INSTRUCTION BOOK

FOR

INSTALLING AND OPERATING

ATLAS-IMPERIAL

MECHANICAL INJECTION

DIESEL ENGINES

OAKLAND, CALIFORNIA

U. S. A.

NO. 20

Some of the Characteristics of the Atlas-Imperial Mechanical Injection Diesel Engines

TYPE OF FUEL USED, 14 to 24 gravity crude oil.

INJECTION OF FUEL, by pressure without the aid of compressed air.

IGNITION, accomplished by heat of compression only.

FUEL CONSUMPTION, 4/10 lbs. per horse power hour.

COST OF FUEL AND LUBRICATING OIL PER H. P. HOUR, approximately ¼ of a cent.

COST OF FUEL AND LUBRICATING OIL FOR 100 H. P. PER HOUR, approximately 25c.

COMPRESSION: 350 lbs. per square inch.

STARTS by compressed air (maximum pressure used 160 lbs.) in 20 seconds from stone cold to full load. No priming or pre-heating is required.

POWER: 20% to 40% in excess of rated horsepower.

SLOW SPEED. HEAVY DUTY.

APPROXIMATE WEIGHT PER RATED HORSEPOWER, 150 to 170 lbs.

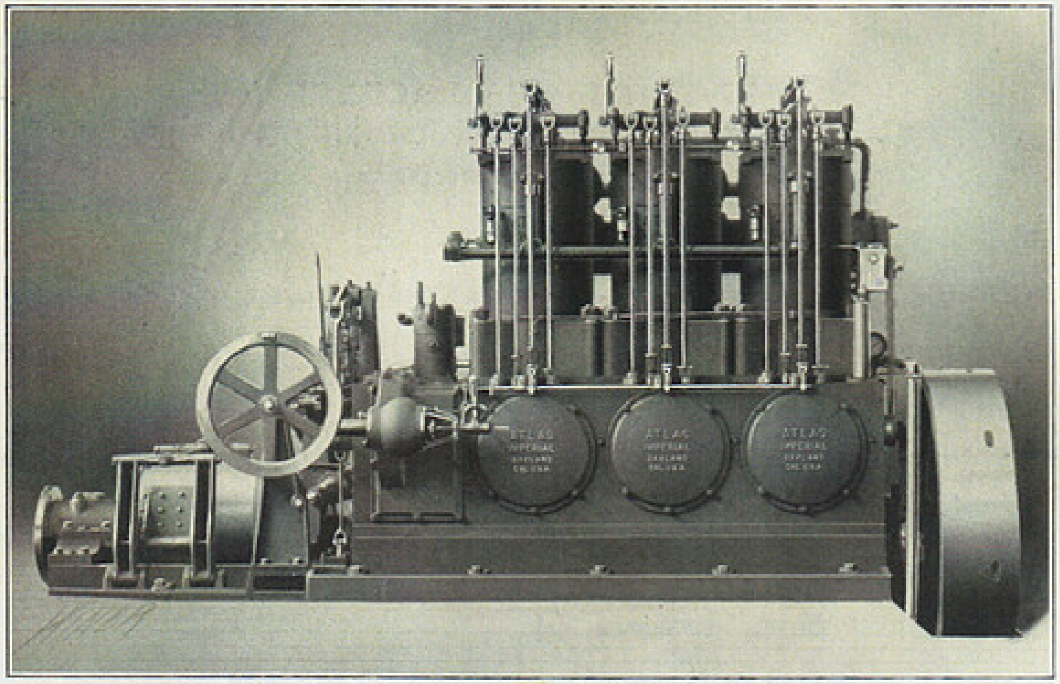
LUBRICATION by force feed through hollow crank shaft and hollow connecting rods by means of oil pressure pump. An oil sump pump is provided which takes the oil from the sump in the base and delivers it to an oil filterer from where it is again delivered to the oil pressure pump which forces the oil through main bearings, crank shaft, connecting rods, and to the cross head pins from where the oil is returned to the sump.

CYLINDERS ARE LUBRICATED by means of multiple force feed cylinder oiler. Quantity of lubricating oil required, about one gallon in ten hours for each 100 horsepower.

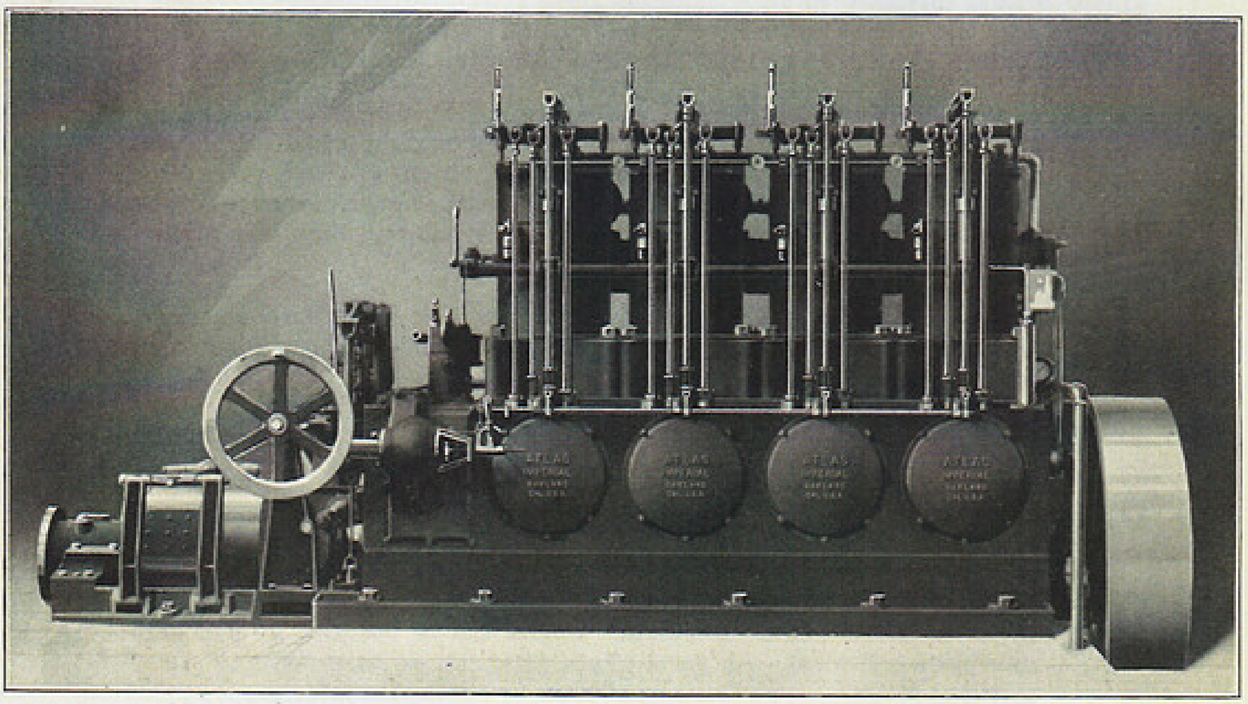
CIRCULATING WATER required, only ½ of the amount necessary for a heavy duty gas engine of the same power.

GOVERNOR: Engines govern closely from full load to no load. Governor controls the amount of fuel injected.

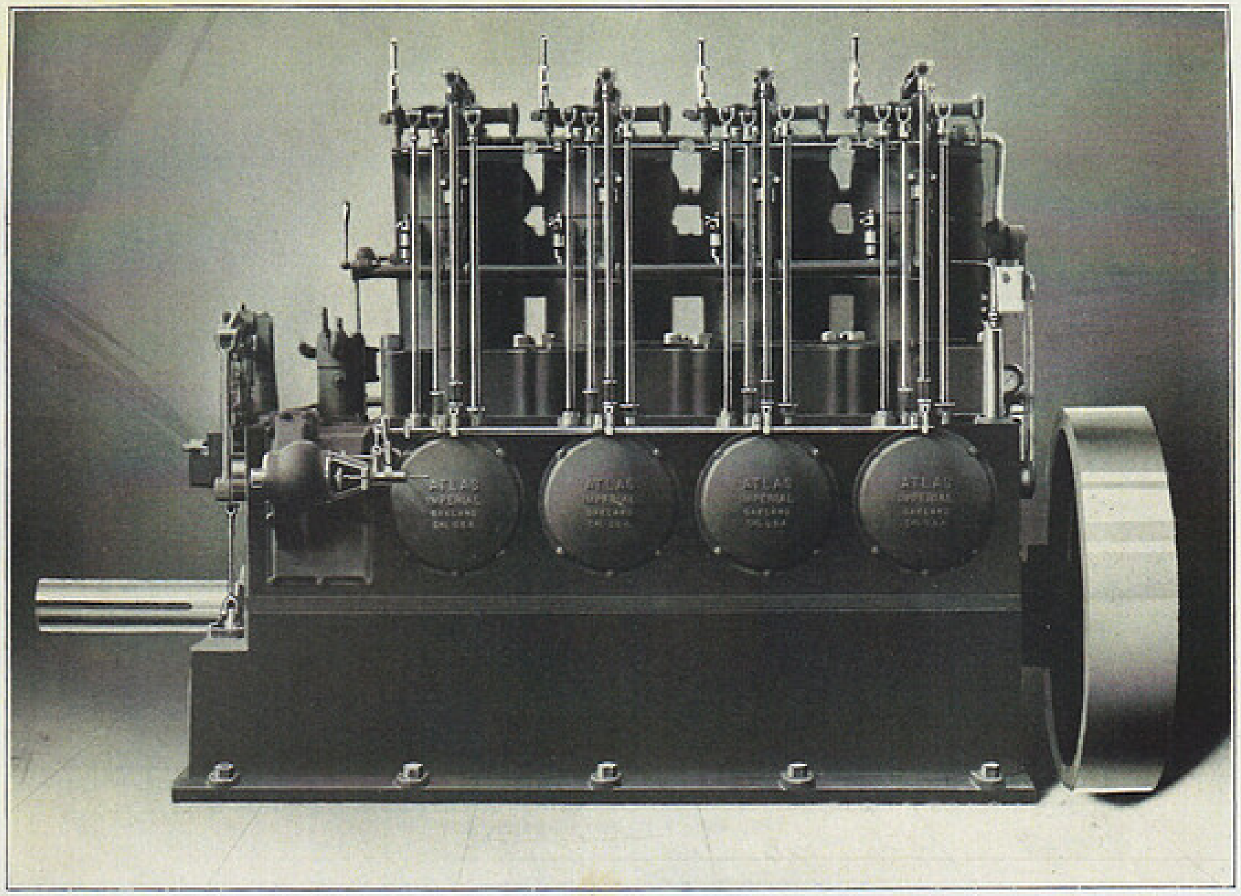
THE ENGINE IS MASSIVE, simple in construction, all parts easily accessible, all parts as far as possible interchangeable. Engine can be operated by any ordinary intelligent individual. All parts where practical are hardened and ground to precision gauge.



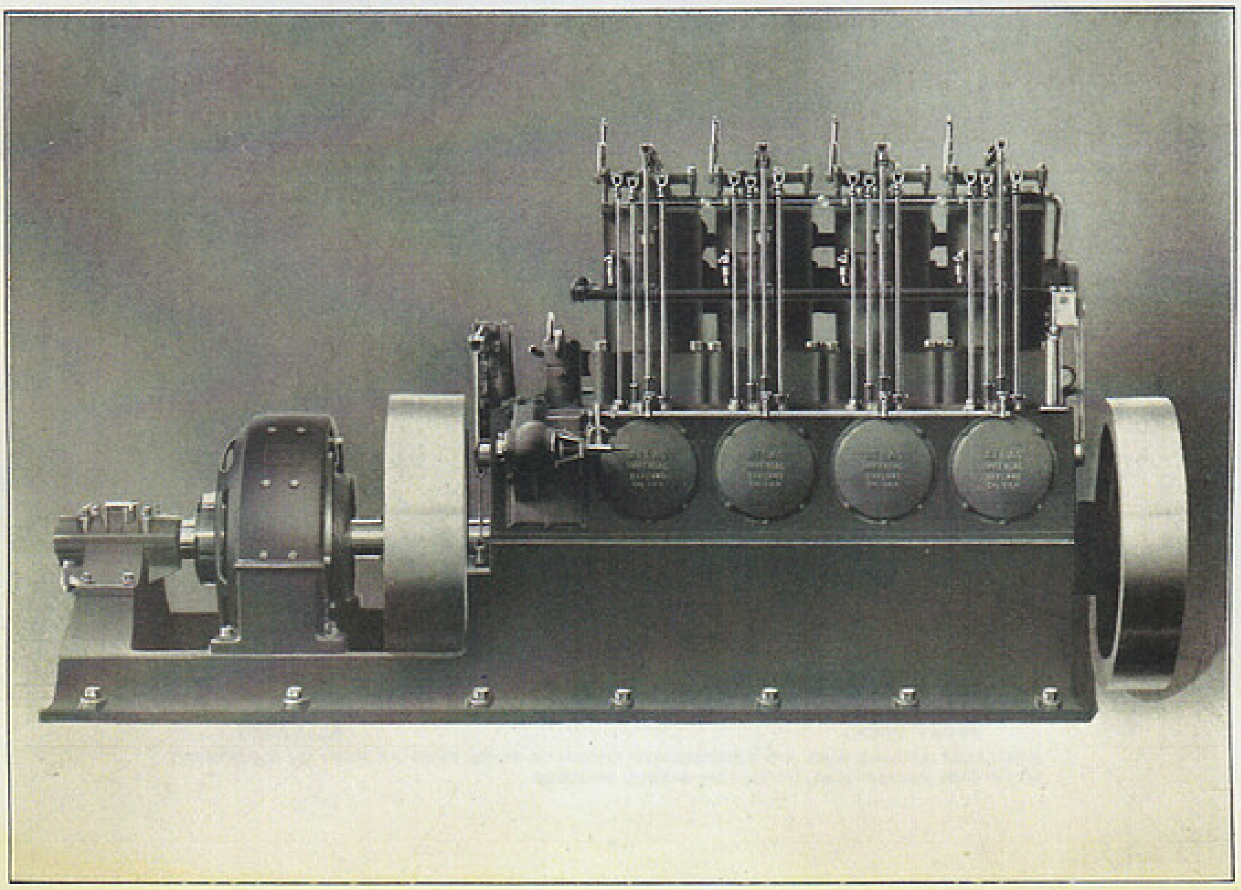
3-CYLINDER ATLAS-IMPERIAL MECHANICAL INJECTION DIESEL ENGINES. BUILT IN SIZES 65, 125, AND 150 HORSEPOWER.



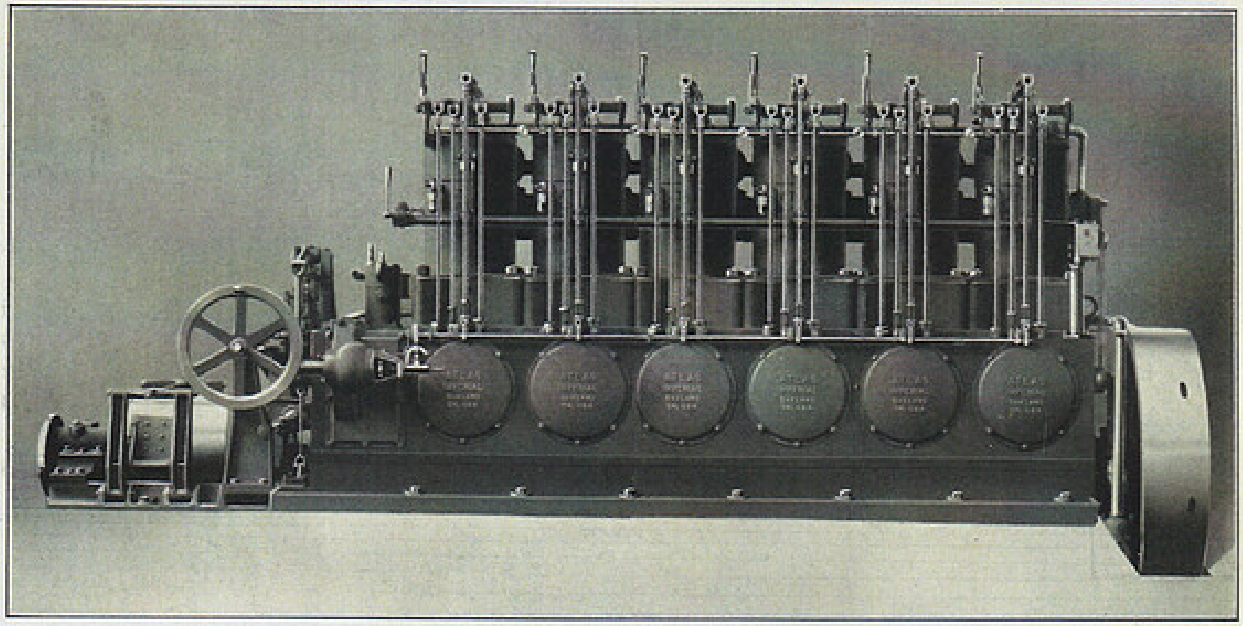
4-CYLINDER ATLAS-IMPERIAL MECHANICAL INJECTION DIESEL ENGINES. BUILT IN SIZES 90, 165, AND 200 HORSEPOWER



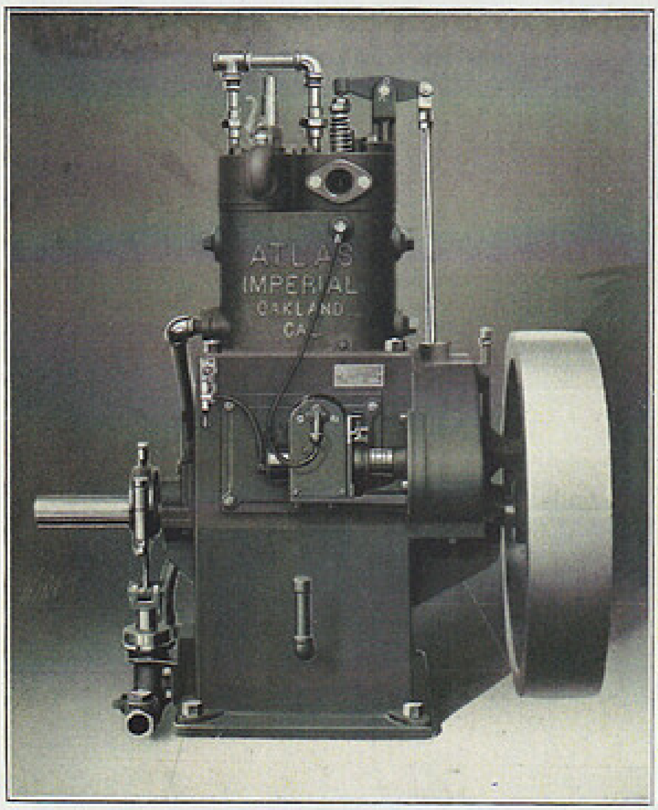
ATLAS-IMPERIAL MECHANICAL INJECTION DIESEL STATIONARY ENGINES. 3-CYLINDER TYPES, BUILT IN SIZES 56, 125, AND 150 HORSEPOWER. 4-CYLINDER TYPES BUILT IN SIZES 90, 165, AND 200 HORSEPOWER. 6-CYLINDER TYPES BUILT IN SIZES 140, 250, AND 300 HORSEPOWER.



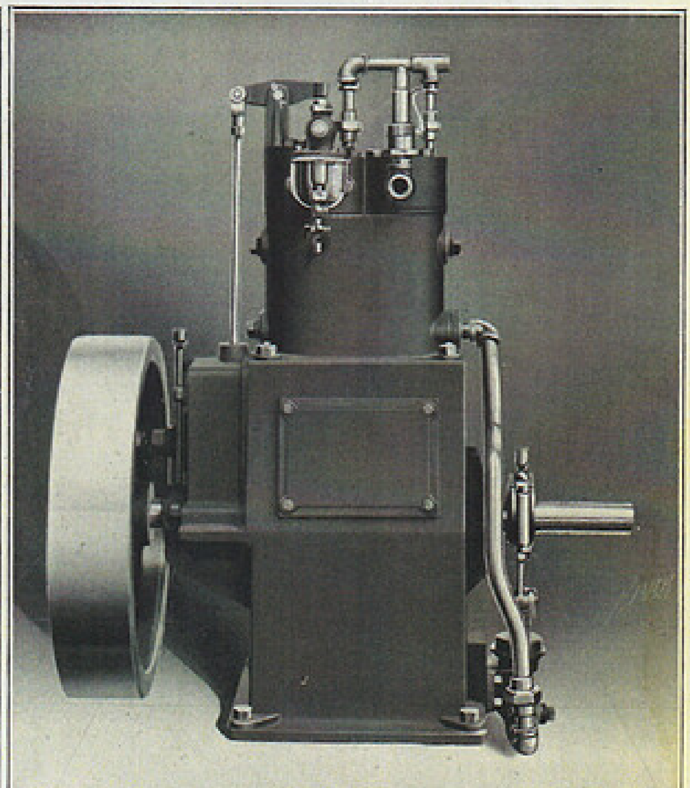
ATLAS-IMPERIAL MECHANICAL INJECTION DIESEL STATIONARY ENGINES. DIRECT CONNECTED DIESEL GENERATOR SETS BUILT TO ORDER IN SIZES RANGING FROM 55 H. P. TO 300 H. P. IN 3, 4, AND 6 CYLINDER UNITS.



6-CYLINDER ATLAS-IMPERIAL MECHANICAL INJECTION DIESEL ENGINES. BUILT IN SIZES 140, 250, AND 300 HORSEPOWER.

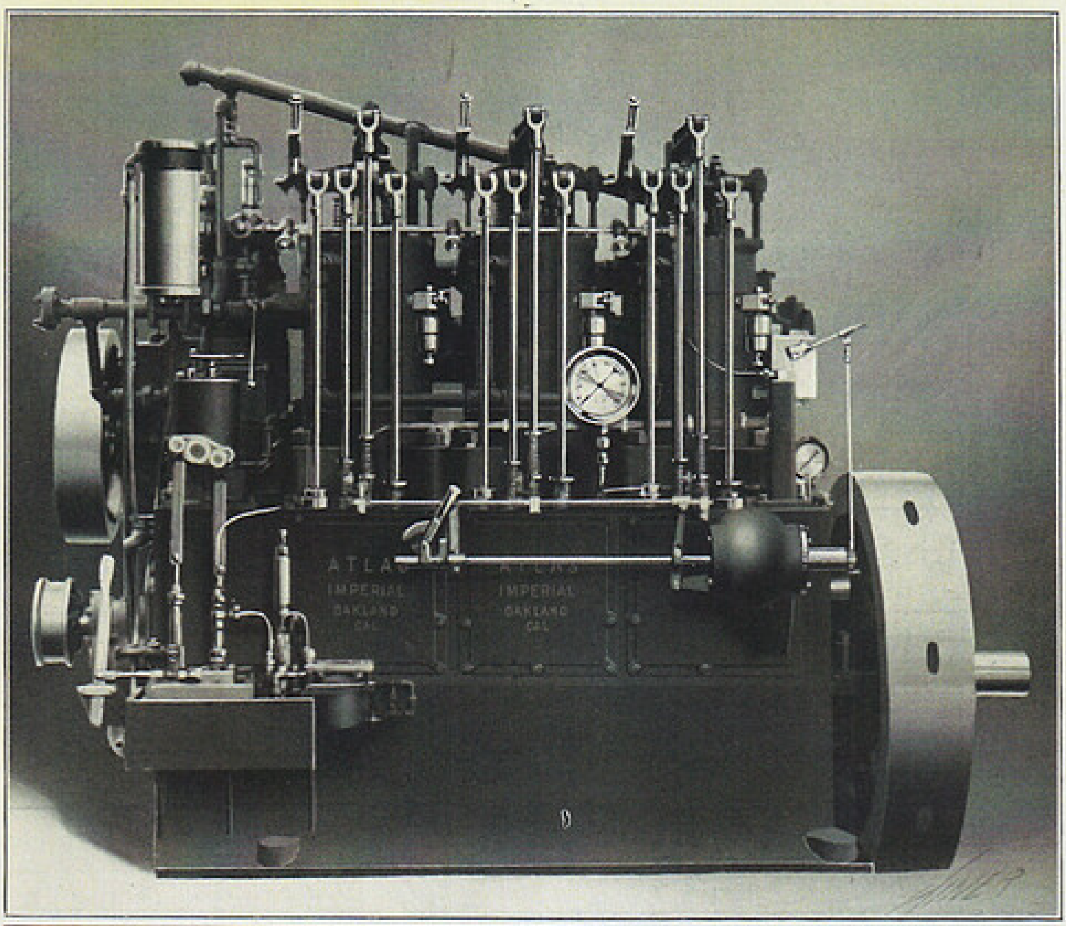


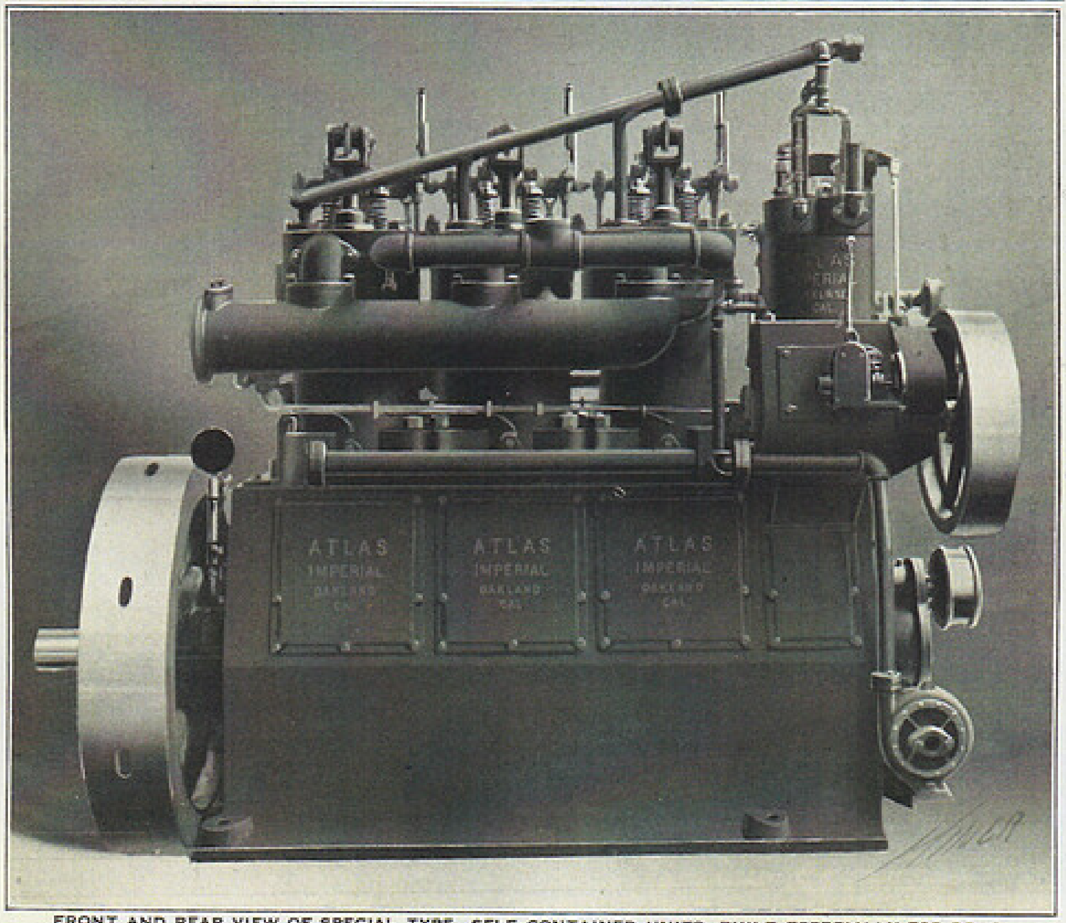
FRONT VIEW



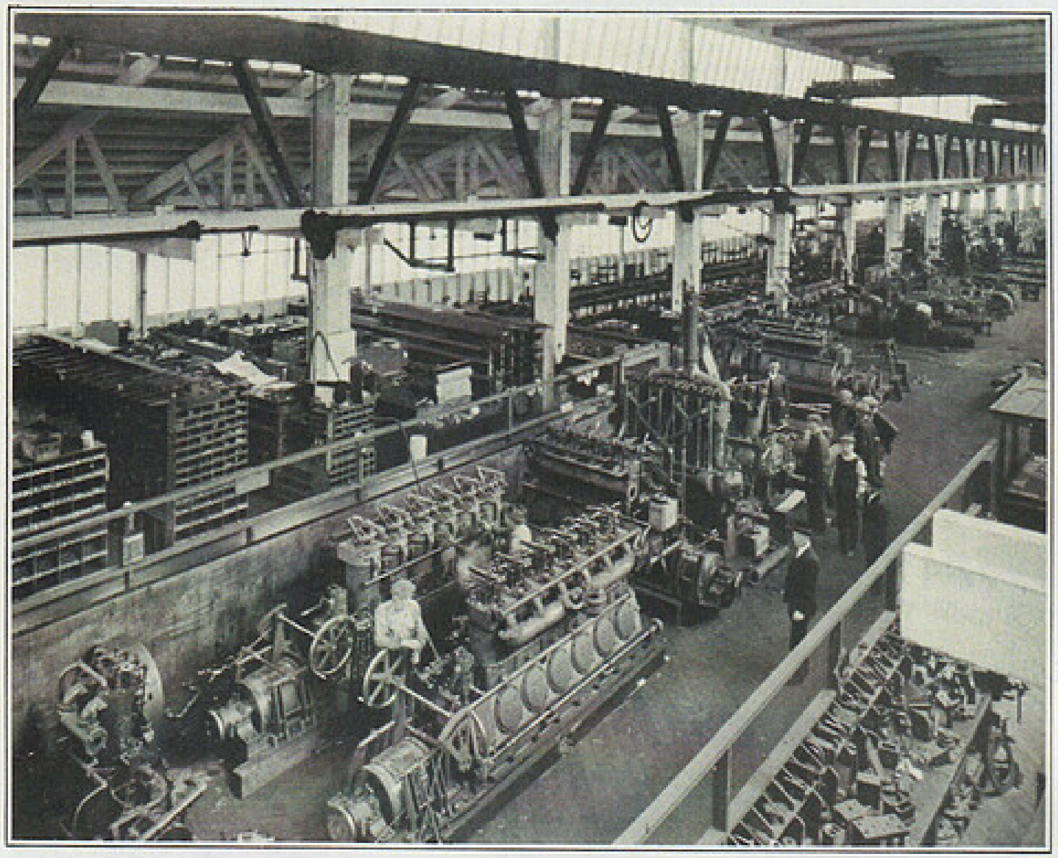
REAR VIEW

AUXILIARY ENGINE AND AIR COMPRESSOR WHICH IS FURNISHED AS PART OF EQUIPMENT WITH OUR MECHANICAL INJECTION DIESEL ENGINES

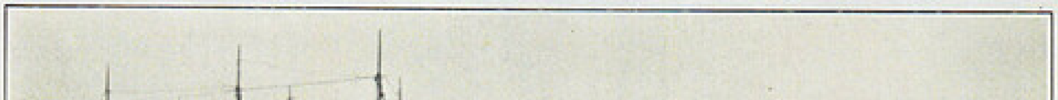




FRONT AND REAR VIEW OF SPECIAL TYPE, SELF-CONTAINED UNITS. BUILT ESPECIALLY FOR DRAG-LINE EXCAVATORS, SHOVELS AND CRANES. ALSO SUITABLE FOR OTHER PORTABLE WORK. NOTE THE SMALL AUXILIARY ENGINE MOUNTED ON FRAME OF MAIN ENGINE. THESE ENGINES OF THE 3-CYLINDER TYPE ARE BUILT IN 65, 125, AND 150 H. P. THE 4-CYLINDER TYPES ARE BUILT IN 90, 165, AND 200 H. P.



SHIPPING DEPARTMENT OF ATLAS-IMPERIAL ENGINE CO.



PRIVATE DOCK SHOWING BOATS IN WHICH ATLAS-IMPERIAL ENGINES ARE BEING INSTALLED.

INSTRUCTIONS
FOR
INSTALLATION AND OPERATION
OF
ATLAS-IMPERIAL
MECHANICAL INJECTION
DIESEL ENGINES

EXPLANATION OF THE MECHANICAL INJECTION DIESEL ENGINE

THE DIESEL PRINCIPLE:

1. Air becomes hot by being compressed. The degree of heat depends on the amount of compression.
2. 350 lbs. compression generates sufficient heat to ignite fuel oil when properly sprayed into the compression chamber at the proper time.
3. When fuel oil is sprayed into the compression chamber at the proper time and properly ignited by means of heat of compression it increases the volume of cylinder contents.
4. The expansion of the burning gases is the power creating force within the cylinder of the engine.

    In order to obtain perfect combustion within the cylinder it is necessary to inject the fuel oil in the form of a very fine spray which is done by our specially designed spray nozzle.

    By understanding these simple requirements for a Diesel engine it is readily seen that the Mechanical Injection Diesel engine is very simple.

CYCLE:

Atlas Imperial Mechanical Injection Diesel engines operate on the four cycle principle, the function of each cycle or stroke of the piston is as follows:

1. INTAKE STROKE—When the piston goes down on the intake stroke, the intake valve is open and the cylinder is filled with air.
2. COMPRESSION STROKE—On the upward stroke of the piston, the inlet valve is closed and the air in the cylinder is compressed to about 350 lbs. pressure per square inch. At this pressure, (as explained above) the temperature of the compressed air is raised sufficiently to ignite the fuel. A few degrees before the piston reaches the top of the compression stroke the fuel spray valve is opened by a cam and the fuel sprayed into the heated air. A constant pressure of fuel oil is kept in the spray nozzles at all times by means of small plunger pumps which are more fully described later.
3. EXPANSION STROKE—The fuel oil burning and expanding in the cylinder maintains pressure on the piston during the downward stroke. Near the end of the power stroke the exhaust valve opens and allows the burned gases to escape.
4. SCAVENGING STROKE—As the piston returns to the top of the cylinder with the exhaust valve open, the piston pushes all the burned gases out of the cylinder through the exhaust valve. When the piston has reached the top the exhaust valve is closed and the intake valve again opened.

    This completes the four cycles or four strokes of the Mechanical Injection Diesel engine and describes the method of functioning.

FUEL OIL is pumped through a small steel tube that leads to the spray valves in the cylinder heads. This pump is a simple plunger pump driven from the cam shaft. The excessive amount of fuel which is pumped into the fuel oil line and not admitted through the spray nozzles into the cylinders, is by-passed to the supply pipe through a relief valve set at the proper pressure.

GOVERNING is accomplished by regulating the length of time the spray valve is kept open. To accomplish this we use a sensitive gear-driven flyball governor which functions by regulating the duration of the spray valve opening, as well as the amount which the spray valve is being lifted. Attached to this governor is a speed regulating device whereby the speed of the engine may be altered by the operator to suit the requirements. This governor is very quick in action and responds immediately when loads are suddenly applied or released.

INSTALLING MARINE ENGINES

Engine foundation timbers should be of sufficient size and well fastened to the boat, timbers to be parallel with the line of propeller shaft and of the proper height. If engine foundation should not be properly in line, undue strain upon engine would be caused when engine base is bolted down, and excessive friction in bearings being the result.

In small engines lag studs are used for fastening engine to foundation, but in larger size engines, more especially when hull is of light construction, it is advisable to use several through bolts.

The after part of stern post and the inside end of sleeve log to be square with line of shaft. Engine and propeller shaft should be as near level as possible after allowing clearance beneath flywheel, and having the top of the propeller blade sufficiently submerged.

Flanges of stern bearing and stuffing box should be set in white lead and fastened by means of lag studs furnished with the engine.

LEAD SLEEVE:

Where such is required to be put through the deadwood lead must be flared over at ends and expanded tight into the sleeve log by drawing greased wooden plugs through the same. Joints between flared ends of lead pipe and bearing to be water-tight.

Clearance between propeller-hub and stern-bearing should be sufficient to allow for lengthening of boat, due to the wood swelling in getting water soaked. Coat tapered end of propeller shaft and threads well with white lead and machine oil, before putting propeller on, as this will prevent the salt water from getting in between and start corrosion. Be sure that the propeller and nut are put on tight.

ALIGNMENT:

In installing the engine use great care in alignment which can be done best by first installing the tail shaft, then line up and bolt the coupling of the intermediate shaft. Adjust the height and thwartship position of the engine so that the flanges of the engine and the intermediate shaft couplings are square with each other. The engine timbers should be set low enough to allow a soft wood shim about 1½" thick to be placed between the engine and engine timbers. After the engine is lined up take the measurements of the shims and cut them to fit snug. They are often a little tapered which is very convenient for final adjustment. Check up the flanges of the engine and intermediate shaft couplings to make sure they are in perfect alignment before bolting up the coupling.

PIPING:

Exhaust piping should not be less than the opening in the exhaust manifold, avoid all sharp bends as much as possible, use preferably 45° elbows, when a turn is necessary.

When the pipe is not water jacketed it will become quite warm when the engine is operating and should be insulated where it passes through any wood bulkheads or decks. Use cast iron or wrought iron exhaust pipe. Never use copper for exhaust pipe.

Mufflers are furnished by us at a slight additional cost where desired. Overboard exhausts should always be above the deep load line. When there is the slightest danger of water getting into the outlet of the exhaust from the rolling of the vessel or splashing of the waves, a gooseneck or large return bend should be installed in the exhaust pipe between the engine and discharge. The gooseneck should be of sufficient height to prevent water from getting back into the exhaust manifold and exhaust port in the cylinder heads. Should water get into these parts it is apt to find its way into the cylinders and do great damage. The surest way to forestall such happenings is the use of dry exhaust and a muffler, running the exhaust pipe up into the air with as few bends and as little resistance as possible. The exhaust pipe can be covered with insulating pipe covering of magnesia or other heat resisting material and the pipe covering again covered with galvanized iron to protect it from damage and wear.

CIRCULATING WATER:

An intake valve or seacock is usually provided with an efficient strainer and connected with the centrifugal and plunger pumps with brass or galvanized pipe. Use a stop cock in the pipe leading to each pump so that each pump suction pipe may be shut off separately. The plunger pump may be connected to the bilge for pumping the bilge water out of the boat. Be sure to have an efficient strainer on the bilge suction and **always pump the bilge water overboard, never through the engine,** on account of oil which is often present in bilge water. This oil has a tendency to cake on the radiating surfaces and prevent efficient cooling of the engine. Circulating water discharge from the engine must be discharged overboard.

Do not put a stop cock or valve in the circulating water discharge from the engine. If it should ever be closed the plunger pump would break the water jacket.

FUEL OIL PIPING:

After piping has been cut to length and threaded, the ends of pipe should be reamed to take off the burrs and the pipes thoroughly cleaned with gasoline or coal oil so as to remove all possible loose scale, dirt and steel cuttings.

The engine is provided with a plunger pump to draw the fuel oil from the main tanks and discharge it to a day tank. An overflow pipe carries the surplus oil from the day tank back to the supply tank when the oil has reached the height of this overflow pipe in the day tank. The suction pipe should be 1" I. D. pipe or larger, and the discharge 3/8" or 1/2" I. D. **High pressure plunger pumps** mounted on and driven by the main engine draw the oil from the day tank mentioned above. There is a duplex strainer in this suction pipe for carefully straining the oil before it goes to the high pressure pump. The strainers are in duplicate with a valve for switching the suction from one strainer to the other as desired. The stem of this valve extends above the strainer, squared at the top end to receive a wrench and has a mark or arrow on the top to indicate which strainer is being drawn upon. The strainer not in use may be opened and cleaned while the engine is running, taking oil through the other section. Strainers should be cleaned about every ten days or oftener if the oil is very dirty. Wash the strainer off carefully with gasoline.

The high pressure oil pump discharges through check valves to the high pressure oil pipe and header pipe at the top of the engine. Branch lines lead from the header pipe to each spray nozzle in the cylinder heads with a stop valve for each nozzle. Connected with the high pressure fuel line is a pressure regulator and relief valve. The high pressure oil pipe leads to the bottom of the barrel of the pressure regulator and relief valve. As the pressure of the oil rises, the valve is pushed up in the barrel against the spring at the top. The tension of the spring holding the valve down is such as to maintain a pressure of about 3500 lbs.

AIR RECEIVERS:

The air receivers or air tanks should be installed as near the engine as practical, using at least as large a pipe as the opening in the tanks. To connect from the tanks to the air starting pipe on the engine it is necessary to place a heavy type Globe valve or angle valve next to each tank so that the air tanks may be shut off when the engine is not in use and thereby hold pressure until such time as the engine is to be started again. If the pipe fitting is done carefully the tanks should hold their pressure for nearly a week without having to be pumped up again.

Whenever starting the engine, the air compressor on main engine should be put to work to pump the air pressure up in the tanks again so as to replenish the amount of air that had been used in starting and thereby have the tanks fully charged for the next time the engine is to be started.

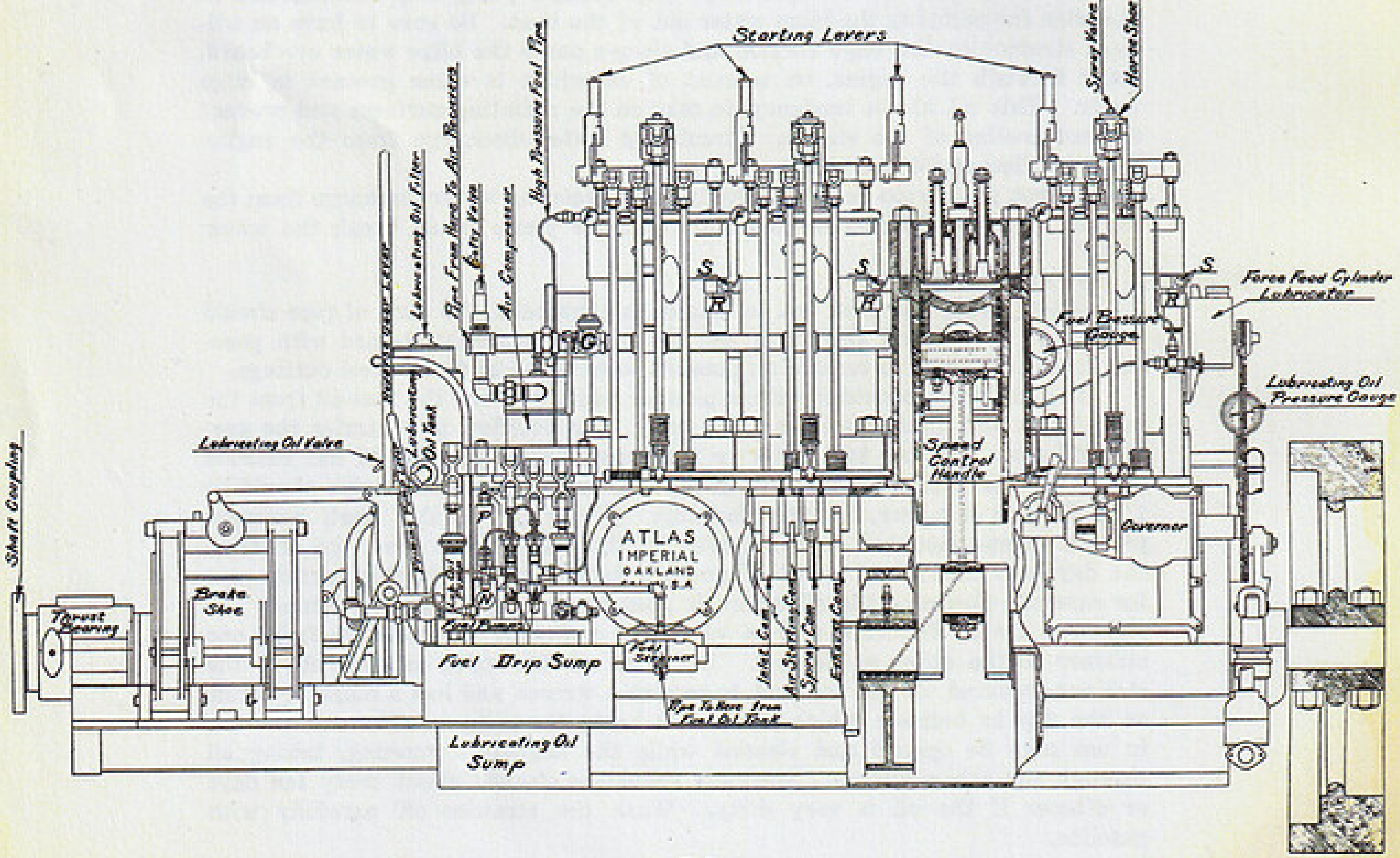


FIG. 1

STARTING AND OPERATING ATLAS-IMPERIAL DIESEL ENGINES

When the engine has been installed and all pipe connections made and tested to see that they are tight and in order, the next thing is to pump up air pressure in the air starting tanks. To do this, start the little auxiliary engine and pump up the air pressure to approximately 200 lbs. Test the safety valve on the auxiliary engine to see that it is in order and that it will blow off at about that pressure. Also see that the safety valve on the main engine compressor is in order and will blow off at about the same pressure. (The time required to charge these air tanks depends on the size of the tanks but will average about 15 minutes to each tank.) See that the inside of the engine base is clean and free from foreign substances and that there is no obstruction near the suction of the sump pump, which is located in the base. The function of this pump is to remove the lubricating oil from the base sump and deliver it up into the lubricating oil filter and receiver. Next, see to it that the lubricating oil filtering tank is approximately half full of good grade mineral oil, preferably the kind known to the oil dealers as Diesel engine cylinder oil. Open the valve leading from this filtering tank to the lubricating oil pressure pump on the engine.

Oil the engine up well, all such exterior parts as rockers, etc. If the oil holes have been stopped up by shavings or dirt of any sort clean them out so as to be sure the oil will work in the bearings freely. When the tanks are charged, shut one tank off for reserve air and make your first attempt at starting with one tank only. (When first starting a new engine there are many little things that may hinder the machine from starting readily, such as dirt from the pipes getting in the valves, leaky pipe connections, etc.) Next see that the fuel oil flows freely from main tank to pump, also fill the small gravity tank with fuel oil and see that the fuel will flow freely from gravity fuel tank to the high pressure spray pumps. Shut all of the small fuel valves F leading to the spray valves, pump up pressure on the spray line with the little hand pump until you get approximately 2000 lbs. pressure on the spray line. Oil all working parts well. Place all of the starting levers on top of cylinder heads in starting position (A) Fig. 2. (Levers leaning towards the operator's side and locked in the quadrant notch in that position.) Open all of the snifter valves (S) attached to the relief valves on the cylinders then bar the engine over by turning the flywheel around a couple of times to see that there are no obstructions and everything clear and that the air will blow freely in and out of these valves. Stop the flywheel in a position where one of the cranks is about 25° past top center, when everything is clear shut snifter valves tight, turn the air on from one tank after first seeing that the gate valve (G, used for starting engine) is shut,

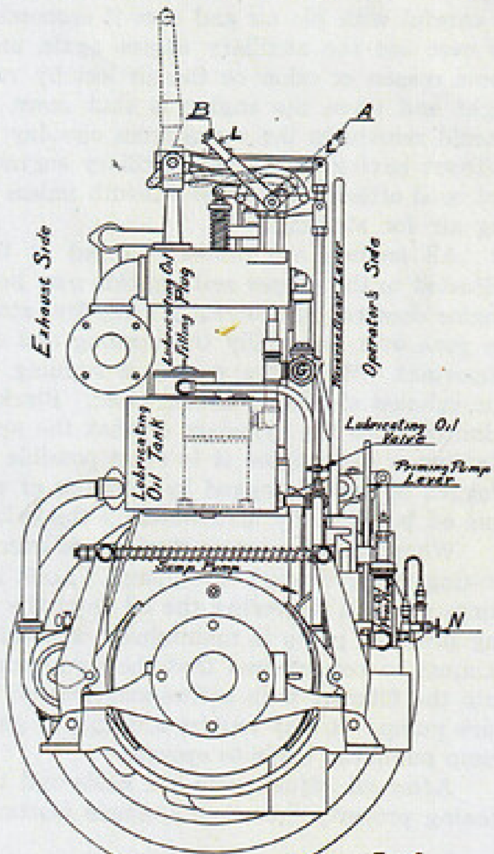


Fig. 2

then open gate valve quickly and engine will start running on compressed air. After engine has made 3 or 4 complete revolutions with air, open up the fuel needle valves (F) leading to the spray nozzles and push one of the starting levers (L) from starting position to running position. As soon as this one cylinder starts to work throw the balance of the starting levers also back into running position and shut off the air gate valve. See that the engine is working on all cylinders. If one is not firing open up the small snifter valves (S) one at a time and close them again to ascertain which cylinder is not firing. In order to start the missing cylinders to fire it may be necessary to raise the spray valve rockers slightly and quickly by means of a small pry, this allowing an additional amount of fuel to the point of that particular nozzle. This gives it a chance to get rid of any air that may be lodged in the spray nozzle. As soon as engine is started see that the circulating water is running freely through the engine and that all cylinders and cylinder heads are maintained at a uniform temperature. In making this first start it is necessary to investigate and see that every part is functioning properly and that the fuel positively reaches each spray nozzle, that all valves are seating properly and do not allow any pipe connections to be leaky. It is advisable to run the engine at first idle for a short time until everything gets in good running order before applying the power.

When the main engine is running the main air compressor should be started so as to pump up pressure in the air tanks for the next time the engine is to be started. When the engine is cold it will require approximately 150 to 200 lbs. pressure on the air in order to give the engines sufficient speed to start properly. If the engine has been shut down only for a short period and is still warm it will start on considerably less air. It is possible to start it on air as low as 30 lbs. per square inch. If the operator is careful with his air and uses it economically in starting there should be no occasion to ever use the auxiliary engine again unless after piping had been taken apart for some reason or other or the air lost by valves being left open, as the air tanks are tight and when the engine is shut down the valves properly closed off, air pressure should remain in the tanks from one day to another sufficient to start the engine again without having to use the auxiliary engine. In many instances the auxiliary engine is not used oftener than once a month unless it is used for other purposes than compressing air for starting.

All engines are properly tested at the factory before shipping and all valves adjusted to the proper setting, this may become altered, however, in installing and if the engine does not run correctly when first started it may be that the valve setting should be gone over, especially the opening and closing time of the spray valves which is very important. When the engine is running at normal load and all valves timed properly the exhaust should be almost clear. Black smoke indicates that either too much fuel is admitted into the cylinders or that the spray nozzle is not functioning properly. When starting a new engine it is often possible that the holes in the spray nozzles become clogged or partly clogged by particles of metal from the piping. When this happens the fuel oil is unequally distributed in the cylinder which causes smoky exhaust.

When starting a new engine use every precaution to see that the lubricating oil is flowing freely through the pumps. Look into the lubricating oil tank to see that the sump pump is delivering the oil from the sump into the strainer and that the lubricating pressure pump is maintaining at least 5 lbs. pressure on the lubricating oil gauge. It must be remembered that the sump pump cannot start to deliver oil from the sump into the filtering tank before sufficient oil has reached the base through the high pressure pump. It may require a couple of gallons of oil to be put into the base before the sump pump can begin to operate.

After all adjustments are made and the engine runs smoothly and all parts functioning properly then it is a simple matter after that to operate the engine, start, stop, etc. When stopping the engine bring the starting levers over from running position to starting position. This automatically cuts off the fuel supply to the nozzles and the engine will stop. Then shut the fuel oil valve between the gravity (day) tank and the high pressure fuel pumps and close the valves on the air tanks tight to prevent loss of air pressure. When starting the engines after they have been fully adjusted open the air valves on tanks, see that the starting levers are in starting position, turn on fuel oil from gravity tank and also from main tank to supply pump. Pump up about 2000 lbs. pressure with the small fuel hand pump. Oil all rockers, etc., see that the flywheel is in proper position for starting, open the gate valve on the air, and as soon as the engine starts to turn over throw the starting levers over into running position one at a time. See that all cylinders start properly, shut gate valve off again, let the air compressor on main engine pump up air pressure again so as to be prepared for the next start, see that circulating water is running properly and that lubricating oil pressure shows the proper amount on gauge. When the engine is first started it is possible that the exhaust will show smoky for a short time but after the engine has run from 10 to 15 minutes the exhaust should be nearly clear.

STARTING LEVER

Starting levers (L) on top of the cylinders attached to the rocker shafts function as follows:

When they are set in starting position, (leaning toward the operator's side of engine, see end view of engine, Fig. 2, position marked A), then the air intake valve is out of action. The exhaust valve is in 2-cycle action. Air starting valve is put into action, 2-cycle, the fuel spray valves put out of action. When the starting levers are brought into running position (leaning towards the exhaust side of engine, Fig 2, position marked B) it changes the action as follows: Air intake valve put into action, exhaust valve changed from 2-cycle to 4-cycle, air starting valve put out of action and spray valve put into action.

It will be seen from the above that when the starting levers are all in position "A" as shown in Fig. 2, the engine can function in the same manner as a single acting steam engine, using compressed air instead of steam, the valve timing being such that the air pressure is admitted on top of the piston at top center, on every revolution, and that the air starting valves are closed when the piston is part way down the power stroke. At the bottom of the stroke, the exhaust valve will open and allow the expanded air to escape through the exhaust valve. When the starting levers (L) have all been brought back to position "B" then the air starting valve will cease to function and instead the air inlet valve in the cylinder head will open at the proper time to admit air into the cylinder during the downward stroke and closes at approximately the bottom end of stroke. All valves remain closed during compression stroke. At a point near the top of compression stroke the spray valve opens and admits the fuel oil in form of a spray in the proper quantity. Spray valve again closes shortly after the piston has passed top center, at the end of second downward stroke or power stroke the exhaust valve will open and remain open during the exhaust stroke or fourth stroke of cycle and closes at the approximate top center just at the time when the inlet valve is again opening, completing the cycle.

In summing up the functions of the starting levers—in position "A" the engine is a 2-cycle compressed air engine and with starting lever in position "B" it is a 4-cycle Diesel engine.

SPRAY VALVES

The function of the spray valve is to admit the fuel to the cylinders at the proper time and at the same time deliver the fuel in form of a very fine spray so that the fuel is readily ignited and properly burned within the cylinder. The spray valve is located in the center of the cylinder head and extends clear through the cylinder head with the spray tip projecting slightly below the surface of the cylinder head. It is provided with a needle valve held in position by a strong spring, the tension of which is slightly adjustable. The fuel is admitted below the stuffing box at a pressure anywhere from 1000 to 4000 lbs. per square inch (depending on the adjustment of the pressure regulating valve.) This spray valve is held in position by a clamp arrangement having a single stud thus making it easily removable for inspection or cleaning. It is operated by a lifting rocker arm which lifts the valve approximately 2/100 of an inch when the engine is pulling full load. The governor controls the lift of these valves so that when the engine is running idle the lift is very little and only sufficient to admit enough fuel to drive the engine. As the load increases the governor causes these valves to raise more and consequently admit additional fuel in direct proportion to the power developed.

LUBRICATING SYSTEM

It is advisable to use good mineral cylinder oil as the cost of lubricating oil is always cheaper than machine shop bills. An inferior grade of oil can do more harm to an engine than anything else. It is better to use good oil and little of it than to use poor oil and lots of it. The amount of lubricating oil required for our Diesel engines is approximately 1 gallon for every 10 hours per 100 H. P. There are two distinct lubricating systems on the engine, one is multiple force feed oiler having copper tube connections to the cylinder walls. When the engine is new it is advisable to let this oiler feed liberally so as to insure proper lubrication in the cylinders. As the engine becomes worn in this can be diminished to some extent but it is not advisable to economize greatly on the oil going to the cylinder walls. The second lubricating system oils the main bearings, crank brasses, piston pins, etc. It consists of a sump pump so connected as to pump all of the oil from sump (in the base of the engine) and deliver it to a lubricating oil filter and receiver which is usually attached to the engine. After the oil has passed through the filter it goes to the lubricating oil pressure pump which pumps the oil through a manifold pipe the entire length of the engine (this pipe is located inside of engine frame.) From this manifold pipe separate branches lead to each of the main bearings. In the front end of this manifold is a relief valve which is spring loaded and which allows surplus oil to be by-passed into the base of the engine. Oil passing through these branch pipes leading to the main bearings is admitted into a groove in the main bearings. This groove is opposite lubricating oil holes in the crank shaft, the oil then passing through the crank shaft and out through holes in the crank pins where it enters a groove in the crank pin brasses. This groove again is connected with a hole through the crank brasses, this hole being directly opposite hole in center of connecting rod, the lubricating oil going up through hollow connecting rod lubricates the wrist pin, from the wrist pin again the oil returns through a special opening down to the sump. In this manner oil is constantly circulating through all main bearings, crank bearings and wrist pin bearings, and keeps them thoroughly lubricated. A certain amount of the oil thus forced through the bearings and crank bearings finds its way out from the bearings and is thrown about inside of the base and frame in form of a spray. This spray is constantly falling on the cam gearing, cams, cam shaft bearings, etc., which are inside of the frame and in this way all moving parts inside of the engine are constantly being thoroughly lubricated without the operator having to guess at his lubrication so long as he sees that the lubricating oil shows the proper pressure on the gauge. The gauge referred to is connected to this lubricating oil manifold pipe.

CYLINDER RELIEF VALVE

The function of the cylinder relief valve is to safeguard against excessive pressure in case too much fuel had been admitted to any one cylinder or in case of starting before the engine obtains its speed, in which case the pressure may rise excessively. Excess pressure escapes through these relief valves. These valves are adjustable and are normally set at approximately 600 lbs. A small steel needle valve, called snifter valve, is attached to these safety valves for the purpose of opening up to see if the cylinders are functioning properly.

FUEL RELIEF VALVES

The fuel relief valve as referred to by letters P N of Figure 1, is a spring loaded valve connected directly to the high pressure fuel pumps by means of steel tubing and is equipped with an adjustable spring tension. The purpose of this valve is to regulate the pressure of fuel delivered to the spray nozzles. It is essential that the pressure be kept up to about 3500 pounds when engine is working normal load, and if excessive loads are carried the pressure should reach 4000 lbs. It will readily be understood that the higher the pressure on the fuel line the greater will be the quantity of fuel admitted to the cylinders, during a given period of spray valve opening.

When the engine has been adjusted to a certain pressure of fuel, then it is essential that this pressure be maintained uniformly, regardless of the load which the engine is pulling or the speed at which it is running. This valve is therefore so constructed that any quantity of oil over and above that which goes through the spray nozzles at the fixed pressure will be by-passed and let back into the suction pipe of the pumps. In this way this fuel relief valve automatically maintains the pressure and takes care of the surplus fuel pumped by the high pressure fuel pumps.

PRIMING PUMP

A priming pump is connected directly to the high pressure fuel pump and is equipped with a hand lever. When starting an engine this priming pump is used for the purpose of exhausting any air from the fuel oil piping and to pump up a little pressure on the high pressure pipes and manifolds so that when the engine is being started the fuel is already at the point of the spray nozzles ready to be admitted to the cylinder as quickly as the spray nozzles are opened by the spray cam.

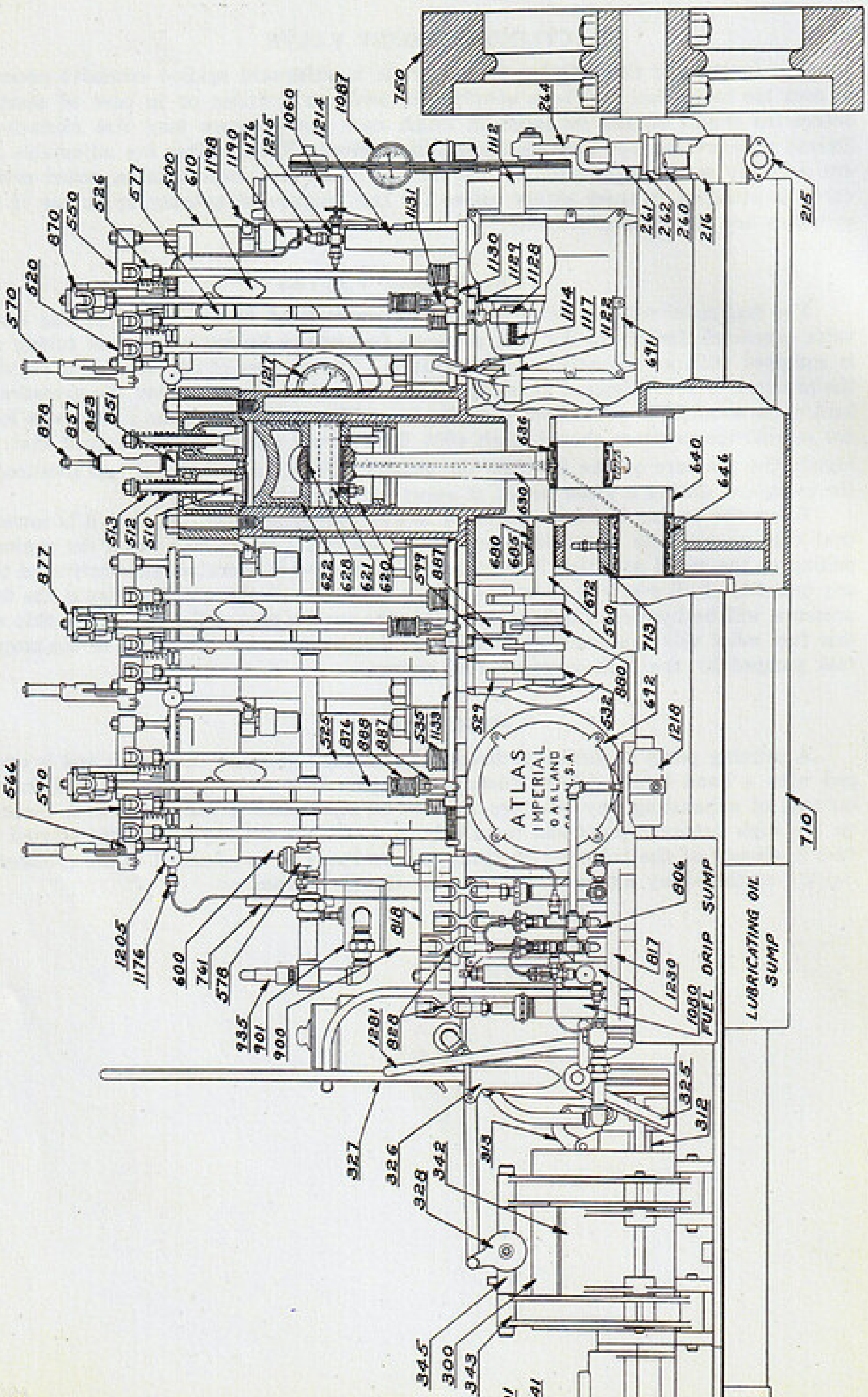

ATLAS
IMPERIAL
OAKLAND
CAL. U.S.A
LUBRICATING OIL SUMP
FUEL DRIP SUMP

FIG. 3

Figures 1, 2, 3 and 4 refer particularly to marine engines, showing location of various parts and also partial cross section. These cuts can also be referred to relative to stationary engines so far as the main portions of the engine are concerned, with the exception of the reverse gear and water pumps, which are not used for stationary purposes.

When ordering spare parts please refer to Figures 3 and 4 and order by number. Also refer to the list where the name of each part is given so as to check up and avoid mistakes.

Figure 5 shows a diagram of valve timing.

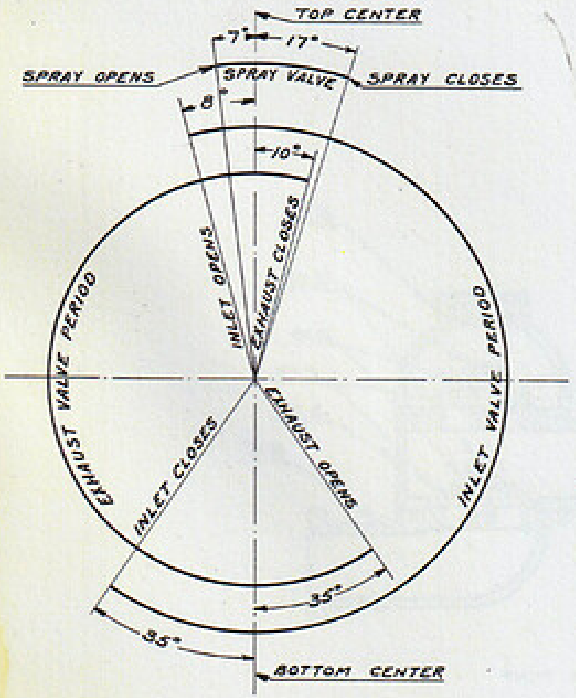


FIG. 5

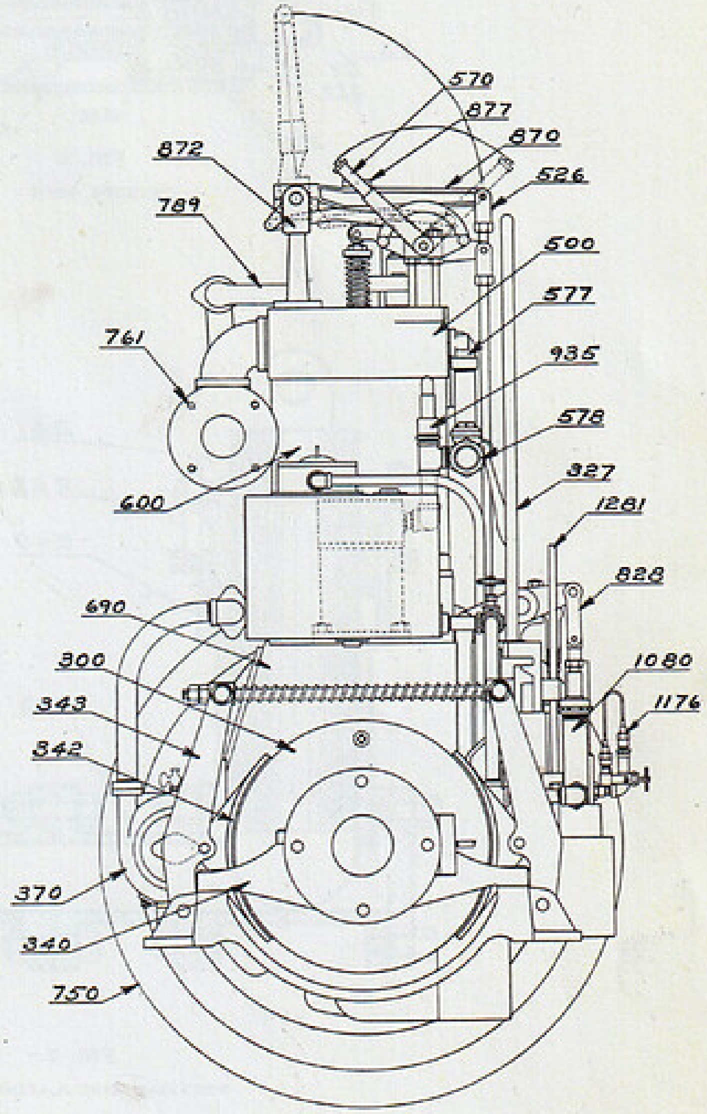


FIG. 4

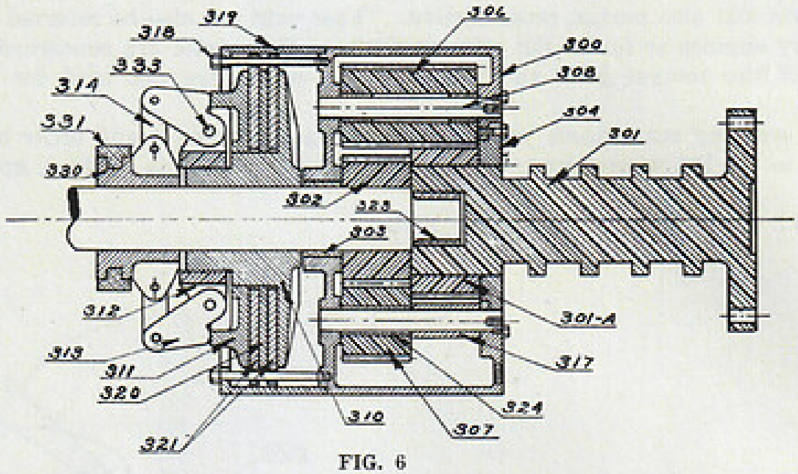


FIG. 6

REVERSE GEAR

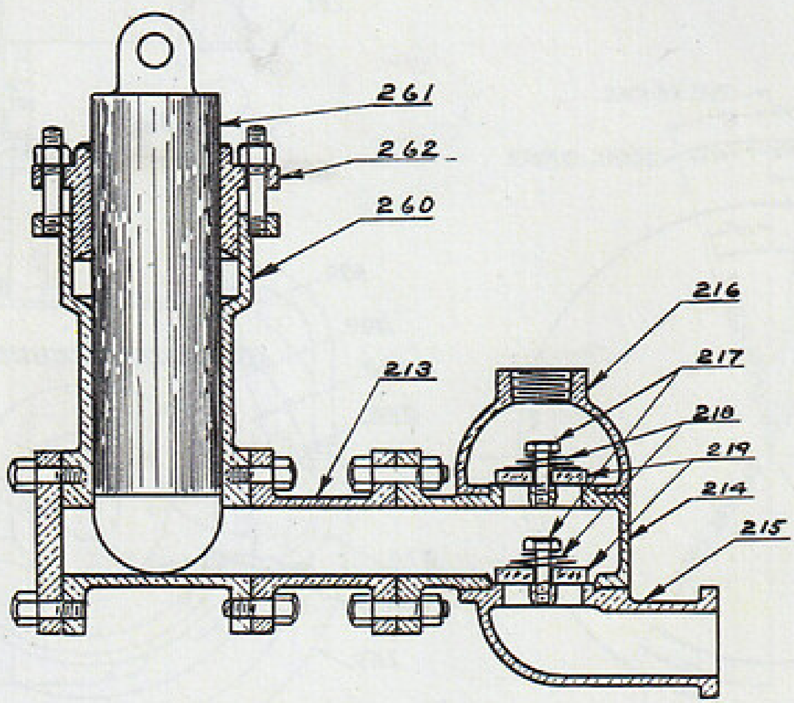


FIG. 7

VERTICAL CIRCULATING PUMP

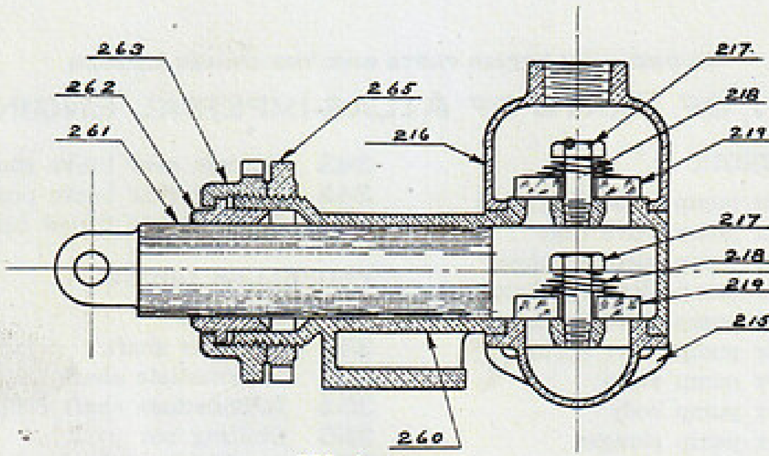


FIG. 8

HORIZONTAL CIRCULATING PUMP

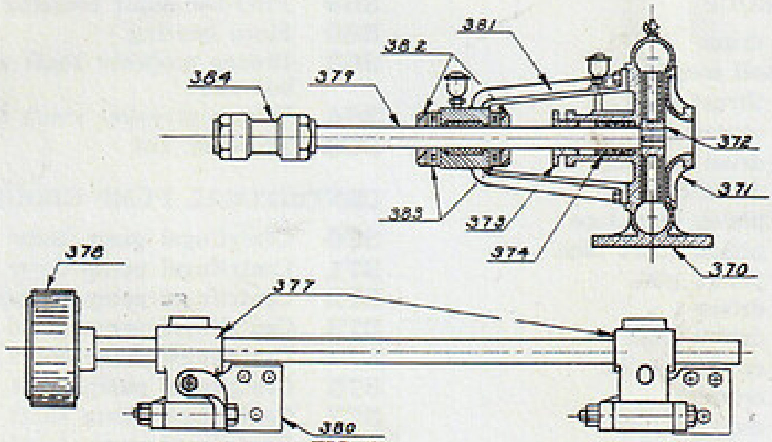


FIG. 9

CENTRIFUGAL PUMP DRIVER

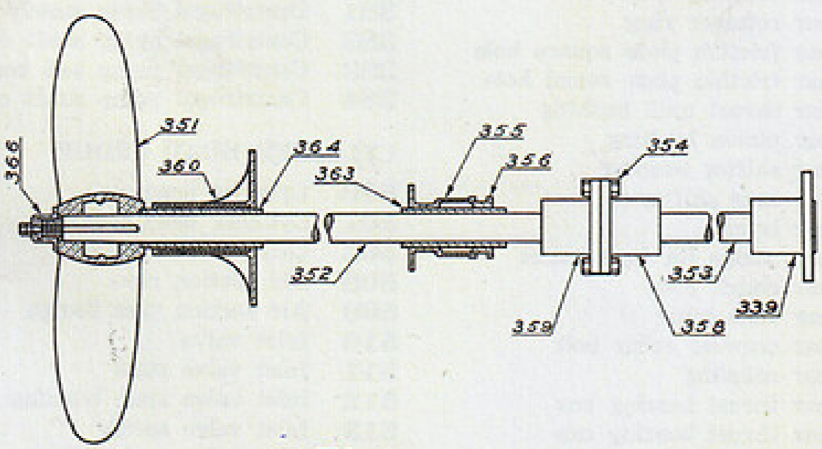


FIG. 10

PROPELLER AND SHAFT GROUP

IN ORDERING REPAIR PARTS GIVE THE ENGINE NUMBER

LIST OF PARTS OF ATLAS-IMPERIAL ENGINES

PLUNGER PUMP GROUP

213 Water plunger pump connecting pipe
214 Water plunger pump valve cage
215 Water plunger pump suction bonnet
216 Water plunger pump discharge bonnet
217 Water plunger pump valve guide stem
218 Water plunger pump valve spring
219 Water plunger pump valve
260 Water plunger pump body
261 Water plunger pump plunger
262 Water plunger pump gland
264 Water plunger pump connecting rod

REVERSE GEAR GROUP

300 Reverse gear drum
301 Thrust quill and coupling
301A Reverse gear thrust gear
302 Reverse gear center gear
303 Reverse gear drum bushing
304 Reverse gear drum cover
306 Reverse gear pinion long face
307 Reverse gear pinion short face
308 Reverse gear pinion pin
310 Reverse gear driver
311 Reverse gear driver plate
312 Reverse gear crowder collar
313 Reverse gear crowder
314 Reverse gear crowder link
315 Reverse gear crowder spring
317 Reverse gear pinion spacing bushing
318 Reverse gear retainer ring bolt
319 Reverse gear retainer ring
320 Reverse gear friction plate square hole
321 Reverse gear friction plate round hole
323 Reverse gear thrust quill bushing
324 Reverse gear pinion bushing
325 Reverse gear shifter bearing
326 Reverse gear cone shifter
327 Reverse gear lever
328 Reverse gear wedge for brake shoe
330 Reverse gear clutch cone
331 Reverse gear cone collar
333 Reverse gear crowder collar bolt
339 Reverse gear coupling
340 Reverse gear thrust bearing box
341 Reverse gear thrust bearing cap
342 Reverse gear brake shoe
343 Reverse gear brake shoe post
345 Reverse gear brake post binder
347 Reverse gear thrust bearing water pipe

PROPELLER GROUP

351 Propeller
352 Propeller shaft
353 Intermediate shaft
354 Intermediate shaft coupling bolts
355 Stuffing box
356 Stuffing box gland
357 Stuffing box gland stud
358 Intermediate shaft coupling
359 Propeller shaft coupling
360 Stern bearing
363 Bronze propeller shaft sleeve, stuffing box end
364 Bronze propeller shaft sleeve, propeller end
366 Propeller nut

CENTRIFUGAL PUMP GROUP

370 Centrifugal pump body
371 Centrifugal pump cover
372 Centrifugal pump runner
373 Centrifugal pump gland
374 Centrifugal pump shaft bushing
375 Centrifugal pump shaft bearing bracket
377 Centrifugal pump shaft bearing
378 Centrifugal pump friction
379 Centrifugal pump shaft
380 Centrifugal pump bearing bracket
381 Centrifugal pump steady bearing
382 Centrifugal pump shaft collar
383 Centrifugal pump ball bearing
384 Centrifugal pump shaft coupling

CYLINDER HEAD GROUP

500 Cylinder head
501 Cylinder head stud
502 Cylinder head gasket
508 Air suction pipe
509 Air suction pipe flange
510 Inlet valve
511 Inlet valve stem
512 Inlet valve stem bushing
513 Inlet valve spring
514 Inlet valve spring nut

520	Inlet rocker
523	Inlet rocker roller
524	Inlet rocker pin
525	Inlet rocker push rod
526	Inlet rocker fork
527	Inlet rocker fork pin
528	Inlet valve lifter
529	Inlet valve lifter guide
530	Inlet valve lifter roller
531	Inlet valve lifter roller pin
532	Inlet cam
535	Exhaust valve lifter spring
536	Exhaust valve lifter spring bottom collar
537	Exhaust valve lifter spring retainer
538	Exhaust valve lifter spring retainer collar
540	Exhaust valve
541	Exhaust valve stem
542	Exhaust valve stem bushing
543	Exhaust valve spring
544	Exhaust valve spring nut
550	Exhaust rocker
551	Exhaust rocker roller
552	Exhaust rocker roller pin
553	Exhaust rocker push rod
554	Exhaust rocker fork
555	Exhaust rocker fork pin
556	Exhaust valve lifter
557	Exhaust valve lifter guide
558	Exhaust valve lifter roller
559	Exhaust valve lifter roller pin
560	Exhaust cam
656	Rocker shaft
566	Rocker shaft bearing
567	Rocker shaft bearing stud
570	Air starting handle
571	Air starting handle
572	Air starting
573	Air starting handle sector
577	Air starting inlet elbow
579	Air starting valve spring bushing
580	Air starting valve
581	Air starting valve cage
582	Air starting valve spring
583	Air starting valve spring washer
584	Air starting valve nut
585	Air starting valve balance bushing
586	Air starting valve gasket
590	Air starting rocker
591	Air starting rocker fork
592	Air starting rocker fork pin
593	Air starting push rod
594	Air starting valve lifter
595	Air starting valve lifter roller
596	Air starting valve lifter roller pin
597	Air starting cam

CYLINDER GROUP

600	Cylinder
610	Cylinder head passover pipe
620	Piston
621	Piston pin
622	Piston ring outer
624	Piston ring inner
628	Piston pin bushing
630	Connecting rod
631	Connecting rod bolt
632	Connecting rod ball check valve
633	Connecting rod valve seat

CRANK SHAFT GROUP

635	Crank pin box
637	Crank pin box bolt
638	Crank pin box strap
640	Crank shaft
644	Crank shaft bushing flywheel end
646	Crank shaft bushing center
649	Crank shaft bushing after end
660	Crank shaft pinion

CENTERFRAME GROUP

664	Intermediate gear
665	Intermediate gear pin
666	Intermediate gear bearing
670	Cam gear
672	Cam shaft
680	Cam shaft bearing
685	Cam shaft bearing bushing
690	Centerframe
691	Centerframe cover and governor door
692	Centerframe cover
693	Centerframe cover
695	Centerframe cover on end of frame

BASE GROUP

710 Base
712 Base cap flywheel end
713 Base cap center
714 Base cap after end
715 Base cap after end
717 Base cap stud
719 Base cap parting piece flywheel end
720 Base cap parting piece center
722 Base cap parting piece after end
750 Flywheel
760 Exhaust elbow
761 Exhaust pipe
780 Inlet water pipe
789 Outlet water pipe
790 Outlet drop water pipe to exhaust
791 Outlet water pipe from exhaust

FUEL PUMP GROUP

796 High pressure full outlet fitting
800 Fuel pump
801 Fuel pump suction valve
802 Fuel pump valve cage
805 Fuel pump plunger
806 Fuel pump
808 Fuel pump gland
809 Fuel pump gland nut
810 Fuel pump plunger eye
811 Fuel pump discharge valve
817 Fuel pump plate
818 Fuel pump rocker
819 Fuel pump rocker shaft
820 Fuel pump rocker shaft bearing
821 Fuel pump rocker shaft bearing cap
822 Fuel pump crank shaft
823 Fuel pump crank connecting rod
824 Fuel pump crank connecting rod cap
828 Fuel pump plunger connecting rod

SPRAY VALVE GROUP

850 Spray valve
851 Spray valve body
853 Spray valve spring casing
954 Spray valve clamp
855 Spray valve clamp bridge
856 Spray valve seat nut
864 Spray valve nozzle
865 Spray valve gland nut
866 Spray valve gland
870 Spray valve rocker
872 Spray valve rocker fulcrum
873 Spray valve rocker fulcrum eccentric
874 Spray valve rocker eccentric crank
875 Spray valve rocker fork
880 Spray valve cam
883 Spray valve lifter
884 Spray valve lifter roller
885 Spray valve lifter roller pin
887 Spray valve lifter guide

AIR COMPRESSOR GROUP

900 Air compressor cylinder
901 Air compressor cylinder head
902 Air compressor cylinder head studs
905 Air compressor inlet valve
906 Air compressor grid
908 Air compressor inlet valve spring
915 Air compressor discharge valve
918 Air compressor valve plug
191 Air compressor discharge valve springs
925 Air compressor piston
926 Air compressor piston ring
927 Air compressor piston pin
928 Air compressor piston pin bushing
929 Air compressor connecting rod
930 Air compressor eccentric strap top half
931 Air compressor eccentric strap lower half
932 Air compressor eccentric stop bolt
933 Air compressor eccentric

LUBRICATOR GROUP

1060 Force feed lubricator
1061 Force feed lubricator bracket
1062 Force feed lubricator pulley
1070 Sump lubricating pump barrel
1071 Sump lubricating pump lower valve casting
1072 Sump lubricating pump top casting
1073 Sump lubricating pump valve
1074 Sump lubricating pump valve cage
1075 Sump lubricating pump plunger
1076 Sump lubricating pump connecting rod
1078 Sump lubricating pump rocker
1080 Pressure lubricating oil pump body

1081 Pressure lubricating oil pump plunger
1082 Pressure lubricating oil pump gland
1083 Pressure lubricating oil pump gland nut
1085 Pressure lubricating oil pump plunger eye
1086 Pressure lubricating oil pump connecting rod

GOVERNOR GROUP

1100 Governor body
1101 Governor weight
1102 Governor weight pin
1103 Governor weight roller
1104 Governor weight roller pin
1105 Governor weight roller plate
1106 Governor thrust button
1107 Governor ball bearing under roller
1108 Governor ball bearing large
1109 Governor shaft
1110 Governor collar
1111 Governor pinion
1112 Governor bearing
1113
1114 Governor compression spring
1115 Governor compression spring block
1117 Governor control handle
1118 Governor control handle pawl
1119 Governor control handle sector
1120 Governor rack for compression spring
1121 Governor rack adjusting screw
1122 Governor speed control socket
1123 Governor control socket bearing
1128 Governor fork
1129 Governor lever on vertical fork rod
1130 Governor lever on wedge shaft
1131 Governor wedge lever
1132 Governor fuel control wedge
1133 Governor fuel control shaft
1134 Governor fuel control shaft bearing
1135 Governor fuel shaft tension spring
1136 Governor shaft spring clamp
1137 Governor shaft connecting link
1176 Fuel union nut
1177 Fuel union sleeve

SAFETY VALVE GROUP

1190 Safety valve body
1191 Safety valve stem
1192 Safety valve seat
1193 Safety valve spring
1194 Safety valve spring bushing
1195 Safety valve locking screw
1197 Safety valve cylinder plug
1198 Safety valve try valve
1199 Safety valve adjusting screw

ISOLATING VALVE GROUP

1205 Isolating valve body
1206 Isolating valve stem
1207 Isolating valve gland
1208 Isolating valve gland nut
1209 Isolating valve handle
1214 Fuel oil receiver end of line
1215 Fuel oil receiver valve body

FUEL OIL STRAINER GROUP

1218 Fuel strainer body duplex type
1219 Fuel strainer cover
1220 Fuel strainer grid
1221 Fuel strainer valve
1222 Fuel strainer valve stuffing box

FUEL RELIEF VALVE GROUP

1230 Fuel relief valve cylinder
1231 Fuel relief valve gland
1233 Fuel relief valve plunger
1236 Fuel relief valve spring
1237 Fuel relief valve spring cage
1238 Fuel relief valve spring cap
1239 Fuel relief valve spring screw
1240 Fuel relief valve screw plug
1242 Fuel relief valve inlet fitting

PRIMING PUMP GROUP

1275 Priming pump cylinder
1276 Priming pump plunger
1277 Priming pump gland
1278 Priming pump gland nut
1279 Priming pump plunger eye
1280 Priming pump plunger connecting rod
1281 Priming pump handle
1282 Priming pump handle bearing