COMPRESSORS

(SERVICE DATA)

CLAYTON DEWANDRE CO. LTD.
TITANIC WORKS · LINCOLN · ENGLAND
Telegrams : "Titanic Lincoln" Telephone : Lincoln 11305-8

AIR PRESSURE EQUIPMENT

A.P. SECTION 6

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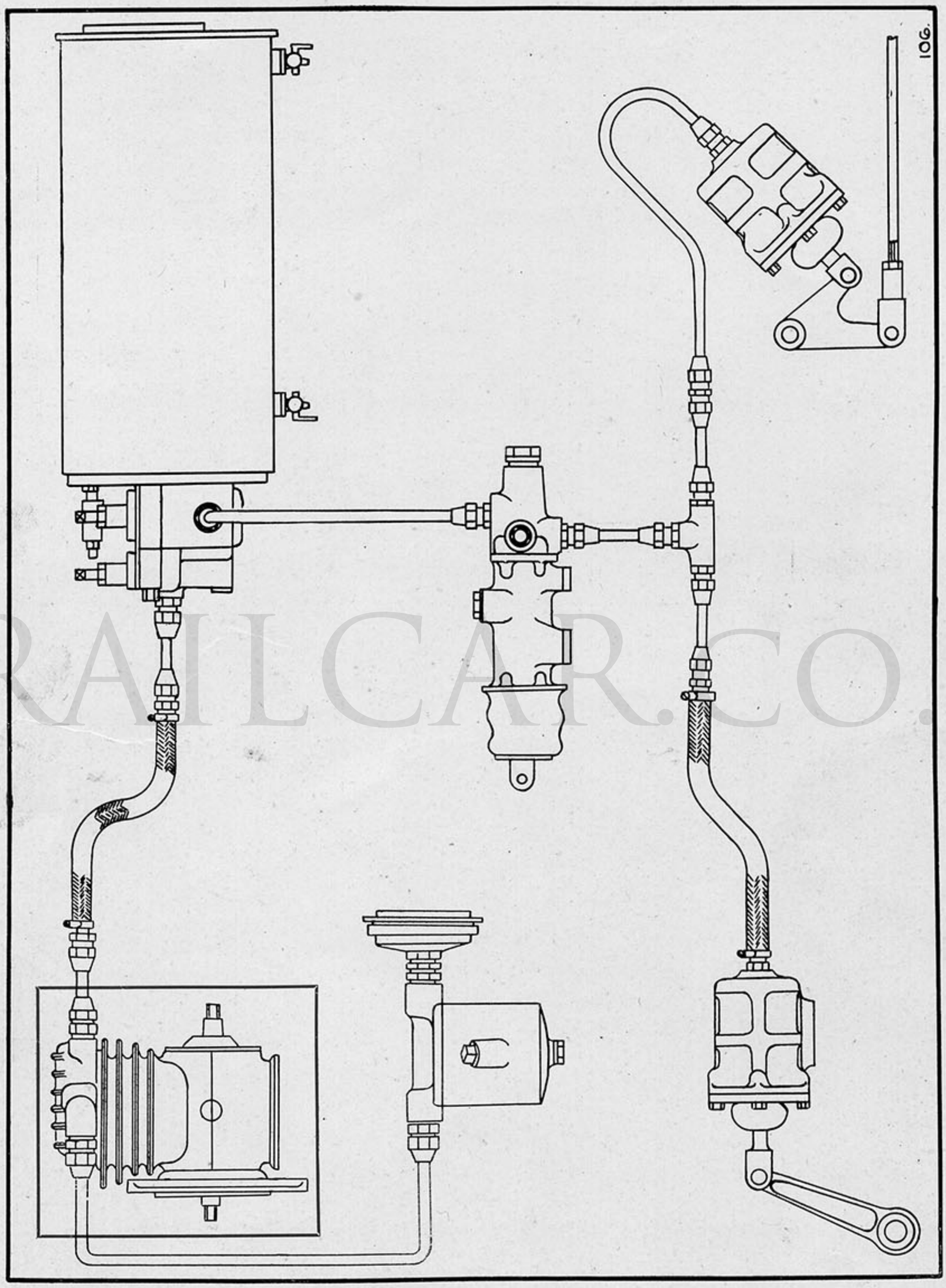


Fig. 1. Typical Air Pressure Brake Lay-out.

COMPRESSORS

INTRODUCTION.

Compressors manufactured by Clayton Dewandre Co. are now all of the reciprocating piston type. At one time the Company also produced a rotary compressor made under licence from the Bosch Co., of Germany, but owing to difficulties in manufacture and installation, production ceased in 1939 and most of the vehicles fitted with the rotary compressor have now been converted to the reciprocating piston type. Should there be operators still using the rotary type, it is recommended that they consider conversion to the reciprocating piston compressor.

The compressors now made are mostly of twin cylinder design, but single cylinder designs are also in production. The single cylinder design is, in effect, half of one of the larger twin cylinder designs.

While Clayton Dewandre naturally prefers to supply standard designs which are in production, it is found there are so many variations in engine design it is impossible to use a common machine for all types of engine. Standardisation, however, is effected as regards the pistons and connecting rods, the valve gear and the oil pump mechanism and crankshafts, the variations occurring generally in the design of the crankcase and end covers.

It is the aim to supply compressors interchangeable with exhausters and for mounting on engines in a similar manner but there is no objection to compressors being mounted elsewhere on a vehicle. Shaft or belt drive from the transmission line is equally satisfactory, and in certain cases preferable.

Three main variations occur in the lubrication systems for these compressors, and it is worthwhile mentioning here the types which are available.

1. A compressor may be supplied with an integral oil pump and sump, in which case the lubrication is self-contained but the compressor needs charging with oil at regular intervals.
2. The oil supply can be in one with the engine oiling system and the oil, after lubricating the compressor, can drain back into the engine sump. Obviously this type needs no attention in service other than the usual attention to cleanliness of oil filters.
3. There is a third type intermediate between (1) and (2) whereby oil is fed from the engine to a certain level in the compressor which retains its own oil pump for the purpose of lubrication. This design, of course, has the advantage of not needing any attention by manual charging and maintains the compressor lubrication system completely independent of the engine oil pressure system.

Other variations occur in regard to cooling. In certain cases water cooled cylinder heads are recommended. These, however, when supplied are interchangeable with the air cooled heads and they call for no special comment here.

It is obviously impossible to illustrate all the types which are manufactured but the following pages will give the outlines.

FUNCTION AND OPERATION

The function of the air compressor is, of course, to provide the compressed air power for the brake system or other control apparatus. Fig. 1 shows a typical installation. The air compressor may well be called the heart of the air system and reliable and trouble free running over long mileages is an essential requirement well met by the several designs available.

For the purpose of illustration, Fig. 2 shows a spigot mounted twin cylinder, air cooled self oiled machine which is of typical design.

The one piece forged steel crankshaft (1) runs in ball bearing main journals with white metalled big end bearings. The crankshaft is drilled from the centre oil pump bearing to feed the big ends. Oil thrown from the big ends lubricates the cylinder walls and the main bearings.

The oil pump (2) is anchored in the sump on pin (3) and is of oscillating cylinder design, the ram having a split cap embracing an eccentric centre bearing on the crankshaft. Delivery from the pump is through the ram itself to a groove in the crankshaft with which the oilways communicate. Suction to the oil pump is through an extension dipping deeply into the sump oil space. A plate relief valve (4) is incorporated in the pump head. Oil pumps are tested separately and set at the correct working pressure before assembly.

The compressor pistons (5) are of orthodox design with two compression rings and a scraper ring at the piston skirt. The connecting rods are steel stampings bronze bushed for the little end pins and white metalled for the big ends.

The air inlet valves (6) are hardened and lapped steel discs lightly sprung against a narrow seat formed integrally with the cast iron head. The delivery valves (7) are similarly constructed but the valve seat (8) is inserted and is renewable if required.

A crankcase breather (9) is incorporated in all self oiled machines and permits breathing without loss of oil. Oil level is indicated by a dip stick, the top portion of which forms the oil filler cap.

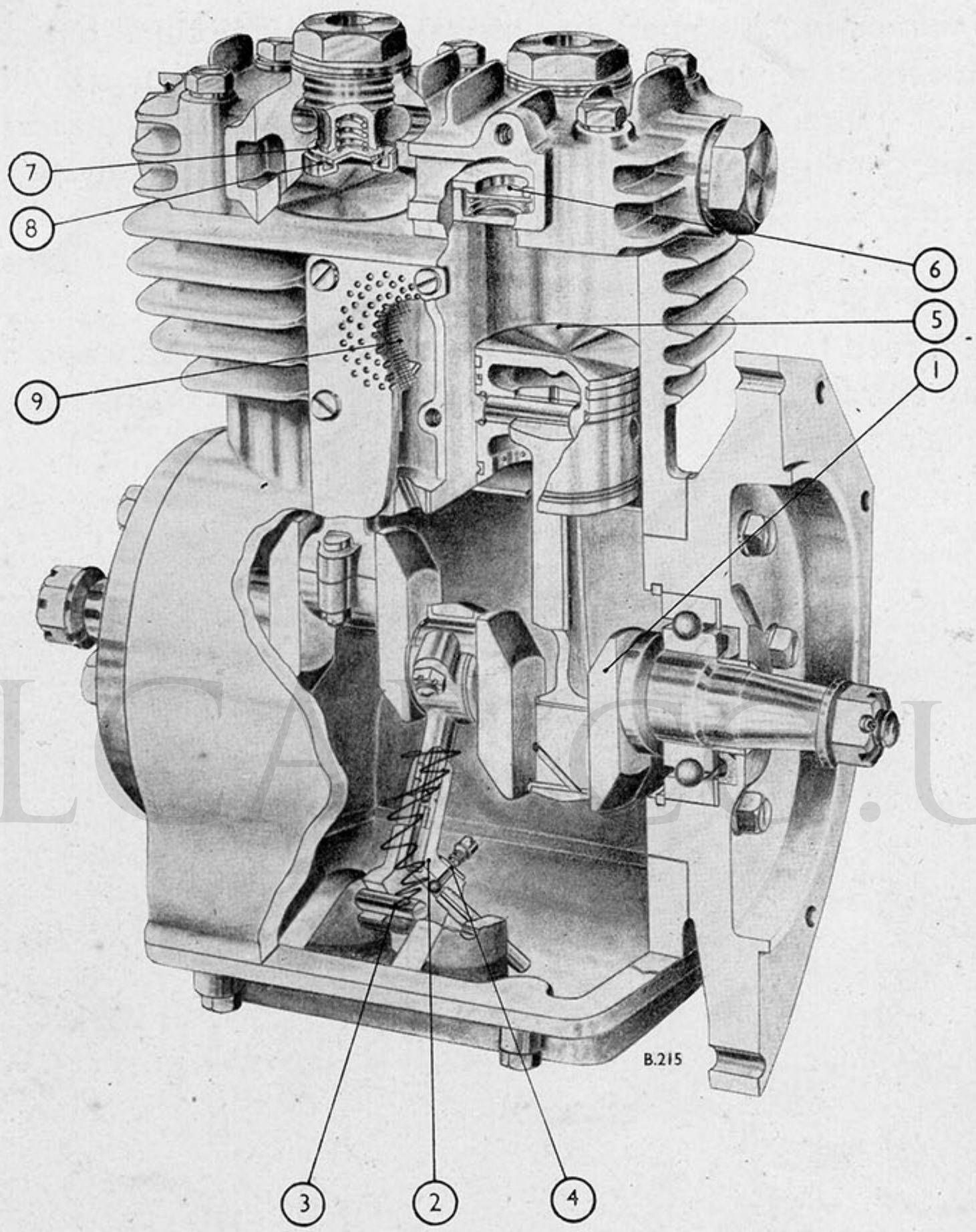


Fig. 2. Twin Cylinder Compressor with Integral Oil Pump. Oil supplied from sump.

The alternative methods of lubrication are as follows:

(a) **By main pressure feed from the engine. See Fig. 3.**

Pressure oil is fed to the crankshaft centre journal through a communicating member, to lubricate the plain crank-pin bearings by means of oilways in the crankshaft. Gudgeon pins, cylinder walls and ballrace crankshaft bearings are lubricated by oil thrown out of the crank-pin bearings. Scavenge oil drains directly to the engine sump.

(b) **By integral oil pump as shown in Fig. 4.**

Oil feed to this pump being from the engine supply and maintained at correct level by a stack pipe, which also drains scavenge oil to the engine sump.

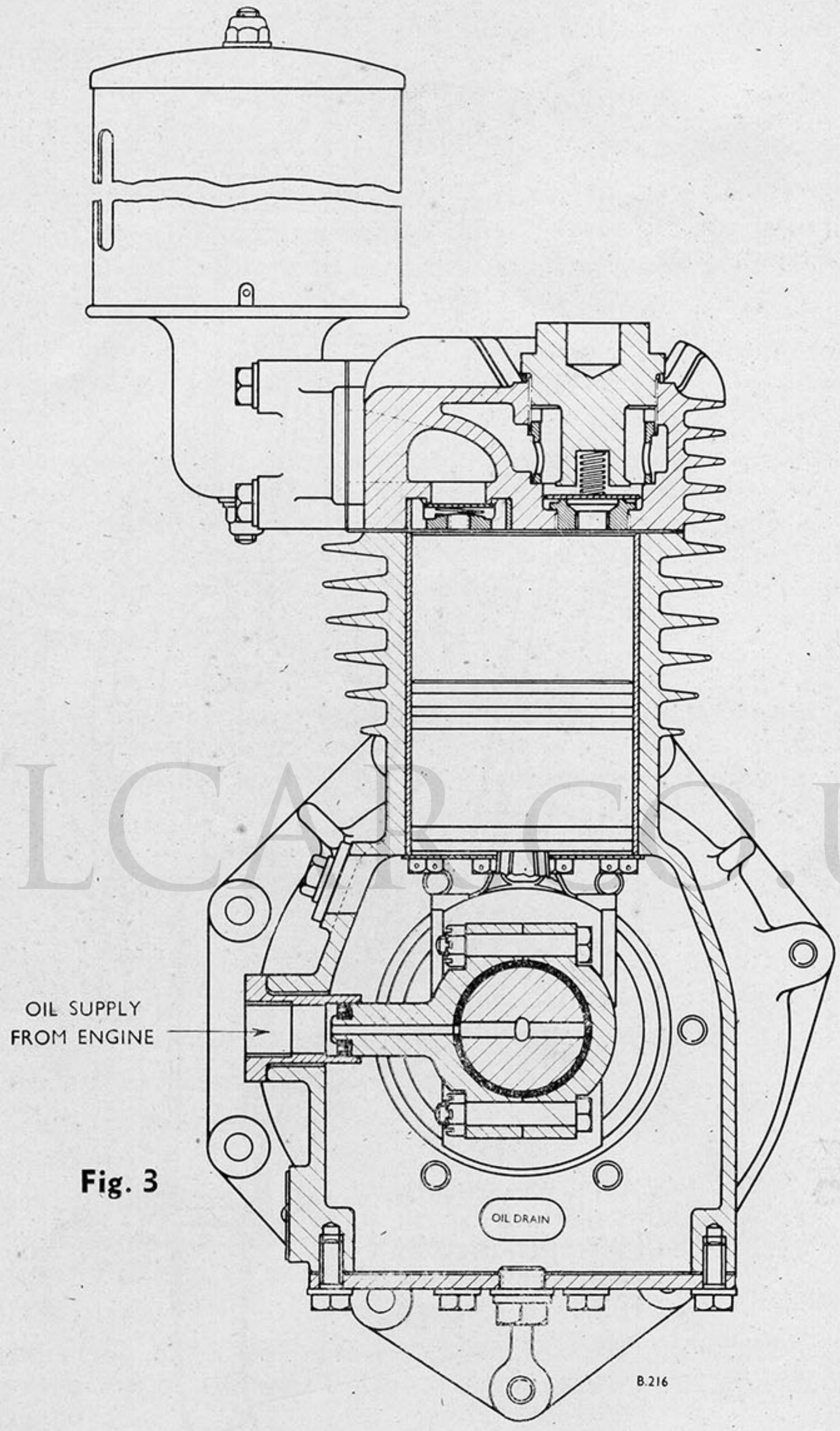


Fig. 3

Compressor with Lubrication by Pressure Feed from Engine.

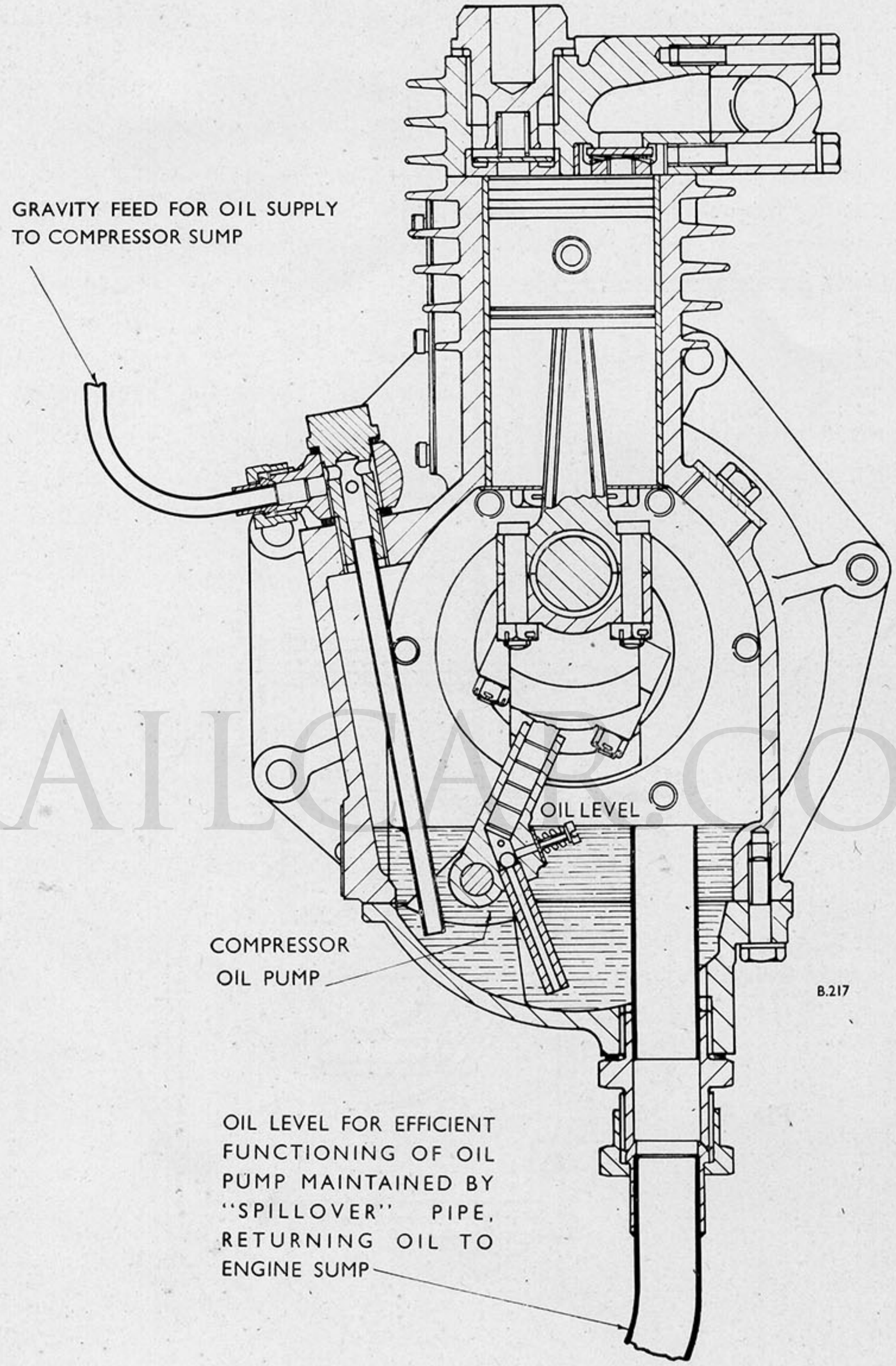


Fig. 4. Compressor with Integral Oil Pump. Oil supplied from Engine to Compressor Sump.

GENERAL MAINTENANCE

For compressors having an oiling system as shown in Fig 1, periodical inspection of the oil level in the compressor sump is important, and this should be checked and topped up whenever the same attention is given to the engine.

Completely drain all types of compressors and refill the sump (where necessary), every 3,000 miles. The drain plug is in the base of the compressor.

The delivery valves and springs should be removed and examined every 10,000 miles running and any carbon deposits removed. If the valves have become ridged or distorted they should be replaced and if found in this state it is probable the springs will also need replacement. The delivery valve seat can be removed and relapped if necessary.

Leaking pipe work or valve leaks caused by dirt result in compressor overheating.

Cleanliness of the air inlet filter is very important, and lack of attention in this respect can cause rapid wear of compressor parts It is advisable, therefore, to clean thoroughly the felt filter element at regular intervals.

TO DISMANTLE THE COMPRESSOR:

Drain oil,

Remove:—

1. Crankcase breather and oil filler.
2. Cylinder head complete.
3. Oil sump or bottom cover.
4. Side covers.
5. Main oil supply inlet flange (if fitted).
6. Unbolt pump plunger from crankshaft or oil communicating member on centre journal of crankshaft.
7. Baffle plate.
8. Connecting rod caps and withdraw pistons and connecting rods through top of cylinder bore. (Mark conn. rods and caps before removal).
9. End covers (to facilitate removal of crankshaft).
10. Crankshaft complete with bearings.
11. Pump body from sump.

TO DISMANTLE THE CYLINDER HEAD:

Remove:—

1. Inlet manifold.
2. Delivery valve cap, spring and disc valve.
3. Delivery valve guide if fitted, using special tool. Fig. 5.
4. Delivery valve seat, using special tool. Fig. 5.

Note.—For compressors having the seats pressed in insert a piece of brass bar $\frac{7}{8}$" dia. x 0.4" long on to the valve seat; replace valve cap and screw down until seat falls away.

5. Inlet valve spring keeper using the special tool, Fig. 6, together with spring and valve.

During a general overhaul it is advisable to fit new inlet and delivery valve discs and springs after all carbon has been removed from the cylinder head.

On water cooled heads a thorough cleaning out of the water section is advisable.

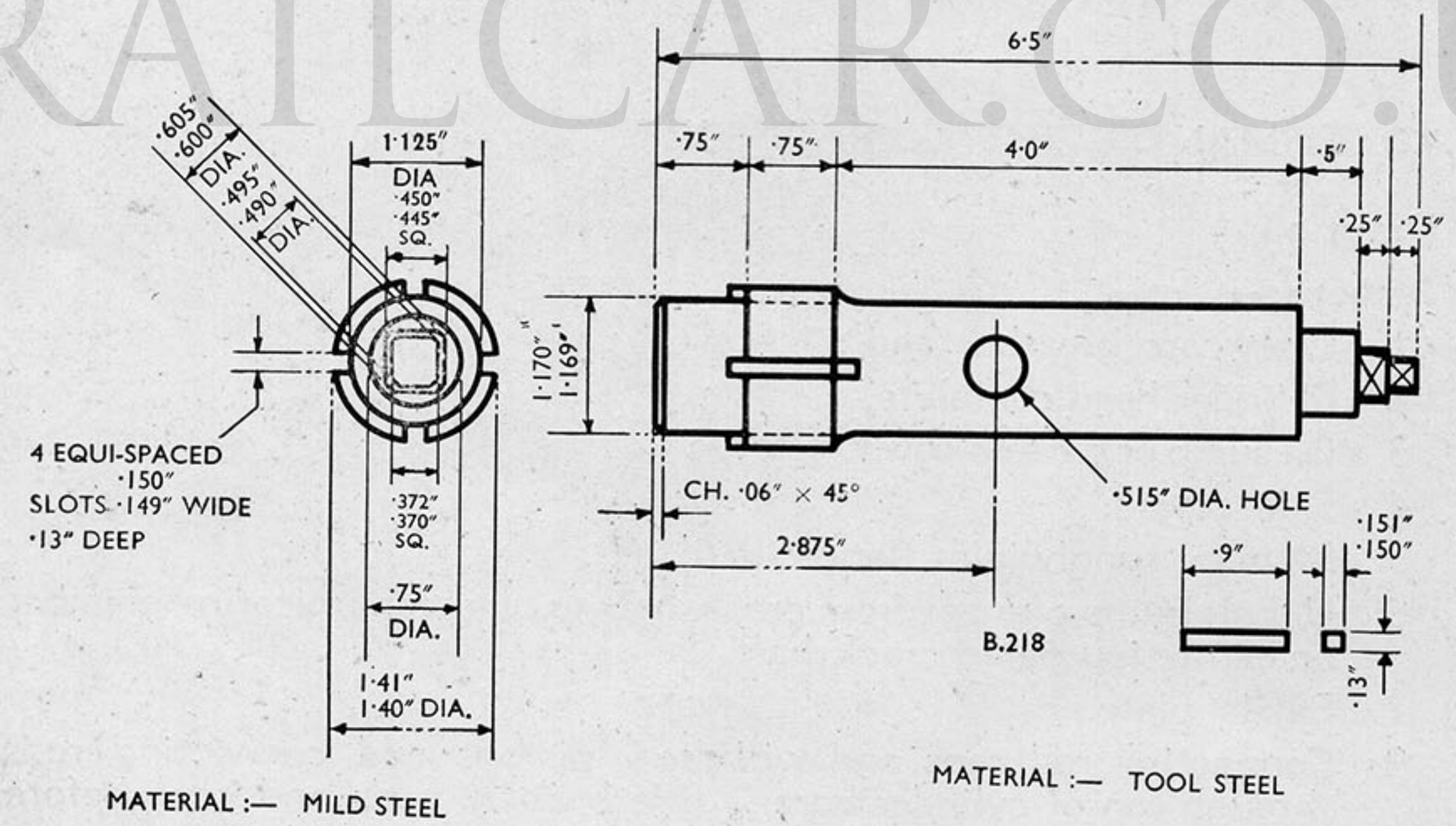


Fig. 5

Combined Valve Seat and Delivery Valve Guide Removal Tool.

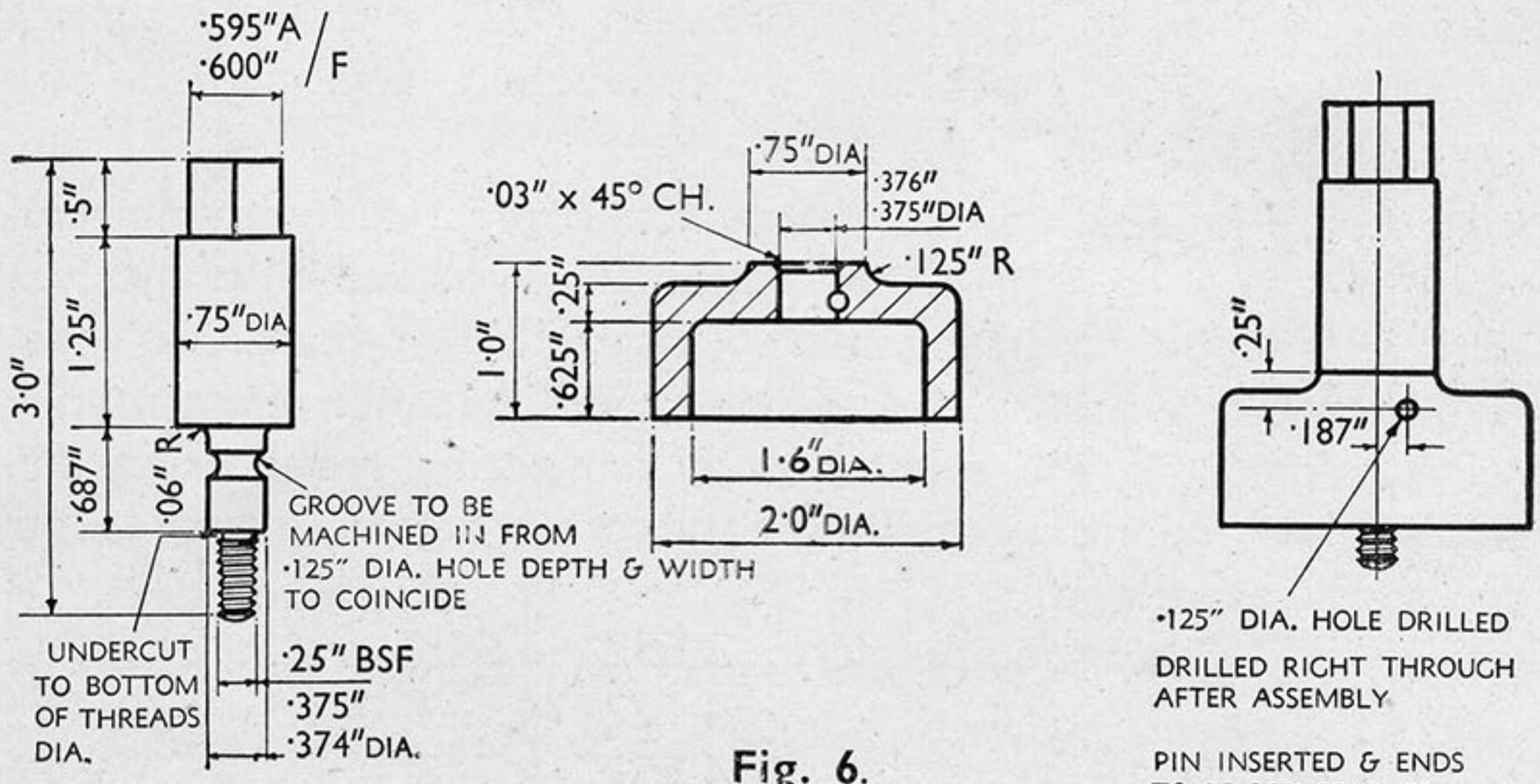


Fig. 6.

FITS AND CLEARANCES.

The original dimensions of the cylinder bores are within the limits as follows:—

$2\frac{1}{8}$" bore compressors	2.125"/2.1255"	dia.
$2\frac{5}{8}$" ,, ,,	2.625"/2.626"	,,
2 13/16" ,,	2.812"/2.813"	,,

For the standard range of compressors, if wear has occurred to a permissible maximum of .005", the cylinders may be re-bored and fitted with oversize pistons. For the convenience of the smaller operator where facilities to carry out this re-machining are not available, Clayton Dewandre Company can undertake the necessary servicing of the compressor. The limits of wear and service instructions are tabulated below.

Wear in Bore.	Service Instructions.
+ .005"	Fit new standard rings.
+ .005" to .010"	Bore out to + .010" and fit .010" oversize pistons and rings.
+ .015"	Fit new .010" oversize rings.
+ .015" to .020"	Bore out to + .020" and fit .020" oversize pistons and rings.
+ .025"	Fit new .020" oversize rings.

Maximum permissible re-machining of cylinder bore .020".

Standard clearances for cast iron pistons are as follows:—

$2\frac{1}{8}$" bore compressors	.001" to .0025"
$2\frac{5}{8}$" ,, ,,	.001" to .0025"
2 13/16" ,,	.001" to .0025"

Both piston and scraper ring gaps should be between .003″ and .006″ for butt-jointed rings when fitted and between .002″ and .004″ for scarf jointed rings Both types are in production and can be used indiscriminately.

Bearings should be fitted to good automobile practice, with particular attention to clearance at the sides of the crankpin and oil pump white metalling. It should not be possible to insert thicker than .003″ feeler between crankpin and journal shoulder or .003″ between pump strap and journal shoulder. In the event of the connecting rod bearing being re-metalled, it is important to maintain the correct connecting rod lengths. The centres are as follows:

$2\frac{1}{8}$″	bore compressors		3.652″/3.648″
$2\frac{5}{8}$″	,,	,,	4.127″/4.123″
2 13/16	,,	,,	4.752″/4.748″

Wear in oil pump parts signifies dirty oil. Clean carefully. Unless some means is available of running the oil pump in an oil bath and measuring the pressure delivered, which should be 10/15 lbs./in², it is undesirable to alter the adjustment of the springs setting the oil release valve. If this must be done, however, measure the height of the springs as set before dismantling and reset to same height. This height should be 0.2″ approximately.

Under no circumstances must the oil relief valve be used as a means of reducing oil consumption.

Excessive consumption of oil may be due to the following causes:—

1. Crankshaft seal damaged during dismantling or assembling.
2. Worn pistons, rings or bores (Examine air filters and inlet manifold for ingress of grit).
3. Excessive side clearance between pump strap or crankpin or both and journal shoulders. This may be due to wear or careless overhaul. If wear, examine for gritty oil.
4. Damaged, missing, or incorrectly assembled crankcase breather.
5. Loose joints generally. Inspect all gaskets and tighten bolts where necessary. It is usually desirable to tighten all joint bolts after the first 3,000 miles operation.

The crankshaft assembly requires care because it is very easy to damage the oil seal. A thimble, shown in Fig. 7, should be slipped over the shaft end to protect the seal edges. Stiff paper may be used in emergency if wrapped round seal collar while assembling through seal.

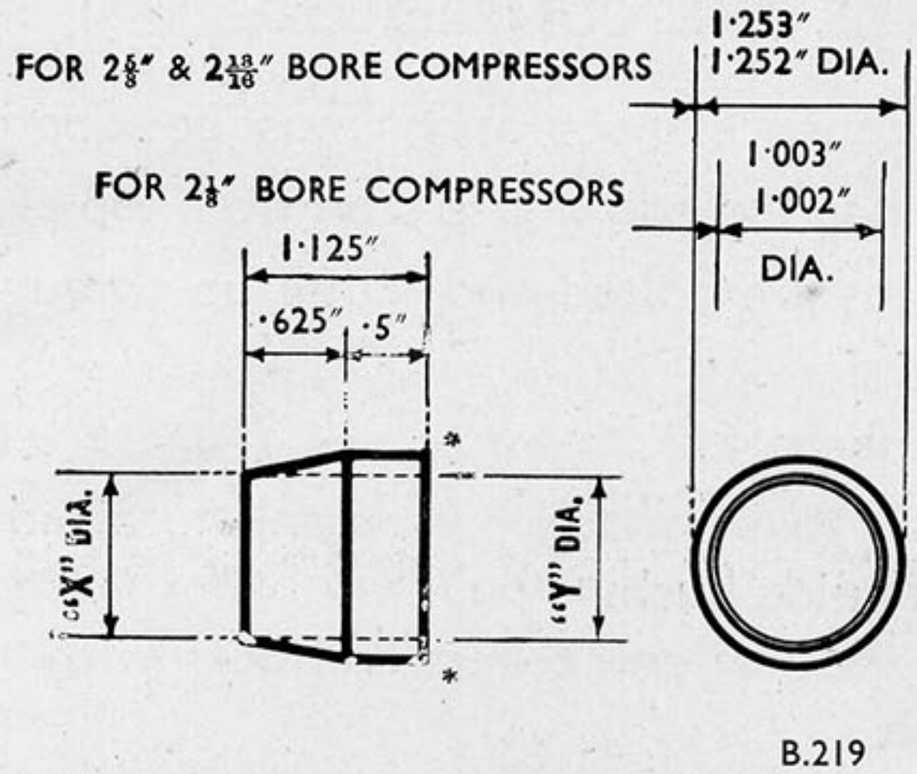
TO REASSEMBLE THE COMPRESSOR:

The following sequence of operations must be adopted:—

1. Insert connecting rod and piston from top of cylinder bore.
2. Baffle plates are bolted and wired up through the hole in side of crankcase.
3. Insert crankshaft.
4. Guide bush to be fitted over crank to avoid seal damage. Fig. 7 shows the guide bush.
5. Assemble the seal end covers and bolt with two screws. Remove guide bush.
6. Fit connecting rod caps, tighten and split pin nuts.
7. Tighten remaining bolts on end covers (the joints must be in good condition or renewed).
8. Fit pump plunger or oil communication member to the centre journal of crankshaft.
9. Assemble pump body in sump (if fitted). Refit plain washers and split pin.
10. Replace seal housing cover on crankcase side (if fitted), care should be taken not to damage the seal when inserting the communicating member from the centre journal of crankshaft.
11. Fit sump or bottom cover to cylinder block.
12. Assemble breather (and oil filler if fitted).

CYLINDER HEAD.

1. Assemble delivery valve seat.
2. Assemble the delivery valve guide, insert valve disc, spring cap and washer.
3. Insert inlet valve, spring and keeper.
4. Fit inlet manifold.
5. Re-fit head on cylinder block with new gasket.
6. Tighten all cylinder head bolts.
7. Refill sump with fresh engine oil to the top of the oil filler or dipstick mark. (Not required on compressors which are pressure fed from main engine).



"X" DIA. = SMALLEST DIA. POSSIBLE

"Y" DIA. = SLIDING FIT OVER SHAFT

REMOVE SHARP CORNERS EXCEPT WHERE MARKED *

MATERIAL—MILD STEEL

Fig. 7.

Guide Bush for Oil Seal inside diameter.

TESTING REQUIREMENTS.

Time to attain pressures of 80 and 100 lb./in² in 1.40 ft.³ Reservoir at 1000 r.p.m.

Type of Compressor	80 lb/in²	100 lb/in²
Twin Cyl. 2.1/8 bore	80 secs.	105 secs.
Single Cyl. 2.5/8 bore	110 secs.	150 secs.
Twin Cyl. 2.5/8 bore	55 secs.	75 secs.
Twin Cyl. 2.13/16 bore	35 secs.	46 secs.