		COVER ASSEM. - OIL SUMP (BOTTOM)	Includes
			Cover & Pipe (No Service Parts)	
	X3562		COVER ASSEM. - OIL SUMP (BOTTOM)	Includes
			Cover & Pipe (No Service Parts)	
	X3563		NIPPLE ASSEM. - HEAT EXCHANGER INLET	Includes
			Nipple & Pipe Coupling (No Service Parts)	

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REF No.	PART NUMBER	No. REQ'D	DESCRIPTION
	X3564		ROCKER ASSEM. - SPRAY VALVE (LONG) Includes
*		1	ROCKER
1	2C2838	2	BUSHING
2	S-2831	1	SCREW - Adjusting
		1	HALF NUT -- 1/2-20-NF-Hex.
		1	CAPSCREW -- 3/8-16-NC x 1 Lg.
	X3565		ROCKER ASSEM. - INLET Includes
*		1	ROCKER
1	2C2838	2	BUSHING
2	527-E25	1	BALL
3	884-E	1	ROLLER
4	C-6464	1	PIN - Shoulder
		1	COTTER PIN -- 1/8 x 1 Lg.
	X3566		ROCKER ASSEM. - EXHAUST Includes
*		1	ROCKER
1	2C2838	2	BUSHING
2	527-E25	1	BALL
3	884-E	1	ROLLER
4	C-6464	1	PIN - Shoulder
		1	COTTER PIN -- 1/8 x 1 Lg.
	X3567		HEAD ASSEM. - CYLINDER Includes
*		1	HEAD - Cylinder
		12	PIPE PLUG -- 1 Std.
		2	PIPE PLUG -- 1 1/2 Std.
1	2C2841	2	BUSHING - In. & Exh. Valve
2	S54A-E	1	STUD - Spray Valve Clamp
3	2C3112L8 1/8	2	STUD - Rocker Shaft Bearing
	X3568		HEAD ASSEM. - CYLINDER Includes
1	X3567	1	HEAD ASSEM.
2	P-4961	1	VALVE - Inlet
3	P-4960	1	VALVE - Exhaust
4	2C2839	2	SPRING - Valve (Inner)
5	513-E	2	SPRING - Valve (Outer)
6	2C2843	2	RETAINER - Valve Spring
7	C-6461	4	LOCK - Valve Spring Retainer
8	580-KX86	1	VALVE - Air Starting
9	585-E3	1	BUSHING - Valve
10	C-2152L1 1/2	2	RING - Piston
11	C-6468	1	BUSHING - Spring
12	582-E	1	SPRING
13	583-F2C4	1	WASHER - Spring (Top)
14	589-KX86	1	WASHER - Air Start. Valve Spring (Lower)
15		1	NUT -- 5/8-18-NF-Hex.
16	2C2842	2	FELT - In. & Exh. Valve Stem Oil
17	2C2840	2	RETAINER - In. & Exh. Valve Stem Oil Felt & Spring Seat)
	X3569		SHAFT ASSEM. - VALVE ROCKER Includes Shaft & Pipe Plugs (No Service Parts)
	X3570		NIPPLE ASSEM. - HEAT EXCHANGER INLET Includes Nipple & Pipe Coupling (No Service Parts)
	X3571		PIPE ASSEM. - PUMP SUCTION Includes Pipe & Pipe Coupling (No Service Parts)
	X3572		MANIPOLD ASSEM. - WATER OUTLET Includes
*		1	MANIPOLD
1	788-KX86	8	ELBOW
	X3576		PIPE ASSEM. - LUBE OIL Includes Nipple, Flange & Reducing Bushing(No Service Parts)
	X3577		PIPE ASSEM. - LUBE OIL Includes Nipple & Flange (No Service Parts)
	X3578		PIPE ASSEM.-LUBE FILTER TO FOUR WAY COCK -Includes Pipe & Flanges (No Service Parts)
	X3579		PIPE ASSEM.-LUBE FILTER TO FOUR WAY COCK Includes Pipe & Flanges (No Service Parts)
	X3580		PIPE ASSEM.-LUBE FILTER TO FOUR WAY COCK Includes Pipe & Flanges (No Service Parts)
	X3603		MANIPOLD ASSEM. - WATER OUTLET Includes
*		1	MANIPOLD
1	788-KX86	6	ELBOW

REF No.	PART NUMBER	No. REQ'D	DESCRIPTION
	X3605		VALVE ASSEM. - FUEL ISOLATING Includes
*		1	BODY
1	1206-C31	1	STEM
2		3	PACKING -- 1/2 O.D. x 1/4 I.D. x 1/4 Wide - Garlock #333
3	866-E	1	GLAND - Packing
4	1206-C3	1	NUT - Packing Gland
	X5014		TUBE ASSEM.-H.P. FUEL(1/4 O.D. x 40 LG.) Includes Tube, Sleeves & Nuts(No Service Parts)
	X5045		TUBE ASSEM.-H.P. FUEL (1/4 O.D. x 24 LG.) Includes Tube, Sleeves & Nuts(No Service Parts)
	X5096		TUBE ASSEM.-H.P. FUEL (1/4 O.D. x 38 LG.) Includes Tube, Sleeves & Nuts(No Service Parts)
	X5097		TUBE ASSEM.-H.P. FUEL (1/4 O.D. x 68 LG.) Includes Tube, Sleeves & Nuts(No Service Parts)
	X5100		TUBE ASSEM.-H.P. FUEL (1/4 O.D. x 21 LG.) Includes Tube, Sleeves & Nuts(No Service Parts)
	X5106		TUBE ASSEM.-H.P. FUEL (1/4 O.D. x 16 LG.) Includes Tube, Sleeves & Nuts(No Service Parts)
	X5134		TUBE ASSEM.-H.P. FUEL(1/4 O.D. x 30 LG.) Includes Tube, Sleeves & Nuts(No Service Parts)
	X5167		ROCKER ASSEM. - SPRAY VALVE (LONG) Includes
*		1	ROCKER
1	S-2070	2	BUSHING
2	S-2831	1	SCREW - Adjust.
		1	HALF NUT -- 1/2-20-NF-Hex.
		1	CAPSCREW -- 5/8-16-NC x 1 Lg.
	X5227		HANDLE ASSEM.-GOVERNOR SPEED CONTROL Includes
1	1117-E	1	HANDLE (Upper Sect.)
2	S-2910	1	HANDLE (Lower Sect.)
3	1249-E	1	SCREW - Handle to Handle
		1	HALF NUT -- 1/4-20-NC-Hex.
4	1118-E1	1	PAWL
5		1	TAPER PIN (Pawl Retain.) -- #1 x 1 Lg.
6	1124-E	1	SPRING - Pawl
7	1125-E	1	PLUG - Spring Retainer
	X5343		ROCKER ASSEM. - SPRAY VALVE (SHORT) Includes
*		1	ROCKER
1	S-3239	1	BUSHING
	X5353		BODY ASSEM. - H.P. FUEL PUMP Includes Body & Plunger(No Service Parts)
	X5390		STEM ASSEM. - ACCUMULATOR VALVE Includes Stem & Handle (No Service Parts)
	X6008		TUBE ASSEM.-H.P. FUEL (1/4 O.D. x 7 1/2 LG.) Includes Tube, Sleeves & Nuts(No Service Parts)
	X6010		TUBE ASSEM.-H.P. FUEL (1/4 O.D. x 45 Lg.) Includes Tube, Sleeves & Nuts(No Service Parts)
	X6011		TUBE ASSEM.-H.P. FUEL (1/4 O.D. x 80 LG.) Includes Tube, Sleeves & Nuts (No Service Parts)
	X6013		TUBE ASSEM.-H.P. FUEL (1/4 O.D. x 18 LG.) Includes Tube, Sleeves & Nuts (No Service Parts)

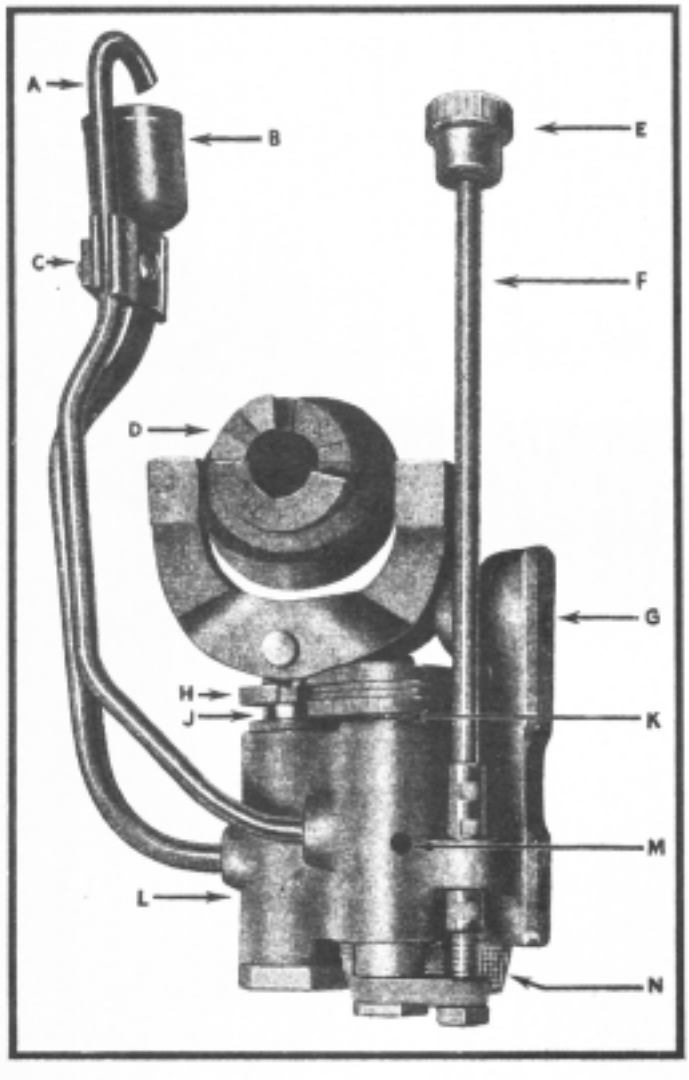
INSTRUCTION BOOK
and
REPAIR PARTS LIST

Model 50

MADISON-KIPP LUBRICATOR

MADISON-KIPP CORPORATION
Madison, Wisconsin, U. S. A.

The **MODEL 50** pumping unit illustrated in Figure 1 embodies a mechanical motion so ingenious as to deserve your special attention. The driving eccentric imparts to both forcing and metering plungers a reciprocating movement for pumping and an oscillating movement for valving. The angle of the eccentric ring groove is 27°. When the eccentric makes a complete revolution, the plungers make a total swing of 54°. The reciprocating movement or lift is .212". Oil intake and outlet ports register with grooves in the plungers as they travel their cycle.



A Sight Feed Tube which shows the amount of oil in drops according to the oil delivery adjustment setting.

B Sight Feed Oil Cup.

C Tube Clamps tying the tubes "A" and "B" together.

D Eccentric to impart the reciprocating and oscillating movement to the plungers *(See first paragraph above)*.

E Adjusting Button to regulate the amount of oil to be delivered per feed impulse.

F Adjusting Spindle.

G Oil Outlet from pumping unit.

H Gear for oscillating and lifting metering plunger in unison with forcing plunger.

J Plunger which forces the measured quantities of oil to the feed outlet.

K Metering Plunger which delivers oil to the sight feed cup.

L Body of pumping unit.

M By-Pass Opening—oil not delivered to the sight feed cup is by-passed back to the reservoir.

N Fine Strainer located at oil inlet of pumping unit.

Figure 1

INSTRUCTIONS FOR ATTACHING, OPERATING AND CARE OF MADISON-KIPP LUBRICATORS.

Madison-Kipp Model 50 Lubricators are built on one standard design, of any required size and number of feed outlets, and are applied universally to all types of steam, oil, and gas engines, steam pumps, air compressors, steam hammers, shovels, dredges and cranes, marine engines, steering engines, drilling engines, agricultural tractors, grain separators, machine tools, and special types of machinery.

The Sight Feed type is built with a visible feed and an individual fine adjustment for each pumping unit. The Blind Feed type is designed for service where fine adjustment and visible feed are not necessary. It can be adjusted, however, by means of employing different lengths on the ratchet arm.

Madison-Kipp Lubricators are built on the Kipp Valveless principle, which permits the pumping and forcing of oil without the use of ball and spring valves.

ATTACHING

The lubricator should be bolted down, using lock washers to prevent bolts from working loose. Try to avoid offset bends in the driving rod.

The driving arm should be clamped on the lubricator shaft so as to place the driving pawl located inside the lubricator in the center of the space available for the stroke. If possible, turn machine over by hand to check stroke and clearance.

The standard lubricator is provided with a 44-tooth ratchet wheel and would require 44 strokes to complete one revolution of the lubricator if connected to engage with one tooth of the ratchet per stroke. The recommended speed varies from four to twenty revolutions per minute, depending on the type and size of machine to be lubricated.

Oil Leads

Lubricators can be furnished with connections for either ¼" O.D. copper or brass tubing, or for ⅜" or ¼" iron pipe. Where many turns and bends are necessary, the copper or brass tubing is preferable. The tubing or pipe should be clean, ends free from burrs and cut to a length which will allow the connections between the lubricator and point to be lubricated to be as direct as possible. Care should be taken when bending tubing to avoid flattening, which would restrict the flow of oil. All joints should be tight, and tubing or pipe should be anchored securely to machine to avoid vibration. Where possible, arrange tubing to prevent exposure to the extreme cold. In making the joint, let the tubing extend through the ferrule into the connection at least ⅛".

OPERATION AND ADJUSTMENT

Fill the lubricator with *clean* oil and turn hand crank until each of the oil leads are filled with oil. At this time make an inspection of all the connections to see that no leaks occur.

Adjustment or regulation of the quantity of oil to be delivered for each revolution of the unit is accomplished by turning the adjusting button, located on the cover (Part C-880-A). Turning to the right (clockwise) decreases, and to the left (counter-clockwise) increases the amount of oil being forced to the point to be lubricated. Observation can be made through the transparent hood to see the amount delivered by each feed. A very close adjustment may be had. Turning the lubricator by means of the hand crank when making adjustment is recommended. When lubricator is first applied, it is recommended as a safe practice to leave lubricator set for maximum delivery of oil, cutting it down gradually with care if an oversupply is noted at the points to be lubricated.

CARE OF LUBRICATOR

The Madison-Kipp pumping unit is made of very accurately machined parts which function coördinately, contains no troublesome check valves and springs and for this reason requires no attention after final feed adjustments have been made, other than the care necessary to keep dirt out of the lubricator.

Field operators, while perhaps not intentionally careless, often make no provision for keeping oil containers, funnels, etc., free from dust and dirt. As foreign matter so collected is likely to find its way into the lubricator tank, it is recommended as standard practice to drain the oil out of the lubricator and clean out the reservoir with kerosene every thirty to ninety days, depending on usage. The following are our suggestions for attention at regular intervals:

Use only clean oil.

Keep the lubricator full of oil.

See that all connections are tight.

See that the oil pipes are supported where excessive vibration is developed.

See that the lubricator is securely bolted down.

Inspect lubricator to see that filler cup strainer has not been removed. This part should be taken out for cleaning purposes only.

Keep the sight feed hood clean.

Cleaning

1. To clean out reservoir or repair lubricator, it is necessary to remove lubricator from the engine by unscrewing the oil tube connections, loosening the driving arm and unscrewing the bolts at the bolting brackets.

2. Remove cover by first unscrewing all cover screws and then lifting the cover off with the aid of a screw driver used as a pry.

3. Remove drain plug and drain oil from lubricator reservoir.

The lubricator can then be thoroughly washed out with kerosene. Do not operate the lubricator any more than necessary while washing and see that all kerosene is removed before filling with fresh oil.

DISASSEMBLING AND ASSEMBLING

If it is desired to disassemble the lubricator for any reason, proceed as follows after removing cover:

1. Drive out the split end taper pin which is driven through the shaft next to the ratchet wheel.
2. You can now remove the shaft as far as desired by pulling the hand crank.
3. Loosen bearings at each end of the reservoir by unscrewing the check nut on the inside of the reservoir.
4. To remove the pumping unit, remove the connector to which the oil pipe was attached and the cap screw below this connector, both of which are located on the outside of the reservoir. With these screws removed and the shaft pulled out beyond the unit to be removed, the pumping unit can be lifted out.

If the plunger is removed from pumping unit, be sure it is replaced in the same barrel from which it was taken, as these parts are ground to an individual selective fit and are not interchangeable.

To assemble, reverse the above operation, and put together, being sure that all screws are tight and check nuts in place.

The eccentric clutch jaws are so designed that they can be assembled only the correct way.

Assemble eccentric and strap so that the part marked "R" is to the right when facing the flat surface of the unit which is applied to the side of the reservoir.

When putting on the cover, it is necessary to see that the flats of the adjusting spindle are all in the same position as the flat depressions in the adjusting buttons. The cover can then be pressed on very readily. Do not drive or force cover in place.

Before reattaching lubricator to machine, it would be well to fill the lubricator and check the quantity of oil being delivered, for during the cleaning and repairing operation it is possible that the adjustment was changed. Do this by noting the quantity of oil delivered through the sight feed tubes at one turn of the hand crank.

SHAFT BEARINGS

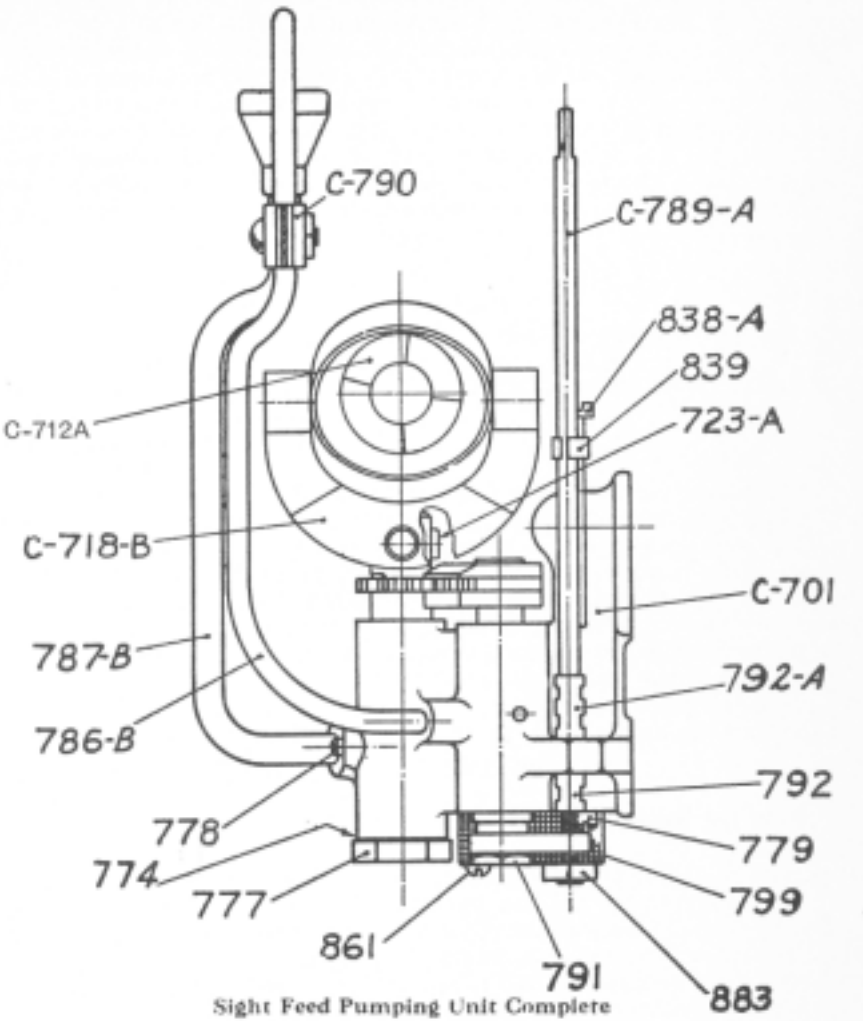
The shaft bearings are each provided with an adjustable stuffing box gland and check nut. Should a leakage develop at these points, unscrew the gland, put in a length of string packing, and replace gland, being careful to have check nut drawn up tight.

The pumping unit itself requires no packing.

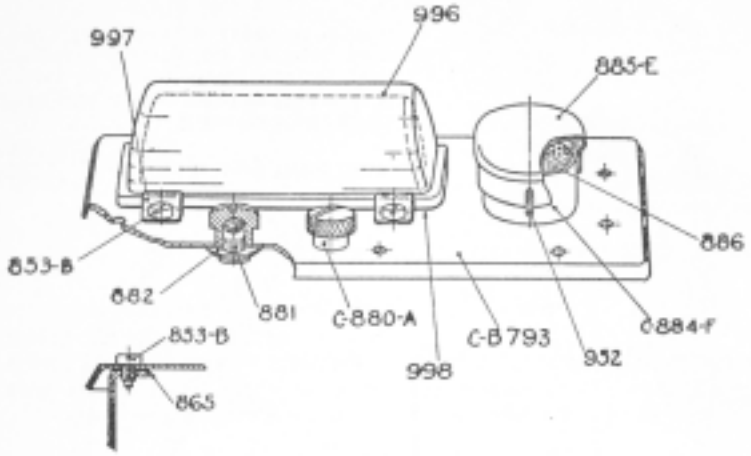
REPLACING GAUGE GLASS

To replace tubular gauge glass, after removing cover as instructed above, unscrew gauge glass plug screw, remove old gauge glass, and replace with new glass and new washers.

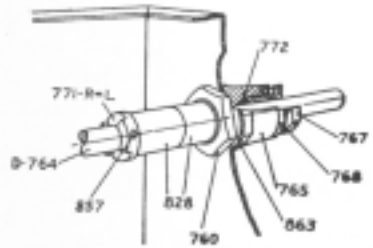
The bull's-eye design of gauge glass can be readily replaced from the outside without removing cover.



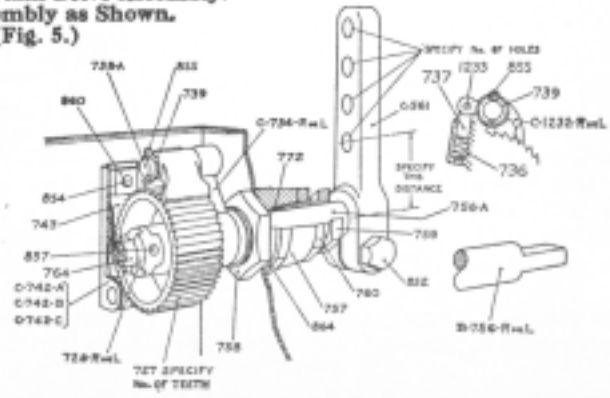
Sight Feed Pumping Unit Complete
(Fig. 3.)



Sight Feed Lubricator Cover. Symbol C—B793. Having Glass Hood L. H. as illustrated
(Fig. 7.)

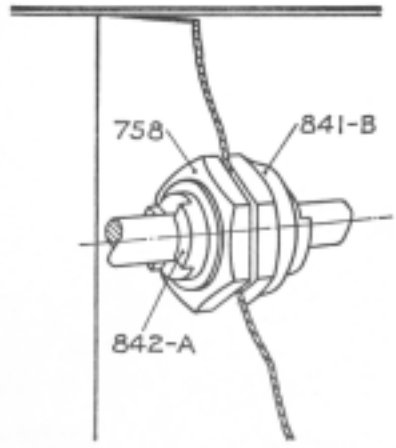


Drive End of Plain Drive Assembly. R. H. Assembly as Shown.
(Fig. 5.)



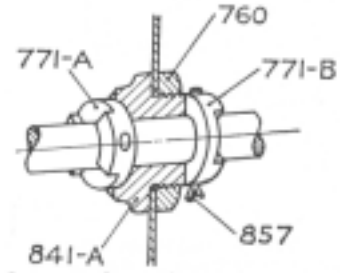
End ratchet drive assembly. Right hand assembly is shown, left hand would be on opposite end of reservoir.

(Fig. 10.)



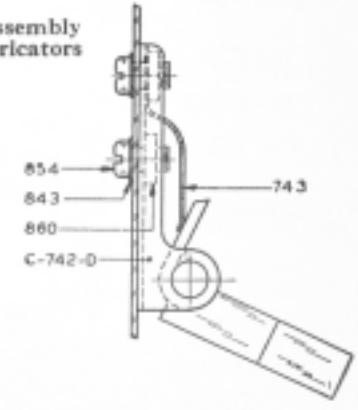
Intermediate bearing assembly for *single compartment* lubricators (New Style).

(Fig. 16.)



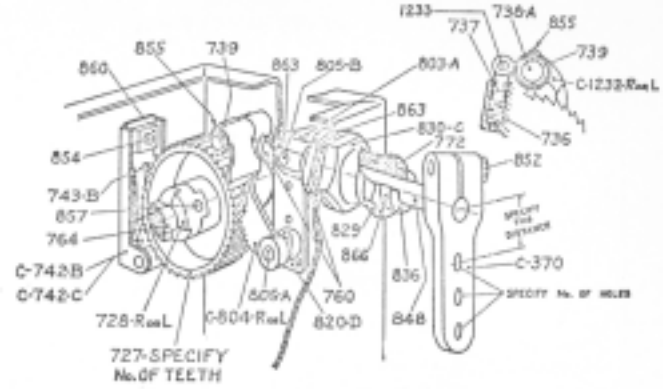
Intermediate bearing assembly for *single compartment* lubricators (Old Style).

(Fig. 17.)



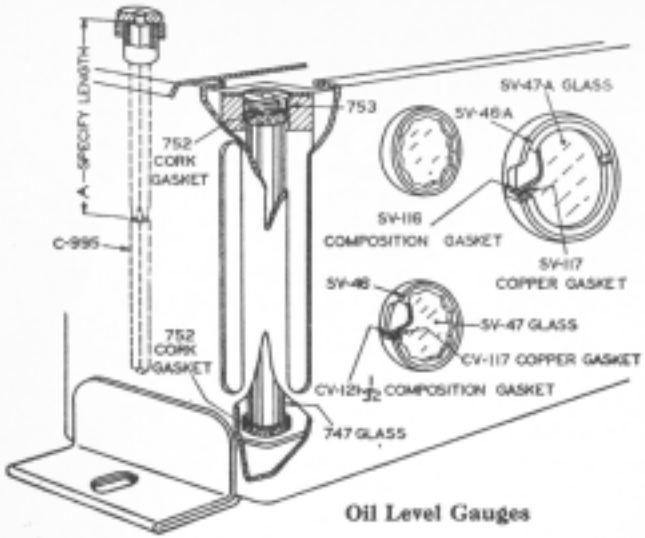
Weighted Retainer Pawl Assembly.

(Fig. 18.)



Front side ratchet drive assembly. Right hand assembly is shown, left hand would be on same side at opposite end of reservoir.

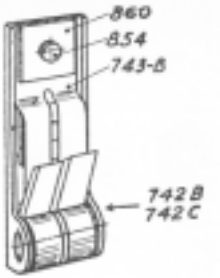
(Fig. 9.)



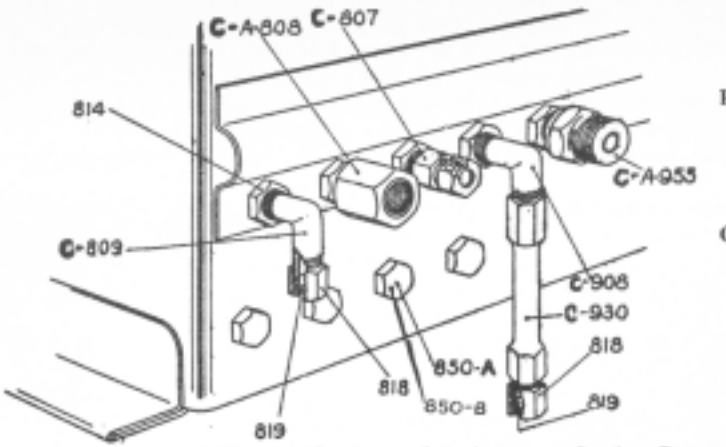
Oil Level Gauges

Illustration shows four different designs used on Model 50 Lubricator. When ordering specify symbol numbers of parts required.

(Fig. 19.)

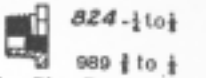


Retainer Pawl Assembly for Double Pawl (Fig. 20.)



Illustrating Five Different Designs of Lubricator Outlet Connections. When Ordering Specify Symbol Number of Part Required.

(Fig. 38.)

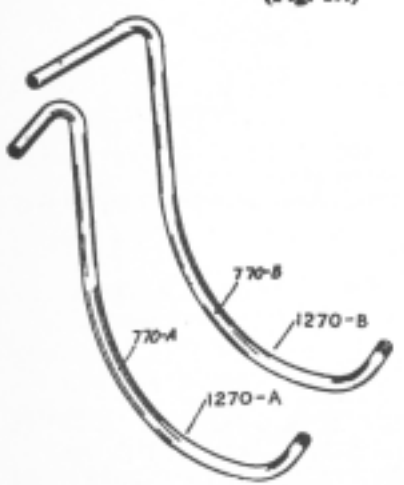


Pipe Size Bushing (Fig. 39.)

Compression Nut (Fig. 40.)

Single Cone Ferrule (Fig. 41.)

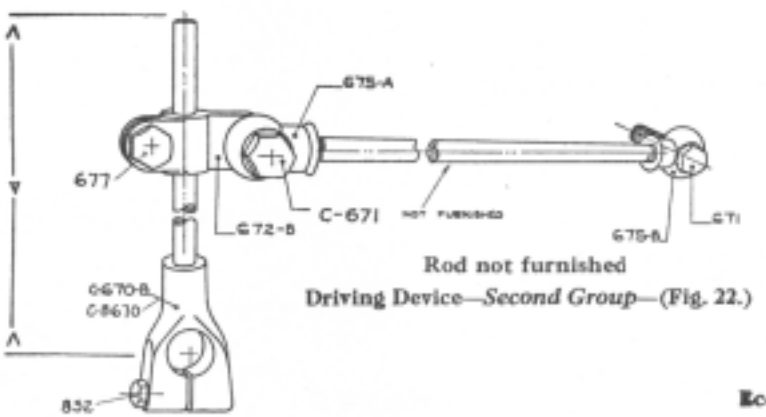
Double Cone Ferrule (Fig. 42.)



Side Ratchet and Rotary Drive Bearing Oiling Tubes

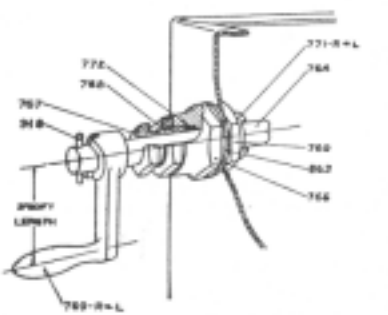
Tubes 770 A & B are for right hand drive lubricators. Tubes 1270 A & B are for left hand drive lubricators—see parts description for tube necessary for different types of drives.

(Fig. 26.)



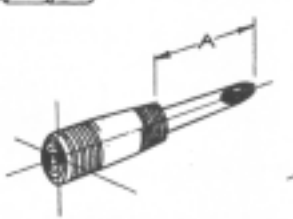
Rod not furnished

Driving Device—*Second Group*—(Fig. 22.)



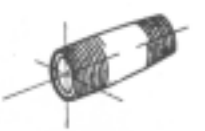
Eccentric Shaft Bearing Assembly. Left hand as illustrated

(Fig. 45.)



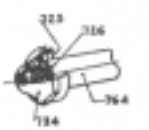
801

Standard Quill (Fig. 36.)

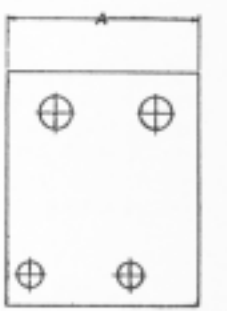


817

Nipple (Fig. 37.)



Hand Crank Shield (Fig. 47.)



720

Unit Gasket (Fig. 46.)

Directions for Ordering Repair Parts

All parts of the Model 50 Lubricator are clearly illustrated and numbered on the preceding pages.

Locate the part wanted in the illustrations to obtain the part number. Names and prices are given on the pages following illustrations.

BE SURE TO GIVE PART NUMBER, NAME AND OTHER INFORMATION ASKED FOR UNDER THE NUMBER OF THE PART WANTED.

Parts are furnished only as listed. Pumping unit and plungers are never sold separately.

Prices are subject to change without notice.

Sales, use, or other taxes imposed on these products shall be borne by purchaser.

Symbol	Name	Price
CV- 16	Union Nut	$ .30
SV- 46	Glass Clamp Screw for SV-47	.25
SV- 46A	Glass Clamp Screw for SV-47-A	.40
SV- 47	Gauge Glass Disc 1 1/16" Diameter	.20
SV- 47-A	Gauge Glass Disc 1 1/2" Diameter	.25
SV-116	Composition Gasket for SV-47-A	.10
SV-117	Copper Gasket for SV-47-A	.15
CV-117	Copper Gasket for SV-47	.10
CV-121 1/2	Composition Gasket for SV-47	.05
CV-233	Terminal Check valve plug	$ .20
C-370	Drive Arm complete with 852 screw. Specify distance indicated on cut and number of holes	1.20
C-561	Drive Arm complete with 852 screw. Specify distance as indicated on cut and number of holes	1.00
C-561-D	Drive Arm weight, complete with set screw	.75
C-575-A	Blind Feed Pumping Unit complete as illustrated. Plunger and barrel never furnished separately	6.00
580-B	Unit Test Tube	.25
581	Unit Test Tube Spout	.15
582-A	Unit Test Tube Spout Screw	.10
C-B-670	Adjustable Drive Arm with 852 screw for 1/2" Dia. shaft. Specify Dimension "A"	2.00
C-670-B	Adjustable Drive Arm with 852 screw for 3/4" Shaft. Specify Dimension "A"	2.25
671	Adjustable Drive Arm Bolt	.20
C-671	Adjustable Drive Arm Bolt with nut and washer	.30
672-B	Sliding Head	1.10
675-A	Adjustable Drive Arm Swivel	.50
675-B	Adjustable Drive Arm Swivel	.50
677	3/8" x 3/4" Hex Head Cap Screw for 672-B	.10
C-678	Connecting Rod Clamp complete with set screw	1.50
700	Sight and Blind Feed Lubricator Tanks (Not illustrated) See footnote before ordering:	
	1 and 2 feed sizes	$8.00
	3 and 4 feed sizes	9.00
	5 and 6 feed sizes	10.00
	7 and 8 feed sizes	12.00
	9 and 10 feed sizes	14.00
	11 and 12 feed sizes	16.00
	Prices of larger sizes on application.	
C-701	Pumping Unit for Sight Feed. Complete as illustrated	7.50
C-A-701-R	Pumping Unit same as C-701 except has 770 Drive bearing oiling tube. For right hand drive lubricators	7.75
C-A-701-L	Pumping Unit same as C-701 except has 1270 Drive bearing oiling tube. For left hand drive lubricators	7.75
C-712-A	Eccentric for pumping unit (Consisting of 2 pieces)	.75
C-718-B	Eccentric Strap Yoke Assembly less C-712 eccentric	$ 1.00
720	Gasket. Specify Dimension "A"	.10
723-A	Eccentric Yoke Knuckle Pin	.05
724	Hand Crank Pin Shield	.20
725	Hand Crank Pin for use with 724	.05
726	1/4" Lock washer for 724	.05
727	Ratchet wheel. Specify number of teeth	1.50
728-R. or L.	Drive Collar. Specify whether lubricator has right or left hand drive. Right hand is illustrated	.50
C-734-R. or L.	Paul Carrier Arm complete with 756-A and 738-A stud. Right hand is illustrated	1.00
736	Pawl Plunger Spring	.10
737	Pawl Plunger	.10
738-A	Stud. Furnished only with C-734 R. or L. and C-804 R. or L. Pawl carrier arms	
738-B	Stud. Furnished only with C-806 R. or L. Pawl Carrier Arm	
739	Pawl Stud Washer	.05
C-742-A	Retainer pawl assembly complete with stud and single pawl	1.00
C-742-B	Retainer Pawl Assembly complete with stud and two pawls for 44 and 88 tooth ratchet wheel	1.00
C-742-C	Retainer Pawl Assembly complete with stud and two pawls for 66 tooth ratchet wheel	1.00
C-742-D	Retainer Pawl Assembly with weighted pawl	1.50
743	Spring for single pawl retainer	.10

Symbol	Name	Price
743-B	Spring for double pawl retainer	.20
747	Tubular Gauge Glass	.30
752	Gasket upper and lower for 747 gauge glass	.05
753	Plug screw for 747 gauge glass	.05
756-A	Drive Shaft, Furnished only with C-734 R. or L.	
B-756	Drive Shaft with milled end furnished only with C-734 R. or L. (Specify milled end shaft if required)	
757	Drive Shaft Bearing	.85
758	Bearing lock nut	.20
759	Bearing Gland	.25
760	Bearing and Gland Lock Nut	.20
761	Washer for 762 and C-981	.05
C-762	Stud for 763 with nut, washers and cotter key	.30
763	Strap and connection complete. Specify Dimension "A"	.85
764	Eccentric Shaft. Specify length and if for hand crank shield	1.00
D-764	Eccentric Shaft for plain drive lubricator. Specify length and if for hand crank shield. Illustrated Figure 5	1.00
765	Hand Crank Bearing	.70
766	Spacing Washer ¾" O.D. x 11/32" I.D. x 1/64" to 1/8" thick (Not illustrated)	.05
767	Eccentric Shaft Bearing Gland	.20
768	Eccentric Shaft bearing gland lock nut	.10
769–R. or L.	Hand Crank. Specify length of crank and whether for right or left hand drive lubricators	$ .40
770-A	Drive Bearing Oiling Tube for side ratchet and side rotary drive lubricators. For right hand drive only	.25
770-B	Drive bearing oiling tube for end rotary drive lubricators. For right hand drive only	.25
771–R. or L.	Spacing Collar. Specify whether lubricator has right or left hand drive	.30
771-A	Spacing collar for drive side of partition. Specify whether for right or left hand drive lubricators	.30
771-B	Spacing collar for crank side of partition. Specify whether for right or left hand drive lubricators	.30
772	Stuffing box packing	.05
774	Copper gasket for 777	.05
777	Plug for plunger hole	.10
778	No. 8 x 32 Brass Plug	.05
779	¼" x 32 Brass Plug	.05
786-B	Sight Feed Tube	.20
787-B	Oil Receiving tube complete with cup	.40

Symbol	Name	Price
C-789-A	Adjusting Spindle with 792, 792-A and 883	.20
C-790	Tube Clamp for single unit, complete with bolt and nut	.10
C-790-A	Tube clamp for binding together more than one unit. Specify how many. Complete with nuts and bolts	.40
791	Plug for adjusting sleeve	.10
792	Adjusting spindle collar (Lower)	.05
792-A	Adjusting spindle collar (Upper)	.05
C-A-793–R. or L. C-B-793–R. or L.	Sight Feed lubricator covers complete as illustrated. Specify whether for right or left hand drive lubricator, length of lubricator tank, if for single or double compartment specify the number of feeds in each compartment. If single compartment of over six feeds specify number of intermediate bearings or number of sight feed hoods and also number of screw holes in cover.	

NOTE: The covers as illustrated show both old (C-A-793) and new (C-B-793) Covers. These covers are not interchangeable and therefore be sure to specify correct number of cover wanted as well as all information requested.

1 and 2 feed sizes	3.50
3 and 4 feed sizes	4.00
5 and 6 feed sizes	5.00
7 and 8 feed sizes	6.50
9 and 10 feed sizes	8.00
11 and 12 feed sizes	10.00

Prices of larger sizes on application

799	Oil Strainer for pumping unit	.20
801	Nipple complete with quill. Specify dimension "A".	1.00
803-A	Blind Bearing	.70
C-804–R. or L.	Pawl carrier arm for front side ratchet drive complete with parts 738-A, 805-A, 805-B, 820-D and 848 shaft. Specify whether right or left hand drive. See illustration Fig. 9	2.50
805-B	Furnished only with C-804 R. or L. and C-A-804 R. or L.	
C-806–R. or L.	Pawl carrier arm for end belt drive complete with 738-B Stud. Specify if for right or left hand drive	1.10
C-807—¼"	Straight tube connector WITHOUT CHECK complete with 814, 818 and 819 for ¼" O.D. Tube	.50
C-A-807¼	Straight tube connector WITH CHECK complete with 814, 818 and 819 for ¼" O. D. Tube	.70

Symbol	Name	Price
C-809–¼	Angular barrel clamp connector WITHOUT CHECK. Complete with 814, 818 and 819 for ¼" O.D. Tubing	.80
C-A-809–¼	Angular barrel clamp connector WITH CHECK. Complete with 814, 818 and 819 for ¼" O.D. Tubing	1.10
814	Connector check nut	.10
817	Nipple for 900 check valve	.10
818	Cinch nut for single cone ferrule. Specify outside diameter of tubing	.05
A-818	Double cone cinch nut	.05
819	Single cone ferrule. Specify diameter of tubing	.05
A-819	Double cone ferrule. Specify diameter of tubing	.05
828	Spacing collar ⅜" O.D. x ½" I.D. Specify length	.20
829	Stuffing box	.45
836	Set collar	.10
838-A	Minimum adjusting spindle	.10
839	Minimum adjusting spindle spring	.05
840	Spring for A-810 and A-811 (Not illustrated)	.05
841-A	Intermediate bearing ½" bore	.60
841-B	Intermediate bearing $\frac{11}{16}$" bore	.65
841-C	Partition bearing	.60
842-A	Spacing collar for 841-B intermediate bearing	.70
842-B	Spacing collar for two compartment partition bearing	.70
843	Gasket for 854	.05
846	Nut for 841-C	.70
847	Packing ring	.20
848	Eccentric driving shaft. Furnished only with 804 R. or L. for side ratchet drive	
849	Bearing packing	.05
850-A	$\frac{5}{16}$"-18 x ⅜" Hex head cap screw	.05
850-B	$\frac{5}{16}$"-18 x $\frac{5}{16}$" Hex head cap screw	.05
852	⅜ x 1⅜" Hex head cap screw	.10
853	Cover screw ¼" Diameter	.05
853-B	Cover screw $\frac{5}{16}$" Diameter	.05
854	¼ x ⅜ Round head cap screw	.05
855	$\frac{3}{32}$ x ½" Spring cotter	.05
857	No. 1 x 1¼" Split end taper pin	.05
858	No. 1 x ¾ taper pin (Not illustrated)	.05
859	$\frac{5}{16}$" Steel ball for A-807, A-809 and C-900	.05
860	¼-20 Standard square nut	.05
861	Screw for 799	.05
863	1-$\frac{5}{16}$ I.D. Composition gasket	.05
864	1-$\frac{5}{16}$" I. D. Composition gasket	.05
865	Cover gasket. Specify length wanted.	

Symbol	Name	Price
879	¼-20 Hollow head set screw	.15
C-880-A	Adjusting spindle head, complete with 881 and 882.	.20
883	$\frac{5}{16}$"-32 nut for 789	.05
884	Oval filler cup	.25
C-884-F	Oval filler cup complete with 885-E and 952	.50
884-H	Round filler cup (Not illustrated)	.50
C-885-A	Filler cup cover complete with chain	.30
885-E	Oval filler cup cover	.20
885-F	Round filler cup plug (Not illustrated)	.75
886	Oval filler cup strainer	.10
C-890	Swivel complete with washer, cotter and set screw	.45
891	Attachment arm. Specify dimension "A"	1.00
C-892	U Bolt with nuts	.20
C-A-900	Check valve complete ⅛" I.P.S. both ends	1.75
C-B-900	Check valve complete ¼" I.P. both ends	1.75
C-908	Angle barrel clamp connection complete with 814. Having ⅛" male pipe thread both ends	.50
914	⅛" I.P. Plug	.05
918	No. 1 x 1" Taper pin	.05
927	Hinge Link	1.80
928	Hinge Link (Upper half)	1.90
C-929	Hinge Link Pin, complete with spring cotters	1.00
C-930	Extension adapter complete with 818 and 819	1.00
952	Filler cup hinge ring	.05
C-995	Oil Dagger gauge. Specify dimension "A"	.80
996	Glass Hood. Specify length overall, also, number of tubes covered by each glass required	
	1, 2 and 3 feed sizes	.50
	4 and 5 feed sizes	.75
	6 and 7 feed sizes	.80
	8 feed	1.00
997	Glass hood clamp	.10
998	Glass hood gasket. Specify length overall	.10
C-1232-R. or L.	Drive pawl with stud for right or left hand drive. Specify which	.90
1233	Pawl wing stud. Furnished only with C-1232 R. or L.	
1270-A	Drive bearing oiling tube for side ratchet and side rotary drive lubricators. For left hand drive only	.25
1270-B	Drive bearing oiling tube for end rotary drive lubricators. For left hand drive only	.25