Cylinder Oil 600 W

What it is for
What it will do

VACUUM OIL COMPANY
New York, U. S. A.,
1920.

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Gargoyle Cylinder Oil 600 W

Introduction Gargoyle Cylinder Oil 600 W was first manufactured over forty years ago. It has since, through sheer merit of service, so enhanced its reputation that today there is more Gargoyle Cylinder Oil 600 W sold throughout the entire world than any other brand of cylinder oil on the market.

It has an international reputation for being the standard of perfection of steam cylinder oils. It is at work in every land. It is endorsed by users and engine builders throughout the world.

It will be our endeavor in this paper to describe the manufacture of Gargoyle Cylinder Oil 600 W, to show its proper range of service, and to give such points in regard to its application and use as will enable our customers to use it to the greatest possible advantage.

Gargoyle Cylinder Oil 600 W is a registered trademark brand, owned and protected by the Vacuum Oil Company. Gargoyle Cylinder Oil 600 W is manufactured solely by the Vacuum Oil Company.

Manufacture of Ordinary Cylinder Oils Most Steam Cylinder Oils on the market are manufactured as by-products in the cracking process of distillation of the light distillate oils, such as gasoline, naphtha, kerosene, etc. This cracking process is primarily employed to obtain the greatest yield of gasoline.

In this cracking process the stills are heated direct by intense external heat. When the gasolines, kerosenes, and lighter lubricating oils have been distilled off, there remains in the still a heavy dark oil full of carbonized matter, in which many of the lubricating properties originally present in the heavy hydro-carbons have been destroyed. From this, various ordinary cylinder oils are produced. The process necessary to remove the harmful carbon particles, also removes the best elements of the heavy, rich, hydro-carbons, so essential to high-grade cylinder oils.

Manufacture of Gargoyle Cylinder Oil 600 W

Gargoyle Cylinder Oil 600 W is produced on quite different lines.

First of all, a specially selected crude oil is used in the manufacture of Gargoyle Cylinder Oil 600 W.

In the vacuum process of distillation, from which the Vacuum Oil Company takes its name, every operation including the final distillation is carried out at temperatures so moderate that the danger of charring or carbonizing the oil is entirely removed. The whole process is brought within the limits of heating by steam instead of heating by fire. The distillation is at all times under perfect control, the products, from which Gargoyle Cylinder Oil 600 W is made, being carefully protected in every stage so that they retain their full lubricating value.

Gargoyle Cylinder Oil 600 W is a standard product, manufactured by standardized methods, according to a standard formula, from specially selected crude petroleum. It, there-

fore, possesses uniformity of quality not possible to attain in blended products derived from a variety of crudes and from different refining processes.

Physical Tests

The physical properties of a cylinder oil are no indication of its lubricating value. It is, therefore, impossible to draw correct conclusions as to the lubricating value of a cylinder oil from any known analysis of its physical properties. The physical tests most frequently applied by chemists are: specific gravity, cold test, flash point, viscosity, loss by evaporation and the degree to which the oil is compounded. None of these tests indicate the lubricating efficiency or service value of an oil.

Specific Gravity Specific gravity is the weight of a definite quantity of oil compared with the weight of the same quantity of water. The gravity of a cylinder oil depends largely upon the crude from which it is made, the temperature and conditions under which it is distilled, and the nature and percentage of fixed oil with which it may be compounded. The gravities of different cylinder oils vary in such an inconsistent manner that it is hopeless to try to draw from this test any conclusions as to their service value.

Cold Test This test is to determine the temperature at which the oil congeals, i.e., ceases to flow. The cold test of a cylinder oil is rarely, if ever, an important qualification.

Flash Point

Flash point is the temperature at which vapor from the heated oil flashes, i.e., ignites momentarily upon the application of a flame. The flash point is determined in the laboratory under atmospheric pressure.

Since there is no air present in steam there can be no flash at any temperature. It is, therefore, possible to use a cylinder oil successfully under superheated steam conditions, where the temperature of the steam is a good deal higher than the flash point of the oil, measured under atmospheric conditions. It is by no means certain that a cylinder oil is suitable simply because it possesses a high flash point.

Viscosity

Viscosity reading (by the Saybolt instrument) is the time in seconds which it takes for 60 cubic centimeters of an oil to flow at definite temperature through an orifice of definite dimensions.

The viscosities of cylinder oils at ordinary temperatures differ considerably, some oils being quite sluggish and others quite fluid. As the temperature, of interior surfaces of steam engine cylinders, is from 385° F. to 700° F., it will be apparent that the ordinary laboratory tests of the viscosity of cylinder oils, generally taken at 212° F., are useless for the purpose of judging the lubricating properties of cylinder oils. In fact, neither the gravity, flash point, nor the viscosity of a cylinder oil is any criterion as to the lubricating quality of the oil when applied to actual work.

Compounded Cylinder Oils

For most operating conditions experience has proved that cylinder oils compounded with the proper kind and amount of fixed

oil (animal or vegetable oil) are more suitable than straight mineral cylinder oils. When engines are working with wet steam the advantage of using a compounded oil becomes apparent. Great care must, however, be exercised in selecting the proper kind of fixed oil. Unsuitable fixed oils, under the action of steam and high pressure and temperature, decompose and develop acids and a gummy residue which corrode the metal surfaces and produce a sticky, pasty, deposit which increase friction.

Compounding mineral cylinder oil with the right proportion and quality of fixed oil usually improves its lubricating properties and better results will be secured than if straight mineral cylinder oil was used without the admixture of fixed oil. Gargoyle Cylinder Oil 600 W is compounded with the proper amount of acidless tallow oil.

A straight mineral oil, i.e., an oil containing no fixed oil, is necessary where the subsequent use of the condensed exhaust steam demands that it be free from oil because a straight mineral oil separates readily from water. For such purposes Gargoyle Cylinder Oil 600 W Mineral should be used.

Loss by Evaporation

Laboratory tests to determine the per cent of evaporation, when a sample of cylinder oil is heated to a certain temperature for a certain time, are of little value in determining the lubricating ("lasting") properties of a cylinder oil, as these tests are carried out under atmospheric pressure and under conditions quite different from those met with in actual service.

Object of Cylinder Lubrication

The object of internal lubrication in a steam engine is, first, to form a *lubricating film* between the rubbing surfaces and thus replace the metallic friction with fluid friction, as far as possible; second, to form an *oil sealing film* in order to prevent leakage of steam past the valves, pistons and gland packings.

The internal moving parts, comprising valves, valve rods, piston and piston rod, are exposed to high temperature conditions and, with the exception of the valve rod and piston rod, none of the internal parts are exposed to view, so that the condition of lubrication cannot easily be inspected. The internal lubrication of the steam cylinders and valves is, therefore, of much greater importance and much more difficult than the lubrication of the external moving parts, comprising the crosshead, crank pin, main bearings, eccentrics etc.

Only the correct grade of high quality cylinder oil, applied in the right way, to the right place, and in the right quantity, will enable the steam engine to operate at its highest efficiency and with a minimum cost for renewals and repairs. Correct lubrication is therefore chiefly dependent on the methods of lubrication employed and the selection of the correct oil to meet the operating conditions of each individual case.

Methods of Lubrication

Points of Application

In order to lubricate the internal parts of steam cylinders and valves, cylinder oil is introduced into one or more of the following points:

1. Direct to the steam chest
2. Direct to the valves
3. Direct to the cylinder
4. Direct to the piston rod
5. Indirect into the steam line

The four first-mentioned points of application are *direct*, that is, the oil is delivered as directly as possible to the moving parts requiring lubrication.

These direct methods have the disadvantage that where a heavy cylinder oil is required it spreads with difficulty and is, therefore, liable to over lubricate some parts and fail to reach other parts. For this reason an excessive amount of oil is required to insure a complete lubricating film being maintained.

The indirect method of application, which embodies an entirely different principle, is to feed the oil into the steam line, the object being to atomize the oil and "lubricate" the steam. The steam passing through the engine reaches and comes in direct contact with all the internal parts requiring lubrication. By introducing the oil into the main flow of steam, the oil is automatically carried along by the steam. In fact, the steam itself is thus made a lubricant and lubricates all parts with which it comes in contact.

Atomizing the Oil

It is not, however, satisfactory to introduce the oil flush with the inside of the steam pipe, as the oil then is merely pushed along in the form of drops.

The best method, insuring perfect distribution, is the

atomizing method, by which the oil is introduced through an atomizer into the center of the flow of steam. The steam impinging with great velocity against the spoon shaped end of the atomizer, will drive the oil through the slits in the atomizer, so that the oil becomes thoroughly broken up and, in the form of an exceedingly fine spray, mixes with the steam and enters the engine.

It lubricates the spindle of the engine stop valve which makes this valve easy to operate.

It lubricates the valves and valve spindles, the steam carrying a portion of the oil on these points.

The oil is thoroughly distributed in the form of a uniform coating over the piston, piston rings and cylinder walls.

The piston rod receives its proper share of the oil, and the piston-rod packing is in this way lubricated from the inside. This is much more economical than lubricating the piston rod from the outside, in which case the lubrication is inefficient, as the oil is scraped off by the gland.

Where the oil is supplied directly to the various parts, it is frequently found that the piston-rod, is poorly lubricated, particularly under high pressure conditions. The rod shows evidence of uneven distribution of oil. It looks scratched all over, and has the peculiar raw polished surface that indicates wear.

Where, in such cases, the atomization method is substituted the oil cups furnishing lubrication to the outside of the piston rod can usually be dispensed with and, due to the better lubrication of the piston rod from the inside, the

surface of the rod will soon assume a glossy, oily, appearance, indicating that the wear has ceased and that the piston-rod surface is getting a hard, polished, skin.

If the exhaust steam is carried over to the low-pressure cylinder (as in the case of a compound engine) or to the intermediate pressure and low-pressure cylinders (as in the case of a triple expansion engine) it will carry over finely atomized oil, which will assist in lubricating these cylinders. Atomizing the oil and using the steam as the oil spreading medium, results in the most efficient distribution of the oil. Not only is the friction reduced, but the quantity of oil required for full lubrication is reduced.

Lubricators If oil is fed by an unreliable lubricator, or if the oil feeds do not introduce the oil in the best possible manner, more oil is required to provide lubrication and the lubrication will not be so efficient as when the oil is properly fed and applied.

True economy in the lubrication of valves and cylinders is obtained by feeding a minimum quantity of the correct grade of oil to the working parts with such regularity as will insure an unbroken oil film between the frictional surfaces.

Such economy can never be secured by the use of a lubricator which feeds intermittently or irregularly.

The hydrostatic lubricator is rapidly being superseded by the mechanically operated lubricator. It is difficult to maintain a uniform feed with the hydrostatic lubricator, especially where a very small feed is desired; also, the oil

feed varies with the engine-room temperature and every time the lubricator is filled with fresh oil.

Modern conditions of high steam pressure and high steam temperature make it desirable, and in some cases necessary, to use mechanically operated lubricators which can be relied upon to automatically feed the high-grade oil uniformly and regularly.

Selection of Cylinder Oil

Efficient Lubrication

Efficient lubrication produces a polished, glossy surface on the valve rods, valves and valve faces, piston rods, piston rings and cylinder walls. The valves and pistons operate without noise, the eccentric rods operating the valves work smoothly, and when opened for inspection the internal frictional surfaces show a complete lubricating film.

When the steam cylinders are opened for inspection, the surfaces should present a rather dull appearance, coated with a film of oil, the presence of which can be determined by wiping a piece of paper over the cylinder walls at various parts of the stroke. On wiping off the oil film, the surface underneath should appear bright and glossy.

With good lubrication it is easier to keep the packing glands tight, as the complete film of lubricating oil helps to make a perfect seal, and the packing will last longer.

Poor Lubrication

Poor lubrication manifests itself in different ways with different types of engines. Slide valves and piston valves groan, and the

eccentric rods operating the valves tremble. Corliss valves groan, the admission valves close sluggishly or may even have a tendency to stick. Faulty lubrication is frequently indicated by "blowing" at the stuffing boxes.

When the engine is opened for inspection, poor lubrication and excessive friction are always indicated by dryness of the rubbing surfaces, which show wear and streaks of cutting where the metallic surfaces have come into contact. The rubbing surfaces will appear bright as if polished with fine emery cloth, although actual cutting or scoring may not have taken place. Under conditions of high steam pressure, and particularly under superheat conditions, poor-quality oils as well as excessive feed of good-quality oils will produce accumulations of carbonaceous deposits, particularly if the steam carries over impurities from the boiler plant or from the steam line. These impurities cling to the oil film and bake together with the oil, forming pasty deposits. These deposits, under conditions of extreme temperature, become hard and brittle and cause excessive wear.

Oil too Heavy in Body

Oil too heavy in body will not atomize and will not spread readily, resulting in poor distribution and necessitating excessive consumption. Due to its heavy body, the fluid frictional losses will be higher than they ought to be and, if the steam carries over impurities to the engine, the use of such an oil will encourage the accumulation of deposits, particularly under high pressure and superheat conditions.

Oil too Light in Body

Oil too light in body will be readily atomized and distributed, but it will not be able to withstand the pressure between the rubbing

surfaces. Metallic contact will take place, resulting in excessive wear. Excessive leakage of steam will also occur, as the oil will not be able to maintain a perfect seal between the moving surfaces.

Too Much Oil Too much oil, under saturated steam conditions, is no better than when the right quantity of oil is used. Under superheated steam conditions, the excess oil is positively detrimental, leading to the formation of carbonaceous deposits.

Too Little Oil Too little oil will not maintain a complete oil film between the frictional surfaces, so that not only will heavy friction and wear occur, but also excessive leakage of steam past the moving surfaces.

Oil Low in Quality Oil low in quality will not maintain a complete oil film on the internal surfaces, notwithstanding a liberal feed, so that the losses due to friction and steam leakage are always high. Under conditions of high pressure and, particularly under conditions of superheat, such an oil will permit excessive wear and will frequently result in the formation of carbonaceous deposits, due to decomposition of the oil.

Gargoyle Cylinder Oil 600 W Gargoyle Cylinder Oil 600 W will maintain a complete oil film between the frictional surfaces. The frictional losses, due to the fluid friction of the oil itself as well as the losses due to leakage of steam past the moving surfaces, will be reduced to a minimum. Consequently, the steam consumption per horsepower will be the lowest possible for that particular engine.

GARGOYLE CYLINDER OIL 600 W

Low cost of cylinder lubrication results from the use of Gargoyle Cylinder Oil 600 W, because of the low rate of feed, the small quantity required to maintain a complete lubricating film. The cost per cylinder, per hour of operation is found to be at a minimum when Gargoyle Cylinder Oil 600 W is properly applied.

Gargoyle Cylinder Oil 600 W possesses unusual characteristics that will enable it to readily atomize under a very wide range of conditions of steam pressure and steam temperature. It is specially manufactured to give its best service with steam pressures above 100 lb. per square inch and high steam temperature, even up to a total steam temperature of 600° F.

The unusual characteristics of Gargoyle Cylinder Oil 600 W permit its use for steam pressures below 100 lb. per square inch, although it will not spread so readily as will other of our high grade cylinder oils, such as Gargoyle Valve Oil and Gargoyle Cylinder Oil Rarus. These cylinder oils are specially made to suit conditions of low pressure, wet steam, etc., and therefore will give greater economy and efficiency than Gargoyle Cylinder Oil 600 W under these conditions.

Gargoyle Cylinder Oil 600 W, when rightly applied and in the right quantity, will not form a carbonaceous deposit even under conditions of high steam pressure and superheat, and will prevent excessive wear.

Where pistons or valves fail to operate satisfactorily, because of severe conditions, it is usually because the lubricating oil film gives way under excessive pressure or temperature.

The construction of the various types of valves limits their use, as to steam pressure and steam temperature. For instance, slide valves are seldom used above 120 lb. steam pressure and a total steam temperature of 450° F.; Corliss valves are seldom used for steam pressures above 160 lb. and a total steam temperature of 520° F., whereas piston and drop valves are used for the highest steam pressures and steam temperatures.

Under conditions of high steam pressure and high superheat, Gargoyle Cylinder Oil 600 W, if thoroughly atomized with the steam and if uniformly and sparingly used, will spread to the best advantage, forming a thin lubricating film over all the internal surfaces. There is no surplus oil to which possible impurities in the steam can adhere, so that the lubrication will not only be efficient but also very clean, not permitting the development and accumulation of carbonaceous deposits.

It is particularly important that Gargoyle Cylinder Oil 600 W should be sparingly fed to the metallic packings usually employed under superheated steam conditions. The oil remains stagnant in the casing holding the metallic packing, exposed to the high temperature, in which case any oil fed in excess will gradually evaporate and lead to the formation of a deposit.

Under certain conditions it is desirable to extract the oil from the exhaust steam and to eliminate, as far as possible, the danger arising from oil getting into the boilers.

Straight mineral cylinder oils separate more easily from the

exhaust steam and feed water than do compounded cylinder oils. But, due to the superior lubricating quality of Gargoyle Cylinder Oil 600 W, it can be used very sparingly under these conditions with entirely satisfactory results. By using Gargoyle Cylinder Oil 600 W, feeding as little as possible, through a reliable lubricator, there will be only a small amount of oil in the exhaust steam to get rid of.

Procedure in Introducing Gargoyle Cylinder Oil 600 W

When introducing Gargoyle Cylinder Oil 600 W for the first time, the rate of feed should be maintained the same as the oil previously used, for the first two days, after which the rate of feed should be gradually decreased until the minimum feed by which smooth and satisfactory running can be accomplished, is determined.

It is not until the internal frictional surfaces have assumed a good working skin with a smooth, glossy, appearance that the rate of feed of Gargoyle Cylinder Oil 600 W can be reduced to its minimum.

It takes time for Gargoyle Cylinder Oil 600 W to produce a good working skin. It takes much longer, in fact, than it does for an unsuitable cylinder oil to destroy a good surface that has been produced by the use of Gargoyle Cylinder Oil 600 W.

After the engine has been in operation some time on the minimum feed of Gargoyle Cylinder Oil 600 W, the cylin-

ders and valves should be opened for inspection, in order to make sure that the lubrication has been efficiently maintained throughout.

When testing Gargoyle Cylinder Oil 600 W, it is frequently found, during the early period, that deposits left by the previous oil are loosened and that some of the deposits work out in the form of a dark sludge on the piston and valve rods. Gargoyle Cylinder Oil 600 W has a cleansing action on these deposits and after a little while all the surfaces will appear clean and well oiled. The appearance of deposits in the early stages of the trial should, therefore, not be attributed to Gargoyle Cylinder Oil 600 W, but to the oil previously in use.

Another evidence of the searching action of Gargoyle Cylinder Oil 600 W is that, where it is introduced into the steam pipe and atomized with the steam, the pipe joints between the point of entrance of the oil and the engine sometimes leak, due to the fact that Gargoyle Cylinder Oil 600 W has dissolved deposits and dirt in the joints, so that the packing will need tightening in order to keep it steam tight.

Typical Results by the use of Gargoyle Cylinder Oil 600 W

I. Careful comparative tests carried out on a 125 horsepower, horizontal slide valve engine showed the following comparative results, using different qualities of cylinder oils. In the table is given the number of drops of oil used per minute and the horsepower consumed in overcoming the

friction of the engine itself, running at normal speed, but without load:

	Frictional Load	Oil Drops per minute
No lubrication	27 hp.	0
Ordinary cylinder oil	23 hp.	10
Better grade cylinder oil	20 hp.	4
Gargoyle Cylinder Oil 600 W	18 hp.	2

In the case of non-lubrication, the frictional horsepower was very high and no doubt a great deal of steam was also lost in leakage past the valve and piston.

When using a heavy feed of ordinary cylinder oil, the friction was reduced. It was reduced still further by using a smaller quantity of a better grade of cylinder oil. But when using only two drops per minute of Gargoyle Cylinder Oil 600 W, the friction was reduced to a minimum, proving that the true value of a cylinder oil lies in its ability to reduce friction even on a reduced feed, so that its price per gallon is of minor importance.

The cost of lubrication when using Gargoyle Cylinder Oil 600 W is, frequently, less than when using other cylinder oils. But, even if the cost should be somewhat higher, the saving in friction, which takes place and which is rarely taken into account, will outweigh, many times, any increase in the cost of lubrication.

II. On a 1500 horsepower cross compound steam engine employing superheated steam, with a total steam temperature of 530° F., when using another cylinder oil, it was never possible to keep the packing absolutely tight and a

certain amount of deposit developed on the seats and spindles of the drop (poppet) valves, preventing them from dropping firmly onto their seats.

After introducing Gargoyle Cylinder Oil 600 W, the consumption was gradually reduced 49.5 per cent, which resulted in a considerable saving in the cost of lubrication. The engine worked much better and the packing was steam tight. The drop valves operated freely, the metallic click of the valves dropping on their seats being clearly audible.

III. Two large, triple cylinder, horizontal, steel works rolling mill engines of 10,000 to 12,000 horsepower each, employing saturated steam at 150 lb. pressure, have for years been running successfully on the exceedingly low consumption of one gallon of Gargoyle Cylinder Oil 600 W per 24 hours per engine.

IV. Three sets of Nordberg steam engines, of 1000 I. hp. each, employing superheated steam at 160 lb. pressure and a total steam temperature of 500° F., are efficiently lubricated with Gargoyle Cylinder Oil 600 W on a feed of approximately one drop per minute on each engine.

Upon opening these engines for their regular periodical inspection, after 3½ years operation, they were found to be in perfect condition.

V. A large vertical blowing engine in an iron works had been running successfully for some time on 8 gallons of Gargoyle Cylinder Oil 600 W, per week. An attempt to use up some stock of the ordinary cylinder oil used previous to the introduction of Gargoyle Cylinder Oil 600 W,

resulted in a gradual ncrease in consumption to 24 gallons per week and was still rising when the experiment was abandoned.

Upon reinstating Gargoyle Cylinder Oil 600 W, the consumption was quickly brought back to the old figure of 8 gallons per week.

VI. A 350 horsepower fan engine, in a colliery, consumed 3 gallons per day of another cylinder oil, fed direct to the Corliss valves through three mechanically operated lubricators, having a total of eight oil feeds.

In addition, it was found necessary to feed extra oil to the ends of two of the Corliss valves, in order to keep them silent.

After introducing Gargoyle Cylinder Oil 600 W, through a single feed mechanical lubricator, feeding the oil into the high pressure steam pipe through an atomizer, great improvement was shown in the lubrication. The consumption was gradually reduced to two pints per day, and it was never found necessary to feed extra oil to the Corliss valves.

VII. An old horizontal rolling mill engine with heavy piston valves was using 26 gallons per week of an ordinary cylinder oil, and laboring heavily at its work.

After introducing Gargoyle Cylinder Oil 600 W, the consumption was gradually reduced to 4 gallons per week, and the improvement in lubrication was noticeable by the much greater ease and quickness with which the engine was able to reverse.

It will be seen by the foregoing that steam cylinder lubri-

cation can be, and is being, successfully accomplished by the proper application of Gargoyle Cylinder Oil 600 W and that it has a wide range of application, within which it is the ideal lubricant.

Advantages of Gargoyle Cylinder Oil 600 W

The following points summarize some of the advantages of Gargoyle Cylinder Oil 600 W for steam cylinder lubrication:

Gargoyle Cylinder Oil 600 W is produced from specially selected crude oils.

It is manufactured by the vacuum process avoiding the intense heat which chars oils produced by ordinary methods.

It is always uniform in characteristics and properties.

It does not contain acids or impurities.

It atomizes readily under a wide range of conditions of steam pressure and steam temperature.

It adheres readily to wet surfaces.

It forms and maintains a tenacious oil film between frictional surfaces.

It forms a sealing film to prevent leakage of steam past valves, pistons and gland packings.

It costs less because of the low rate of feed necessary.

It will not form carbonaceous deposits.

When first introduced, it cleanses the working parts of all deposits.

GARGOYLE CYLINDER OIL 600 W

Supplementing Gargoyle Cylinder Oil 600 W, in extreme cases and under conditions for which 600 W is not ideal, the Vacuum Oil Company provides other oils to meet a wide range of conditions. By consultation with our lubrication engineers, the user is enabled to get the grade of oil that will exactly meet the lubricating requirements of his engines.

BUILDERS FOR WHOSE EQUIPMENT GARGOYLE CYLINDER OIL 600 W IS RECOMMENDED.

BUILDER	EQUIPMENT	BUILDER			
		Recommends or Approves Use of 600 W	Sends Samples 600 W	Attaches Plates Recommending 600 W	Issue Lubrication Instructions
Alberger Pump & Condenser Co.	Steam Engine Driven Pumps	x	x		x
Allis-Chalmers Manufacturing Co.	Steam Driven Compressors	x	x		
" " " "	Steam Engines	x	x		
American Carbonic Machinery Co.	Steam Driven Compressors				
Ames Iron Works	Steam Engines	x	x		x
American Road Machinery Co.	Steam Road Rollers, Tractors and Engines	x	x		
Ball Engine Company	Steam Engines	x	x		x
Barber Asphalt Paving Co., The	Steam Road Rollers	x	x		
" " " " "	Steam Engines	x	x		
Brownell Co., The	Steam Engines	x			x
Brown Hoisting Machinery Co., The	Enclosed Gears of Cranes				
Buckeye Engine Co.	Steam Engines	x			
Buffalo Forge Co.	Steam Engines	x			
Bury Compressor Co.	Steam Driven Compressors	x	x		x
Chandler & Taylor Co.	Steam Engines	x	x		
Chicago Pneumatic Tool Co.	Steam Driven Compressors	x	x		x
Chuse Engine & Manufacturing Co.	Steam Engines	x			x

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		Recommends or Approves Use of 600 W	Sends Samples 600 W	Attaches Plates Recommending 600 W	Issue Lubrication Instructions
Clark Brothers Co.	Steam Engines	x		x	x
Clayton Air Compressor Works.	Steam Driven Compressors				
Climax Manufacturing Co.	Steam Locomotives	x	x		
C. & G. Cooper Company, The	Steam Engines	x	x		x
DeLaVergne Machine Co.	Steam Driven Compressors				
Epping-Carpenter Pump Co.	Steam Driven Pumps	x			
Erie City Iron Works.	Steam Engines	x	x	x	
Erie Engine Works.	Steam Engines	x			x
Filer & Stowell Co., The,	Steam Driven Compressors	x	x		
" " " " "	Steam Engines	x	x		
Fisher Machine Works Co.	Steam Driven Compressors				
" " " "	Steam Engines				
Fitchburg Steam Engine Co., The,	Steam Engines	x	x		x
Foote Brothers Gear & Machine Co.	Speed Transformers				
Frick Company.	Steam Driven Compressors	x	x		x
" "	Steam Engines	x	x		x
Harris-Corliss Engine & Mach. Co.	Steam Engines	x	x		
Harrisburg Fn'dry. & Mach. Works.	Steam Engines	x	x		x

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BUILDER	EQUIPMENT	BUILDER			
		Recommends or Approves Use of 600 W	Sends Samples 600 W	Attaches Plates Recommending 600 W	Issue Lubrication Instructions
Heisler Locomotive Works.	Steam Locomotives	x	x		
Hewes & Phillips Iron Works.	Steam Engines	x			
Hooven, Owens Rentschler Co., The,	Steam Engines	x			x
" " " "	Steam Driven Compressors	x			
" " " "	Sugar Milling Machinery				
Ide & Sons, A. L.,	Steam Engines	x	x		x
Ingersoll-Rand Co.	Steam Driven Compressors and Vacuum Pumps	x			
Link-Belt Company.	Steam Locomotive Cranes				
Mesta Machine Co.	Steam Engines	x			
Morris Machine Works.	Steam Driven Pumps	x	x		
Murray Iron Works.	Steam Driven Compressors	x	x		
" " "	Steam Engines	x	x		
National Transit Pump & Machine Co.	Steam Driven Pumps	x			
" " " " "	Steam Engines	x			
Nordberg Manufacturing Co.	Steam Driven Pumps	x			
" " "	Steam Engines	x			
" " "	Steam Driven Compressors	x			

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BUILDER	EQUIPMENT	BUILDER			
		Recommends or Approves Use of 600 W	Sends Samples 600 W	Attaches Plates Recommending 600 W	Issue Lubrication Instructions
Providence Engineering Corp.	Steam Engines	x			
Reeves Engineering Co.	Steam Engines	x			
Ridgway Dynamo & Engine Co., The,	Steam Engines	x	x		x
Rollins Engine Co.	Steam Engines				
Scranton Pump Co., The,	Steam Driven Pumps	x			
Skinner Engine Co.	Steam Engines	x	x		x
Southwark Foundry & Machine Co.	Steam Engines	x			
Sturtevant Co., B. F.	Steam Engines	x			
Sullivan Machinery Co.	Steam Driven Compressors and Pumps	x	x		x
Vilter Manufacturing Co., The,	Steam Driven Compressors	x			
" " " "	Steam Engines	x			
Vulcan Iron Works, Wilkes-Barre, Pa.	Steam Locomotives	x	x		
" " " " "	Steam Engines	x	x		
Wellman-Seaver-Morgan Co., The,	Steam Engines				
Worthington Pump & Machinery Corp.	Steam Driven Pumps and Pumping Engines				
	Steam Driven Compressors				
York Manufacturing Co.	Steam Driven Compressors	x			
" " "	Steam Engines	x			

Lubricants

A grade for each type of service

VACUUM OIL COMPANY

New York, U. S. A.

DOMESTIC BRANCHES

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