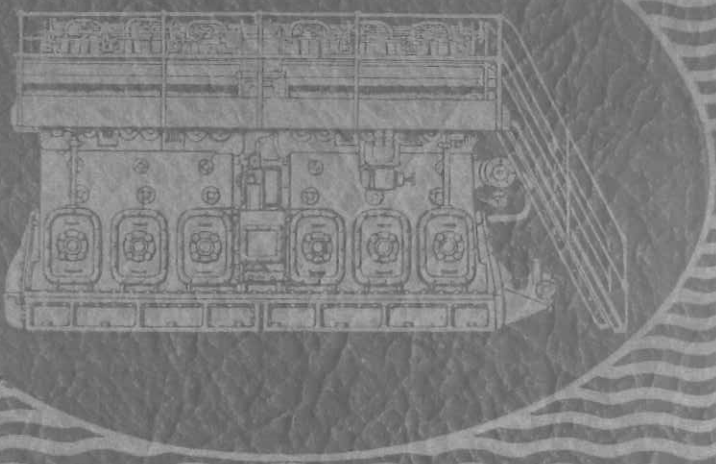


BESSEMER STATIONARY DIESEL ENGINES

BESSEMER DIESEL ENGINES

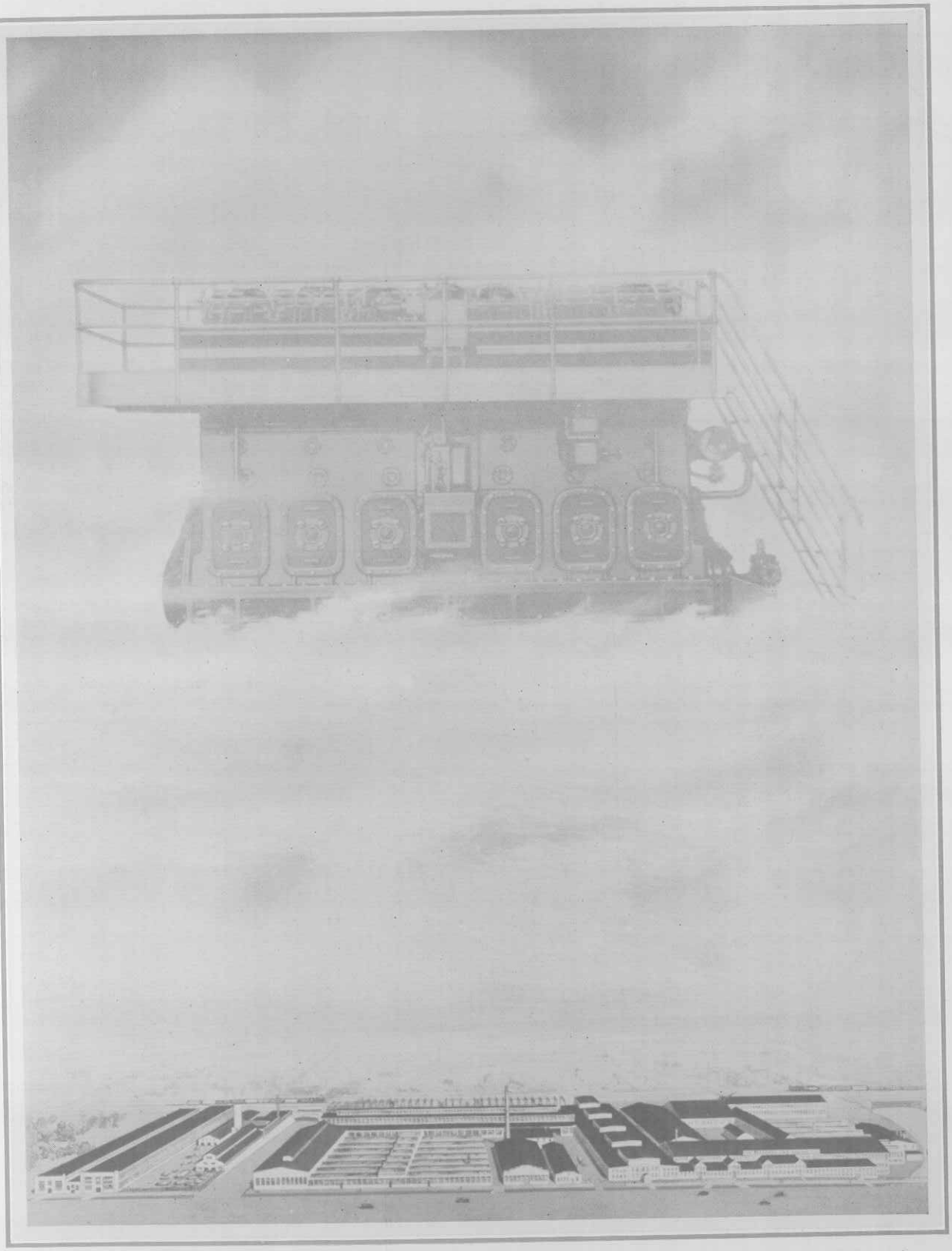
VERTICAL 4-CYCLE STATIONARY TYPE

Catalog G. S. 744

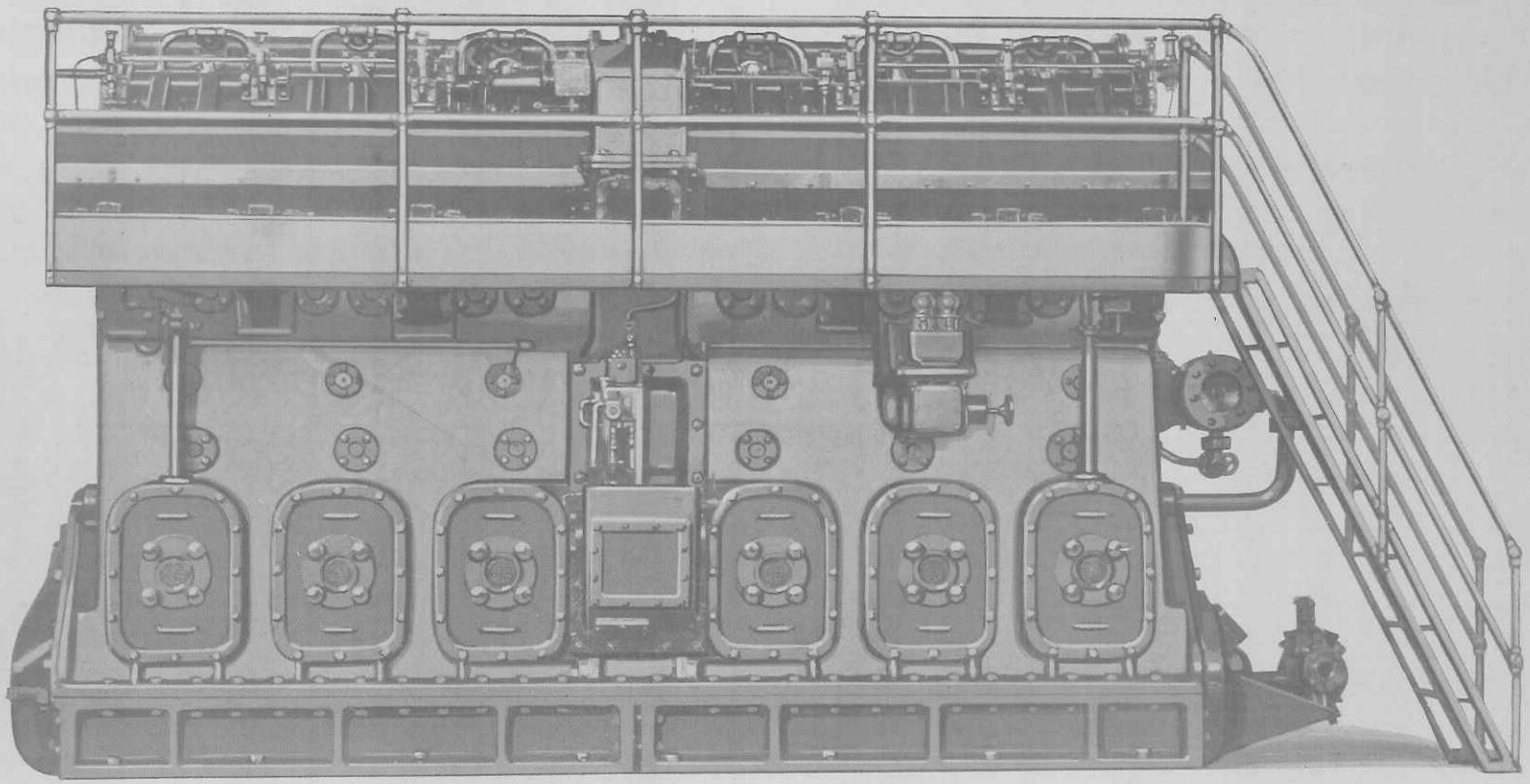
For smaller horsepower Diesel Engines—
from 40 H. P. to 230 H. P.
See Bulletin SS-745

(For Marine Service see Catalog GM-743)

BESSEMER ENGINE CO.
GROVE CITY, PENNA., U. S. A.



THE HOME OF BESSEMER DIESEL ENGINES—GROVE CITY, PA., U. S. A.



A SIX CYLINDER BESSEMER STATIONARY ENGINE, MODEL KR, EQUIPPED WITH PLATFORM, STAIRS AND RAILING

FOREWORD

BESSEMER Diesel Engines are the result of over three decades of successful internal combustion engine building. In the stationary field Bessemer Diesel Engines enjoy an enviable reputation for economical, dependable power in units from 40 H. P. to 1240 H. P. They are known as "smooth-running or vibrationless engines" by users and engineers who are familiar with the performance of the best Diesel engines.

Bessemer Diesels are being constantly improved and the models offered in this catalogue are superior in engineering, in material and in construction. They are simple in design, yet at the same time accessible; they are reliable and rugged in construction; and they follow universally approved methods of engineering.

To those who are seeking information regarding the advisability of using Diesel Engines for power, our experience and engineering department is at their service and we can assure them of unbiased advice as to type of prime mover best adapted to their needs.

The Bessemer Engine Company has always cherished as its friends the many customers who have for more than three decades continued to use Bessemer Engines. There can be only one reason for this friendship and that is satisfaction on the part of the customer and service on the part of the Bessemer Engine Company.

We will be glad to show you why so many owners continue to buy Bessemer Diesels and why they say, "You buy the best when you buy the Bessemer."

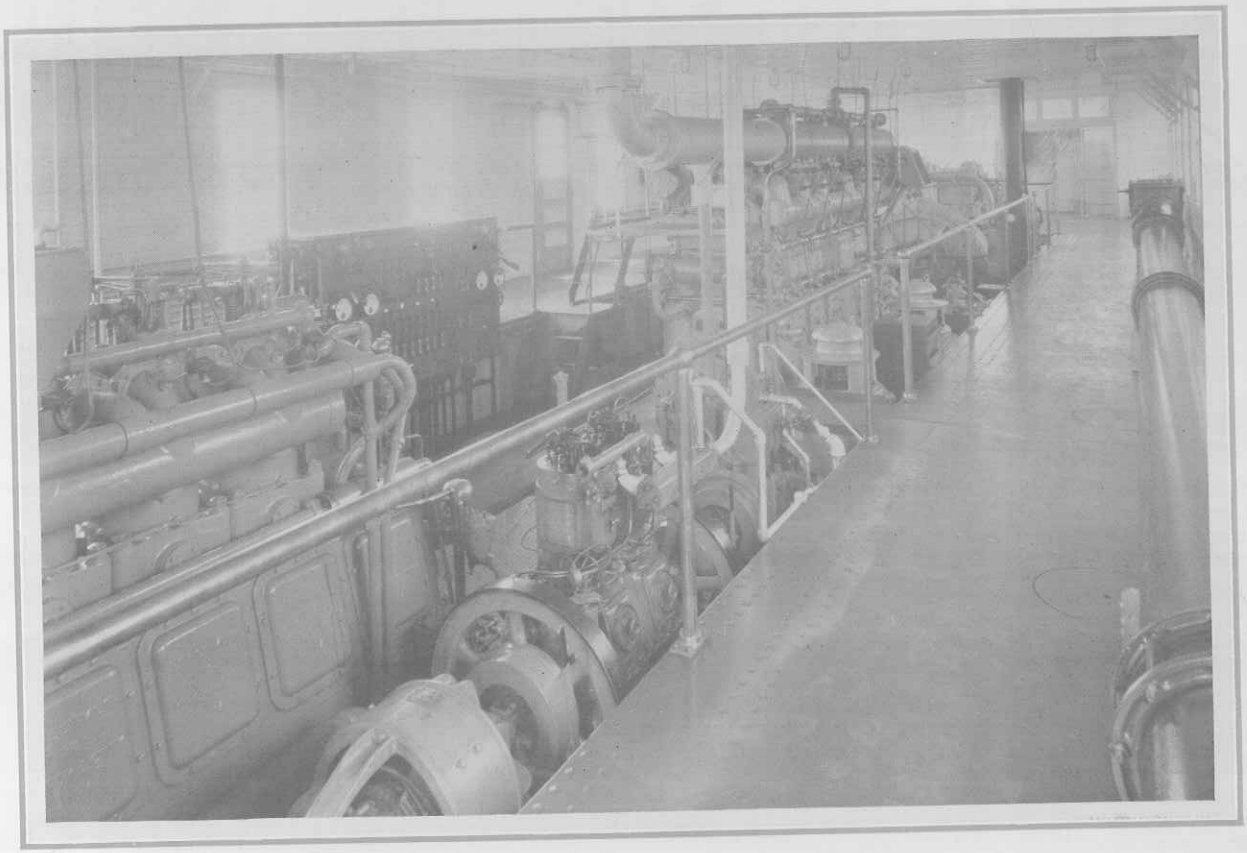
BESSEMER ENGINE COMPANY
GROVE CITY, PA., U. S. A.

DIMENSIONS OF BESSEMER STATIONARY DIESEL ENGINES

VERTICAL TYPE, MULTI-CYLINDER, SOLID INJECTION.

Model	B. H. P.	R. P. M.	Bore & Stroke	Diameter Crank Shaft	Approx. Weight without Flywheel	Head Room Necessary to Remove Piston Above Center Line of Crankshaft	Maximum Width	Approximate Length
KR-3	250	277	14x18	10″	20 ton	9′6″	6′6″	8′
KR-4	330	277	14x18	10″	24 ton	9′6″	6′6″	12′
KR-6	500	277	14x18	10″	36 ton	9′6″	6′6″	16′
KR-8	660	277	14x18	10″	40 ton	9′6″	6′6″	20′
LR-3	335	257	16x20	11¼″	30 ton	10′8″	7′6″	8′6″
LR-4	450	257	16x20	11¼″	43 ton	10′8″	7′6″	13′0″
LR-6	670	257	16x20	11¼″	58 ton	10′8″	7′6″	17′6″
LR-8	900	257	16x20	11¼″	70 ton	10′8″	7′6″	22′0″
MR-3	465	257	18x22	12¾″	36 ton	11′4″	8′6½″	9′4″
MR-4	620	257	18x22	12¾″	43 ton	11′4″	8′6½″	14′5″
MR-6	930	257	18x22	12¾″	63 ton	11′4″	8′6½″	19′6″
MR-8	1240	257	18x22	12¾″	75 ton	11′4″	8′6½″	24′7″

SMALLER SIZES ARE BUILT IN 40—60—80—85—110—125—150—170 and 230 H. P. FOR HORSEPOWER SIZES SMALLER THAN 250 H. P. SEE BULLETIN SS-745.



Engine Room of the New York State dredge, showing the 500 H. P. Bessemer diesel direct connected to 15" Morris pump, and the 150 H. P. Bessemer direct connected to a 100 K. W. D. C. generator.

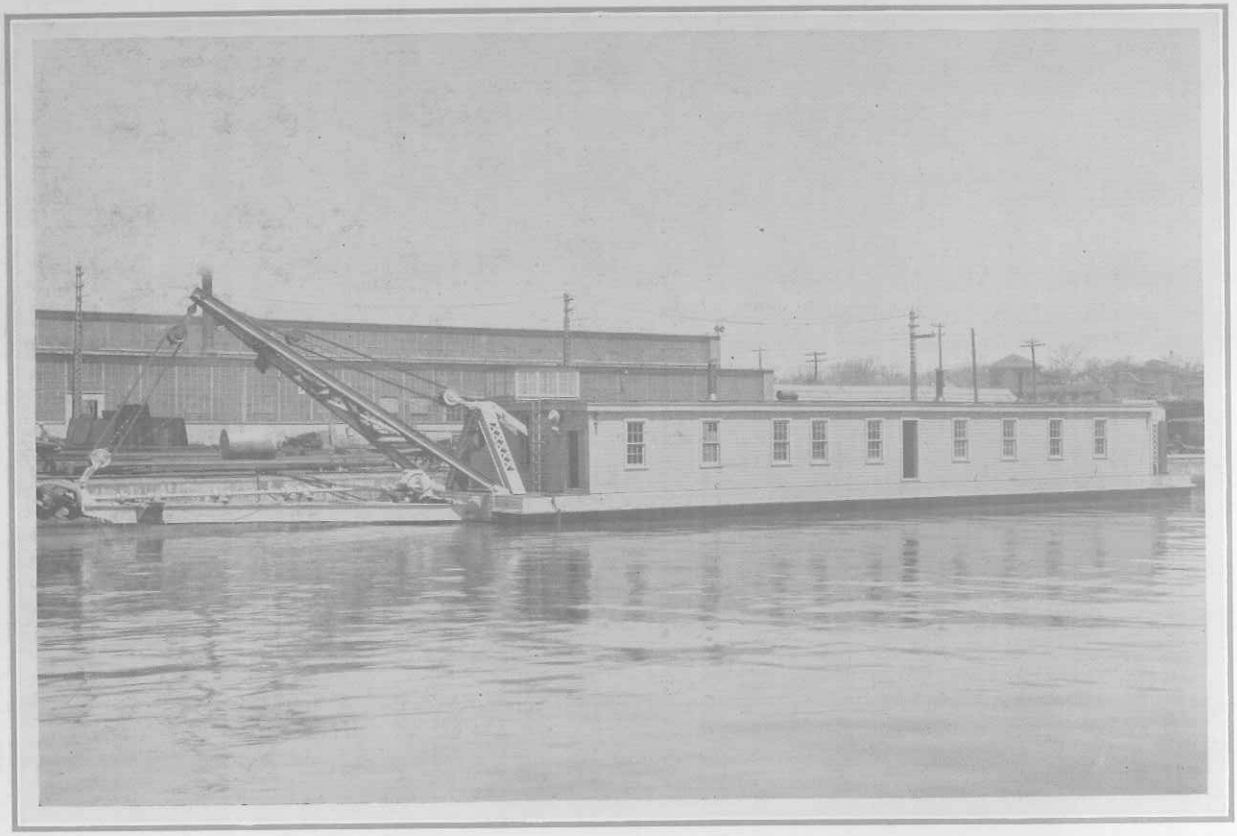
THE Bessemer Diesel Engine is of the four-cycle solid injection type. The general design follows well recognized principles of the highest type of internal combustion engineering. Every detail of design and construction has been tried and proven to be entirely satisfactory on both land and sea, under the most trying conditions. Tens of thousands of horse power are daily serving their owners with entire satisfaction and with the utmost efficiency and economy.

The Diesel Principle

The Diesel principle is the ignition of fuel by the heat of compression. Eliminating technical language it is thus explained: By compression, the temperature of the air in the cylinder is raised to approximately 900° Fahrenheit, which temperature is sufficient to ignite the fuel oil when properly sprayed into the compression chamber. The oil spray burns at this temperature, thereby increasing the volume of cylinder content or in other words the molecules of hydrogen and carbon of the oil unite with the molecules of oxygen in the hot compressed air, forming water vapor (H_2O), carbon monoxide (CO) and carbon dioxide (CO_2). The uniting of these elements creates heat, heat expands the gases, the expansion of the gases is the power-creating force within the cylinder that drives the piston downward.

Ignition

Ignition is accomplished solely from the heat of compression. No hot heads, balls, "punks," plates, electric plugs or any other heated devices are used to aid ignition,



The New York State dredge, powered with two Bessemer diesel engines, one developing 500 H. P. at 275 R. P. M. and the other developing 150 H. P. at 350 R. P. M.

and no electricity is used in connection with the operation of Bessemer Diesel Engines.

Starting

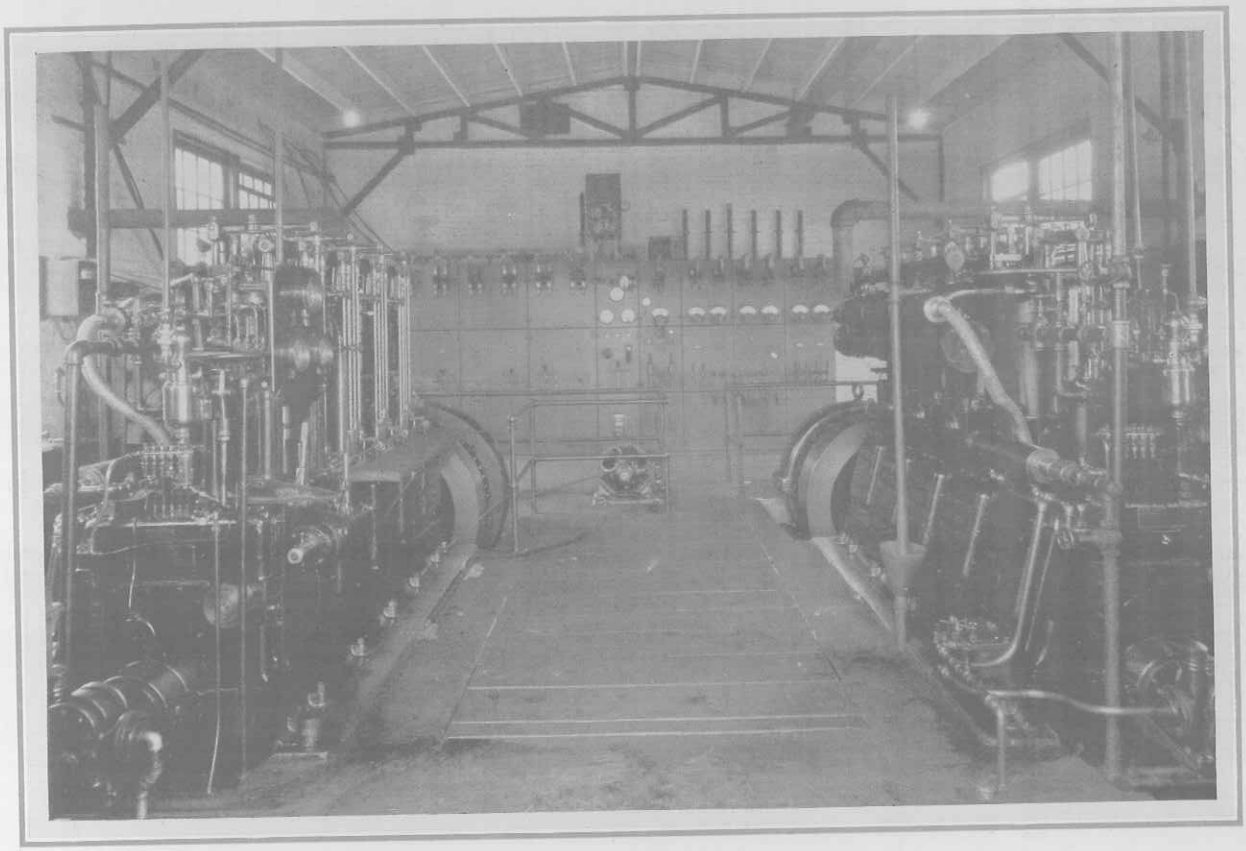
Starting is accomplished by the aid of compressed air with an air pressure of from 200 to 250 pounds per square inch. The amount of air pressure required depends upon the load the engine is carrying at the time of starting. The air tanks and the entire compressed air system is built and tested out for a working pressure of 250 pounds per square inch in order to carry a large reserve for unusual conditions should occasion ever require. Air is admitted on every power stroke of the piston and the entire air starting valve mechanism is automatically swung out of action after the engine is in motion. This allows the engine to be started on the minimum quantity and pressure of air. This feature is very desirable, as it permits the starting of the engine from stone cold to full power without the use of high pressure air, and consequently eliminates a three stage air compressor, and also the air receivers and intercoolers necessary for the use of high pressure air.

Cycles

The functions of the four cycles of the Bessemer Diesel Engines are as follows:

First, *Intake Stroke*—When the piston goes down on the intake stroke the intake valves are held open and the cylinder is filled with air from the outside atmosphere.

Second, *Compression Stroke*— On the upward stroke of the piston the intake valves are closed and the air in the cylinder is



Power plant of the Ellwood City Forge Co, showing the two Bessemer diesel engines of 150 H. P. each, one driving a 100 K. W. A. C generator, the other a 100 K. W. D. C. generator These diesels are producing current for less than one half of the former cost.

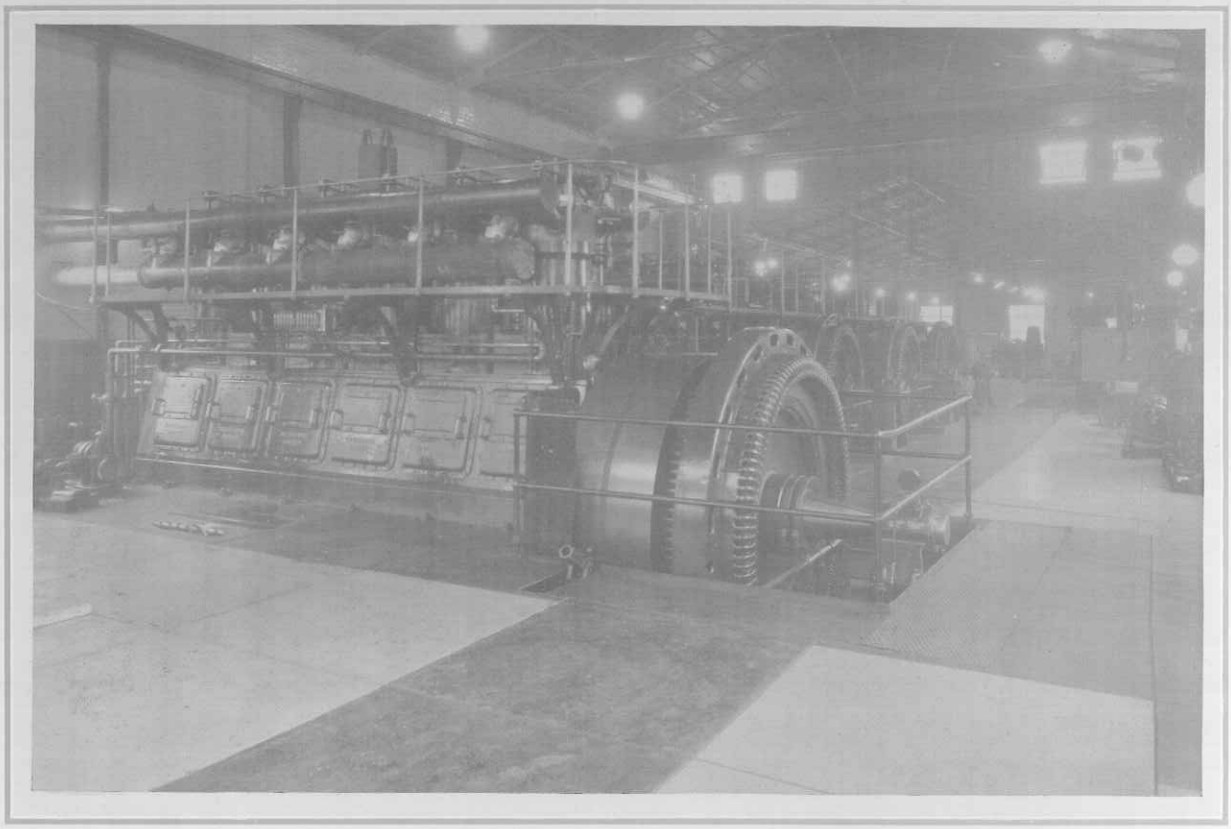
compressed to a sufficient temperature to ignite the fuel, and at the height of compression the fuel spray valve is opened by a cam and the fuel sprayed into the highly heated air within the combustion chamber.

Third, *Expansion Stroke*—The fuel oil burning and expanding in the combustion chamber maintains a high pressure on the piston during the downward stroke, this being the power-creating force within the cylinder. At the bottom of the expansion stroke the exhaust valves are opened and the piston returns on the scavenging stroke.

Fourth, *Scavenging Stroke*—As the piston returns to the top of the cylinder, the exhaust valves are opened and the burnt gases pass to the atmosphere. Almost simultaneously with the closing of the exhaust valves the inlet valves open and the four cycles of inlet, compression, power and exhaust are again taken up.

Fuel Oil System

The fuel oil system is of the constant pressure solid injection type, with pressure maintained by plunger pumps. These pumps deliver fuel oil into the high pressure oil system leading to the fuel spray nozzle located in the center of the cylinder heads. A branch pipe connects each spray nozzle to the high pressure oil system. An additional branch pipe leads to a pressure regulator and relief valve, which regulates the pressure and by-passes all oil not required to maintain constant pressure. The operator can adjust the pressure of the oil in the high pressure oil system as may be



The Grove City Municipal Light Plant, operating 3 Bessemer diesel engines of 350 H. P., and one Bessemer of 750 H. P., producing current for less than 1½c per K. W., including all fixed charges.

required. The spray valve is mechanically opened by a cam and properly timed with the cycles of operation to inject the fuel at the proper time for ignition.

Lubrication

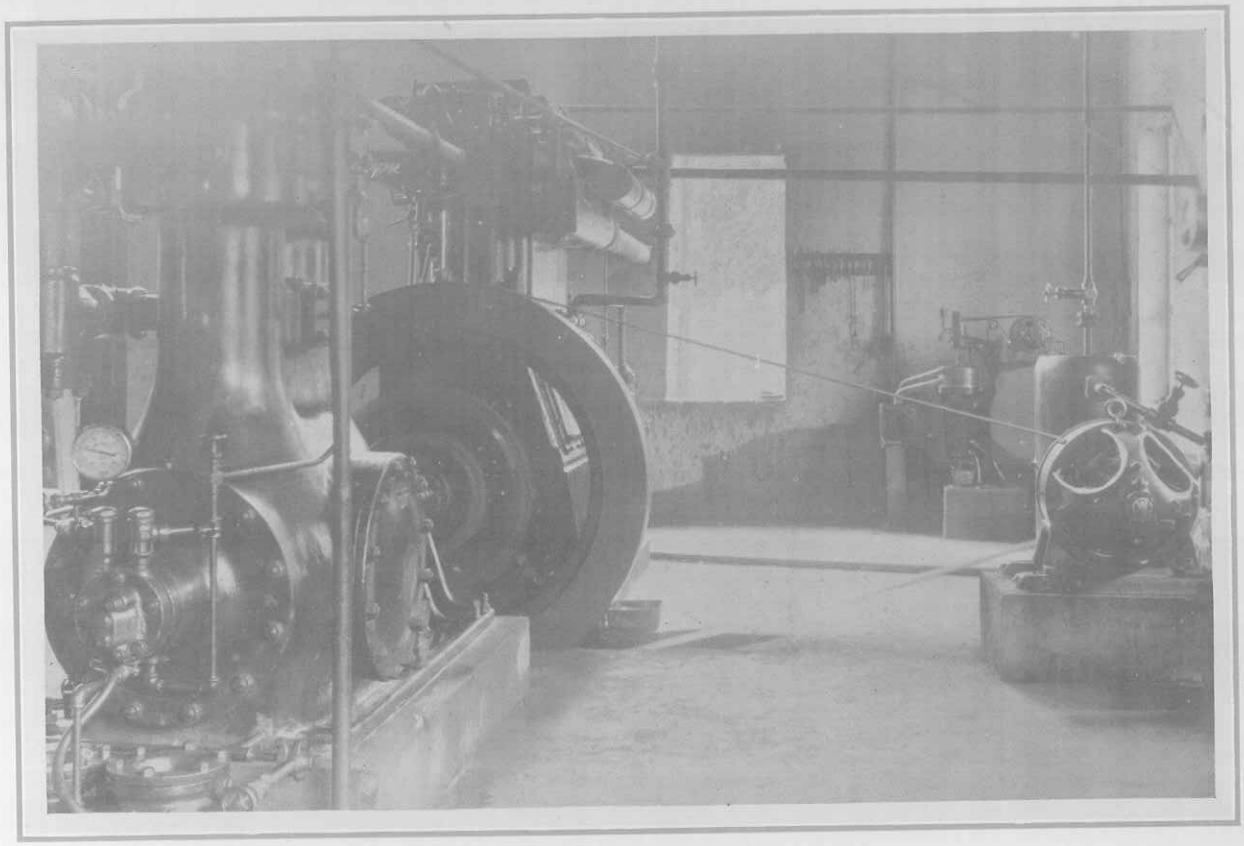
Bessemer Diesel Engines are lubricated by a primary and a secondary system. The primary system consists of a mechanical force feed oiler, which supplies oil to the cylinder walls.

This mechanical force feed lubricator is a development of the Bessemer Engine Company, designed especially for lubricating the walls of four-cycle diesel engines.

It is a glycerine sight feed lubricator with a special plunger pump of very small dimensions for each point of lubrication. With the usual type of oiler that may be obtained on the market it is difficult and often impossible to supply a small quantity of lubricating oil to the cylinder walls at short intervals, resulting in either too much lubricating oil or too great a period between lubricating oil injections.

With the Bessemer special force feed lubricator as small a quantity as one-fourth of a drop for each stroke of the plunger pump may be fed to the cylinder walls at any desired interval, which is usually set at about every twentieth stroke of a piston. Thus one-fourth of a drop may be fed at every twenty to thirty strokes of the piston.

This feature eliminates the waste of expensive lubricating oil



A 100 H. P. Bessemer Diesel engine driving a 30 ton York ice machine in the plant of Lequercia, Espriella & Cie., Carthagena, Colombia, S. A. There are also three 150 H. P. Bessemer engines in this plant.

and any dangers resulting from using too much lubricating oil. When oil is fed in excessive quantities it has the tendency to decompose behind the first, second and third piston rings.

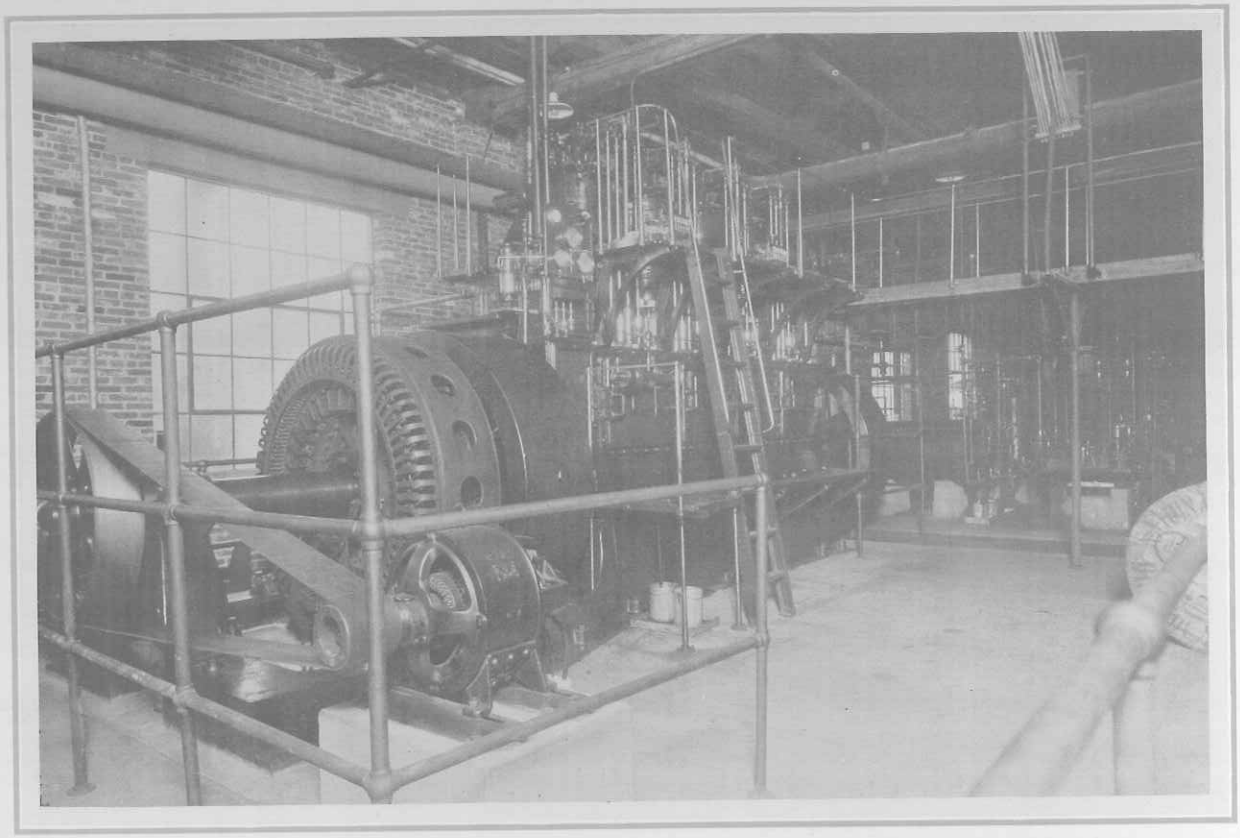
Our special lubricator eliminates this danger entirely. Regulation is very minute and accurate.

New oil is always used in this oiler. There is always a small amount of waste oil from cylinder lubrication, which is caught up in the oil tight base and is the "make up" oil for the secondary system.

The secondary system supplies oil under pressure to all main bearings, crank bearings and wrist pins. The pressure is maintained by a pump, which draws the oil from a reservoir. All of the oil pumped through these bearings is caught up in the oil tight base and drains from the base into the reservoir above mentioned. The oil in the secondary system should be filtered and centrifuged systematically. A constant pressure is maintained on the secondary system by a pump mounted on the engine or an independent motor driven pump. This pressure can be adjusted at will by the operator.

The lubricating oil consumption is a variable factor, depending on the grade and quality of oil used, and the power load at which the engine is operated.

Ordinarily about 2000 H. P. hours per gallon is an average, but with care a gallon will furnish needed lubrication for 4000



The 450 H. P. Bessemer diesel engine in the plant of the Salem Glass Co. There is also a 6 cyl. 670 H. P. Bessemer diesel in service in this plant.

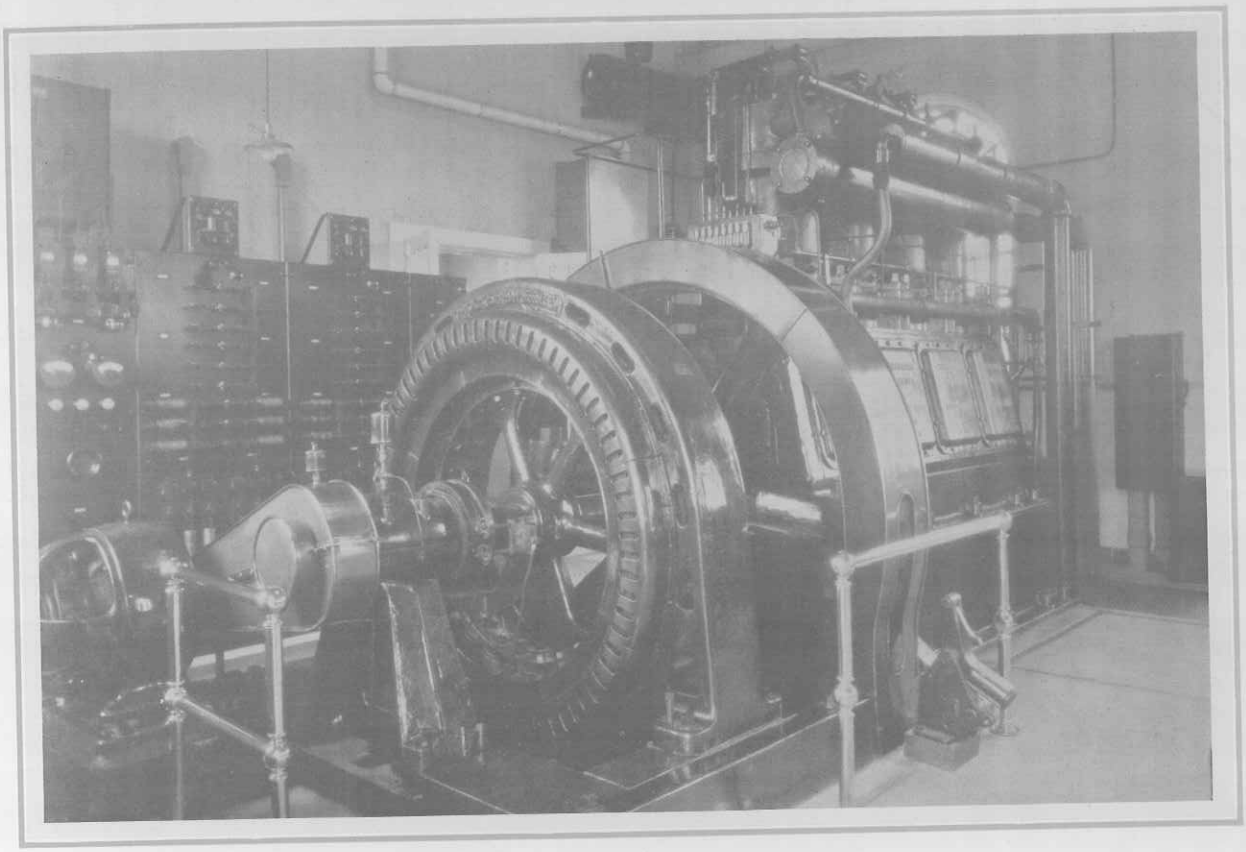
H. P. hours with the proper use of a centrifuge which is part of the standard equipment furnished with each engine.

Tests Bessemer Diesel Engines are all thoroughly run in at the factory, being given tests of a certain number of hours idling, then at ¼ load, then at ½, ¾ and full loads.

A test chart of each engine is kept on file showing the results of each test. The last 24 hours of final test is under the supervision of the head inspector. He ascertains whether all reciprocating parts have been weighed, whether the flywheel has been perfectly balanced and many other details which make a smooth running "vibrationless" engine.

Power All Bessemer Engines are run at full load and are tested either by water or electrical brakes. Bessemer Diesels are guaranteed to deliver their full rated horse power at sea-level. Where 10% overload tests are required or where fuel economy tests are required these are run at the factory and the owner's engineer may be present to supervise all tests. Bessemer engines are able to develop more horse power per cylinder due to a very high mechanical efficiency, a perfected combustion chamber, a very efficient fuel injecting system, dual intake and exhaust valves and a very efficient constant acceleration cam.

The high mechanical efficiency of the engine is due to elimination of auxiliaries. Being of the solid injection type considerable



The Bessemer diesel engine of 280 H. P. in the Point Pleasant Water Works, driving a 3 phase, 60 cycle, 220 volt generator of 150 true K. W. at 257 R. P. M.

power is saved in the elimination of the complicated and troublesome high pressure air compressor. Likewise the refrigeration action of the expansion of the high pressure air in the combustion chamber is eliminated. This cooling action due to expansion absorbs considerable power.

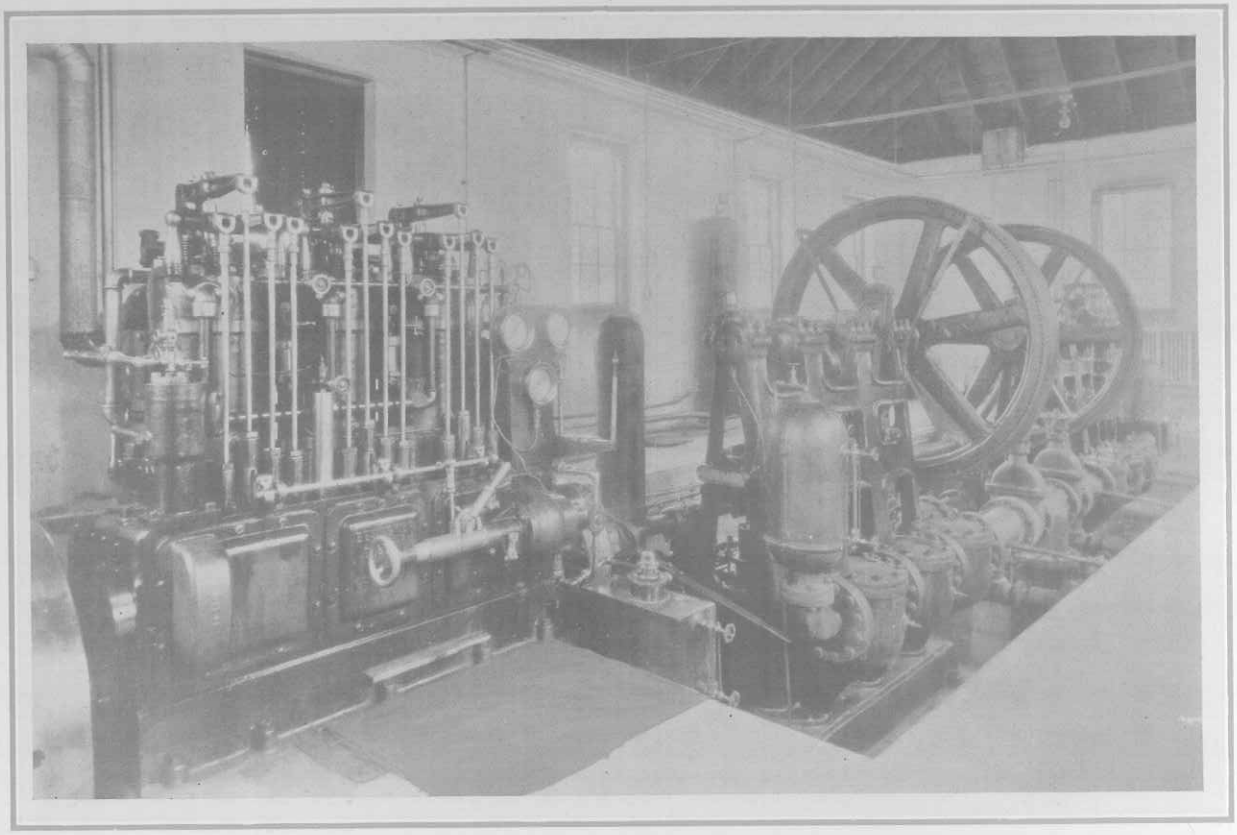
The Combustion Chamber is so simple and efficient that on tests conducted by U. S. Government officials on engines purchased by them, even in small bores (7½"), the fuel consumed was less than .4 of a pound of fuel oil per B.H.P. hour at full load. There is not any "sub-chamber" or "pre-combustion chamber" on Bessemer Diesel engines to lessen the fuel economy. The oil is injected directly into the combustion chamber at the proper angle, at the proper time and for the proper duration of time. The shape of the combustion chamber is such as to allow a minimum fuel consumption, a clear exhaust and a maximum of oil to be burnt in the given space.

The design of the constant acceleration cam is such as to permit the burning of from 10% to 20% more fuel oil in the combustion chamber and likewise to give better fuel economy.

Fuel Economy

Bessemer Diesel Engines are guaranteed a fuel economy at full load of .45 pounds of fuel oil per B.H.P. hour with oil containing not less than 18,500 B.T.U. per pound. Fuel oil recommendations in detail are described in the Instruction Book.

"You Buy the Best when you Buy the Bessemer"



The Wayland Municipal pumping plant, operating two 60 H. P. Bessemer diesel engines direct connected to heavy duty pumps.

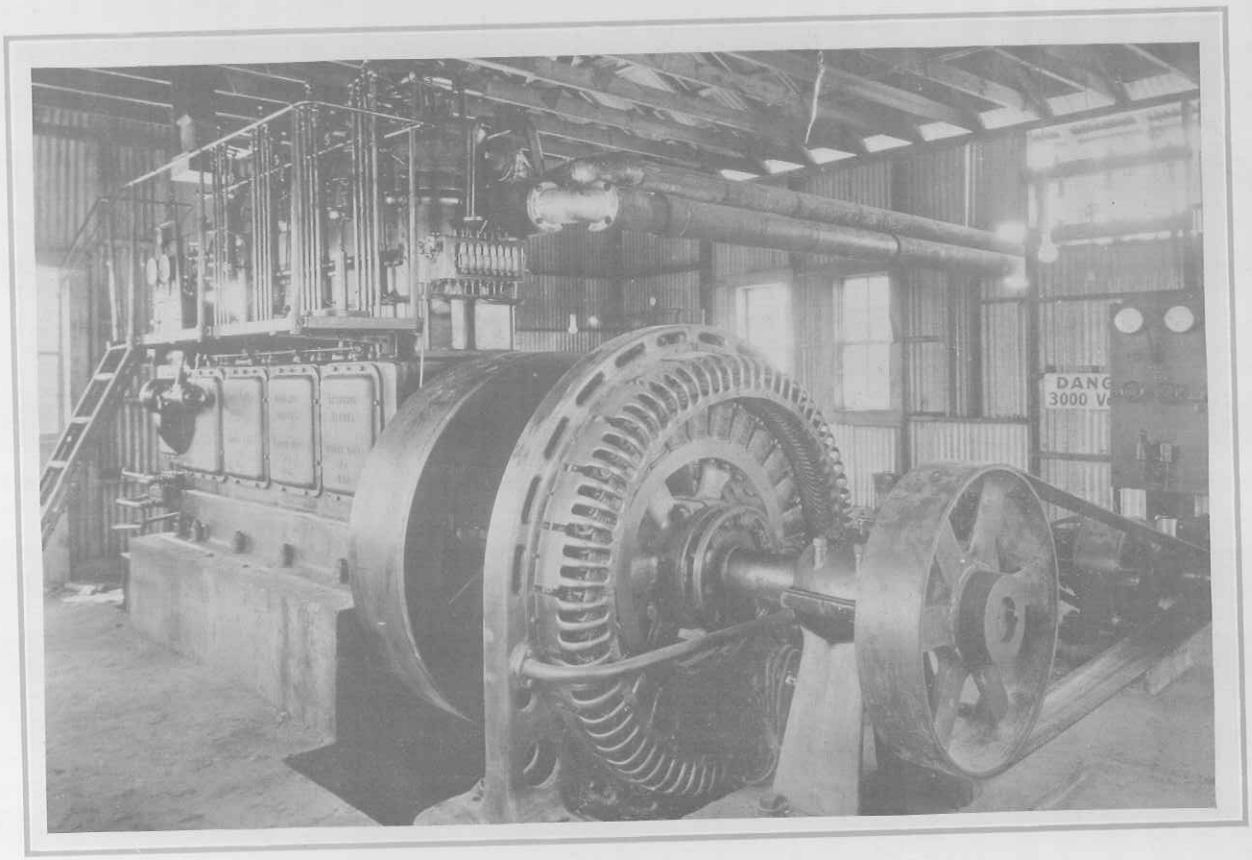
Advantages of Bessemer Diesels

Briefly, a Diesel Engine should be dependable, accessible, economical and adaptable. Since a diesel engine is to last from 15 to 25 years, the design must be modern otherwise through obsolescence the investment must be depreciated much faster, which adds greatly to the fixed overhead.

Economy includes consumption of lubricating oil, fuel oil and repair upkeep. Over a period of years the fuel and lubricating oil economy amounts to a great deal. Four-cycle diesel engines effect a considerable saving in fuel oil, a larger saving in lubricating oil, and since they are self scavenging the savings in piston ring costs, cylinder head costs, bearings and other repair parts is an appreciable item.

The old "cry" of five years ago of "constantly grinding valves" is a thing of the past, as modern engineering has developed materials for valves that require very little attention; in fact, there are Bessemer Diesels in service where the exhaust valves were inspected semi-annually and were not touched until after the fourth inspection at the end of the two-year period.

Probably the five largest repair items over a period of years in most diesel engines was cylinder head breakage, cylinder replacement, crankshaft breakage, bearing replacement, and broken rings. Here is the way Bessemer has overcome these difficulties.



A 280 H. P. Bessemer diesel direct connected to a 200 K. W. generator. This unit is generating power for use in irrigation work in Louisiana.

Bessemer R-Line cylinder heads are fitted with dual valves which give an excellent distribution of metal as shown in the illustration of the cylinder head (and of course being four-cycle there is less heat to be taken care of), also the use of dual valves results in a better and more effective distribution of water circulation.

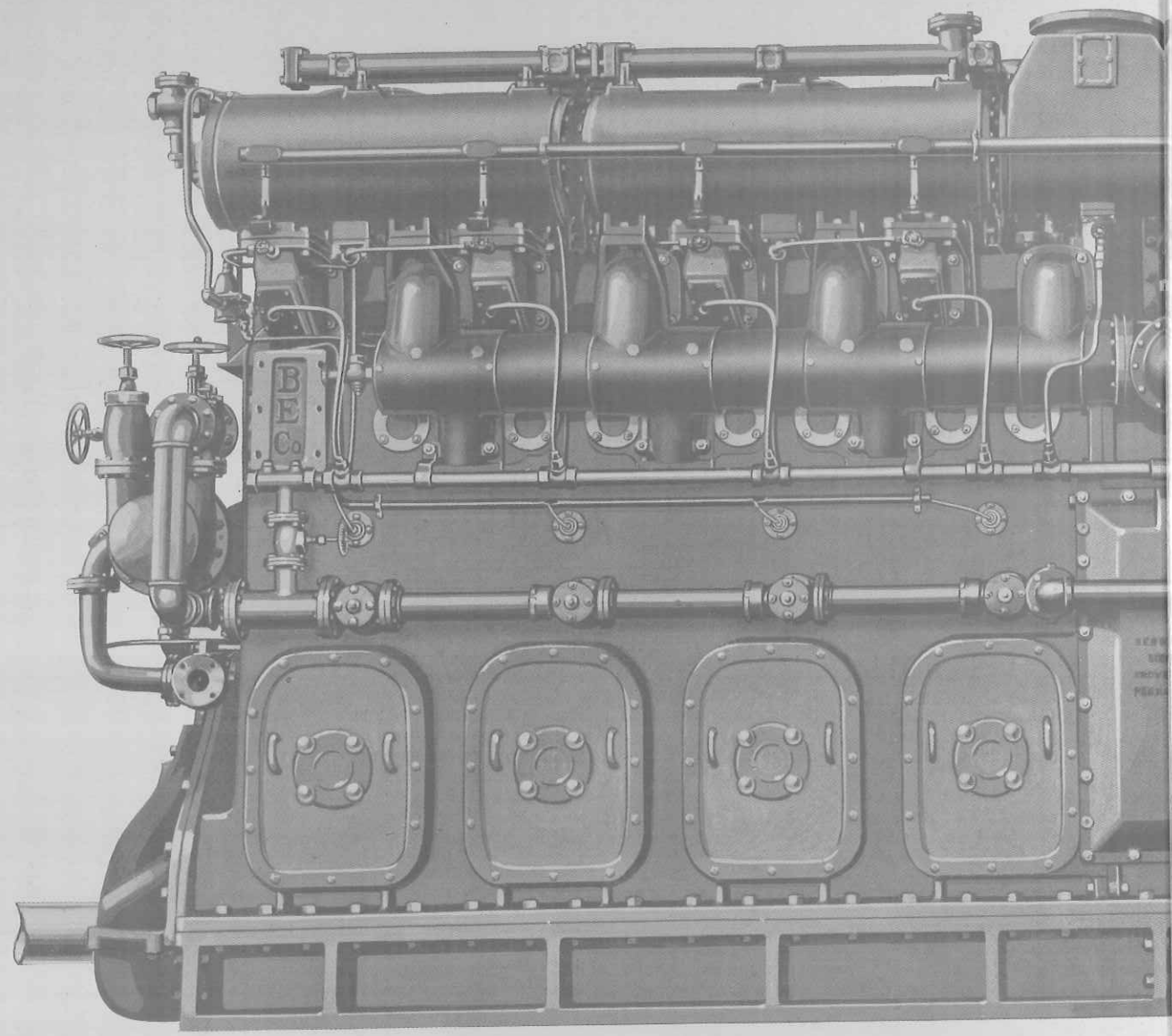
Bessemer diesels as illustrated in this catalogue (R-Line) are all fitted with removable liners, so that in case of scoring it is not necessary to buy a complete new cylinder but merely to replace the liner at a fraction of the cost of a cylinder.

The diameter of the crankshafts are listed in the table giving the horsepower sizes. Compare these shaft sizes with the bore of the engine and note the excess strength in the "backbone" of the engine.

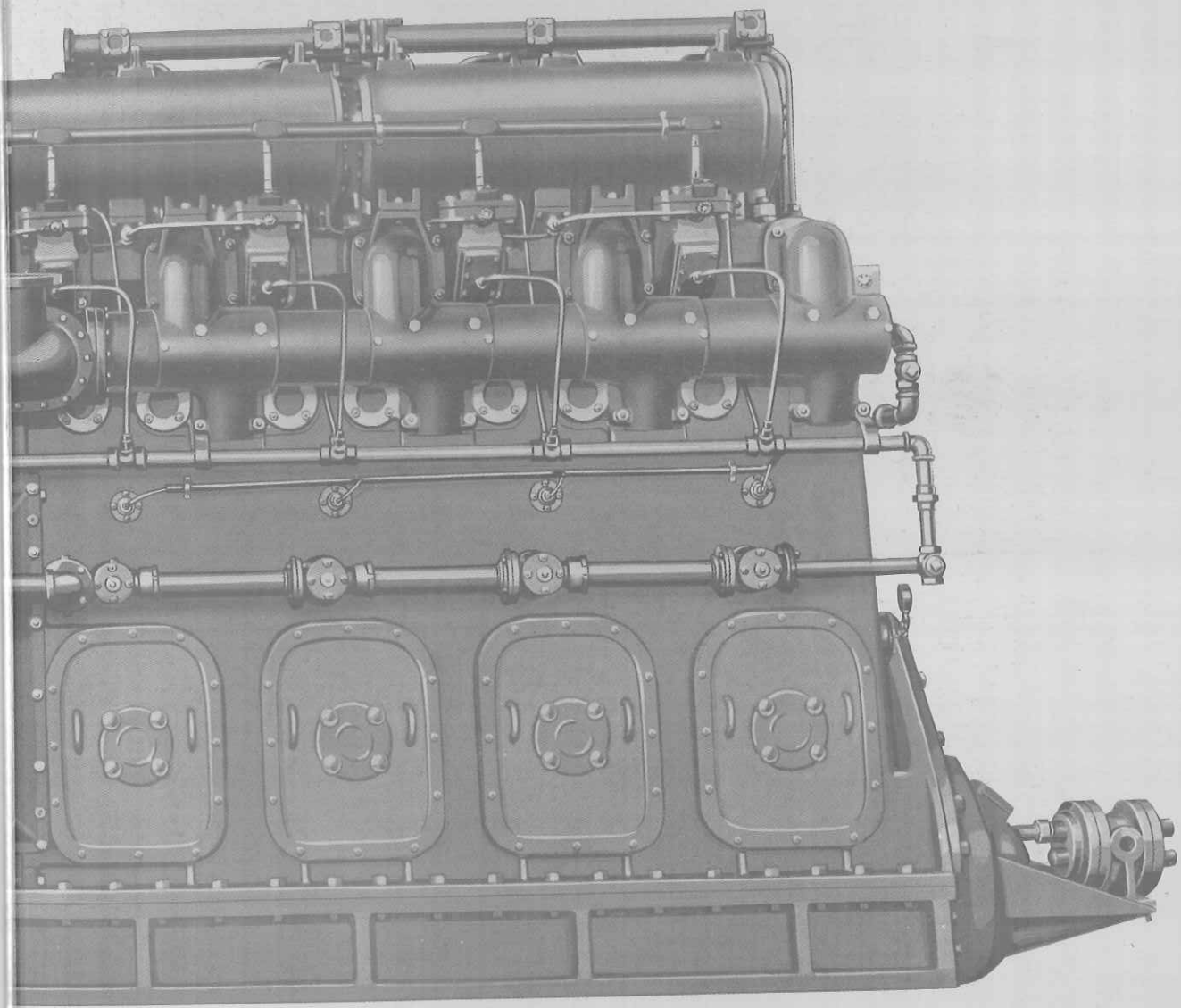
Since Bessemer Diesel crankshafts are of large diameter the bearing area is large and the bearing wear is small. In addition the bearings are all centrifugally cast or spun, giving the finest bearing obtainable.

Bessemer Diesels are amply supplied with the finest rings obtainable, which are very carefully fitted. Since the engine is four-cycle and self scavenging, the rings keep free in the grooves and breakage is very rare.

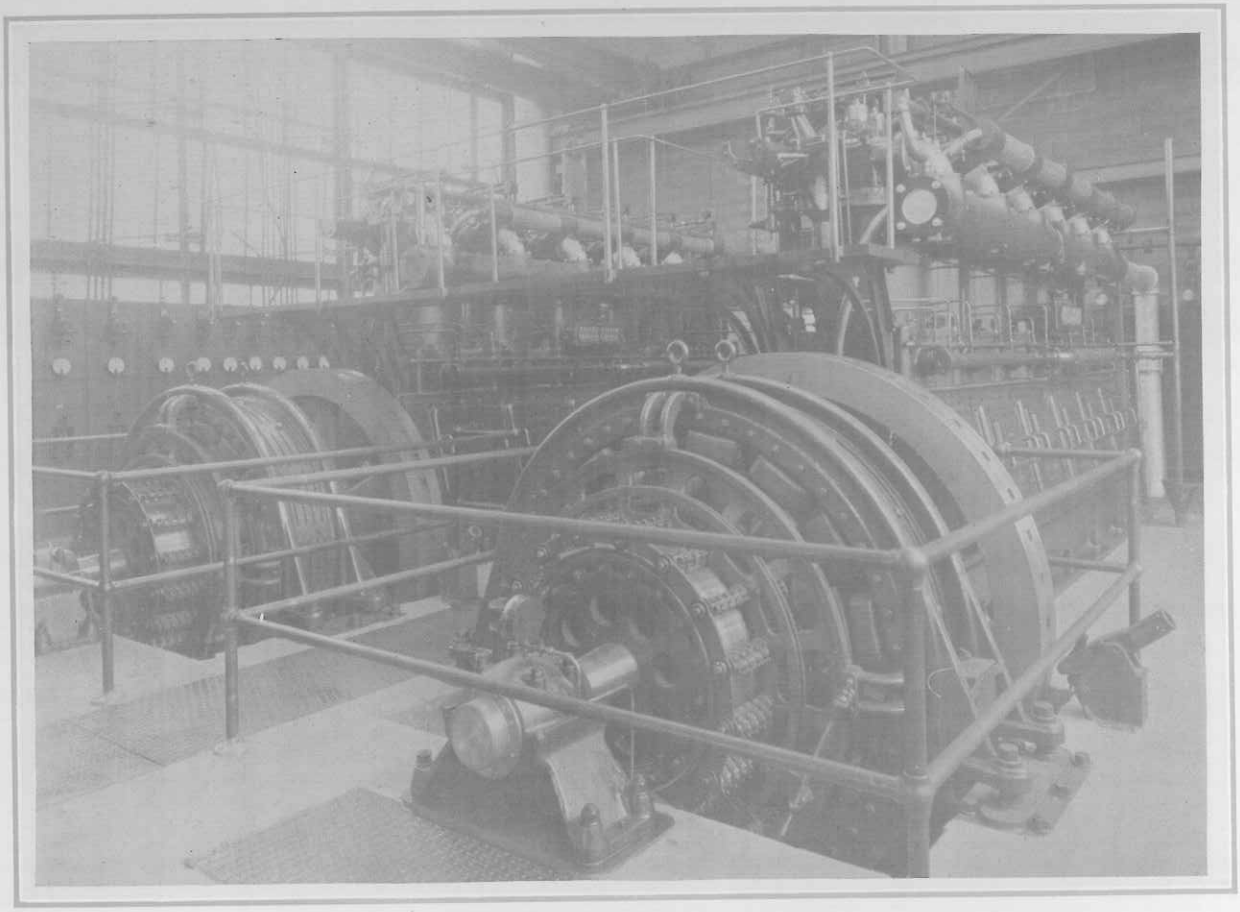
The cooling of Bessemer four-cycle Diesel engines is a simple matter as is also the scavenging. There is no need for a scavenging



EXHAUST SIDE OF THE EIGHT CYLINDER, 1240 H.P. BI
AND RAILING OMITTED TO SH



EMER DIESEL STATIONARY ENGINE, WITH PLATFORM
V THE DETAILS MORE CLEARLY.



Two 750 H. P. Bessemer diesel engines in the power plant of a large Pennsylvania manufacturing plant. These engines are direct connected to 500 K.W. D.C. generators.

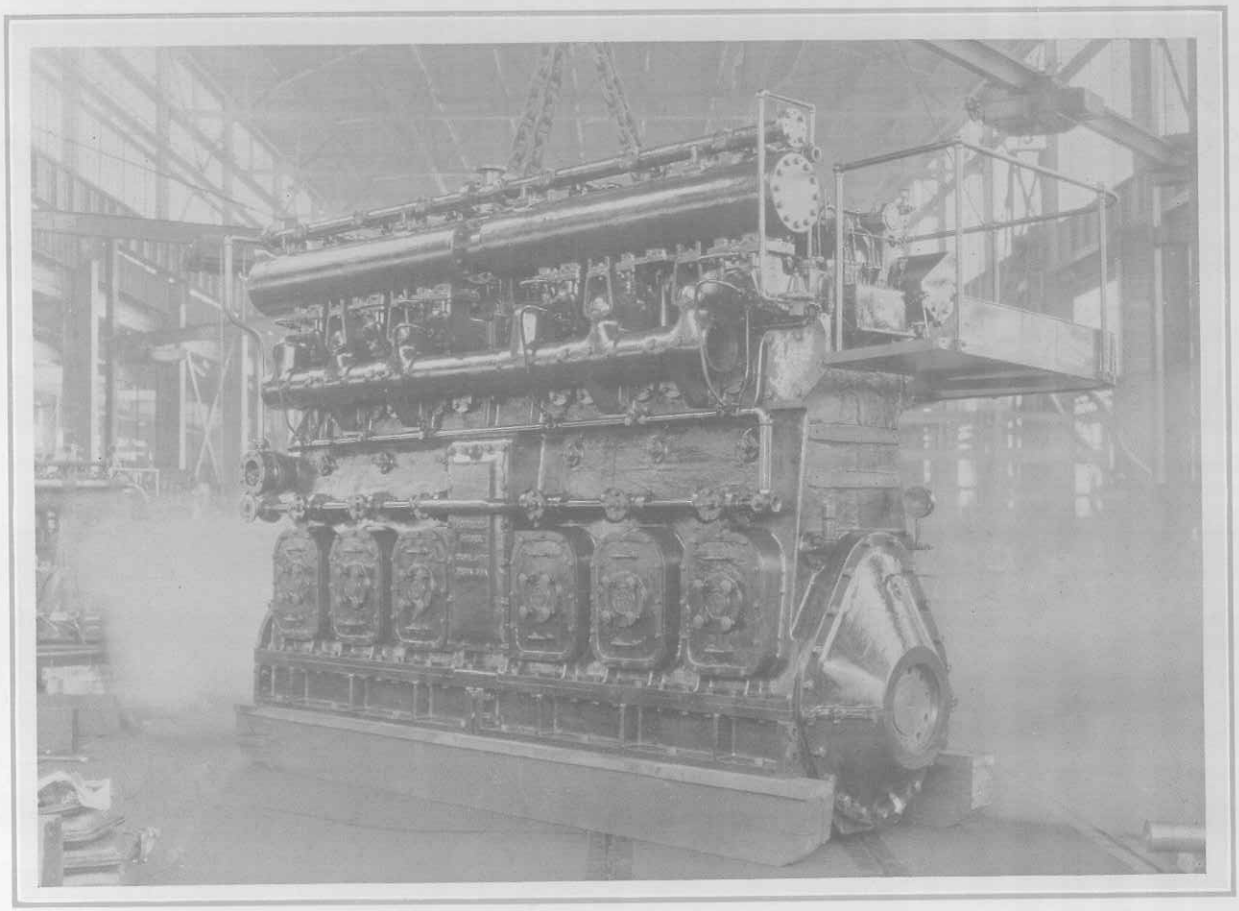
pump which throws an engine out of balance, nor of other scavenging devices. The four cycles of operation in the Bessemer Diesel engine automatically take care of the scavenging in the most satisfactory manner possible without causing the slightest detrimental effect on the lubricating oil consumption. The crank case of the four-cycle Bessemer Diesel is kept clean and clear of all exhaust gases from the cylinders, thus giving longer life both to bearings and lubricating oil.

Brief Description

ACCESSIBILITY. The simplicity of design and construction is remarkable in Bessemer Diesel Engines, and coupled with these desirable features is that of accessibility. All parts are easily accessible for inspection, adjustment or replacement, reducing non-productive time to a minimum.

CYLINDER HEADS are removed without disassembling any other part of the engine other than disconnecting the fuel, air and water lines attached thereto, removing the sectional rocker arm shaft and unbolting the intake and exhaust connections.

VALVES may be inspected by removing the cages and, in the case of the exhaust valve cages, by disconnecting the water leads to the cage.



A completely assembled 6 cylinder Bessemer diesel engine ready to be hoisted from the test blocks and moved to the shipping platform as a complete unit, without dis-assembling.

FUEL OIL PUMPS are visible at all time, and being located at a convenient height, they can be inspected when in operation.

CAM SHAFT AND FORGED STEEL CAMS are visible and accessible. Cam shaft bearings are easy to inspect and to remove. The complete cam shaft can be removed easily and quickly should occasion ever require it.

ROCKER ARM SHAFT is built in sections, one for each head, and is removable by withdrawing 4 bolts.

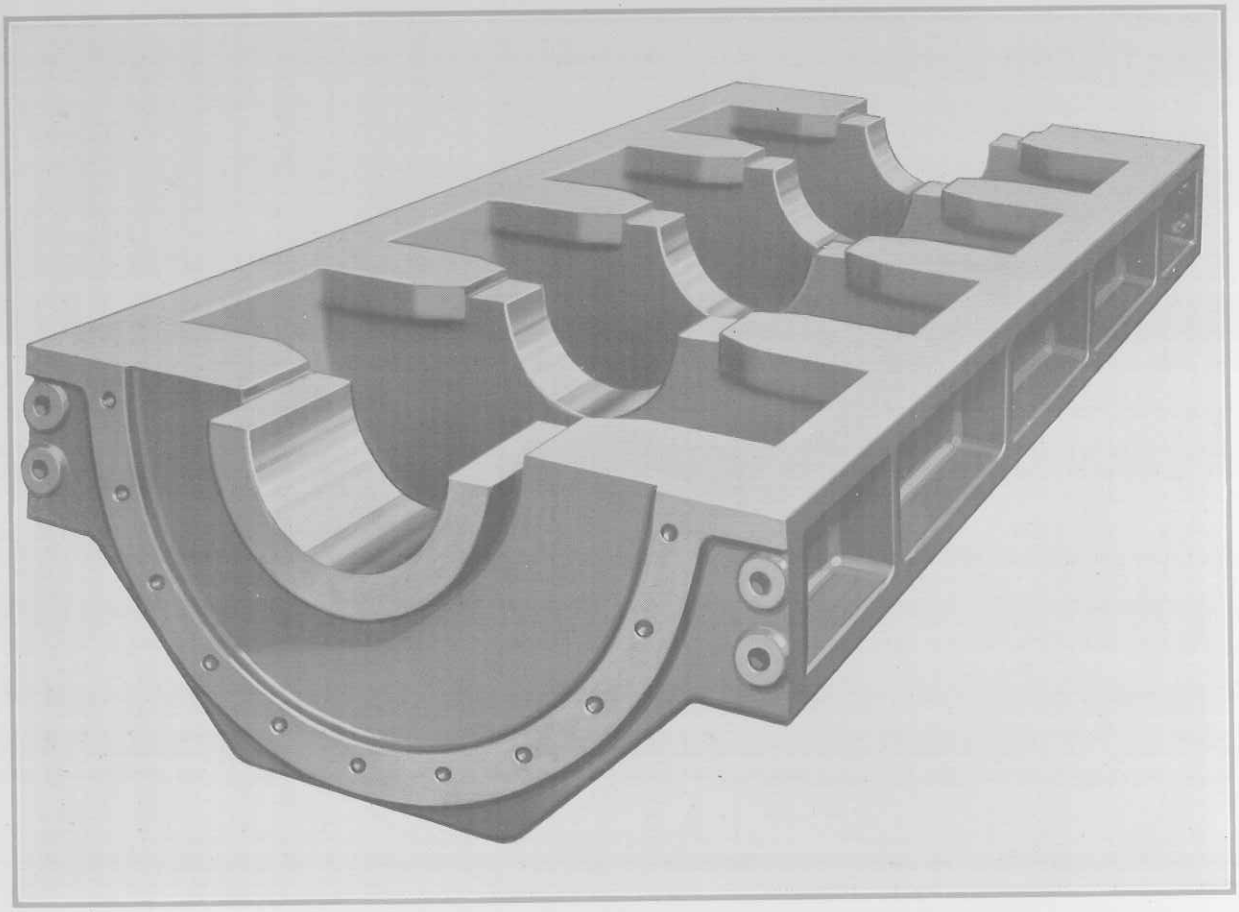
MAIN BEARING SHELLS or CONNECTING ROD BOXES can easily be removed through the exceptionally large side doors in the centerframe.

SAFETY VALVE. Each cylinder is equipped with an automatic safety valve to relieve pressure within the cylinder greater than that which is desirable for bearings, cylinder studs, etc., should such pressure ever become excessive.

GAUGE AND INSTRUMENT BOARD. The gauge and instrument board is mounted to suit location of operating platform and contains the lubricating oil pressure gauge, the air starting pressure gauge and the fuel oil pressure gauge.

RAILINGS AND PLATFORM. All KR-LR-MR Engines are equipped with platform and railings of suitable design.

"You Buy the Best when you Buy the Bessemer"



One-half of the bed plate of an 8 cylinder Bessemer diesel engine. Note its sturdy construction, and the extra large main bearings —typical of Bessemer over-size, over-strength construction throughout.

Engine Base or Bed Plate

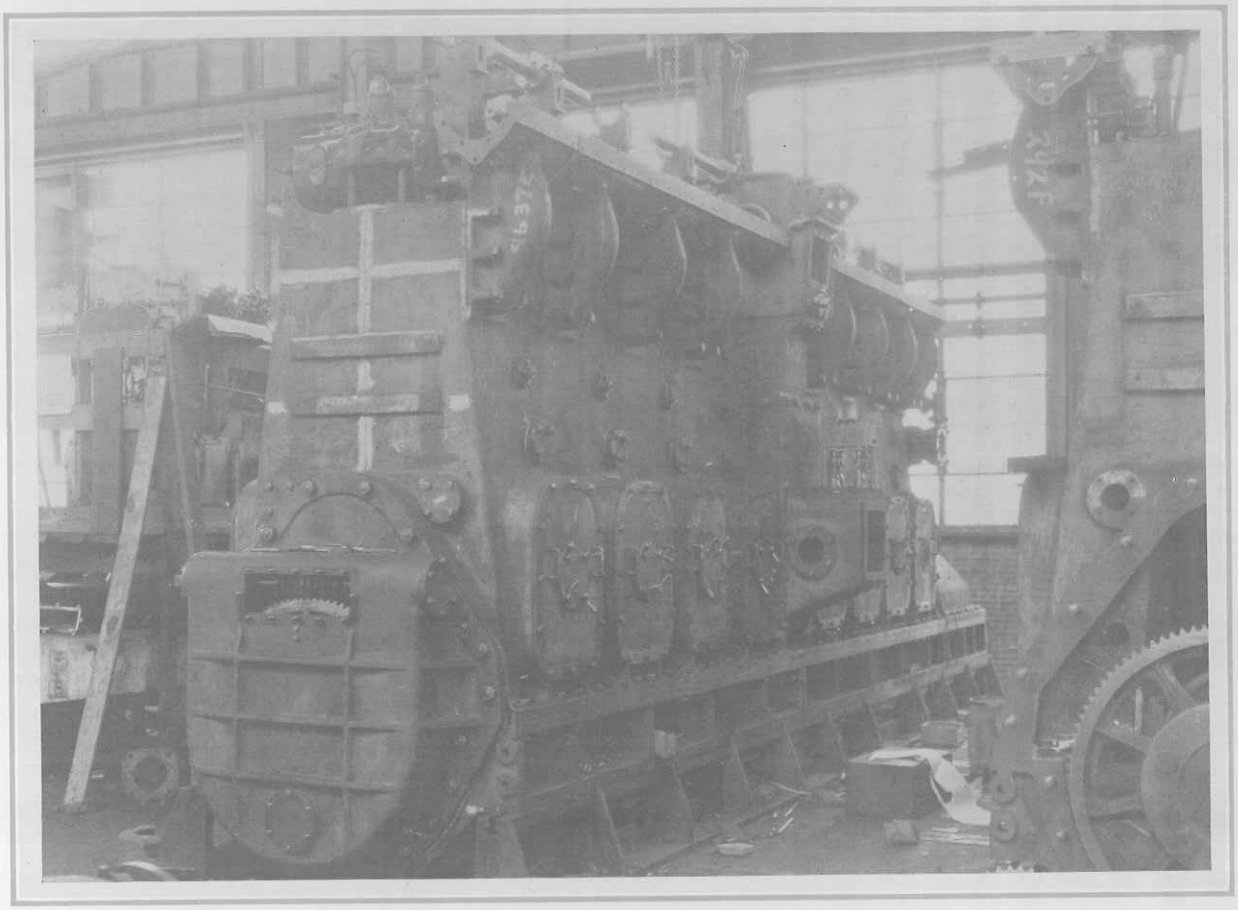
The bed plate carries the crankshaft and supports the centerframe which is bolted to it. The main bearings are carried in the bed plate which is of the heavy box type formed by cross webs.

The bed plate is built in one piece in the three and four cylinder engines and in two pieces in the six and eight cylinder engines. It is machined completely assembled on a 34-foot milling machine of the latest design.

The bearing supports are scraped to fit the back of the bearing shells so that the lower half of the main bearings may be rolled out in case replacement should become necessary.

The bed plate forms the catch reservoir for the lubricating oil. Drainage from cylinder pit to cylinder pit is furnished with leads to the lubricating oil reservoir.

The bases are bored at one operation assuring perfect alignment before being scraped in to fit shells. The internal surfaces of the base are treated with acid to make the base absolutely clean and then covered with a special preparation, giving it an enamel finish which better fits it for use as a lubricating oil receptacle.



This unretouched photograph of an 8 cyl. Bessemer diesel engine, taken on the erecting floor, shows the ruggedness of the Bessemer centerframe and also symmetry of design.

Center Frame

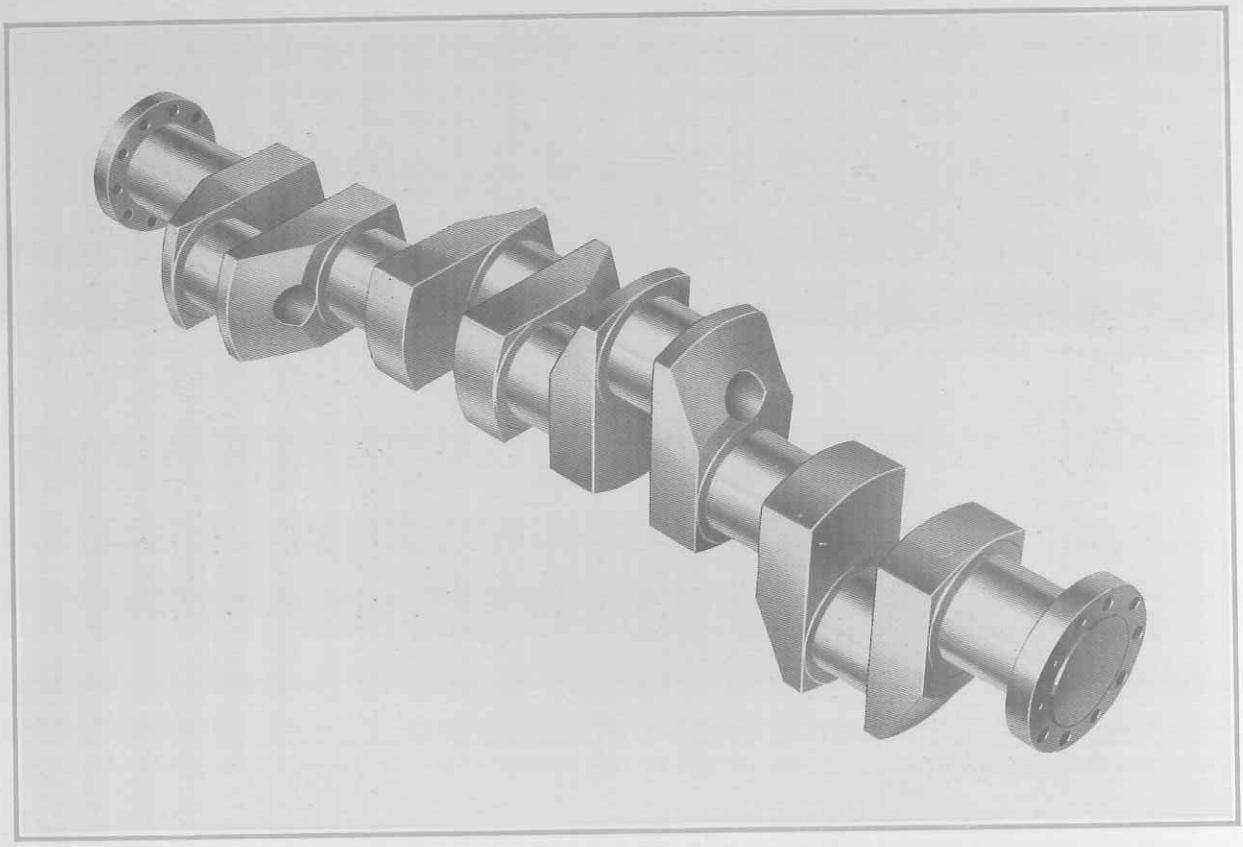
The center frame is of the water box type, made of semi-steel, built in one piece in 3 and 4 cylinder engines, and in two pieces bolted together in 6 and 8 cylinder engines. The center frame castings are of ample cross-section and are built with a very strong arch construction over each main bearing.

The liners are of semi-steel, ground to the finest automobile cylinder finish. The outside of the liner is treated with a special non-corrosive preparation to reduce collection of mineral deposits on sides of liner. The liner is fitted with copper asbestos gasket at the top, and with a stuffing box and packing at the bottom, eliminating any chance of distorting the liner due to pressing-in when the stuffing box is not used.

Large water jackets are formed between the water box and the cylinder liner, while very large cleanout openings with quickly removable plates are furnished for cleaning out water jackets.

Bessemer Forged Crankshaft

It is a well known term that "the crankshaft is the backbone of the engine," and Bessemer shafts are the largest crankshafts made for the given bore of the cylinder. The shafts are forged from a solid billet of high grade



One-half of an 8 cylinder crankshaft. The Bessemer crankshafts are the largest per given bore of any diesel engine crankshafts built. They are forged from special 35-40 special carbon crankshaft steel, annealed, heat treated and precision turned.

.35 to .40 point special carbon crankshaft steel. They are annealed, rough turned and centers rough blocked and then heat treated. This process involves heating the shaft to a very high temperature and immersing it in a liquid solution for cooling. It is then heated to a slightly less degree and allowed to cool slowly. This process refines the steel, adds greatly to its strength, and relieves all internal strains. The shafts are then laid aside to season. After seasoning, the shaft is re-centered and finished. While the Bessemer heat treating process is more costly, it adds fully 25% to the strength and elastic limit.

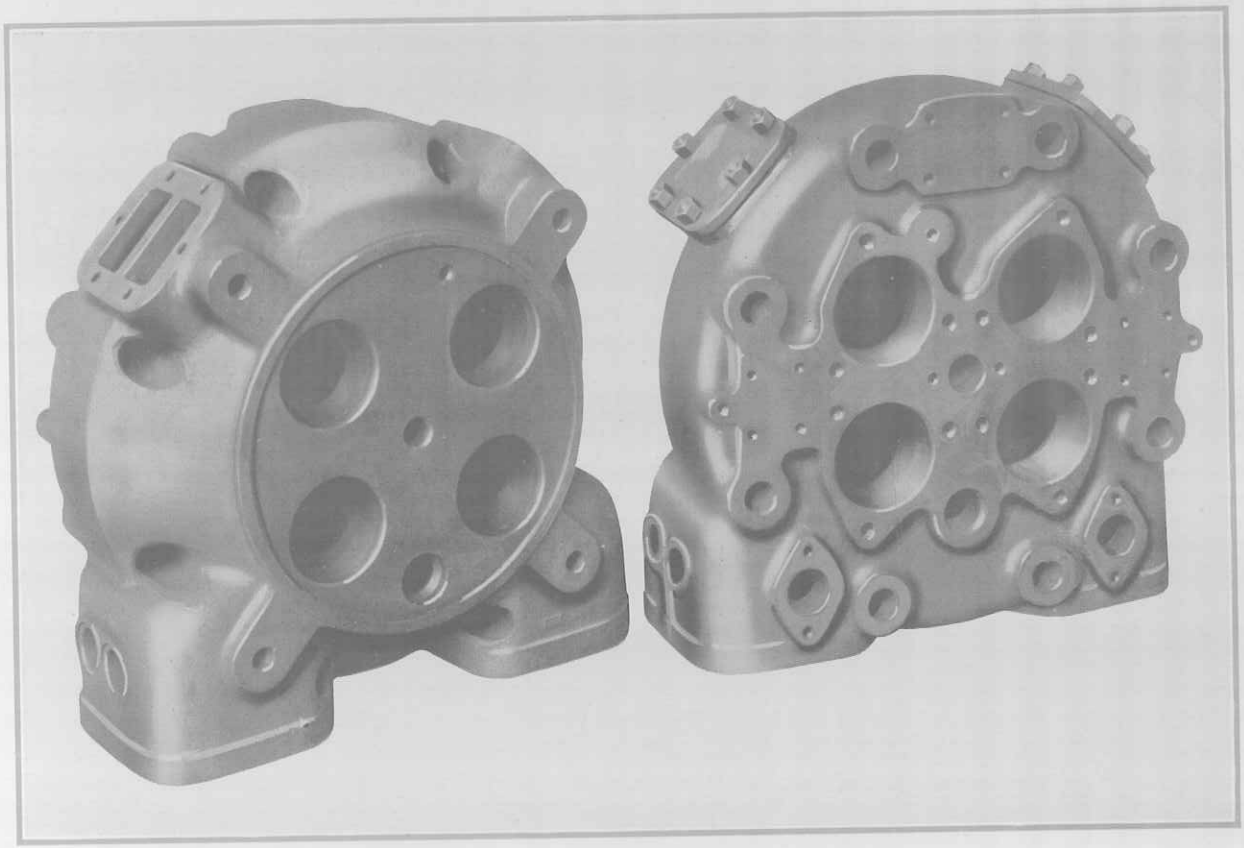
The crankshafts are more than ample in size to meet Lloyd's or American Bureau requirements.

The pins of the shaft are hollow to further strengthen the shaft and to lessen the weight of the reciprocating parts.

The shaft is drilled and piped to carry the lubricating oil under pressure to all crank journal bearings and through the hollow connecting rod to the wrist pin.

Limit gauges or bridge gauges are made for all shafts and all measurements are within the finest of limits. There are no square corners and shoulders but liberal fillets are allowed at the points at which direction of shaft changes.

Cam Shafts are of special accurate steel to which are fitted the removable forged steel, case hardened and ground cams. The cam shaft is driven by chain drive from the "1 to 2" gear, which is meshed with the gear on the



The cylinder heads on all R-line Bessemers are fitted with openings for dual intake and exhaust valves; cast from a special semi-steel mixture with water jackets spaced to give even water distribution.

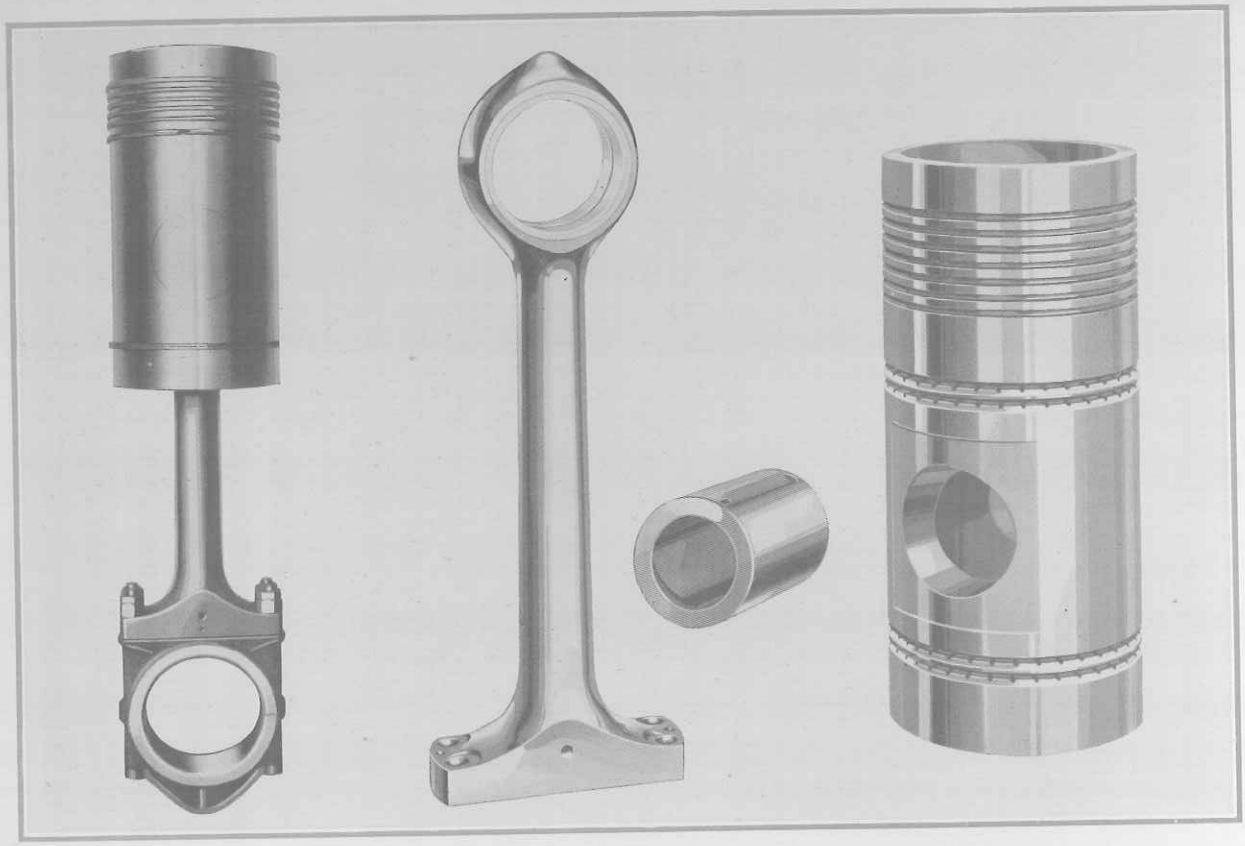
crankshaft. On 6 and 8 cylinder engines the cam shaft drive is located at the center of the engine, thus giving a smooth operating cam shaft where the shaft is quite long. On 3 and 4 cylinder engines the cam shaft drive is at the end.

Bearings

All main bearings are full shells with dovetail grooves machined for holding the non-ferrous metal in rigid position, as will be observed by the cut on page 26). The crank pin bearings are made of cast steel with dovetail grooves machined in them in the same manner as in the shells. The top and bottom halves are interchangeable and are also interchangeable longitudinally. These bearings are lined with the finest grade of non-ferrous metal that can be obtained for this purpose, poured into the shells and crank bearings by a special centrifugal process which creates a pressure on the molten metal of about 175 lbs. per square inch. This method eliminates all impurities in the metal, making a perfect contact with the shell and giving it a homogeneous structure throughout. The bearing shells are easily removed and replaced without disturbing the crankshaft.

Valves

Exhaust and inlet valves are carried in interchangeable cages and the valves are likewise interchangeable. The exhaust cage is water cooled. The valves are made of special alloy metals which have a very high tensile strength at high temperatures and are not affected by the hot exhaust gases. Both inlet and exhaust valves are of one piece forged steel.



Bessemer aluminum alloy piston and rod assembly, Bessemer connecting rod and Bessemer cast iron piston. Note the number of rings on the piston at the right.

Fuel Oil Pumps

Fuel oil pumps and check valves are of simple design and are interchangeable. When running at light or half loads, one, two or three of the pumps may be thrown out. The constant pressure fuel oil system makes for flexibility and by decreasing or increasing the fuel pressure the fuel economy can be increased.

Pistons

The pistons are made of selected close grained grey iron annealed and carefully machined to precision gauges. The pistons are of sufficient length to give them ample strength and reduce the side wall pressure to approximately 35 lbs. per sq. in., at which pressure there is a minimum of wear, resulting in extremely long life. The pistons are carefully designed with ribs to support all strain to which they are subjected.

Each piston is equipped with a Ramsbottom fire ring, special seal rings and oil control rings above the wrist pin, and with oil control or regulating rings below the wrist pin.

Cylinder Head

The cylinder heads are cast from a special mixture of semi-steel. They are carefully designed to allow all parts subjected to heat to be carefully water cooled and also to allow an equal distribution of metal between the openings for the valve cages, the fuel oil injector, and the air starting valve.

The water circulation from the jackets around the liner to the

A corner of the diesel erecting plant, showing a group of Bessemers in the process of being assembled.

head is through four openings spaced 90° apart to give equal water distribution. Likewise to each liner jacket there is a water regulating valve to maintain equal temperature in all cylinders.

The water connections from the water-box to head are sealed with rubber grommets and the water connection is outside of the combustion chamber, eliminating any chance of water leakage into the combustion chamber.

A copper-asbestos gasket forms the seal for the cylinder head step-joint to the top of the liner.

The cylinder head when assembled includes the dual exhaust valve cages, the dual intake cages, the fuel injector and the air starting valve.

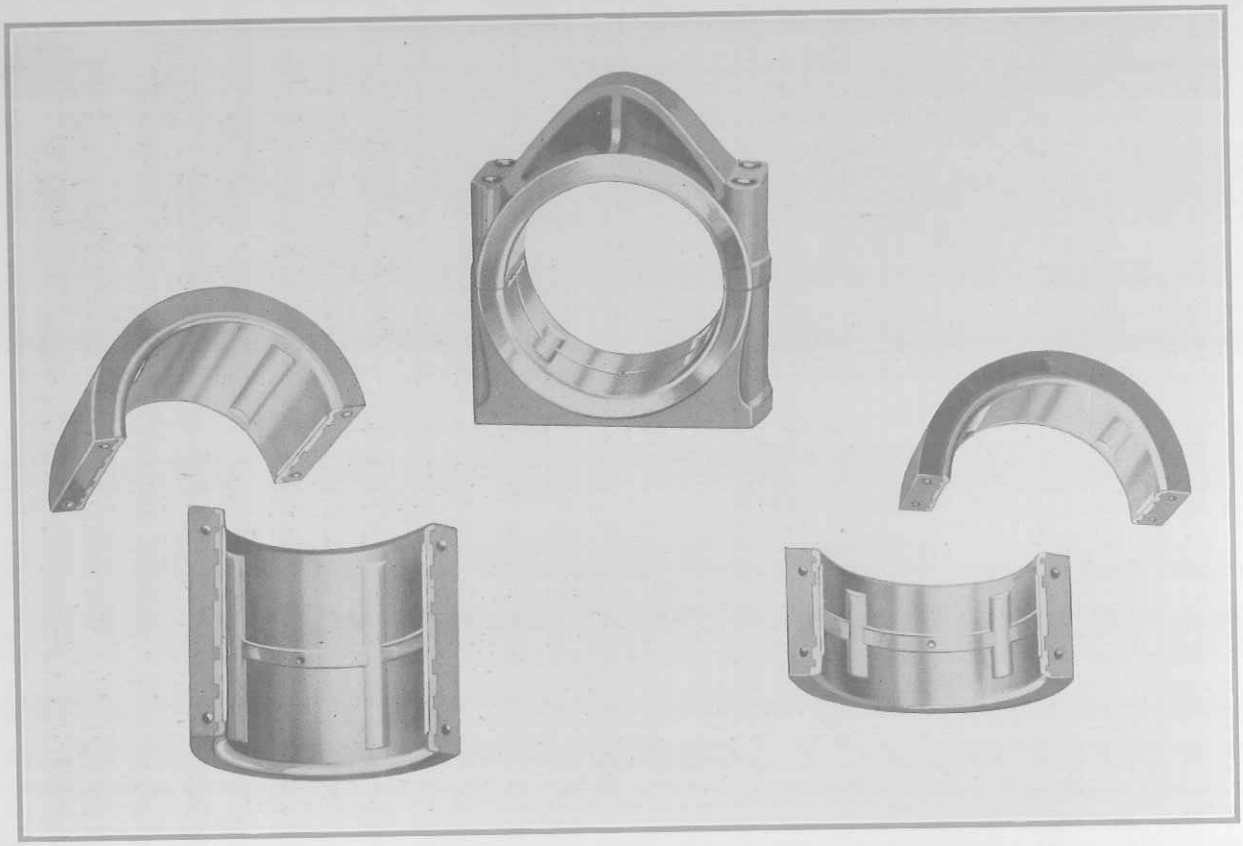
Connecting Rod

The connecting rod is of the same material and specification as the crankshaft. The wrist pin bearings are of solid phosphor bronze and are fitted to the eye of the rod. The connecting rod box is separate from the rod and is fitted by a scraped fit to the foot of the rod.

The connecting rod box is of cast steel and being separate from the rod is readily removable for inspection or for refitting should occasion ever require.

Fuel Oil System

consists of the fuel oil pumps, the pressure regulator, the fuel oil lines, the fuel oil header, the accumulator and the spray nozzles. The



The connecting rod bearing, end and center main bearings, and intermediate main bearings of Bessemer diesel engines. The shell backs are of cast steel and the babbitt is centrifugally cast in the shells after they have been "tinned".

injection of the fuel oil is timed for admission at the point of injection into the combustion chamber. The fuel oil pressure is changed by the pressure regulator according to the load the engine is carrying, thus giving the maximum economy at all loads.

Governor

Likewise the maximum fuel economy is obtained by varying the period of injection by governor control of the wedges.

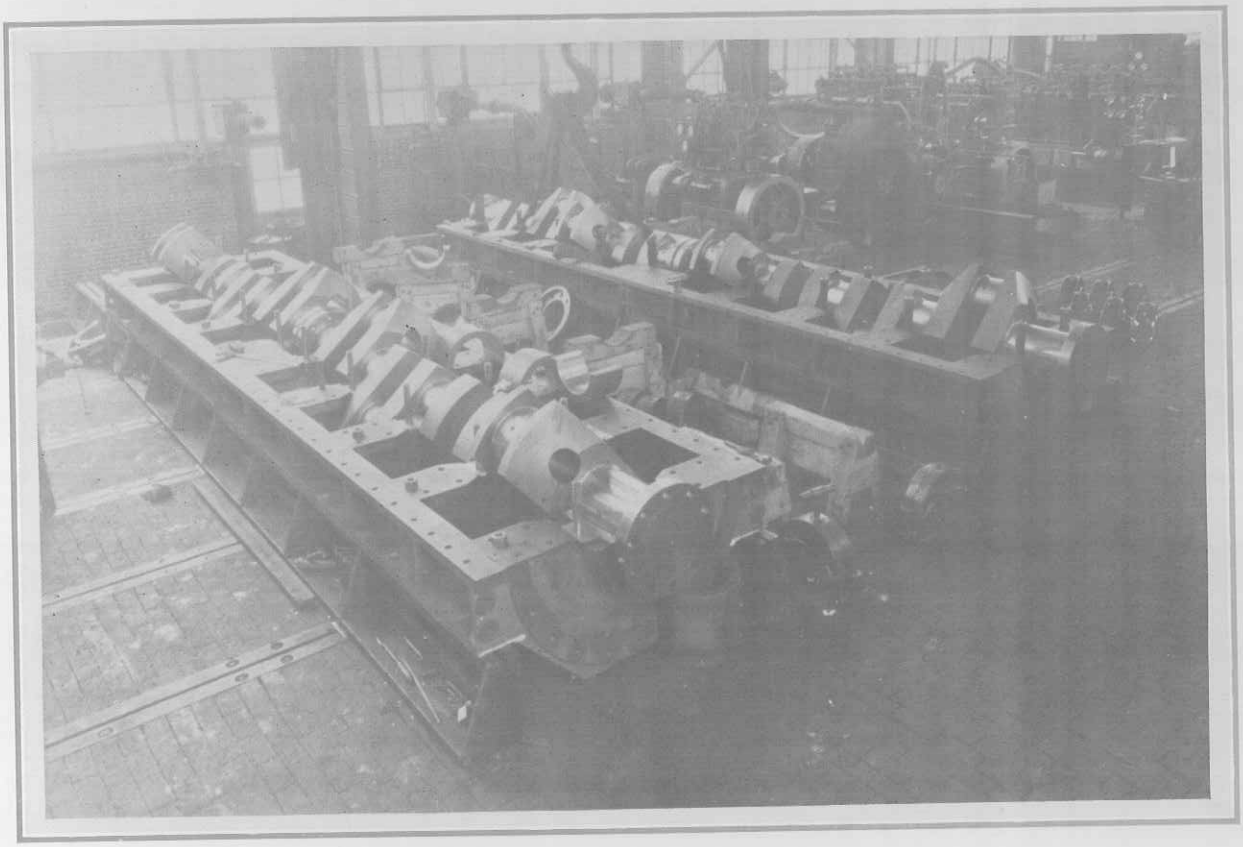
The governor at all times controls not only the speed of the engine but the timing or duration of the injection period. This governor dual control is probably one of the simplest and most efficient controls and gives a flexibility unobtainable with other fuel injection systems. Likewise the pressure regulator eliminates fuel pump detonations or damage to pumps or fuel oil system.

Equipment and Accessories

The equipment with each engine consists of spare parts, tools, governor, gauge board and gauges, platform and railings and stairs, safety relief valve, fuel oil pumps, lubricating oil gear pump, cylinder liner lubricator or sight feed oiler, duplex fuel oil strainer, duplex lubricating oil strainer, barring over device, lubricating oil cooler, centrifuge and lubricating oil supply tank.

Accessories

Fuel oil transfer pump motor driven, switchboard synchronizing motor control, clutches, armature shaft, pedestal bearings, fuel oil day tank, pyrometer and



Bessemer crankshafts being bedded in "MR-8" engines. Note the large size of the shafts and the rugged strength of the bed plate—typical of Bessemer overstrength construction throughout the engine.

muffler can be furnished at reasonable prices when requested. Pyrometers are an indispensable aid balancing and checking the horsepower of the engine and are recommended for use on all engines.

As Vertical Gas Engines

Any of the Diesel Engines listed in this catalog can be built as a natural gas engine giving approximately 15/17 of the diesel horsepower.

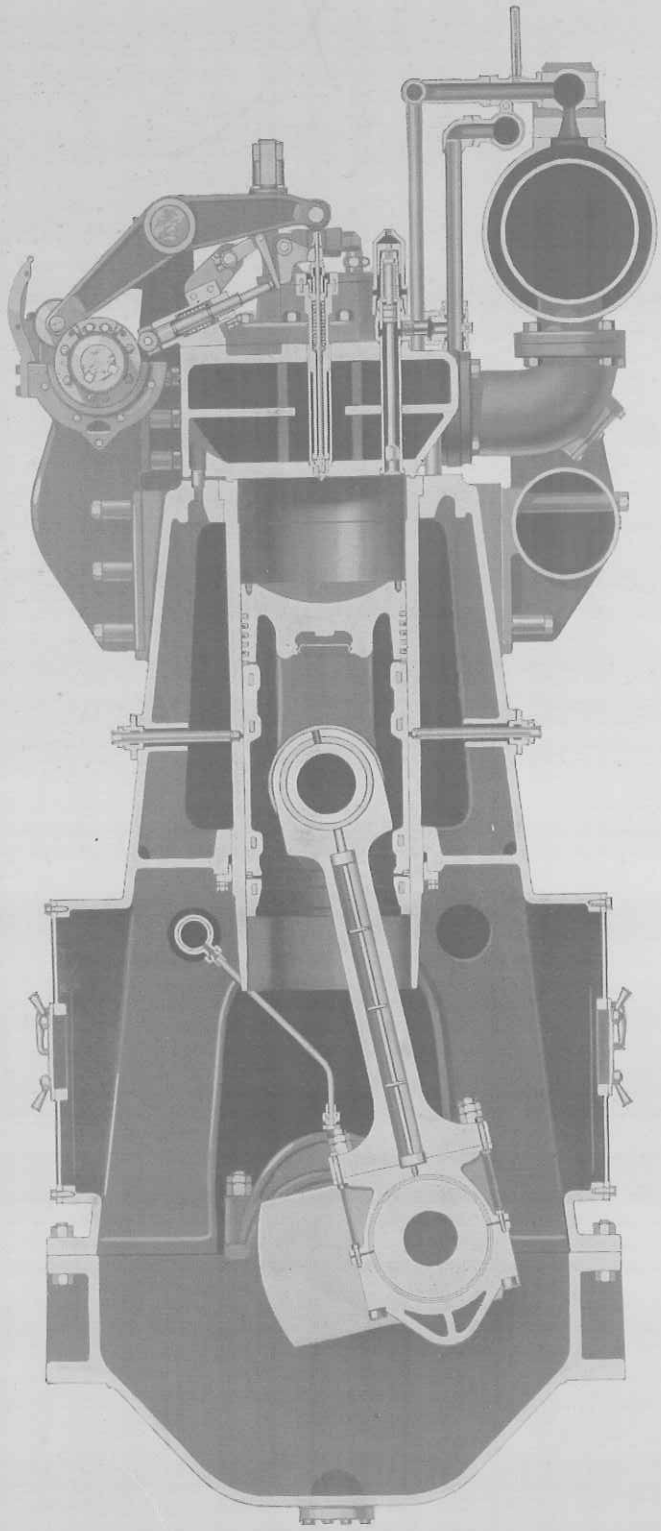
For approximately 10% of the cost of the engine as a gas engine, it may be changed over to a diesel engine should the supply of gas cease or the purchase price of the gas become prohibitive.

Engineering Service and Recommendations

are gladly given with layouts for complete drives or plants. The result of our 30 years of experience in all types of power plant installations is at your service without the slightest obligation on your part.

The Bessemer Engine Company reserves the right to make such changes in the design of all engines at any time as it sees fit without obligating itself to make these changes on engines now in service.

"You Buy the Best when you Buy the Bessemer"



Sectional View of the Type M R Bessemer Diesel Engine

"You Buy the Best when you Buy the Bessemer"

A section of the erecting floor in the large new diesel addition to the Bessemer plant. Here all Bessemer diesels are assembled, tested and given their final inspection before shipment.

The Bessemer Factory

The Bessemer factory is one of the world's largest plants devoted to the manufacture of internal combustion engines—a plant that is a veritable exposition of modern methods and modern machine tools manned by skillful workmen. The factory covers 458,272 sq. ft. of floor space and is laid out for economical straight-line production from foundry to shipping platform.

The foundry, one of the largest industrial plant foundries in the world, is a modern building 100 ft. wide by 647 ft. long and is equipped with the most up-to-date machines and equipment known to foundry practice. Three huge cupolas pour the carefully mixed irons to make Bessemer castings, the quality of which are guarded by our laboratory in charge of a chemist specially trained in metallurgy.

Close to the foundry is the pattern shop and pattern storage room, while adjoining the foundry are the corerooms and ovens, sand-mixing machinery and ram-up shop with five electric traveling cranes serving these floors. Many of the castings are made in dry-sand moulds, the method which, in many instances, is superseding the green-sand moulds used heretofore. Paralleling the foundry is a vast stockyard where huge quantities of pig iron and coke are stored and handled with giant electric cranes equipped with buckets and magnets.

From the foundry the castings are moved by giant overhead cranes to the machine shops where 742 precision machine tools

"You Buy the Best when you Buy the Bessemer"

A part of the diesel machine shop where the larger diesel parts receive their final precision machining before going to the erecting floor.

are in constant service. In these shops one of the largest milling machines ever constructed, together with numerous smaller ones, machine the bed plates. The cylinders are taken to six special boring machines where they are machined by solid reamer heads, after which they are ground to the finest automobile cylinder finish by special grinders developed and perfected for this work.

The flywheels are sent to large boring mills, which bore the hubs and face the rims at one setting, insuring true running wheels.

The small parts are distributed to a wide variety of lathes, shapers, planers, milling machines and automatic machines of various kinds, where they are subjected to the constant check of skilled inspectors.

The assembling of the parts into the complete engine and the testing of the engine is accomplished in our new large Diesel engine plant illustrated above, where 50 engines may be assembled and 30 may be tested at one time. No engine is ever hurried through its test to make room for another, and every test is thorough and complete. A very large electric traveling crane and many electric two-ton jib cranes serve this assembly floor. Engines of 75 tons in weight can be handled by the testing room crane and loaded intact.

In all stages of the manufacturing process every possible means of economical production is used so that Bessemer customers are assured the utmost value for their investment. Quantity produc-

A corner of the diesel erecting plant, showing a group of Bessemers in the process of being assembled.

tion and mechanical handling naturally assist to this end. 27 giant overhead travelling cranes, scores of jib cranes and hoists and a fleet of electric trucks keep parts moving with a minimum of hand labor and permit economies that are passed along to the user.

In addition to Bessemer's manufacture precision and production efficiency you will find at the Bessemer factory an engineering organization which is willing and anxious to be of service in solving your power problems. A trip through the Bessemer factory will convince you that our claims for Bessemer superiority are based not on mere words, but on actual facts. You will find our claims for superiority are conservative, and when you have looked over perhaps the largest and certainly the best equipped exclusive oil and gas engine factory in the United States, you, too, will believe what owners of over 35,000 Bessemers know to be the truth, viz.: "You Buy the Best, when you Buy the Bessemer."

Bessemer Engine Company

Grove City, Pa.

"You Buy the Best when you Buy the Bessemer"

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