

INSTRUCTIONS  
FOR  
Fitting-Up,  
Starting,  
and Working,  
THE "ALLAN"  
OIL ENGINE.

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SOLE MAKERS

ALLAN BROTHERS,  
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# THE "ALLAN" OIL ENGINE.

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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 instructions, is liable to err.

## ERECTION.

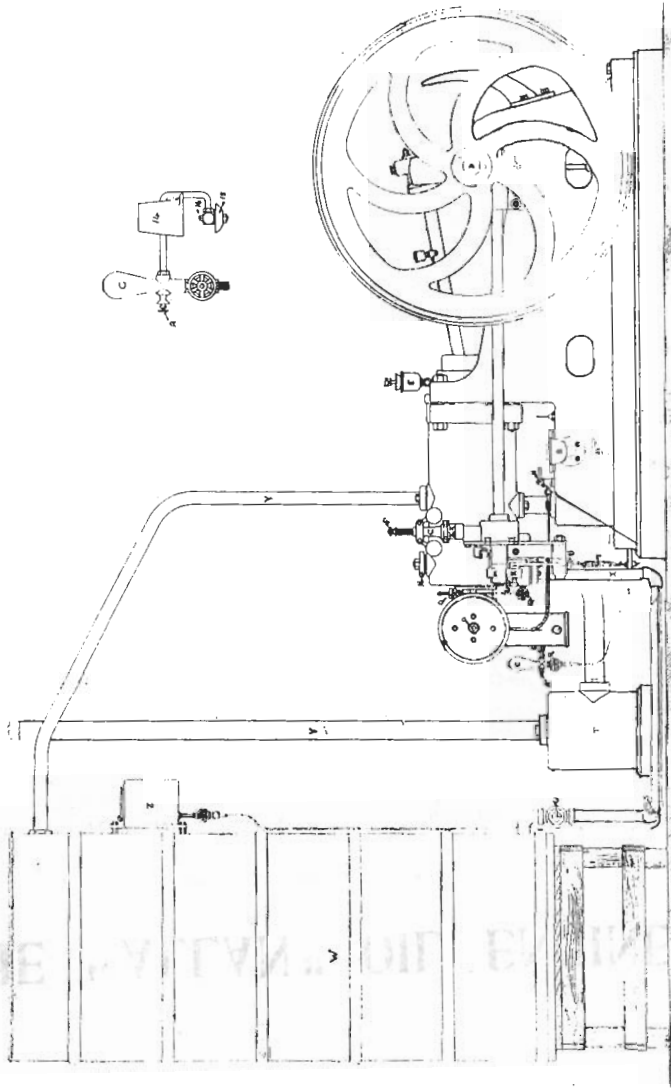
**Unpacking and Cleaning.**—Unpack and clean the parts carefully, taking special notice that no dirt remains about the charging valve, oil cisterns, oil cocks, or in any of the oil feed pipes.

**Crank Shaft.**—The Crank Shaft is placed in position, so that the respective marks on 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 ends of crank shaft (D) as marked, and should be pushed quite close to the bearings before being keyed up.

**Exhaust Valve.**—The Exhaust Valve is dropped into its seat, and the hook nut (J) is screwed on to the spindle end below, until the pin can be inserted and lightly tapped in. This insures that the top of the exhaust valve lever (17) will be  $\frac{1}{8}$  of an inch clear of the hook nut (J), except when the cam (M) is actually pressing on the roller (K). The exhaust valve spring (I) is now hooked on, and just sufficient tension applied to prevent the valve from being lifted, except when the cam (M) is in action. The tension is finally adjusted when the engine is running full speed and loaded. It is then very easy to detect the tendency of the valve to jump on its seat when the suction takes place, and sufficient tension must be applied to resist this. *This is a most important point.*

**Overhauling Connections.**—In connecting the vaporiser, the strain put upon each nut should be equal, but not too great. We find that users of these engines, when not practical men, have a tendency to screw up all nuts and connections to the breaking point. When this tendency is persisted in, where frequent disconnection is required for cleaning, it leads to breakage and annoyance; and users will do well to note that all joints, such as the exhaust valve cover (N), vaporiser flange (O), etc., have an ample number of studs or bolts, so that an excessive strain on each is entirely unnecessary. The ignition tube, the nuts on the vaporiser cover, and the oil feed connections should also be strained very lightly. It is only necessary to have the oil feed pipe air-tight, as there is no pressure to be resisted.



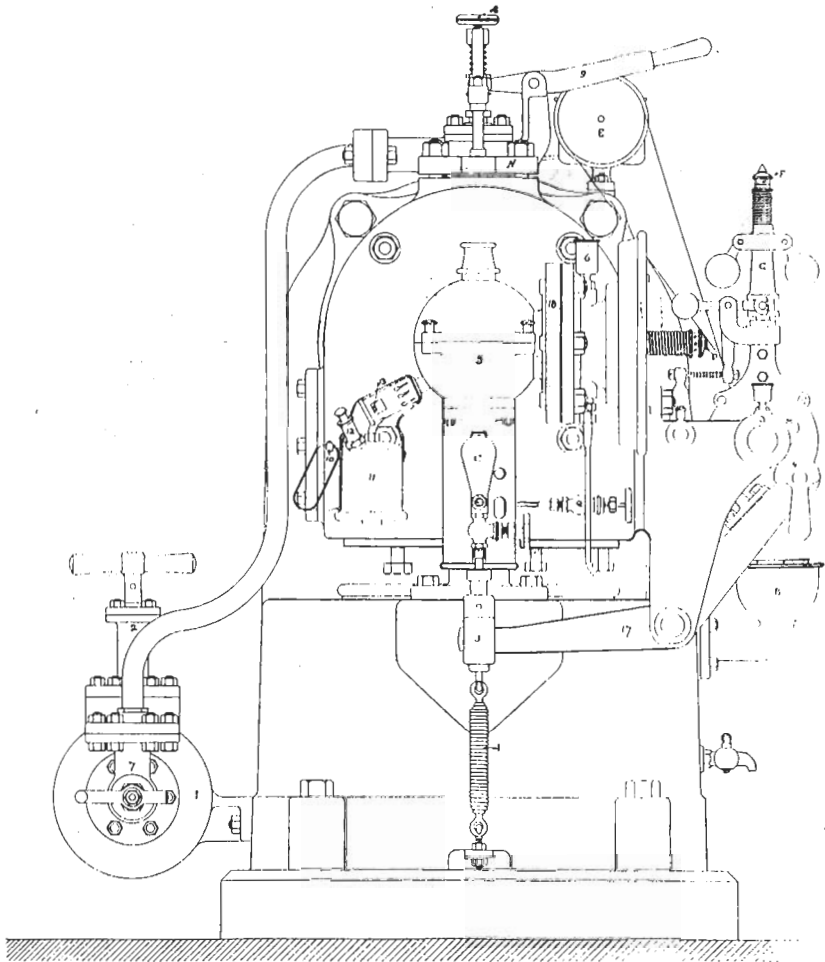
Descriptive Diagram showing "Allan" Oil Engine erected complete.

#### REFERENCES TO ILLUSTRATIONS.

- |    |                            |    |                      |
|----|----------------------------|----|----------------------|
| 1  | Air Chamber.               | 11 | Blow Lamp.           |
| 2  | Air Pump.                  | 12 | Blow Lamp Pump.      |
| 3  | Can Shaft Bearing.         | 13 | Blow Lamp Nipple.    |
| 4  | Eccentric Handle.          | 14 | Gravity Lamp Hood.   |
| 5  | Vaporiser Cover.           | 15 | Gravity Lamp Saucer. |
| 6  | Starting Cup.              | 16 | Gravity Lamp Nipple. |
| 7  | Air Chamber Wheel Valve.   | 17 | Exhaust Lever.       |
| 8  | Starting Valve Stop Screw. | 18 | Vaporiser Flange.    |
| 9  | Starting Handle.           | 19 | Air Muffler.         |
| 10 | Blow Lamp Thumb Screw.     |    |                      |

### REFERENCES TO ILLUSTRATIONS.

A	Lamp Draining Screw	N	Exhaust Valve Cover.
B	Oil Filler.	O	Injector.
C	Lamp Air Vessel.	P	Charging Valve.
D	Crank Shaft.	Q	Injector Water Valve.
E	Cylinder Lubricator.	R	Gravity Lamp.
F	Governor Nuts	S	Run-off Cock
G	Governor.	T	Silencer.
H	Oil Supply Cock.	U	Water Cock.
I	Exhaust Spring.	V	Exhaust Pipe.
J	Exhaust Spindle Nut.	W	Cooling Water Tank
K	Exhaust Cam Roller.	X	Bottom Water Pipe
L	Starting Cam.	Y	Top Water Pipe.
M	Exhaust Cam	Z	Lamp Oil Cistern.



Self Starter

**The Lamp**—The gravity lamp (R) should be adjusted below the vaporiser, so that the ignition tube enters the lamp hood (14) about  $\frac{1}{4}$  of an inch.

**Lamp Cistern**—When the lamp cistern (Z) is not already fixed on the water tank (W), it may be fixed on the wall or any convenient position, but not less than 3 feet above the lamp.

**Exhaust Pipe**—The exhaust silencer (T) should be placed as near to the cylinder as possible, and it is not advisable to have the exhaust pipe (V) longer than 12 feet.

## HEATING AND STARTING.

The principle on which the lamps are made is as follows:—The petroleum or paraffin is vaporised during its circulation through the previously heated bulb or burner, and issues through a fine opening or nipple, when it mixes with air and burns with a bluish smokeless flame.

**To Light Gravity Lamp (R)**—Fill the saucer (15) below the burner with petroleum and light asbestos wick (where the smoke given off during this operation is an objection, methylated spirits can be used instead). The flame is allowed to heat the bulb enough to vaporise the oil. One minute is sufficient. When this is accomplished, open both wheel valves very slightly, and the vaporised oil will issue from the nipple (16), and on mixing with air will burn with considerable heat. Should oil spurt out at the nipple (16) instead of vapour, shut the valves and continue heating a short time longer. Should the lamp at any time not burn steadily, charge the air vessel (C) by slacking the draining screw (A), and allowing the oil to run out of the air vessel. The lamp oil cistern (Z) can be filled full.

**The Blow Lamp (11)** is used for auxiliary heating, and is supplied with the larger-sized engines only. Unscrew lid and fill with paraffin, not more than  $\frac{2}{3}$ ths full. Replace lid and screw up air-tight (always keep a soft piece of leather or other jointing inside lid to insure this). Heat burner enough to convert the oil into vapour by wetting the asbestos brush with oil, and inserting inside burner hood. About one minute of heating will suffice. To test if the heat is sufficient, screw up thumb-screw (10) air-tight, and give pump (12) handle a few gentle strokes. If oil is spurted out at nipple (13) the heat is not sufficient, and the thumb-screw (10) must be slackened, and the heating continued. If, however, the heat is sufficient, vapour will issue, and the asbestos brush may be withdrawn. After the lamp has burned a few seconds longer, to insure the burner being thoroughly heated, the pressure may be pumped up hard, 20 to 30 strokes of the pump will be sufficient. The lamp can be stopped by slacking the thumb-screw (10).

**Starting Engine by Hand**—The vaporiser and ignition tube must first be heated by the lamp or lamps. This operation takes about ten minutes more or less, according to the size of engine. A rough indication of the necessary heat is given, when the vaporiser flange (18) becomes too hot to admit of the hand being pressed on it. The required heat being arrived at, slip the cam Roller (K) into its left hand position, so as to engage with the starting cam (L), open feed cock (H), fill starting cup (6) on vaporiser, and after putting the fly-wheels as far back as possible against the compression, turn them in the usual running direction as sharply as possible until the first charge ignites. The

cam roller (K) is now slipped into the right hand or working position, and after a few consecutive charges the engine will gain full speed, when the load may be applied. *It is quite useless to expect the engine to start until the vaporiser is sufficiently heated to vaporise the oil.* Where an auxiliary lamp (11) is used, it may now be extinguished, but the gravity lamp (R) must be kept burning as long as the engine is working. This secures certain ignition, and consequent economy in oil with varying loads, and also enables the engine to be stopped for a short time, the blow lamp not being required unless the stoppage has lasted some time.

**By Self-Starter**—The valves on the Air receiver (1) are shut tight, and the Air pump (2) is operated with full strokes until the gauge shows a pressure of 50 lbs. The fly-wheels are then turned by hand until the mark stamped, TO START, on the exhaust cam (M), coincides with the corresponding mark on the cam shaft bearing (3). To entirely relieve the compression on the larger engines, so that one man is capable of turning the fly-wheels, the eccentric handle (4) is used. This handle (4) is slipped on to the end of the cam roller pin, and allowed to hang down vertically, thus preventing the exhaust valve from closing and allowing the air in the cylinder to escape. The handle (4) is now removed, and the cam roller (K) shifted to the left, so as to engage the starting cam (L). The oil feed cock (H) is opened, the starting cup (6) filled, and the wheel valve (7) on air chamber (1) opened. The stop screw (8) on the starting valve is now opened, and the starting handle (9) pulled smartly down, when the piston will be impelled forward by the air pressure. The starting handle (9) must be held down while the piston is moving forward, but should be let go at the end of the stroke, thus allowing the spring to close the starting valve, and the stop-screw (8) must be tightened before the piston ends its return stroke. The engine will now commence to work, and after a few revolutions the cam roller (K) is shifted into the working position, and the engine is ready for the load. In practice it is unnecessary to use the air-pump (2), except for the first time of starting, or any future emergency. The air chamber (1) can be charged very easily when the engine is working, by opening the wheel valve (7) and stop-screw (8) slightly, and the pressure passes from each explosion, until the receiver (1) is fully charged, when the wheel valve (7) and stop-screw (8) are closed tight, and the pressure in the receiver held for future use. This renders the starter entirely automatic. Blow off the slight condensation from the receiver occasionally by means of the small cock provided.

## WORKING.

**Principle**—The engine works on the "Otto" principle, *i.e.*, one explosion for every two revolutions of the crank. On the *suction stroke* of the piston, oil is drawn into the vaporiser, along with a sufficient quantity of air, to form an explosive charge. On the *compression stroke* of the piston this charge is pressed into the combustion chamber, part being forced down the ignition tube, thus firing the charge, and producing the *working stroke* of the engine. On the *exhaust stroke* of the piston the burned products are expelled through the exhaust valve, the closing of which is controlled by the governor (G), so as to regulate the charges in accordance with the power required.



**Speed**—The most effective working speed for each size of engine is given in the Catalogue, but may be varied 5 per cent. up or down to suit circumstances. Excessive speed, however, is highly detrimental to the continued satisfactory working of the engine. The speed can be raised or lowered by screwing the nuts (F) on top of governor (G) down or up as required. After the requisite speed is obtained, the nuts should be locked so as to prevent accidental shifting. If at any time the engine is inclined to race, i.e., run away from the load, the governor is not acting properly, and should be examined to see it is working freely, and, if not, well lubricated. In course of time the governor pawl, acting on the exhaust lever (17), may need a slight grind on the edge of the steel face.

**The Injector and Adjusting the Explosive Mixture**—The oil cock (H) controls the supply of oil, and is marked for easy adjustment to any required position. The charging valve (I) controls the supply of air, which is increased or diminished as the nut on spindle is screwed off or on. These adjustments are rendered necessary to suit the requirements of different brands of oil, and the respective positions of the oil cock and spindle nut must be determined by trial, and the positions that give the most powerful charge fixed on, the pin being then inserted through the nut to prevent shifting, as no further alteration is required, unless a change is made in the quality or brand of oil used. The Injector water valve (Q) is not opened until the engine is working, and then just sufficient to eliminate the shock of explosion. As the injection of water vapour is designed to regulate the temperature of the explosion, care must be taken that no more is used than is absolutely essential for smooth working, otherwise the temperature of the charge may be cooled, until the ignition is delayed, or fails altogether, thus causing a loss of power. Should the load be greatly reduced, or thrown off altogether, for any length of time, the amount of water must also be reduced, or shut off accordingly. Loud reports at the exhaust pipe are owing to failures in ignition. These may be caused by the engine being started before the vaporiser is hot enough to vaporise the charge, to excess of air at charging valve, some interruption to oil supply, or to a dirty vaporiser. *The lamp nipple should be pricked out when starting lamp, and at any time subsequently, should the heat fall away, as the ignition tube should be kept red hot for the purpose of procuring sure ignition.* It is sufficient indication that the lamp is burning correctly if it is capable of raising and maintaining the hood and ignition tube at a dull red heat.

## CLEANING.

Oil engines require occasional internal cleaning, otherwise the impurities present in the oil accumulate, and hinder the initial heating of the vaporiser, making starting difficult. The lamp vaporiser and exhaust valve require cleaning once every 50 working hours, if engine has been running with light loads, but if the engine has been well loaded, once every 100 hours is sufficient. The combustion chamber may be cleaned out internally once in six months.

**Lamp (R)**—Disconnect oil feed pipe, slacken clamp, and lower lamp. Remove the hood (14) and unscrew nipple (13). Clean out the inside of nipple with wooden spill or match end, afterwards pricking out the small hole with pricking needle provided. Do not overhaul nipple when replacing.

**Vaporiser**—Take off air muffler (19), disconnect oil feed pipe and charging valve (P), detach vaporiser, and scrape out interior thoroughly with the cleaning tool provided. Take off vaporiser cover (5), and unscrew ignition tube. Take special note that the inside of tube is clean, and that the ignition hole leading to the inside of the vaporiser is open. Wipe outside of vaporiser and replace. Clean charging valve (P) and seat, and see that no obstruction has got into the oil hole on the valve seat. Do not overstrain ignition tube and oil pipe connections when screwing up.

**Exhaust Valve**—Take off cover (N), remove exhaust lever (17), unhook spring (I), tap out pin, and unscrew hook nut. The valve can now be taken out with the lifter provided, and the inside of seat, and spindle hole, together with valve and spindle, cleaned before replacing. When putting on cover (N), care must be taken to screw the nuts up equally, otherwise the joint will not be tight. If at any time when starting the engine it is found that the wheels go round easily, and the piston does not draw air, and compress as usual, then the exhaust valve is **leaking**, and must be taken out and cleaned. The exhaust valve requires to be cleaned rather oftener when new than after it has worked for some time.

**Combustion Chamber** may be cleaned by turning the piston as far back into the cylinder as possible, and scraping out through the end of chamber when the vaporiser is off.

**Piston**—If suitable oil is used, the piston, cylinder, and combustion chamber should only require cleaning every six months. To do this—Turn fly-wheels until the piston is as far into cylinder as possible, and wipe out inside of liner, particularly the part next the mouth, which, if gummed, may require to be rubbed with smooth emery cloth. Turn wheels until the crank is at top of stroke, and take off connecting rod brass at crank (D), and draw out the piston until the crosshead is clear of the cylinder liner. Slacken the pinning pins inside the piston with the box spanner provided, then tap out the crosshead and remove the connecting rod. The piston may now be drawn entirely out. (*In no case should the piston be handled while attached to the connecting rod.*) Clean the piston well with paraffin, and see that all the rings are loose, and work easily in the grooves. When fitting a spare ring do not attempt to spring it across the piston, but slip it over the end, using three or four pieces of stiff **gun** to pass over the grooves. Scrape out all dirt from the combustion chamber, and back end of cylinder. Before replacing the piston, oil the rings well, and see that all rings are on their respective catch-pins, as all ring joints are spread round the bottom side of piston. To put in the piston turn it upside down. This enables you to see that all ring joints are in their proper places. Hold each successive ring central when pushing back (*i.e.*, do not let the rings slip down so as to catch the lip of the liner, which is bell-mouthed, so as to take the rings easily). After the piston is half entered the cylinder, turn it round, place connecting rod in position, tap in crosshead, and tighten up the pinning pins inside the piston. Bring the figures on the butt end of rod to the top, fit on brass, care being taken to put the split pins into the bolt holes. The connecting rod ends are fitted with adjustable bushes, which should be examined, and adjusted when necessary.

**Grinding the Valves**—The charging and exhaust valve seats should be examined, and ground to a bearing with fine emery powder occasionally. The charging valve seat is

ground, and afterwards scraped *until the parts immediately round the oil holes have a slightly harder bearing on the valve than the rest of seat.* The exhaust valve is ground to have an *equal bearing all round its seat.* It is important that these seats be examined occasionally, and kept in the conditions stated.

**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 consequently breakage may ensue. To obviate all danger of this the water must be run off. 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), and allow the water to run until it stops of its own accord, when the cylinder jacket, top water-pipe, bottom water-pipe, and the water-tank, down to the bottom edge of the top water-pipe, will be found to be empty. Care must be taken to fill up the water-tank after opening the water-cock (U), before commencing to work the engine again. *The water-tank should always be kept full,* and it is advisable to change the cooling water at least once a year, when a running supply is not available.

**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. The quantity of this oil required is very small (about three drops per minute for the smaller sizes of engines, and six drops per minute for the larger). The oil used should be "*special quality gas engine cylinder oil,*" and we strongly recommend our clients to get this oil from us, or to use some brand which we have proved to be suitable. Such oils as "*Whale,*" "*Seal,*" "*Harness,*" and "*cheap machinery oils*" are *entirely unsuitable for cylinder lubrication,* as the animal or vegetable matter in their composition "gum" under the action of heat, and foul the piston.

**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 quick dispatch. The number of the engine should always be given. This will be found stamped on the cylinder liner and connecting rod butt.

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### SPECIAL HINTS TO ATTENDANTS.

Generally see that the engine is kept clean and free from dirt.

Always heat the vaporiser sufficiently before attempting to start.

If the engine does not start with a few turns of the fly-wheel do not continue attempts to start, but heat a short time longer.

See that the injector is properly regulated to suit the quality of the oil being used.

Keep the water-tank full, so as to make up for water used by the injector.