INSTRUCTIONS

FOR

Fitting-Up, Starting, and Working

THE

"ALLAN" LAMPLESS OIL ENGINE.

SOLE MAKERS:

ALLAN BROTHERS,

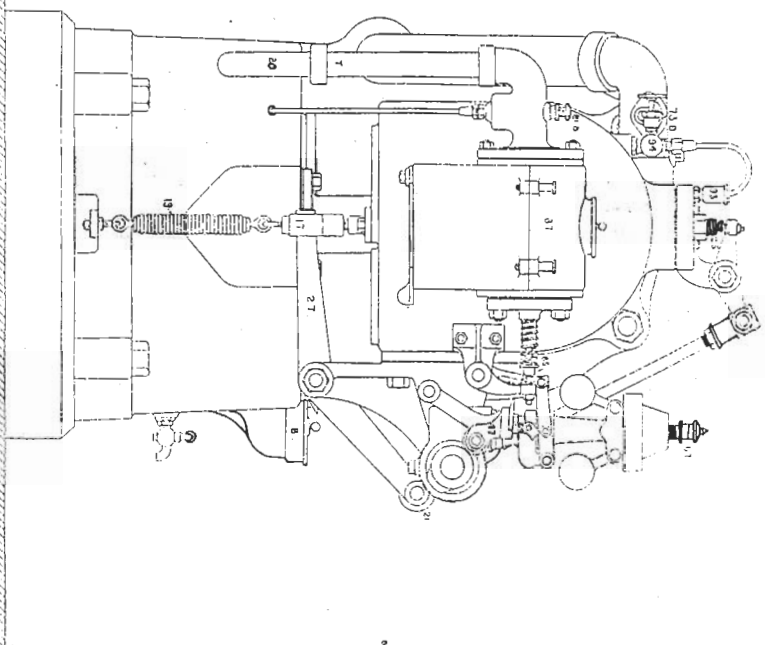
ASHGROVE ENGINEERING WORKS,

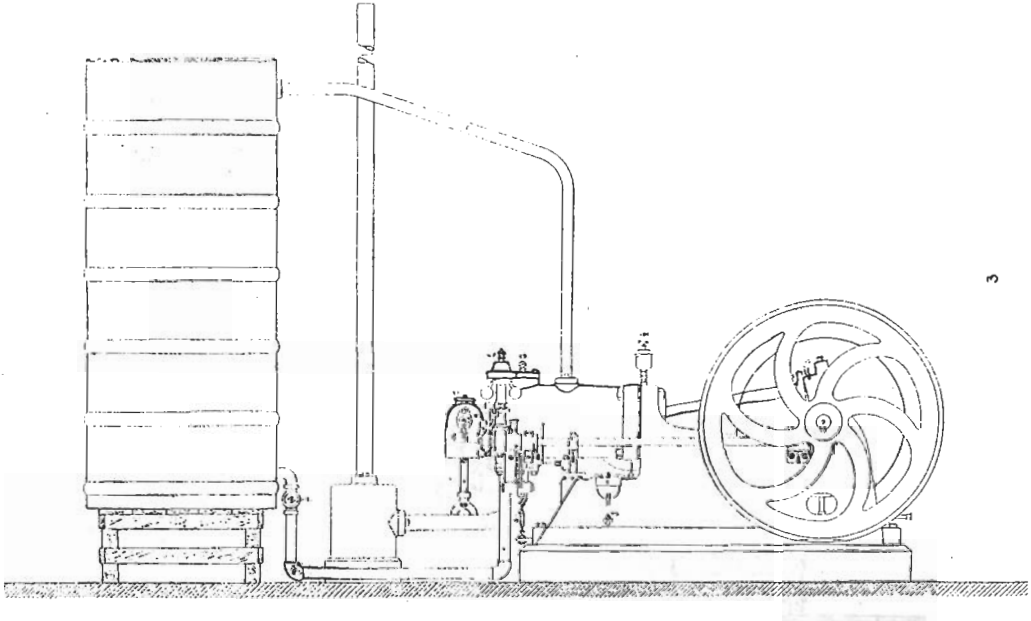
ABERDEEN, Scotland.

Telegram and Cable Address, "Ash," Aberdeen.
Station—Kittybrewster, G.N.S.R.

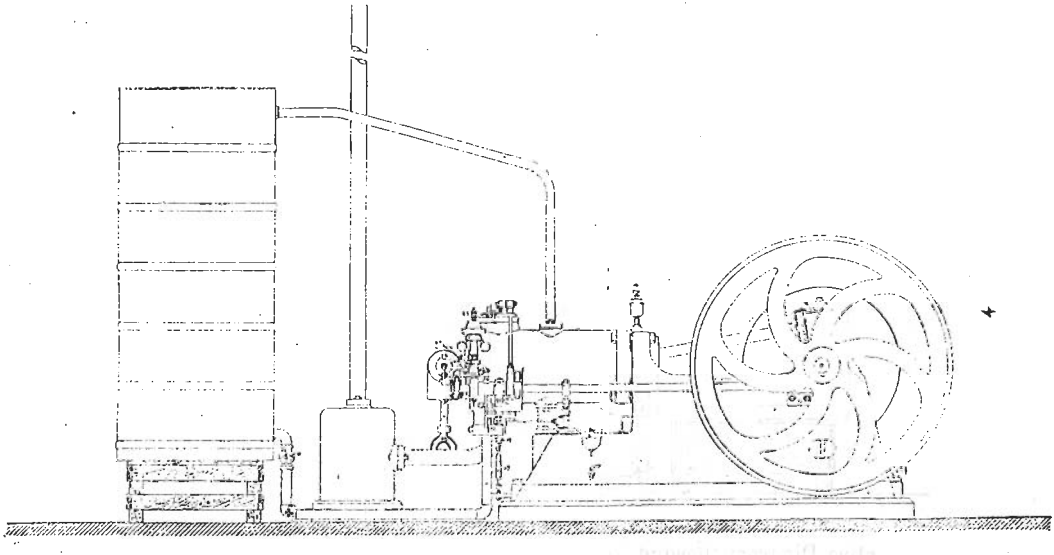
References to Illustrations.

73-B	Air Throttle.
B	Oil Filler.
69	Stop Catch.
D	Crank Shaft.
101	Cylinder Lubricator.
67	Governor Nuts.
81-B	Oil Feed Regulating Screw.
47	Vapour Cam Lever.
19	Exhaust Spring.
17	Exhaust Valve Nut.
21	Exhaust Cam Roller.
L	Starting Cam.
M	Exhaust Cam.
87	Vaporiser Cover.
93	Water Injector Cup.
85	Vapour Valve.
94	Injector Water Valve.
27	Exhaust Lever.
S	Run-off Cock.
T	Vaporiser Air-pipe.
U	Water Cock.
25	Air Valve.
15	Compression Plate.
X	Bottom Water Pipe.
Y	Top Water Pipe.
80	Air Muffler.





Descriptive Diagram showing type of all sizes of "Allan" Lampless Oil Engine LL and downwards.



Descriptive Diagram showing type of all sizes of "Allan" Lampless Oil Engine CL and upwards.

THE "ALLAN" LAMPLESS OIL ENGINE.

The foregoing illustrations show generally the arrangement of the various parts, but before proceeding to erect an "Allan" Engine, the following explanations should be carefully studied, as they describe operations in which the user, without special knowledge, is liable to err.

ERECTION.

Unpacking and Cleaning—Unpack and clean the parts carefully, taking special notice that no dirt remains about the vaporiser, valves, oil cistern, or the oil feed pump and pipes.

Crank Shaft—The crank shaft is placed in position, so that the respective marks on skew gear wheel and pinion coincide. This they must do each alternate revolution, otherwise the exhaust valve will not open at the proper time.

Fly-Wheels—The fly-wheels are placed on the crank shaft (D) as marked, and should be worked quite close to the bearings before being finally keyed up.

Exhaust Valve—The exhaust valve is dropped into its seat by means of the lifter provided, and the valve nut (17) is screwed on to the spindle below, until the tapered pin can be inserted and lightly tapped in. This ensures that the top of the exhaust lever (27) will be $\frac{1}{32}$ of an inch clear of the valve nut (17), except when the raised part of cam (20) is actually pressing on roller (21). The exhaust valve spring (19) is now hooked on, and just sufficient tension applied to prevent the valve from being lifted during the suction stroke of the piston. The tension should be finally adjusted when the engine is running, as any tendency of the valve to lift, except when the cam is actually in operation, is then readily detected.

Overhauling Connections—In screwing up the nuts on vaporiser, igniter, vapour valve, and air valve, etc., the strain put on each nut should be equal, but not too great. We find the unpractical man has a tendency to screw up all nuts almost to the breaking point. When this tendency is persisted in, it leads to breakage and annoyance, and users should note that all joints are ground metal to metal, and if the faces are clean when put together, they will keep tight with a very slight pressure on the nuts. The foregoing remarks apply with special force to the parts mentioned, and where expansion subsequently takes place owing to the natural working heat.

Igniter and Starting Tube—See that there is no obstruction in the respective holes leading down to the igniter and the ignition tube, and that the igniter is packed loosely with the copper filling.

LUBRICATION.

Lubricating Oil for Cylinder—Owing to the high temperature in an oil engine cylinder, it is necessary to use an oil of purely mineral constituents, and of very high flash-point. Unless the oil has these qualities, the heat of successive explosions may burn it off the cylinder walls, and stuck piston rings and excessive wear will result. The quantity of oil used is regulated by the adjustable cylinder lubricator, and it varies in accordance with the size of cylinder and its working temperature, but enough must be used to ensure the piston being efficiently oiled all round, and a rough rule for this quantity is, "two drops per minute per inch of cylinder diameter." The oil used should be "special quality gas engine cylinder oil," and cheap machinery oils generally are entirely unsuited for cylinder lubrication. Any good brand of engine oil will do for the bearings generally, but special care must be taken to oil the crosshead inside the piston and also the crank bearings efficiently and regularly.

STARTING THE ENGINE.

The vaporiser, working igniter, and starting ignition tube, must first be heated by the starting lamp. This operation takes ten minutes, more or less, according to the size of engine.

Starting Lamp—Special instructions are sent with each lamp, but the following special hints should be noted:—Fill the tank three-fourths full of petroleum. Heat the burner sufficiently to gasify the petroleum before turning on the pressure at the valve. While methylated spirit is best for the purpose, the burner can be heated by lighting a small quantity of petroleum in the cup, using a short piece of asbestos as a wick. If the flame spurts when the pressure is turned on at the valve, then the burner is too cold, and the pressure should be shut off and the heating operation continued until on trial the flame burns steadily. Always prick out the mouth-piece with the cleaning needle before lighting, and either pump a little petroleum up into the mouth-piece, or otherwise dip the cleaning needle in petroleum to facilitate this operation.

Heating the Vaporiser—When the lamp burns at full force, place it below the working igniter, avoiding the igniter door. It will now heat the igniter, and incidentally the vaporiser above it at one operation. Keep the lamp in this position until the vaporiser ends are too hot to admit of the bare hand being pressed against them. Then shift the lamp forward below the starting tube for a minute, until it becomes red-hot, and the engine is now ready to start.

Starting Engine—The vaporiser and starting tube being heated as described, the cam roller (21) is slipped along to engage with the starting cam (L), the air throttle (73-B) is shut close, the stop catch (69) supporting the governor is released, the oil feed pump is worked by hand until the oil well overflows down the waste oil pipe, and if the oil-adjusting screw (81-B) above the oil well is in its working position, the engine can now be started. This is accomplished by turning the flywheels backward as far as they will

go against the compression, and then turning them forward in the usual running direction as quickly as possible, until the first charge is drawn in, compressed and ignited. The engine will now run slowly of its own accord, and the cam roller (21) must at once be slipped back into its working position opposite the cam (M), and the air throttle (73-B) opened, when the engine will, after a few consecutive explosions, gain full speed. The load should now be applied, and if after doing so, care is taken to shift the lamp once more below the igniter for a minute or thereby until it assumes a dull red heat, the lamp can then be extinguished by releasing the pressure, and the vaporiser covers shut, when the charges will be ignited automatically, unless the engine has practically no load, and the explosions are so few that the heat of the igniter falls below ignition point, in which case the lamp must be used continuously, but with a reduced flame.

WORKING.

Principle—The engine works on the "Otto" principle, *i.e.*, it gives one explosion for two revolutions of the crank, as follows:—On the 1st stroke of the piston it goes outward and draws a small quantity of air mixed with oil, through the vaporiser into the combustion chamber. This mixes with a larger quantity of air drawn in through the air valve, and forms an explosive mixture. This is termed the suction stroke. On the 2nd stroke of the piston it goes inward and compresses the explosive mixture until part is forced into the igniter, thus firing the charge. This is termed the compression stroke. The force of the resultant explosion now forces the piston outward again during the 3rd stroke, which is termed the working stroke, and on the 4th stroke the piston again returns inward and the burnt gases are expelled through the now open exhaust valve. This is the exhaust stroke. This cycle of operations is only interrupted when the engine overruns the speed for which the governor is set, when the sliding blade is lifted out of the gap in front of the pivoted pusher, thus cutting out the vapour until the speed falls to the normal again.

Speed—The most effective speed for each size of engine is given in the Catalogue, and should not be increased more than 5 per cent. beyond this. The speed can be raised or lowered by screwing the nuts (67) on top of governor spring, down or up as required. After the requisite speed is obtained, the nuts should be firmly locked together to prevent accidental shifting. A considerable reduction of speed can be instantly effected by lifting off the governor dead-weight where one is fitted.

Adjusting Explosive Mixture—The adjusting screw (81-B) controls the supply of oil. It is set and marked when the engine is tested to give sufficient oil for full load, and while it may be expedient to vary this quantity slightly for different brands of oil in order to secure complete combustion in every case, it should be noted that the same oil adjustment is suitable for both light and heavy loads. Note that the least deposit of soot inside the igniter indicates an over-supply of oil, and care should be taken to keep the oil adjustment within this limit. The air throttle (73-B) controls the air supply, and should be closed when starting, but opened full and locked in that position as soon as the engine moves away of its own accord.

Timing the Ignition—It is necessary for power and economy that the charge should be fired as early as possible consistent with good running, and at the same time care must be taken to retard the tendency to pre-ignition, or too early firing, that follows when a heavy load is applied and the cylinder begins to heat up.

Compression—The degree of compression given to the charge largely determines the time of ignition. A compression plate (or plates) (15) is fitted between the connecting rod end and the crank brasses in order to induce early firing, when the less inflammable brands of oil are used as fuel, and this plate (or plates) can be shifted to the front side of the brasses as required, if ignition is found to be too early when the more inflammable brands of oil are used.

Water Injection—The water injection is used to prevent pre-ignition by cooling the charge more or less as required. Pre-ignition is indicated by a pronounced "knock" inside the cylinder each time a charge is fired. When this tendency begins, the injector valve (94) is opened just sufficient to soften the shock of the explosion. The quantity of injection water usually requires to be increased as the temperature of the cooling water rises, but if the load is greatly reduced, or thrown off altogether, the water injection must be reduced or shut off accordingly. Too much water injection may cool the charge, and so retard ignition that it ultimately fails altogether and the engine slows down. If the quantity of water required to retard pre-ignition is so great that it shows at the cylinder mouth, then the compression is too high for that particular brand of oil, and it should be reduced by shifting the compression plates as explained, and conversely, if no injection water can be used with a fair load on the engine, without unduly cooling the charge, then the compression is too low for that particular brand of oil, and it should be increased. Always shut off the water injection before stopping the engine.

Stopping the Engine—This is done by pulling the stop catch (69) forward with the finger. Note that force is unnecessary. This props up the governor (64), which has the effect of cutting off the supply of vapour by lifting the governor steel out of action, in the gap between the vapour cam lever (47) and the rocking shaft lever (52) operating the vapour valve (85). When this stop catch (69) is released previous to starting the engine, the vapour valve (85) should be pressed inward by hand in order to make sure that the governor steel falls into its working position in front of the vapour cam lever (47). Unless it does so the vapour valve will not be opened and the engine will not start.

CLEANING.

These engines require very little internal cleaning when oil of good quality is used and the conditions of load are such as to maintain a fairly high and uniform temperature, but when cleaning becomes necessary, the parts requiring attention are, the igniter, the vaporiser, exhaust valve, and combustion chamber.

The Igniter—Access is got to the igniter by removing the vaporiser cover and afterwards the igniter end door. Note that the nuts on the igniter have holes drilled in

them, and it is advisable to pour a little paraffin on them to soak the screws before slackening, as, owing to the intense heat to which they are subject, the nuts tend to seize if worked dry.

The Vaporiser—Detach the oil pipes and the oil well connection, and the vaporiser can then be taken off, and by removing the vapour valve the whole interior can readily be scraped out. Before replacing the vaporiser, see that the respective holes leading down to the igniter and starting tube are quite open, and when the vaporiser is once more in position, wipe and replace igniter rods.

Exhaust Valve—Take off air valve casing (23-24 V), remove exhaust lever, unhook spring, tap out pin, and unscrew valve nut (17). The valve can now be taken out with the lifter provided, and the inside of the seat, the spindle hole, together with the valve and spindle, cleaned with paraffin oil and replaced.

Piston—If suitable lubricating oil is used, the piston, cylinder, and combustion chamber should run without cleaning for twelve months. When cleaning is required, turn fly-wheels until the piston is as far back into the cylinder as it will go, and wipe out the inside of the liner, particularly the part next the mouth, which, if gummed, may require an application of smooth emery cloth. Then turn the wheels until the crank is on top, take off crank brasses and draw out the piston until the crosshead is clear of the liner mouth. Slacken the pincing pins inside the piston with the box spanner provided, tap out the crosshead pin and remove connecting rod. The piston may now be drawn entirely out. *In no case should the piston be handled while attached to the connecting rod.* If any of the piston rings are fast, soak the piston well with paraffin oil, and loosen the rings by tapping on the outside with a piece of wood only. Do not attempt to force them outwards by prying under the ends. When fitting a spare ring, slip it over the end of the piston, and by means of four narrow strips of tin it can be passed over the grooves. See that the ring is an easy fit for the groove before putting it on, as the rings must work quite loosely to give the best results, and will not get fast if sufficiently lubricated with a suitable oil. When replacing piston, oil the rings well, and see that all rings are on their respective catch-pins. As all the ring joints are spread round the bottom of the piston, it is advisable to enter the piston upside down. This enables you to see that all the joints are in their proper places. Hold each successive ring central as the piston is pushed back (*i.e.*, do not let the rings slip down to catch the bottom lip of the liner). After the rings are all entered the liner, turn the piston right side up, place connecting rod in position, tap in crosshead pin, and tighten up the pincing pins inside the piston. When connecting the crank brasses, see that the figures on top read correctly to avoid misplacement, tighten the nuts well, and replace the split pins in the bolt ends. The connecting rod ends are fitted with adjustable bushes, which should be examined and adjusted for wear when necessary.

Combustion Chamber—This part should be scraped quite clean when the piston and exhaust valve are removed, special care being taken that no dirt remains about the exhaust valve seat and spindle.

Grinding the Valves—The valves, and especially the exhaust valve, should be examined occasionally, and if the faces show signs of leakage, they should be ground in with fine emery powder and oil. Note that the seat should show a complete ring as well as the valve.

Frost—If the engine is exposed to frost when not working, the water in the cylinder jacket and pipes is in danger of being frozen, and breakage may ensue. To obviate all danger of this, the water must be run off the jacket and pipes. Provision is made for doing so by a tap (S) fitted into the bottom water pipe (X).

To run off the Water—Shut the main water cock (U) and open the run-off tap (S), allowing the water to run until it stops of its own accord, when the cylinder jacket, top and bottom water pipes, and also the water tank down to the bottom of the top water pipe, will be found to be empty. It is imperative that enough water is replaced to refill the tank over the mouth of the top water pipe after the cock (U) has again been opened before commencing to work the engine. It is advisable to wholly change the cooling water at least once a year where a running supply is not used.

Spare Parts—When ordering these, the figures and letters on the castings should be given. If parts, forgings, or springs without marks are required, a description and rough sketch will facilitate delivery.

SPECIAL HINTS TO ATTENDANTS.

Generally see that the engine is kept clean.

Heat the vaporiser sufficiently before attempting to start. It is useless to expect the engine to start until the vaporiser is hot enough to vaporise the oil.

Any tendency of the engine to run backward when starting, due to overheating of the vaporiser and early firing of the charge, can always be corrected by a slight opening of the air throttle valve (73-B).

The temperature of the igniter should never exceed that of a low red heat, and any tendency to exceed this heat, with heavy loads, or oil of high flash point, can be obviated to a considerable extent by leaving the vaporiser covers open, by reducing the number of igniter rods, and if further effect is needed, by reducing the compression, as already explained.

If at any time when starting the wheels go round without the usual compression being felt, this indicates that a valve, most likely the exhaust valve, is failing to seat itself properly, and it should be removed and cleaned on the faces and spindle guide.

Lubricate the working parts well, especially the cylinder, crosshead inside piston, and crank bearings. Bearings once in order will not begin to heat unless neglected.

Keep the water tank full, to make up for the water evaporated.

Note it is perfectly natural that the cylinder and ultimately the cooling water should heat, and this will do no harm, but will rather be beneficial up to 160 degrees F.

While it is not advisable to keep the cylinder cold, engines running long hours should be fitted with a running water supply, so that the temperature of the cooling water can be kept within the above limit.

If a "knock" occurs other than that due to preignition, this indicates that a bearing or fly-wheel has loosened, and this should be at once remedied.

The "knock" due to preignition will occur only when a charge is fired, while a mechanical knock will occur more or less every revolution of the crank.

Keep the driving pulleys clean. If the belt runs in a dusty place, filth may gather on the pulleys and stretch the belt.