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LUCAS

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EQUIPMENT

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WORKSHOP INSTRUCTIONS

REMAGNETISATION OF LUCAS

MAGNETOS

(EXCLUDING RACING AND WADING MODELS)

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REMAGNETISATION OF LUCAS MAGNETOS

(Excluding Racing and Wading Models)

INTRODUCTION

Recent development in the manufacture of alloy steels for permanent magnets has been most marked. Taking the obsolete tungsten horseshoe magnet as a datum, the effect has been to increase the energy content per unit volume by some twenty-six times. Until about 1920 tungsten steel was the chief alloy used. Since then Chrome, Cobalt, Alni, Alnico, Alcomax 1, Ticonal E, Ticonal G and Alcomax II steels have been produced, whilst more recently research has been carried out at Cambridge on a cobalt-platinum alloy.

Under normal conditions of service the modern high-energy magnet will retain its power far more readily than was formerly the case. It is, however, sometimes necessary to remagnetise a magnet, and electro-magnetic magnetising machines are used for this purpose. These are classified as either vertical or pot type. The vertical type is the more common machine and is the type referred to in these notes, but the principle and method of use is similar in both cases. The magnet to be re-magnetised is placed on or in the magnetiser so that by bridging two pole faces or adjustable jaws it completes an iron circuit round which the magnetising flux can pass. The principle of all electro-magnetic magnetisers is shown symbolically in Fig. 1.

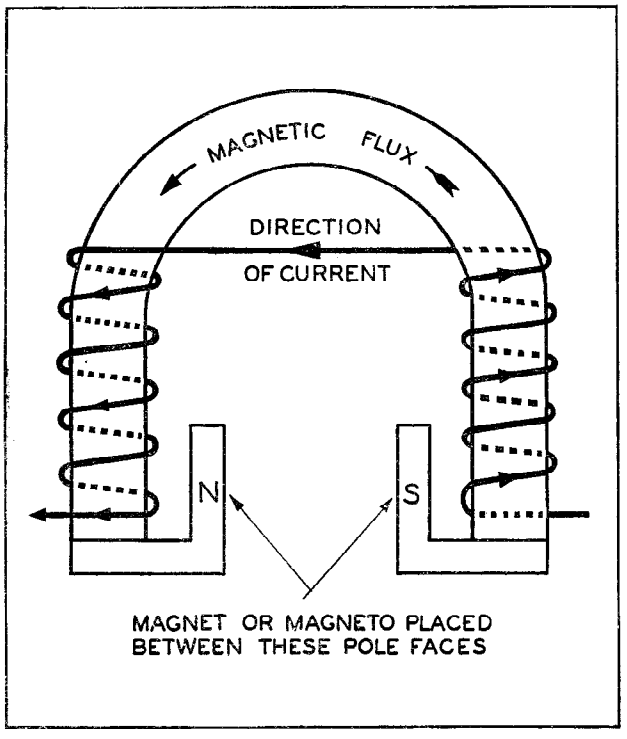

Fig. 1

Principle of an electro-magnetic magnetiser

As the current is switched on, the coils on each limb produce a magnetic field. This field is concentrated within the limbs, since these form a common iron core. The intensity of such a field is a product of the current flowing (in amperes) and the number of turns of wire on the core. The recommended number of ampere-turns for a machine to remagnetise Lucas magnetos is stated on Page 2. The magnetising effect of one ampere flowing through one thousand turns of wire, is the same as one thousand amperes flowing round one turn, and either method may be used, whichever is the more convenient. In practice, since smaller currents are more easily switched, it is usual to employ many turns of fairly light-gauge wire and a small magnetising current.

Due to requirements of machine mounting and to the irregular shapes of some magnets, or of complete magnetos, the horse-shoe form of magnetiser shown in Fig. 1 is seldom used. A typical inverted horse-shoe or vertical magnetiser is shown in Fig. 2.

Should the magnet to be re-magnetised be of the horse-shoe form, as illustrated in Fig. 2, it will be a simple matter to obtain good magnetic contact with the ends of the magnet, and the flux path will then be through a closed iron circuit. However, with present day magnetos the magnet system is often cast integral with the aluminium or similar non-magnetic alloy body. In such cases some sections of the flux path or circuit may, of necessity, be through air and aluminium; but by supplementing the iron circuit between the pole faces with adaptor pieces, and by building up with specially shaped soft iron blocks, these non-magnetic sections of the flux circuit can be kept to a minimum and the flux concentration within such a circuit can be greatly increased.

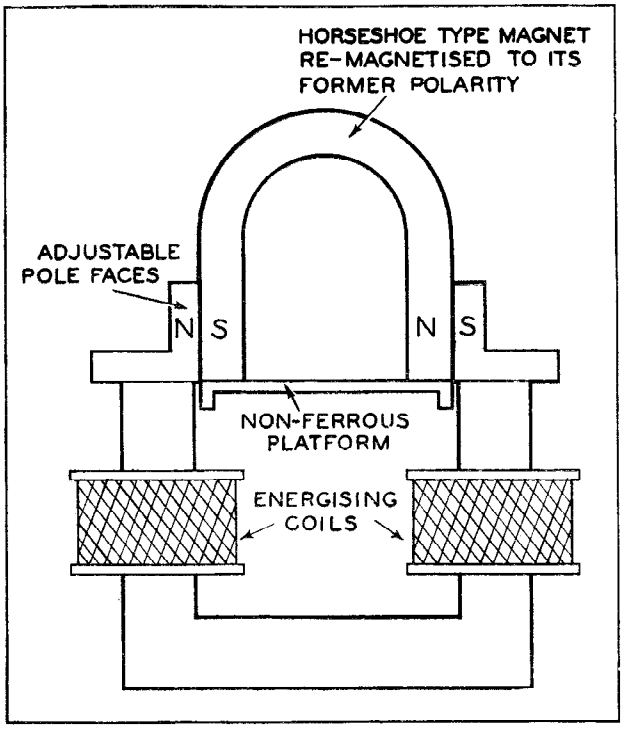

Fig. 2
Vertical type magnetiser

SPECIFICATION OF A TWO-POLE MAGNETISER

A two-pole magnetiser complying with the minimum specification detailed below would be capable of magnetising to saturation all commonly met with magnetos, including all Lucas models referred to in the following notes.

Core Area	9 square inches
Recommended Core Winding	65,000-70,000 ampere-turns
Core	Soft (preferably Swedish) iron
Magneto Platform	Brass or other non-magnetic material
Minimum Distance Between Poles	Width of magneto body

NOTES ON THE REMAGNETISING OF VARIOUS LUCAS MAGNETOS AND INDUCTOR GENERATORS

MAGNETIC CIRCUIT

The recommended ampere-turns value given in the foregoing specification must be regarded as empirical and is intended only as a guide to cover the worst case. In practice it may be found that saturation is possible at much lower values but this will depend on the efficiency of the external magnetic circuit. It is, therefore, most important when setting up magneto and blocks to keep all air gaps to a minimum, and to butt the various components so as to give maximum metal surface contact between them. The contacting faces of the blocks should be ground in order to increase this metal-to-metal contact. If these precautions are not observed the magnetiser may fail to saturate the magneto magnet.

VOLTAGE DROP

Cables connecting the magnetiser to the supply must be of sufficient section to carry the magnetising current without causing an excessive drop in volts. Likewise, any cable joints must be capable of passing the required current. To test for voltage-drop, a voltmeter reading must be obtained at the magnetiser terminals **with the magnetiser switched on.** The reading so obtained must not be less than the rated voltage of the magnetiser. If this is not the case, raise the supply voltage to compensate for line volt drop and for other losses which may occur.

IMPULSE STARTERS

Some magnetos are fitted with impulse starters.

These must always be removed before such magnetos are remagnetised, otherwise the starter pawls will become polarised and their operation be adversely affected.

POLARITY

The sparks produced by a magneto designed for multi-cylinder engines are alternately positive and negative in polarity; that is to say, they jump alternately from the central electrode of the sparking plug to earth ('positive spark'). and from earth to the central electrode ('negative spark'). When remagnetising it is normally not necessary, therefore, to observe the original polarity of the magneto magnet. (An exception to this will be found in Model KVF. This magneto, designed for use with V-twin engines, produces two sparks, one of which is much retarded, and in order to obtain the most favourable slow speed performance, it is essential to follow the special instruction given on Page 6). On the other hand, the sparks produced by single-cylinder magnetos (and all ignition coils) are always of the same polarity — every spark can be a positive spark or a negative spark according to design — and the question arises regarding the most suitable polarity to adopt.

The voltage at which a spark will jump the plug gap is influenced by the temperature of the negative electrode — the hotter this electrode the lower will be the voltage required to cause a spark, and since it is desirable to keep the plug voltage as low as possible, the central electrode, being hotter than the outer earthed electrodes, is normally made negative.

The spark polarity is determined by two factors, (1) the direction of rotation of the magneto armature or rotor, (2) the polarity of the magnet. The first factor is indicated by an arrow mark to be found on the outside of the magneto body, whilst the second factor can normally be ascertained with the aid of a pocket compass.

Note: When a compass needle is brought within the influence of a magnet (e.g. a magneto or magnetiser) that end of the needle which normally indicates North will be attracted to the South pole of the magnet.

We give now a rule by which it is necessary for an operator to know only the magnetic polarity of his magnetiser in order correctly to remagnetise any Lucas single-cylinder magneto.

A GENERAL RULE TO ENSURE CORRECT POLARISATION OF SINGLE-CYLINDER MAGNETOS WHEN REMAGNETISING

Place the machine in its normal upright position and face the drive end—also, in the case of rotating magnet magnetos, models RS1 and SR1, turn the rotor so that the longer gap is uppermost, as shown in Figs. 3 and 4 — when the magneto South pole should be on the left-hand side of counter-clockwise rotation machines. (This rule may be applied also to the single-cylinder Magdyno machine, model MO1, provided the machine is first positioned on its side as shown in Fig. 6).

In other words, if the left-hand limb of the magnetiser is made the North pole, then clockwise rotation machines must be placed on the magnetiser with the contact breaker end towards the operator, and counter-clockwise machines with the drive end towards the operator.

DISTRIBUTOR AND CONTACT BREAKER COVERS

It is important that distributor and contact breaker covers are in position during remagnetisation to prevent the possible entry of foreign particles.

APPLYING THE MAGNETISING CURRENT

After placing the magneto between the pole faces of the magnetiser and, if required, suitably arranging blocks or jigs, the current should be intermittently applied. Five or six applications are recommended,

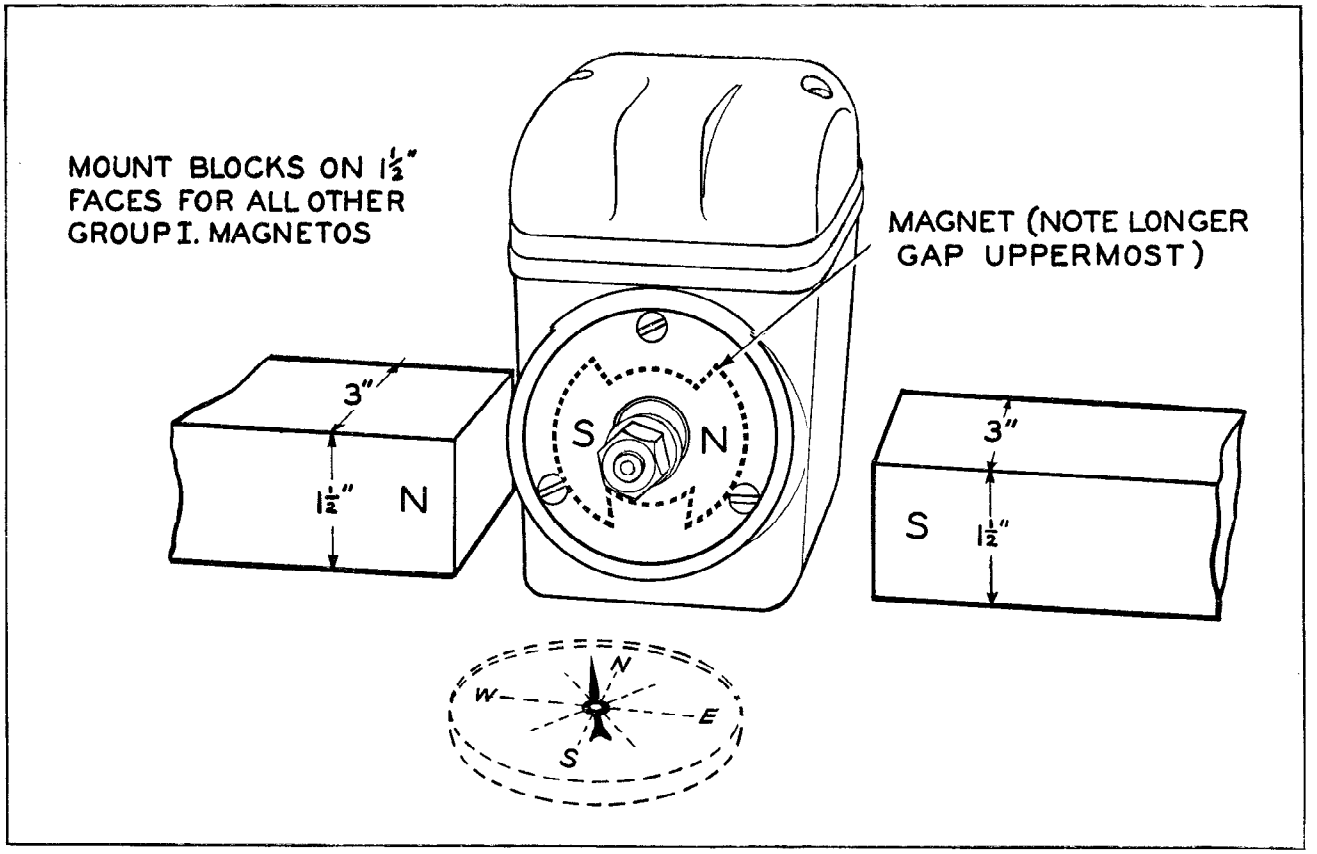

Fig. 3

Typical arrangement for remagnetising magnetos of Group 1 showing magneto model RS1 (counter-clockwise rotation) and blocks

each of one second's duration with two seconds interval. Further or longer applications will not increase magnetisation.

PROCEDURE FOR MAGNETISING

The following sections show which magneto models may be remagnetised using the same pair of blocks. The block dimensions are given, together with points to be watched with individual magneto models. The accompanying illustrations show one magneto from each group in position for remagnetising. They also show in broken line the approximate location, shape, and size of the magnet(s) within the magneto.

1. GROUP I

(a) Comprises:

(*i*) Rotating Armature Magnetos:—
Model GJ4 and others having horseshoe magnets;
Models N1, KN1, N2, KN2 etc.

(*ii*) Rotating Magnet Magnetos:—
Models RF2, RF2F, RF4, RF4F; Model RS1.

(b) Blocks:

The above ranges of magnetos require butting with two plain-ended, annealed mild steel blocks of $1\frac{1}{2}''$ x 3″ section — their length will depend on the distance between the magnetiser poles. Note that, except for model RS1 magnetos, the blocks are mounted on the $1\frac{1}{2}''$ face.

(c) Procedure:

Remove the impluse starter, if fitted.

(*i*) Rotating Armature Magnetos:

Check polarity of the magneto and magnetiser, and place unlike poles adjacently.

NOTE: In the case of single-cylinder magnetos the right-hand side, when facing the drive end, must be a South pole in clockwise rotation machines, and a North pole in counter-clockwise machines.

Arrange blocks to give a good low reluctance magnetic circuit. Operate the magnetiser.

(*ii*) Rotating Magnet Magneto: Single-Cylinder Model RS1.

Remove the moulded cover and turn the rotor shaft until the longer of the two gaps between the rotor poles is seen to be at the top. Then, facing the driving end of the magneto, the right-hand side must be a South pole in clockwise rotation machines, and a North pole in counter-clockwise machines.

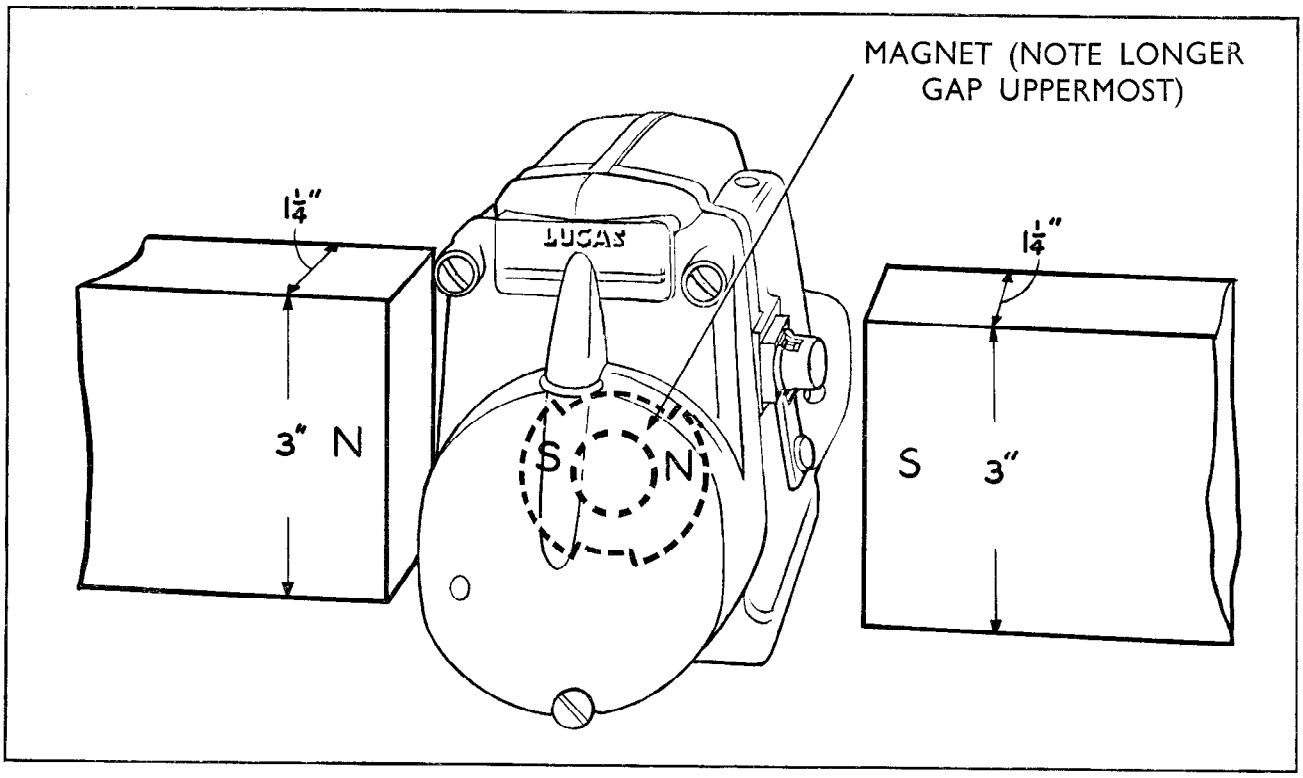

Fig. 4

Typical arrangement for remagnetising magnetos of Group II showing magneto model SR1 (clockwise rotation) and blocks

Check the polarity of the magnetiser. Place the magneto and blocks in position so that unlike poles of magneto and magnetiser are adjacent. Refit the moulded cover and operate the magnetiser.

(*iii*) Rotating Magnet Magnetos: Twin-and-Four-Cylinder Models RF2, RF2F, RF4, RF4F.

The rotor poles must correspond to the stator pole pieces. To fulfil this condition, turn the driving shaft so that its keyway is horizontal. Place the magneto and blocks in position so that unlike poles of magnet and magnetiser are adjacent. Operate the magnetiser, KEEPING THE ROTOR KEYWAY HORIZONTAL. N.B. Where large numbers of RF models are handled the use of a dummy impulse starter is recommended. This spare impulse starter should be marked so that by aligning the mark with the starter cover securing screw the correct rotor position for remagnetisation (i.e. rotor pole shoes corresponding with stator pole pieces) is obtained automatically. The starter must be gripped to restrain the rotor from turning whilst re-magnetising.

2. GROUP II

(a) Comprises:

Rotating magnet magnetos:

Models SR1, SR2, SR4 (with or without prefix K or suffix F).

(b) Blocks:

$1\frac{1}{4}$" x 3" section, plain-ended.

(c) Procedure:

Remove the impulse starter, if fitted. If large numbers of model SR magnetos with impulse starters are handled, it is advisable to use a dummy impulse starter as in the case of Group I above.

(*i*) Single-Cylinder Magnetos: Models KSR1, SR1, SR1F.

Remove the moulded cover and turn the rotor until the longer of the two gaps between its poles is seen to be at the top. Then, facing the driving end of the magneto, the right-hand side must be a South pole in clockwise rotation machines, and a North pole in counter-clockwise machines. Check the polarity of the magnetiser. Place the magneto and blocks in position so that unlike poles of magneto and magnetiser are adjacent. Refit the moulded cover and operate the magnetiser.

(*ii*) Twin-and-Four Cylinder Magnetos: Models KSR2, SR2, SR2F, KSR4, SR4, SR4F.

Remove the moulded cover and turn the rotor until its poles are seen to correspond to the stator pole pieces. Refit the moulded cover and place the magneto and blocks in position on the magnetiser platform. Operate the magnetiser.

3. GROUP III

(a) Comprises:

Rotating armature magnetos: models KIF, KVF, K2F.

(b) Blocks:

$1\frac{1}{2}$" x 3" section, eccentric-concave-ended.

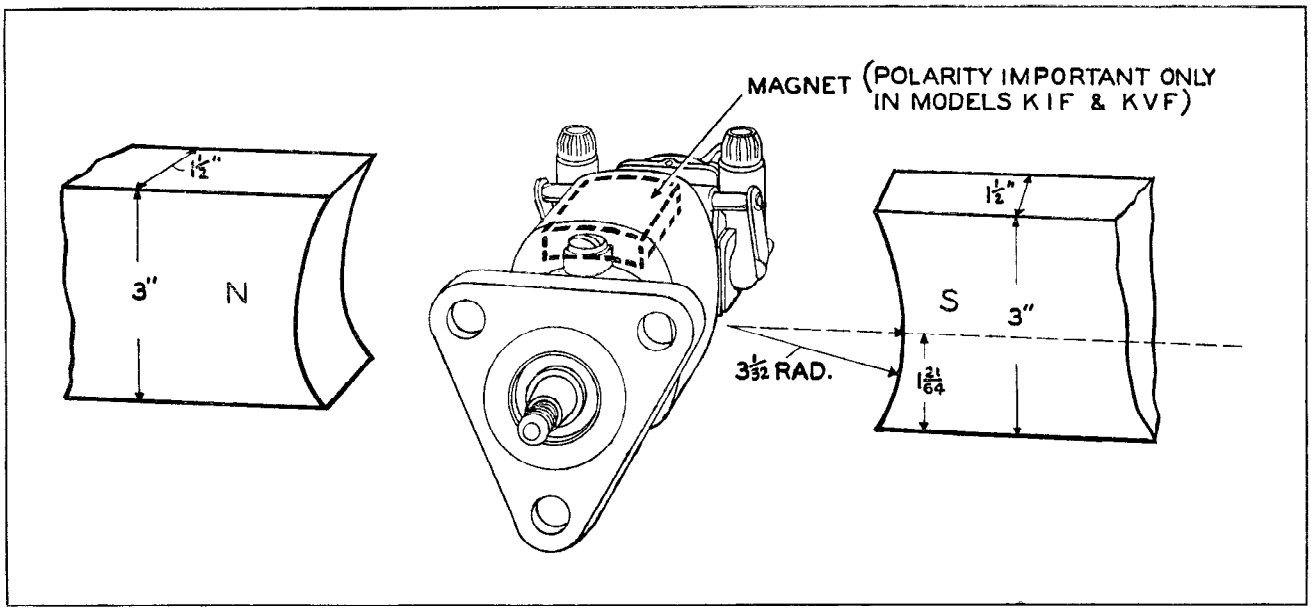

Fig. 5

Typical arrangement for remagnetising magnetos of Group III showing magneto model K2F with two special blocks

(c) Procedure:

(*i*) Single Cylinder Magneto, Model K1F.

The right-hand side, when facing the drive end, must be made a South pole in clockwise rotation machines, and a North pole in counter-clockwise machines.

(*ii*) Twin Cylinder Magnetos, Model KVF.

The right-hand side, when facing the drive end, must be made a **North** pole in **clockwise** rotation machines, and a **South** pole in **counter-clockwise** machines.

(*iii*) Twin Cylinder Magnetos, Model K2F.

No special rule need be observed since, with these machines, performance is unaffected by magnet polarity.

In the case of models K1F and KVF, check polarity of the magnetiser and place the magneto in position so that unlike poles of magneto and magnetiser are adjacent. Arrange the blocks to give a good low reluctance magnetic circuit and operate the magnetiser.

4. GROUP IV

(a) Comprises:

Rotating armature magneto incorporated in Magdyno models MN2, MN1E, MO1, etc.

(b) Blocks:

Two blocks of $1\frac{1}{2}$" x 3" section. One must be convex-ended (to fill the space normally occupied by the dynamo yoke). The other must be plain-ended for contact with the magneto base.

For magnetos having dowel pins in the base a flat mild steel plate will be required, drilled to clear these dowel pins. This plate, or extra block, is shown in Fig. 6.

(c) Procedure:

Place the magneto on its side as shown in Fig. 6, then the right-hand side, when facing the drive end, must be a South pole in clockwise rotation machines, and a North pole in counter-clockwise machines.

Check polarity of the magnetiser. Place the magneto in position so that unlike poles of magneto and magnetiser are adjacent. Arrange the blocks to give a good low reluctance magnetic circuit and operate the magnetiser.

5. GROUP V

(a) Comprises:

Rotating magnet 'vertical' magnetos:

Models 4VR, 6VR, (with or without suffix A or S); Model 8WRSF.

(b) Blocks:

These camshaft-speed 'vertical' magnetos require two blocks or plates about two inches square each having a circular recess to accommodate the bare shaft extension. The block or plate to be placed against the contact breaker assembly must have a central hole $\frac{7}{16}$" deep and $\frac{5}{8}$" dia. The block or plate to be placed against the drive end must have a central hole $\frac{3}{4}$" deep and $\frac{9}{16}$" dia.

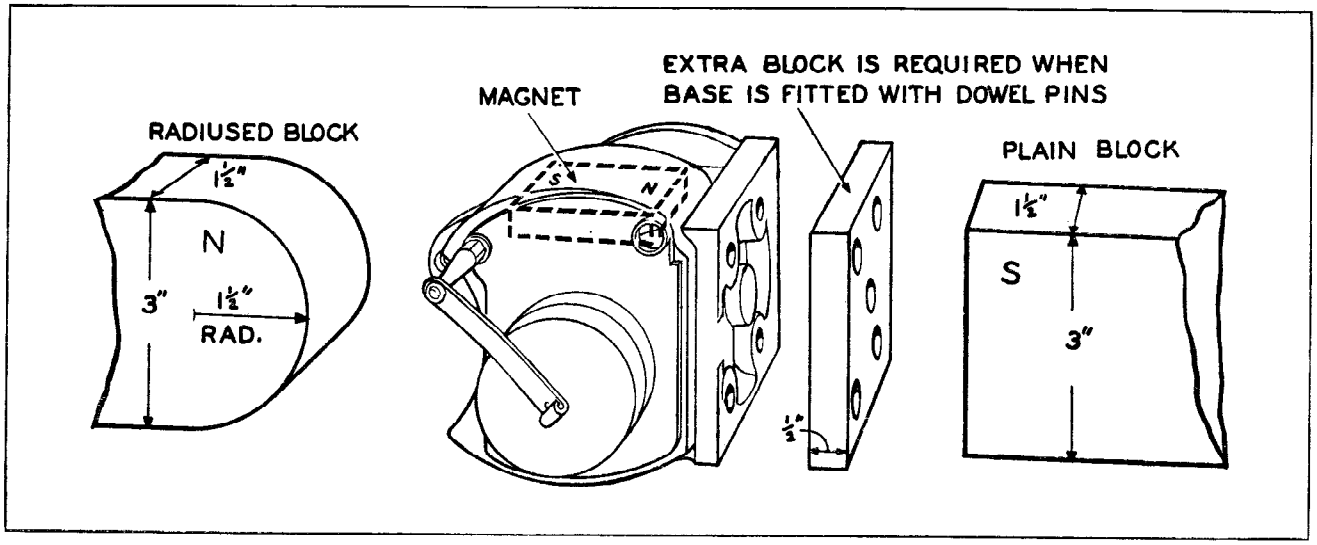

Fig. 6

Typical arrangement for remagnetising magnetos of Group IV showing magdyno model MO1 (clockwise rotation) with dynamo removed

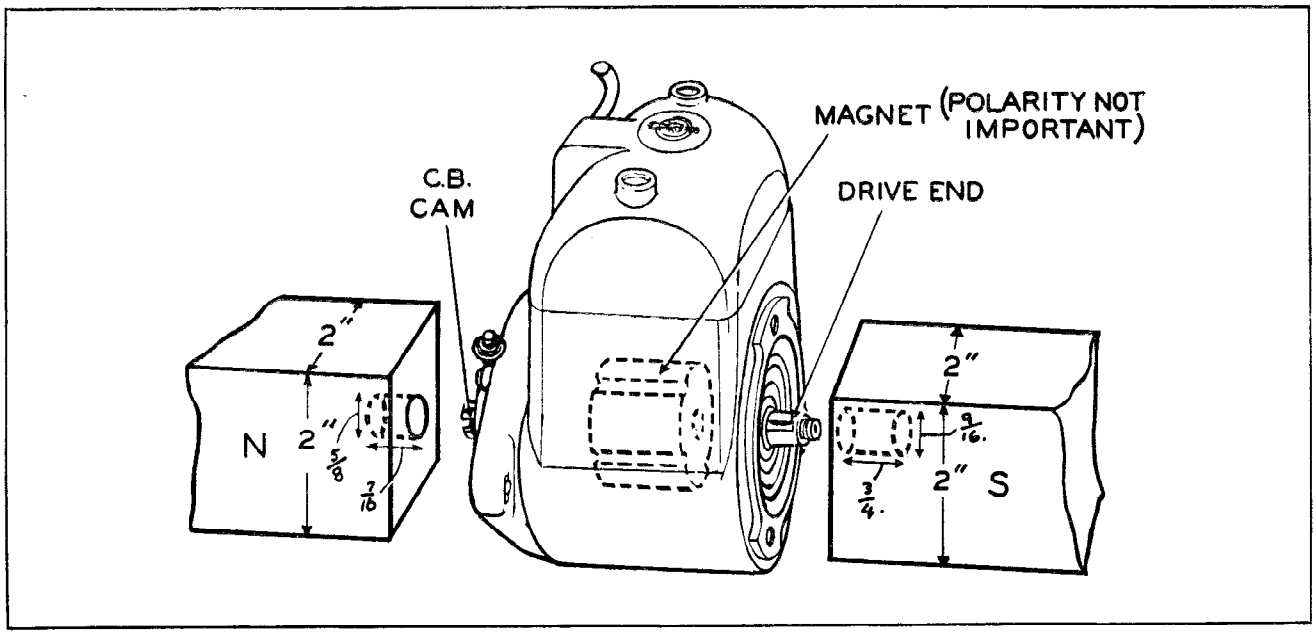

Fig. 7

Typical arrangement for remagnetising magnetos of Group V showing magneto model 4VR and blocks

(c) **Procedure:**

Before magnetising, the distributor cover and h.t. rotor arm must be removed from the upper end, and the lower part of magneto body containing impulse starter or auto advance mechanism from the other, (as Fig. 7). Place the magneto horizontally on the magnetiser platform and arrange the blocks as illustrated. Operate the magnetiser.

6. GROUP VI

Inductor Generator: Model IA45.

The rotor must not be removed from the stator, otherwise the magnets in the latter will become demagnetised.

The Inductor Generator calls for very special attention if remagnetisation should be made necessary and, therefore, if the rotor is to be removed for any reason, it is strongly recommended that keepers be fitted across the magnets in the stator (see Fig. 8a.) thus preventing demagnetisation.

If it is necessary to carry out bench work, such as the replacement of stator coils, be sure to replace the rotor (or fit a dummy rotor) before taking the keepers off the stator. By this means, the need for remagnetisation will be avoided.

If these precautions are not observed, it will be necessary to return the complete unit to the Works, in order to restore its original performance.

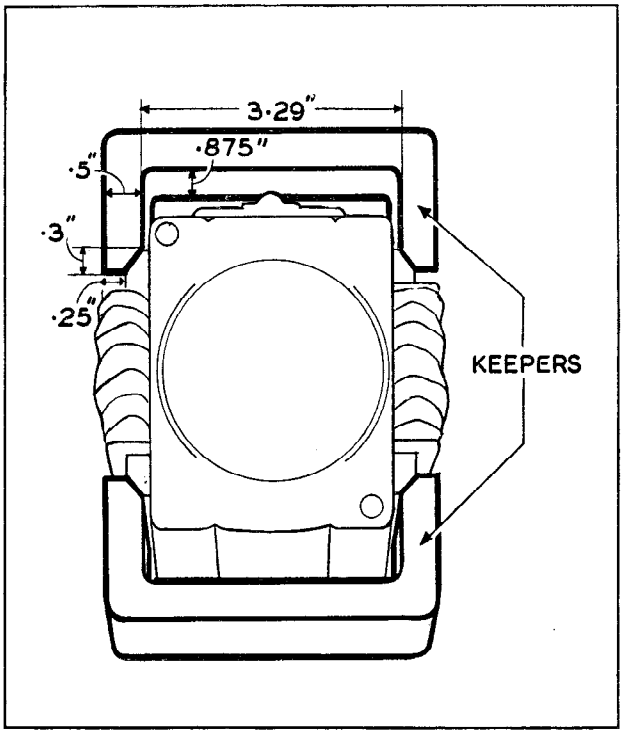

Fig. 8a

Showing keepers fitted to model IA45 inductor generator before removal of rotor

However, in an emergency, the magnets can be partially remagnetised with the magnetiser specified — but the output of the machine will not reach its original designed value.

The two blocks required for this 'first aid' treatment are of 3″ x 1½″ section, with the 1½″ edges chamfered to locate with the laminated cores of the stator coils.

The stator contains two magnets which are to be separately remagnetised.

To remagnetise proceed as follows:

Leaving the rotor inside the stator, lay the generator flat on the magnetiser platform with the contact breaker assembly uppermost and the terminal board furthest away from the operator (see Fig. 8b). It will be seen that both magnets must be remagnetised in the same direction with respect to the stator. This calls for a two-stage operation. The arrangement for remagnetising the magnet furthest from the operator is shown is full line and labelled Position I; arrange the generator thus and operate the magnetiser. Then, to remagnetise the magnet nearest to the operator, arrange the generator as shown in broken line and labelled Position II. Operate the magnetiser.

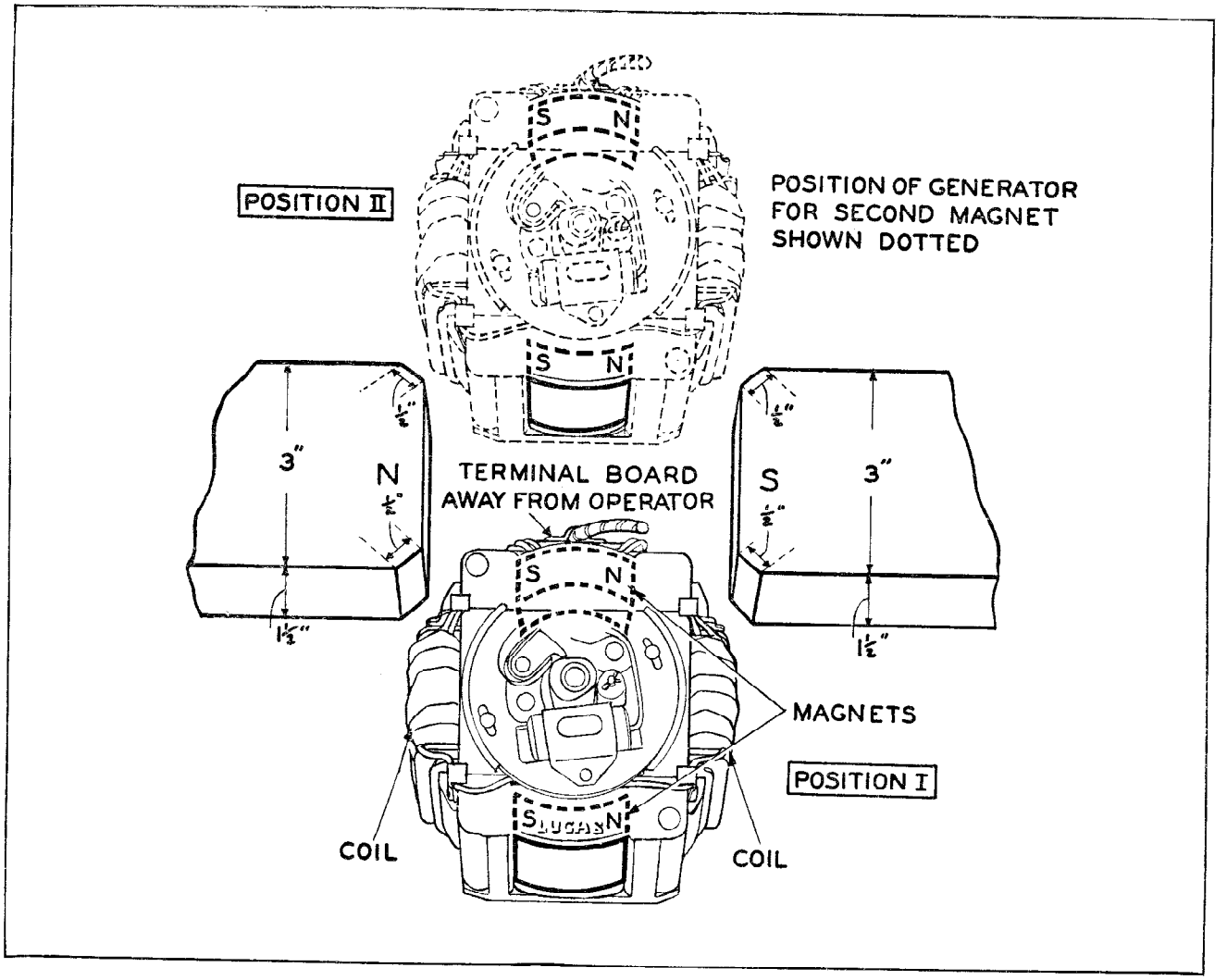

Fig. 8b

Typical arrangement for remagnetising model IA45 inductor generator