GARDNER

Engine Forum

Spring 2013

www.gardnerengineforum.co.uk

No. 23

GARDNER Engine Forum

Membership Application

Title	Mr / Mrs / Miss / Dr / Other		
Forename(s)			
Surname			
Address			
	Post Code		
Telephone Number		Ex Directory	Yes / No
Mobile			
Email Address			
Engine Model			
Engine Serial Number			
Engine Application	Stationary	Road	Marine
Year of Manufacture			
Name Vehicle /Vessel			
Signed		Dated	
Any Other Info			

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Gardner Engine Forum Philosophy

"The aims of the Forum are to promote and foster interest in all Gardner engines"

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Contents **Page**

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Cover Picture

6LK displayed at the Anson Engine Museum during the 2004 Gardner exhibition

Photo by S Gray

Chairman's Notes

To all members of the Forum a happy and prosperous New Year. May your engines start first time and your batteries never flatten!

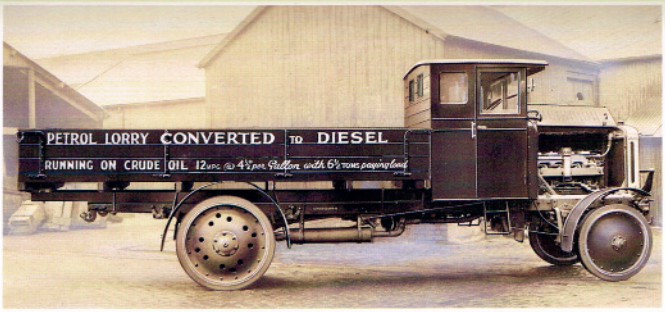
With mild weather right up till Christmas I have been busy moving boats around the system, even during the festive season, however, the current cold weather has allowed me to concentrate on other tasks, namely the forthcoming Gardner Gathering in June.

The landlord of the Cotton Arms at Wrenbury has confirmed the dates of June Saturday 1st and Sunday 2nd for the rally, with around 20 boats expected, together with a similar number of road vehicles and stationary exhibits. I shall shortly contact BW – sorry CRT about reserving moorings for boats. Space on the field for camping, exhibits etc. is already reserved.

It is intended to have a meal at the pub on the Sunday evening for all Gathering attendees, details later. Booking forms on the website for the rally. Hope to see you there!

Mike

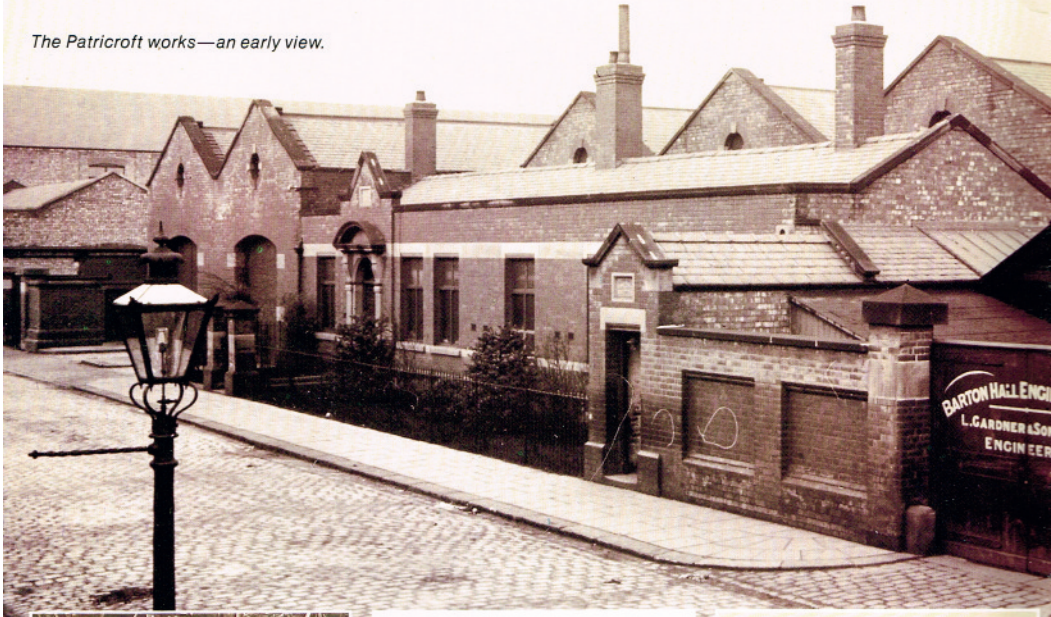
Sales Folder Circa 1981, the back inside cover had a pocket into which individual engine data sheets could be inserted

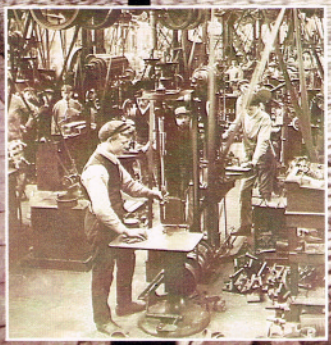


A 1930 Leyland lorry fitted with a Gardner 4L2 diesel engine.

Mr. Thomas H. Gardner, Mr. W. Parkinson Sons Limited– an early customer, and Mr

The Patricroft works—an early view.





An early machine shop.

A Gardner powered road maintenance machine—circa 1913.

The Great War saw the first women at Barton Hall.

of Walker Brothers (Wigan) and Joseph Gardner.

A century of excellence.

To anyone interested in the development and history of the oil engine, there is one name which stands apart from its contemporaries. A name that has become synonymous with quality and craftsmanship and a true innovator in the development of the high speed diesel engine — Gardners of Patricroft.

Lawrence Gardner—the founder.

From its introduction the Gardner engine was a technical, practical and most important, a commercial success story. Sound and thorough research and development, backed up by a dedicated work-force, ensured a healthy growth from the start and now, after more than a century of production, the Manchester firm still stands by its initial policy to turn out nothing but the best.

Founded by Lawrence Gardner in 1868, the factory moved out of Manchester to its present site at Patricroft at the turn of the century. Here, a 25 acre plot of land was acquired adjacent to the site of Barton Hall in open countryside, where there has been ample room for constant development. In this first building at Patricroft, engine parts were manufactured, assembled and tested. This original building still remains as part of the present works and is still known as No. 1 Bay — now housing the precision grinding plant.

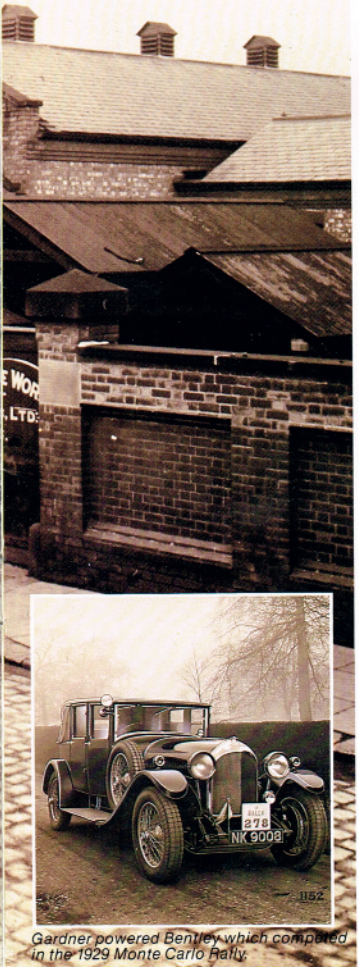
From these humble beginnings has grown the Gardner engine business now employing approximately 2,000 people and from which more than 200,000 engines have been produced since 1930.

The years have seen the production of many successful engine ranges including the 'M' type, 'T' type, 'J' type, L2, L3, LK, LW, LX, and L3B. 1966 saw the introduction of the very successful LXB series, followed by the LXC in 1978 and the LXCT in 1981. In keeping with Gardner's policy of constant advancement further engine development is now underway.

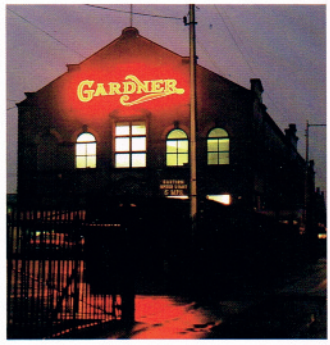
The company has constantly resisted pressures to step up production at the cost of quality. However, full advantage is taken of new techniques, special purpose machine tools and creative engineering, to ensure production efficiency.

The Gardner engine has achieved a world-wide reputation for quality, durability and fuel economy, and in recent years an average of thirty per cent of products have been exported either directly, or indirectly in vehicles.

The continuing demand for a quality product, combined with an enviable world-wide reputation for durability and craftsmanship should ensure Gardners future success and maintain them as a legend in their industry.



Gardner powered Bentley which competed in the 1929 Monte Carlo Rally.



The modern Gardner engin

The production of a Gardner engine is not a thing to be hurried — there's too much pride at stake for a thing like that. The modern engine is still produced with the same care, precision and craftsmanship that has established the Gardner reputation.

Even today, each engine is individually built by one man — from the crankshaft upwards.

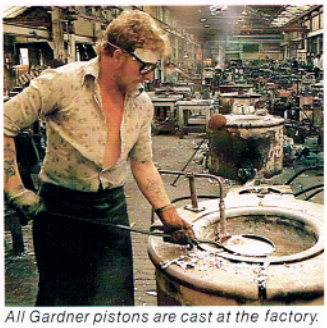
Similarly, each engine is individually performance tested for several hours — and just in case it might be thought that this kind of dedication means antiquated methods, take a look at some of the Gardner production areas. High capital investment over the years has established modern foundries, machine shops and assembly shops with equally modern standards to match. Indeed, quality is more easily kept in control at Gardners because of the very high percentage of engine components which are manufactured on site at Patricroft.

The lightweight engine

Due to the very high aluminium content, the Gardner engine is amongst the lightest in production and until recently all engines have been naturally aspirated. The Gardner research and development team have, however, kept a very watchful eye on the progress of turbo charged engines and they are now available from

The Gardner Pattern Shop-the origin of the engine crafted by hand in wood and resin.

Casting in the Aluminium foundry.



All Gardner pistons are cast at the factory.

e – something very special.

Gardners.

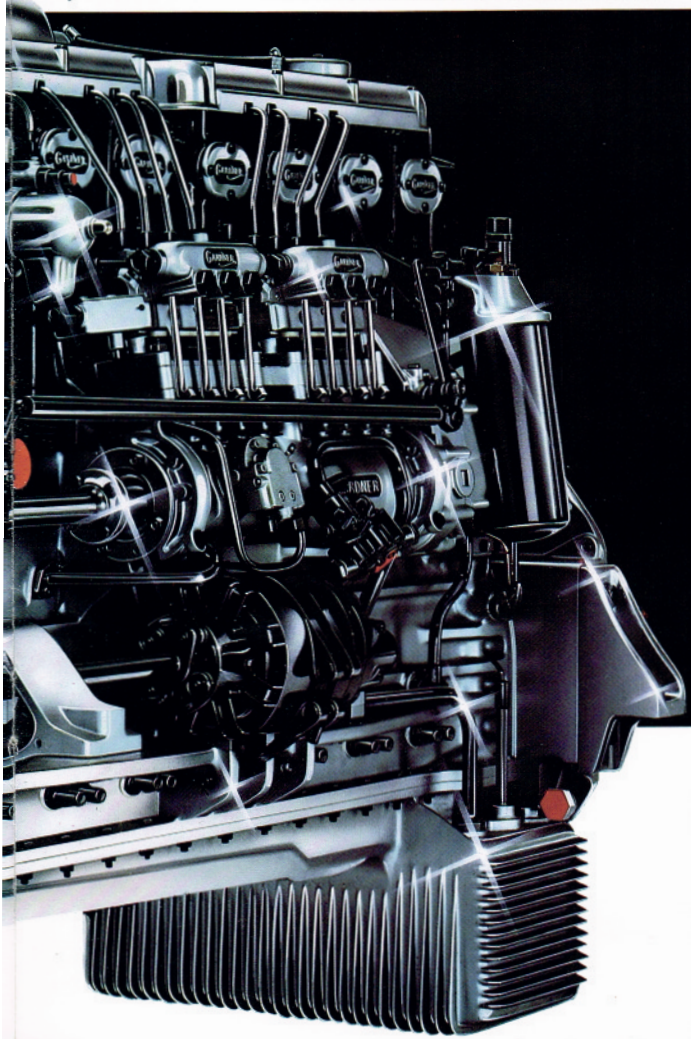
The benefits of improved fuel economy, higher power output and quieter running, combined with a substantial reduction in the weight per horsepower, makes the Gardner Turbo a very attractive proposition indeed.

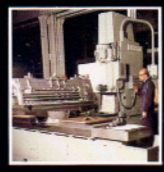
The building of an engine

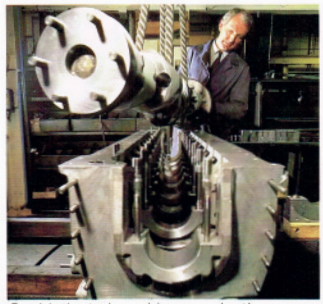
A feature of the Gardner LX series of engines is a crankcase of aluminium alloy construction, pre-loaded vertically and transversely. It accommodates the crankshaft; dynamically balanced and manufactured from chromium molybdenum steel with hollow bored crankpins and main journals in eight or ten bearings, dependant on the number of cylinders.

The coolant is circulated by a pump, mechanically driven and not relying on belts, to the base of the cylinders and is transferred to the cylinder head via synthetic rubber joint rings independent of the main gasket. The patented Gardner dual wax thermostat elements effect automatic temperature control with a built in safeguard against thermostat failure. Pistons are constructed from medium silicon aluminium alloy and have the Gardner innovated hemispherical combustion chambers formed in the piston crown.

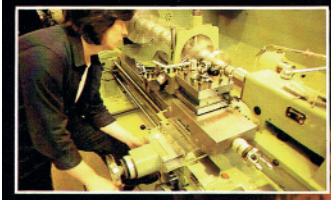
Chromium plated rings on these pistons give a long piston ring life.



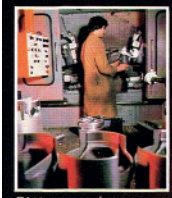




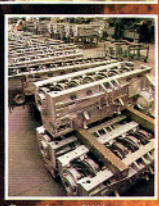
Sophisticated machinery under the watchful eye of skilled craftsmen ensures Gardner quality standards are maintained



Repair and service of customers vehicles at the Gardner workshops.



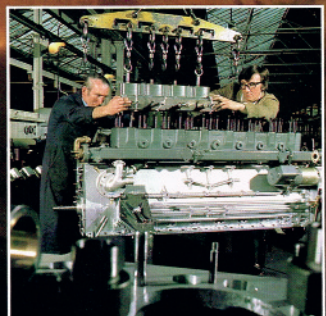
Pistons and crankshafts are machined to very fine tolerances.



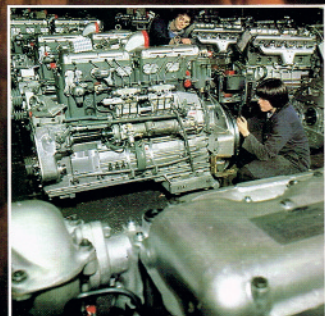
Spacious fitting shops.

1951 Foden, still in daily use, has now covered over one million miles on the original 6LW engine.

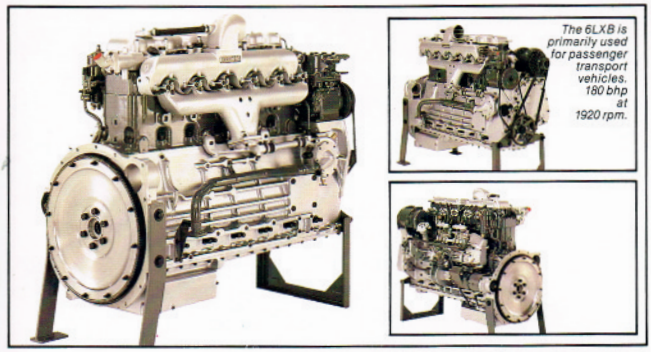
Precision turning of a Gardner crankshaft.



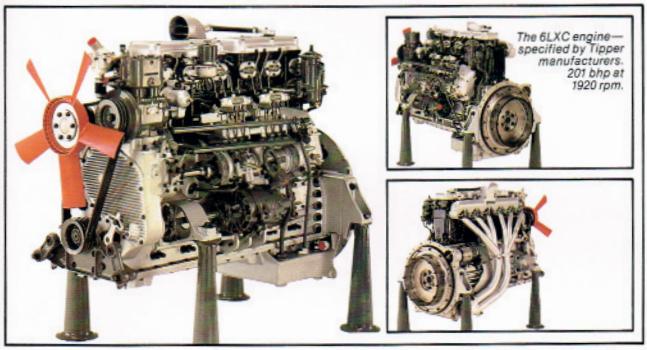
Fitting cylinder heads to the block.



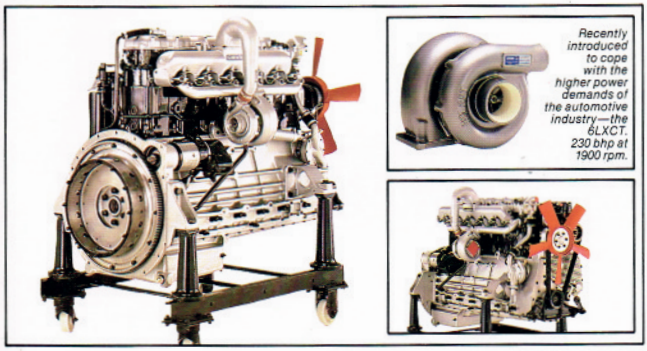
Individual customer requirements are met at the final engine assembly.



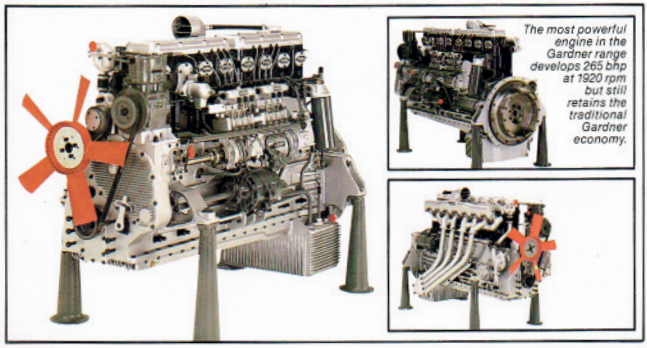
The 6LXB is primarily used for passenger transport vehicles. 180 bhp at 1920 rpm.



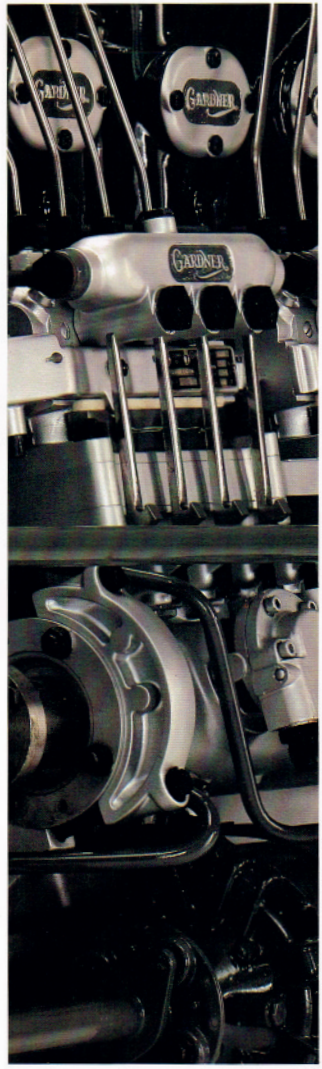
The 6LXC engine—specified by Tipper manufacturers. 201 bhp at 1920 rpm.



Recently introduced to cope with the higher power demands of the automotive industry—the 6LXCT. 230 bhp at 1900 rpm.



The most powerful engine in the Gardner range develops 265 bhp at 1920 rpm but still retains the traditional Gardner economy.



The Gardner engine is one of the few automotive engines to retain a detachable cylinder block enabling dry liners to be used, thus avoiding wet cylinder liner corrosion and leakage problems. This feature also enables pistons and connecting rods to be removed from the engine — if necessary it can be done without dropping the sump using special tools — a valuable asset on many installations, particularly some types of bus and marine units. However, the sump is usually removed to give easy access to connecting rod nuts.

Investment in the future.

Research and Development

The importance of research and development at Gardners cannot be overstressed. Constant metering of the changing market, the introduction of new production techniques and the investigation into possible new materials and processes ensures that the Gardner engine incorporates up to the minute technology. As a member of the Hawker Siddeley Group of companies, a vast pool of knowledge and information is available to maintain Gardners growth in the industry.

Changes in market demands require constant upgrading of engine design.

Service and Parts

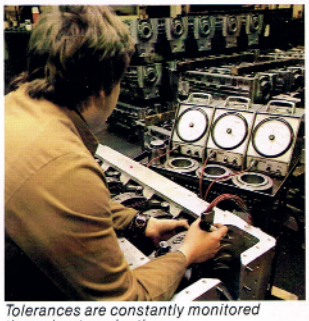
The service and parts network at Gardners conforms to the high standards associated with the company. The Parts Division is now computerised and offices in London and Glasgow complement the Service Personnel based at Head Office in Patricroft.

Extensive spare parts stores.

Regional Field Engineers are on call throughout the United Kingdom and thirteen recommended repairers, thirty official Service Agents and Regional Stockists are available, also nationwide.

Repairs and service can also be carried out at the Gardner workshops at Patricroft and for customers own premises. All aspects of maintenance and routine servicing are covered to ensure trouble free running and engine durability.

Research, development and engine testing.



Tolerances are constantly monitored throughout production.

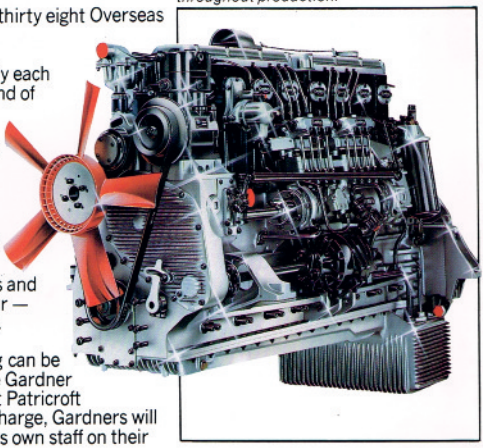
abroad, there are thirty eight Overseas Distributors.

Engine Warranty

Gardners supply each engine with the kind of comprehensive engine warranty you'd expect from a company with standards to maintain. Each customer is protected against the cost of replacement parts and labour for one year — unlimited mileage.

Training

Service training can be undertaken at the Gardner Training Centre at Patricroft or, for a nominal charge, Gardners will instruct customers own staff on their



The great British diesel.

HAWKER SIDDELEY

L. GARDNER & SONS LTD

Head Office & Works: Barton Hall Engine Works, Patricroft, Eccles, Manchester M30 7WA.
Tel: 061-789 2201. Telex: 668023. Telegrams: Gardworks, Eccles, Manchester.

Publication No: 794.

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GARDNER HEAVY OIL ENGINES

LIQUID FUELS FOR HEAVY OIL ENGINES

The Heavy Oil Engine, in its earlier days, was commonly spoken of as a Crude Oil Engine, which often led to the erroneous idea that the engine burned crude oil in its natural state, just as it leaves the earth. In the first place, natural oil is of a very complex nature containing other things of greater value than heavy fuel oils and which will repay their separation; and, in the second place, it contains impurities which render it unfit to burn in an oil engine without previous treatment, when obviously it ceases to have any right to be called Crude Oil.

In order to make the best and most economic use of all its constituents, and, at the same time, to rid it of its impurities, the natural oil is subjected to distillation, the principle of which process is here briefly sketched.

The oil is heated in a retort to a certain temperature sufficient to volatilise the lighter constituents. The vapour is then led to a condenser where it is cooled to a liquid form and drawn off. When the oil in the retort has parted with all the vapour which it can give at this temperature, the latter is increased by a certain amount and so gives off a vapour of a second order of heaviness, and this, in turn, is condensed and drawn off. And so the process goes on, in steps of increased temperature of the retort, until nothing is left in the retort but pitch, coke, ash, and other sediment.

Such is the process of distillation, shorn of all its technical refinements. Bearing in mind the infinitely complex structure of natural oils, it will now be evident that, by increasing the number of steps in the rise of temperature of the retort, the distilleries can draw off a great variety of liquids, beginning with the lightest of all the petrols, passing through the range of lamp oils, and so on to what are called the Heavy Oils, which are used as fuel, or else, by further treatment, are converted to lubricating oils.

The preceding may be taken as a rough definition of the term Heavy Oils for use in Oil Engines. The specific gravity varies from about 0·85 to 0·95, while the calorific value varies from about 18,000 to 19,500 British Thermal Units. The lighter classes of heavy oils are known technically as Gas Oils. The heavier classes are denominated either by their origin or by trade names adopted by the Merchants or Distillers.

Owing to the enormous variety of fuel-oils current upon the market, it is not possible for any engine builder to make a general sweeping statement as to what fuels his engine will or will not burn efficiently: he must of necessity limit his assertions to the fuels that he or his customers have actually used. The accumulation of such experience is a long and arduous process, but, happily, the Distillers and Merchants have simplified the process very materially by putting upon the market fuel oils specially prepared for Heavy Oil Engines. It generally suffices now for the user to buy the fuel oil which is current in his part of the world, stating to the merchant the kind of engine he is running.

Viscosity.—Sometimes it happens that the fuel available is too viscous at normal temperatures to flow sufficiently freely through the injection pumps and sprayers. In this case, the engine has to be started on a more mobile fuel, such as gas oil, and run under load for a short time until the engine is " warmed up," when the engine is changed over to the viscous fuel. This, of course, applies to all Heavy Oil Engines, Diesel and Semi-Diesel. The Gardner Engines are provided with proper means of instantly changing over from one grade of fuel to the other in case a viscous fuel be met with. As a general rule, however, the modern fuels are sufficiently mobile at ordinary air temperatures.

LIQUID FUEL FOR HEAVY OIL ENGINES (*continued*)

The Purchase of Fuel Oil.—The cheaper and more convenient way of buying fuel oil is by bulk. This necessitates the consumer providing storage tanks into which the fuel is delivered direct by the Oil Merchants from their delivery tanks. This is the general practice for Marine Engines and is becoming general for Land Engines. It may also be bought by the barrel, but obviously this is dearer by reason of the handling and filling on the barrels and is also less convenient.

The price is generally quoted by the ton when bought in bulk, and by the gallon when bought by barrel. The relation between tons and gallons depends of course on the specific gravity of the fuel. The following table may prove useful :

Specific Gravity.	Gallons per Ton.	Pints per Ton.
0·85	263·5	2108
0·86	260·5	2084
0·87	257·5	2060
0·88	254·5	2036
0·89	251·7	2014
0·90	248·9	1991
0·91	246·2	1970
0·92	243·5	1948
0·93	240·9	1927
0·94	238·3	1906
0·95	235·8	1886

Consumption of Fuel Oil.—This is usually and conveniently specified as a fraction of a pint per BHP per hour. For the engines mentioned in this catalogue, it varies from 0·510 pint to 0·460 pint per BHP per hour for a standard fuel of specific gravity of 0·86 and calorific value of 19,500 British Thermal Units.

LIQUID FUELS FOR HEAVY OIL ENGINES (*continued*)

For a medium size of engine this gives the convenient figure of 0·500 pint, that is, half a pint per BHP per hour at full load. From this, and the price per ton or per gallon, it is a simple calculation to determine the cost of fuel per hour burned by the engine when running at full load. For example, the present price of the above standard fuel is about 6d. per gallon of 8 pints, that is ¾d. per pint, which, at ½ pint per BHP per hour, costs ⅜d.=0·375d. per BHP per hour.

The makers will gladly quote guaranteed details of consumption on receipt of enquiry.

LUBRICATING OIL CONSUMPTION

THIS is a point of extreme importance and merits the closest attention of the purchaser when selecting an engine. It is well known that the cost of lubricating oil forms quite a considerable part of the running costs of the engine : any material reduction in the consumption of lubricating oil is, therefore, a strong point in favour of the engine.

Low consumption depends very largely upon perfect combustion in the engine, as well as upon first-class workmanship and perfection of the methods used for lubrication. These form the basis of the extremely low consumption of lubricating oil in the Gardner T Type Engines, which is of the order of one-fiftieth part of that of the Fuel Oil (actually it is much less than this).

It ought to be said that every engine undergoes proper tests for oil consumption, and that the low consumptions observed on test are amply confirmed by the logs of engines in actual service.

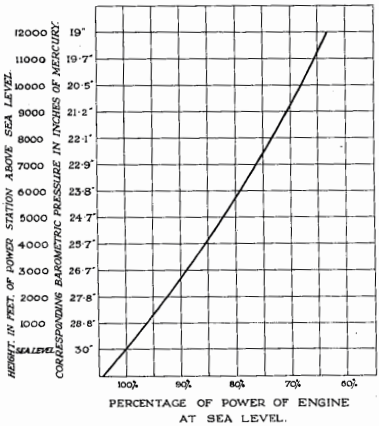
TESTING

THE test bay is equipped with all the appliances necessary for testing the engines from all points of view. The fundamental test for power developed is made by Hydraulic Dynamometers, the power which is recorded being that transmitted by the coupling on the crank shaft. All engines are tested for power, fuel consumption, consumption of lubricating oil, heat units carried away by cooling water, etc., etc. Tests are made at full load, overload, light and intermediate loads.

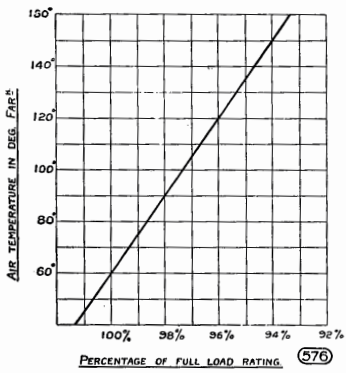
The powers quoted in the list are those measured by the Hydraulic Dynamometer, commonly called the Brake Horse Powers.

Customers or their representatives are cordially invited to attend the tests. All facilities are afforded to enable them to make independent tests. Electric Generator Sets are tested as such and the figures recorded are based on the measured electric output of the set.

ALTITUDE *and* AIR TEMPERATURE DIAGRAMS



ALTITUDE



AIR TEMPERATURE

THESE have been prepared for the purpose of enabling prospective users to arrive at the approximate size of an engine required to develop a given power under any conditions of altitude and air temperature. The resulting particulars may be taken as fully on the safe side.

The following example shows how to use these diagrams.

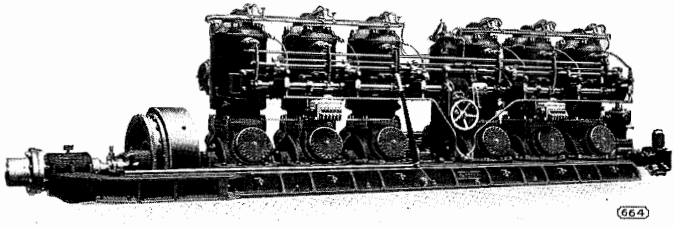
Given that an engine is to work at 3000ft. above sea level with an air temperature of 90°F.

From the diagram we read the following reduction coefficients :—

For Altitude : 88 per cent. or 0·88.
For Temperature : 98 per cent. or 0·98.
Combined coefficient = 0·88 × 0·98 = 0·86 or 86 per cent.

Thus an engine listed at 100 BHP, that is, at sea level, and with an air temperature of 60°F., will give 86 BHP at 3000 ft. and 90°F.

MARINE ENGINES



6T8 Engine—210 BHP
A pair of these engines (420 BHP) is comprised in the propelling machinery of the vessel "Pentowna," illustrated on page 30.

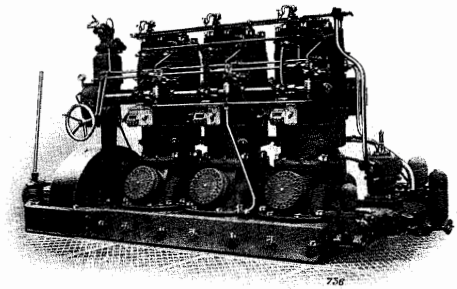
Mainly Historic.—The original Gardner Marine Engine came into being with the advent of the Motor Boat, many years ago. Its design was preceded by a careful study of the conditions under which Internal Combustion Engines had to work when used for boat propulsion. Considerations of economy and safety led us to avoid the use of petrol, even for starting, and to adopt as fuel the heavy Russian Petroleums. This type of engine was, from the first, so successful that it remained our standard type of marine engine for many years until the coming of what is now termed the Heavy Oil Engine. During that period we installed many thousands of the Gardner M Type Marine Oil Engines varying from 10 BHP to 250 BHP. Their design was of course revised from time to time, as experience dictated. It is significant to add that we are still making this type of engine.

With the development of Magneto Ignition to its present state of perfection, and the lessening prejudice against the presence aboard of petrol, a demand arose for small power marine engines up to 40 BHP, to start on petrol and to run on petroleum (paraffin), which gave rise to the Gardner CR Marine Engine described in another catalogue.

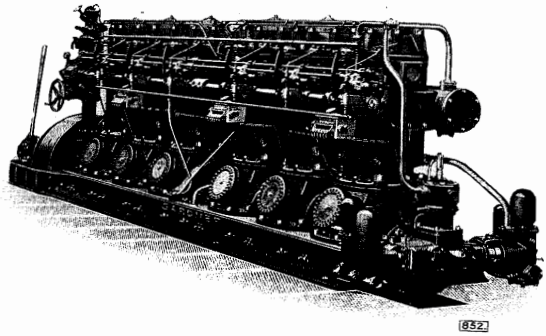
Later, there came the development of the Heavy Oil Engine of two and four cycle types, which burn low grades of fuel cheaper than petroleum (paraffin) and much less of it. We chose the Two-cycle Engine by reason of its great simplicity, of the ease with which it can be reversed and of the consequent flexibility when manœuvring, a choice which experience has more than justified.

It will be gathered from the preceding that we have amassed an enormous amount of experience of Marine Practice, which we willingly place at the disposal of our friends.

MARINE ENGINES (*continued*)



3T9 Engine—150 BHP
The above is from a photo of the propelling engine which is installed in the vessel " Lido," shown on page 33.

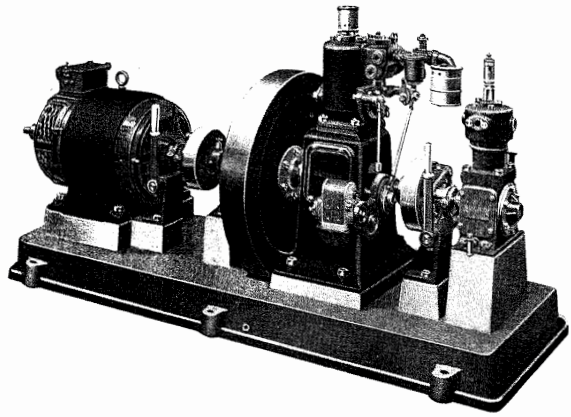


6T9 Engine—300 BHP
A pair of these engines (600 bhp) comprise the propelling units in each of the vessels " Chia Ling Maru," " Iguazu," " St. George," and " Endymion," which are shown on pages 30 and 38.

MARINE ENGINES (*continued*)

Installation.—We have a department exclusively devoted to the construction of propelling gear and to the design of installation work. On receipt of the necessary data, accompanied by plan and section of the hull, showing the space available for the propelling machinery, we will, if desired, prepare a complete installation drawing. As these drawings involve considerable trouble, we trust to our friends to send the fullest possible details of their requirements so as to avoid the cost of amended drawings.

Small Stand-by Sets.—We have established a series of small paraffin engines coupled direct to dynamos or air compressors, or both, as auxiliaries to the propelling engines, for direct lighting or battery charging and for charging the compressed air reservoirs for the first start after installation, also as a stand-by in case of a loss of air pressure by inadvertence. One of these sets is here illustrated.



691.

In the absence of one of these stand-by sets, the air reservoirs are usually charged (for the initial start after installation) by means of a bottle of highly compressed air which is readily obtainable in most districts. Failing this, a hand pump is used, but this method of initial charging is both long and laborious.

As a compromise between this and the use of one of the above auxiliary sets, we have designed a simple combination of a petrol engine and air compressor known as the OVC Compressor Set, which is described on page 48.

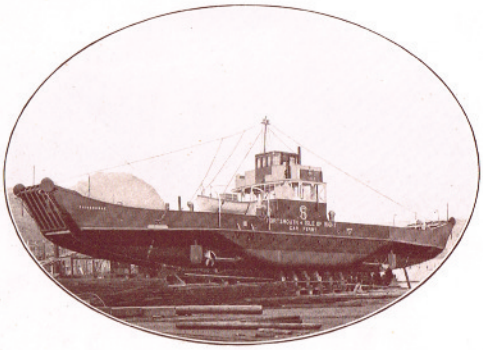
To Be Continued

MARINE ENGINES *for* COMMERCIAL CRAFT (*continued*)

Thames Motor Tug

" Unico "

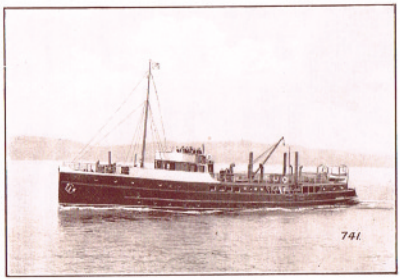
63ft. 9ins. × 15ft. 6ins. × 6ft. 6ins. draft
4T9 Engine : 200 BHP



Isle of Wight Motor Car Ferry Boat

" Fishbourne "

130ft. × 25ft. × 4ft. 6ins. draft
Speed 8 knots
Two 4T7 Engines : Total 240 BHP



Oban Passenger and Cargo Vessel

" Lochinvar "

145ft. × 22ft. × 6ft. 9ins. draft
Speed 10½ knots
Three 4T6 Engines : Total 288 BHP

For Sale

The following was received via the website email address. and is a summary of communications received

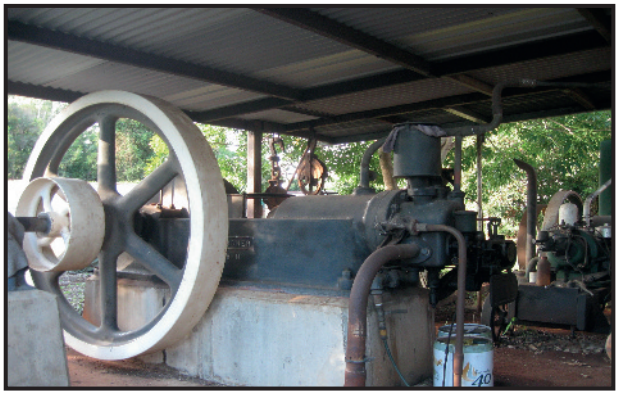
Sorry for the delay in getting back to you, I have listed below the details that I am aware of.

Engine: Gardner 8HF
Location: North Queensland Australia (Cairns region)
Serial Number: 881 - stamped on side

The engine was used for the lighting plant at Mourilyan Sugar Mill.

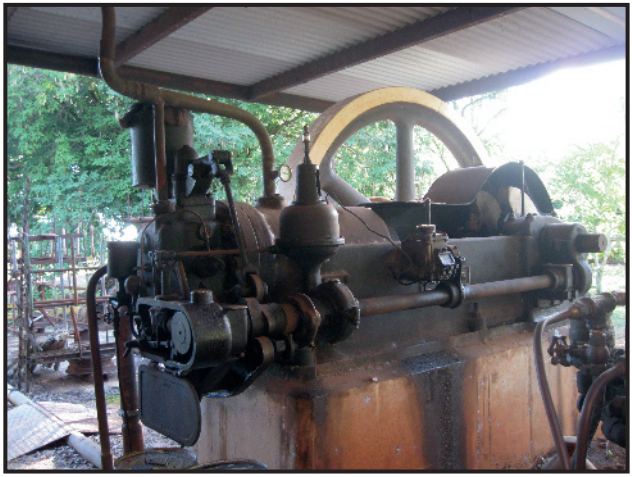
I would like to ascertain its value as a starting guide and this has been one of the main reasons for contacting you.

Any advice you can tender would be greatly appreciated.



Regards
Mark Taylor

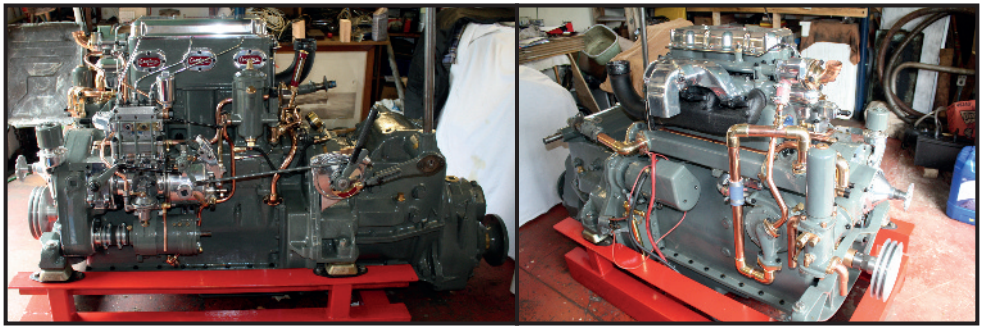
An Internet search reveals the Mourilyan Sugar Mill is one of the oldest (1880's) to have been built in Australia, it suffered badly from tornado Larry which hit in March 2006 ending its manufacturing life, presumably the engine has been stood since then, if you have any interest or can offer Mark any further advice please contact him directly at mailto:vireya123@gmail.com]



For Sale

Marine 3LW with 2UC Gearbox

Imported from Australia, then a full nut and bolt rebuild by ex Gardner personnel,with everything that needed replacing has been (and many that didn't also) inc block, liners, pistons + rings, head, valves and guides, all roller bearings, timing chain, recon sprayers etc plus full photographic record.



Contact Paul Smith on 01282 771874 or Mob 0771-100-702 (Lancashire)

paul@paulsmithsabden.co.uk