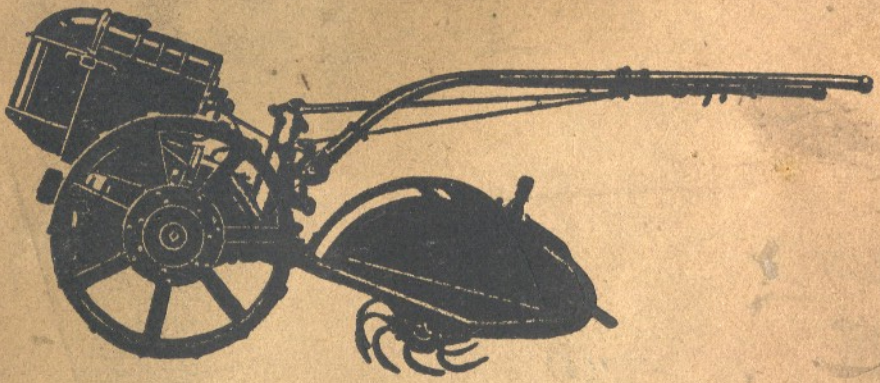
THE SIMAR ROTOTILLER 5 MANUAL



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Preliminary Notes.

IMPORTANT. It is essential that this instruction manual should be carefully read and the mechanism of the machine thoroughly understood before endeavouring to start, run or work the machine.

Although the machine has been made as fool-proof as possible, it is obvious that good results cannot be obtained if a few essential precautions are not taken. Careless treatment may in certain cases lead to damage to the machine or injury to the driver exactly as in the handling of a motor car.

THE MAN TO BE TAUGHT. In selecting a man to drive the Simar Rototiller, we would advise the choice of an active man. It is further advisable that tuition be given to the man whom you intend actually putting in charge of the machine, as by doing so, it will guard against the possibility of any tuition which is given not being passed on to the proper quarter. This instruction book should be available when tuition is given.

THE SIMAR ROTOTILLER 5 MANUAL

1929 (First) Edition.

A copy of this book is sent out with every Simar Rototiller 5.

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Foreword

Considerable time and thought have been expended in the preparation of this manual. Despite this fact there may be further points which could helpfully be embodied in future editions. **Suggestions from users** in this connection will be gratefully received and carefully studied.

These instructions may appear somewhat exaggerated in their details to a superficial reader. They are intended to give the means to benefit from the **experience and practice** which we have gained with the Rototiller.

In order however to facilitate reading on the part of the user who would not wish to be bound to study the whole contents of this book we have printed in **heavier type** the more important sections, a study of which will give the user the **fundamentals** of Rototiller management.

The words printed in *italics* in the text of this booklet correspond to those which appear on the **sketches** and which are intended to render the reading of these instructions more easy. Besides the sketches in the text there is appended to the inside of the back cover a **folding diagram** which can usefully be consulted when reading these instructions.

The **detail index** given at the beginning of this booklet will be a further means for the user to get quickly at the information required by reverting to the page number and in each page to the paragraph dealing with the item about which explanations are sought.

Index to Sections

DETAIL INDEX.

I. Lubrication and Upkeep

FUEL—ENGINE LUBRICATION & UPKEEP

General.

The engine fitted to the Rototiller No. 5 being a two-stroke engine mounted with roller and ball bearings throughout is exclusively lubricated by the oil which is to be mixed with the fuel, in definite proportions, before introducing the fuel into either of the fuel tanks. It is consequently obvious and of **supreme importance strictly to avoid running the engine even for half a minute on fuel not mixed with the required proportion of oil.**

Petrol.

If petrol (gasoline) is used as fuel add 6 per cent. of oil to the petrol. This is done in a simple way by using the oil measure (supplied separately with each machine), which consists of a receptacle in the shape of a tumbler and which should be filled up to the proper groove with oil.

One measure of oil is the ration for one gallon of petrol.

Use good quality motor oil, preferably Wakefield's Castrol XL or C and avoid cheap oils which are the dearest in the long run.

Mix the oil thoroughly with the fuel by shaking the can of petrol to which the oil has been added. It is essential in order to obtain an homogenous mixture, **to mix the oil with the fuel before it is introduced** into the tanks and not to introduce fuel and oil separately into the tanks.

Do not add oil to the fuel already contained in the fuel tanks. When supplied in this manner the oil may not thoroughly mix with the fuel. Starting troubles would be the outcome of this practice.

Fill the *auxiliary tank* which holds one quart, and also the *main tank* which holds one gallon, with the mixture.

When running the machine use the fuel contained in the *main tank* and keep the *auxiliary tank* as a reserve in case you should run short of fuel. It will enable you to carry on until you return to your fuel dump.

Further hints concerning lubrication and the running in of a new engine are given in Chapters **IV** and **V**.

Benzol. If benzol is used as fuel, follow the same directions as are given for petrol.

Alcohol. **If alcohol is to be used add to the alcohol 4% of castor oil** which is the only oil which will be diluted with alcohol. (We specially recommend the standard brand of castor oil supplied by Messrs. Wakefield and known as Castrol "R.")

Fill the *main tank* with the alcohol-castor oil mixture and fill the *auxiliary tank* with a 6% petrol-oil mixture and otherwise proceed as described above.

The *auxiliary tank* will supply the fuel for starting the engine and running it until it is warmed up (about 10 minutes) and also before stopping the engine in order to have a supply of petrol-oil mixture in the *carburettor* for starting the engine again.

This last mentioned precaution consisting of switching over to petrol before stopping is, moreover, essential when using alcohol in order to avoid oxidisation of the cylinder under the influence of the alcohol gases.

Paraffin-Benzol. If paraffin (kerosene) is to be used as fuel give preference to a good clean paraffin or vaporising oil.

Add to the paraffin 12% of oil and add also about 24% of benzol. The benzol is necessary to avoid the tendency to "pinking" which is inherent to the use of paraffin with normal compression.

Fill the *main tank* with the paraffin-benzol-oil mixture and fill the *auxiliary tank* with a 6% petrol-oil mixture as described before under "Petrol."

The *auxiliary tank* will supply the fuel for starting the engine and running it until it is warmed up (about 10 minutes) and also before stopping the engine in order to have a supply of petrol-oil mixture in the *carburettor* ready for starting the engine again.

Paraffin Petrol Certain kinds of petrol supplied in the trade have such qualities as will be found satisfactory if mixed with paraffin in the proportions stated above for benzol.

Others, on the other hand, will not prevent the "pinking" which is consequent to the use of paraffin at high compression. We can only advise users wishing to use a mixture of paraffin and petrol without altering the compression to experiment until they find the right brand and the right proportion of petrol to paraffin.

Paraffin. If it is desired to use paraffin without benzol, it is **necessary to alter the volume of the compression chamber** of the cylinder. This alteration can be carried out by us before the machines leave our Works or can be effected by the customer with the assistance of additional parts described in Chapter **IX** on page 69.

When using paraffin without benzol add to the paraffin 10% of oil, and fill the *main tank* with the paraffin-oil mixture, and the *auxiliary tank* with a 6% petrol-oil mixture. In all other respects proceed as for paraffin-benzol oil mixture as described above.

Carburettor Adjustment. According to Fuel. When using petrol mixture as normal fuel use the needle No. 2 in the *carburettor*.

When using benzol as normal fuel use the needle No. 2 in the *carburettor*.

When using paraffin mixture (with or without the addition of benzol) as normal fuel use the needle No. $2\frac{1}{2}$ in the *carburettor*.

When using the alcohol mixture as normal fuel use the needle No. 3 in the *carburettor*.

For changing the carburettor needle proceed as per the instructions given in Chapter **II** dealing with the *carburettor*.

AIR CLEANER.

General.

The engine is provided with a combined *canvas bag* and *oil-soaked wood shavings* filter situated in front of the engine inside the bonnet. The *canvas bag* separates most of the dust and the *oil-soaked wood shavings* retain the finer dust which has been allowed to pass the *canvas bag*. **Thorough cleaning of the air is essential to the life of the engine, as any dust admitted to the engine will form a grinding compound and wear the ball bearings and the roller bearings as well as the gudgeon pin, the cylinder and the piston.**

These troubles will be avoided by giving the air cleaner a reasonable amount of care. Attention should, of course, be given more frequently when the machine is applied to work under dry soil conditions.

Canvas Bag.

The *canvas bag* must be kept in good condition, dry and clean. It can be easily removed and washed. To remove it from the machine, remove the *bonnet* and pull the *bag* together with its *cage* upwards, when it will slip out. If the *canvas bag* is allowed to get dirty or wet, the air will have difficulty in passing through, with the consequence of a reduction of engine power and an abnormal consumption of fuel.

The *canvas bag* must not be allowed to be used if torn or threadbare as all its efficiency is thus destroyed.

The large *felt ring* which fits at the lower part of the *body* must be kept in good order.

Particular care should be taken that the *cage* carrying the *canvas bag* rests properly on this *felt ring* so that no air can be admitted otherwise than through the *canvas bag*.

Wood Shavings.

The *wood shavings* which fill the *body* of the *air cleaner* must be clean, fine, pliable and dust-free. They must be reasonably soaked in clean oil before introduction into the *air cleaner*, so as to enable the remaining dust to be caught in its meshes.

An excess of oil in the *wood shavings* may perhaps lead to the superfluous oil, possibly mixed with dust, penetrating into the engine and causing damage.

On the other hand, the use of insufficiently oiled shavings, or shavings that have been allowed to dry during a period of idleness of the machine, would reduce the efficiency of the dust retaining powers of the shavings and lead to trouble. It is consequently essential, especially for machines having travelled a long way, for instance Overseas, to inspect and re-oil the shavings before starting to work the machine.

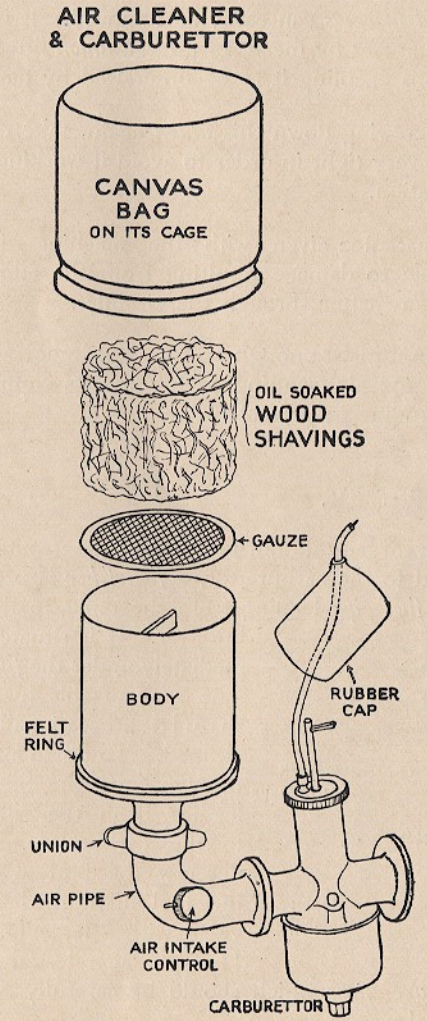

Fig. 1.

The *body* of the air cleaner must be kept ¾ full of *wood shavings* only slightly compressed.

The *gauze* at the bottom of the air cleaner body must be kept in good condition and if damaged in any way, should be repaired or replaced immediately.

For cleaning purposes, the whole *body* of the *air cleaner*, in other words, the receptacle containing the *wood shavings* can easily be removed. It is fixed on the *air pipe* by means of a large *union* fitted with extensions enabling it to be unscrewed by hand.

When screwing down this *union* again, take care to screw it very tight in order to avoid it working loose by vibration.

The guarantee given with the machines is not applicable to damage resulting from the admission of foreign matter through the air inlet.

We cannot insist enough on the vital importance of keeping the air cleaning device and its connection to the engine in perfect order.

FUEL FILTER.

To prevent any impurity in the fuel from being admitted to the carburettor, a *fuel filter* is provided on the *fuel pipe* leading from the tanks to the carburettor. It is situated immediately under the *fuel taps*. The *sieve* of this fuel filter should occasionally be cleaned. To do so unscrew the *union* on the fuel pipe leading from the *fuel filter* to the carburettor. Then unscrew the bottom part of the fuel filter which is provided with a large hexagon. The part so released carries the *gauze sieve* which should be carefully washed in petrol.

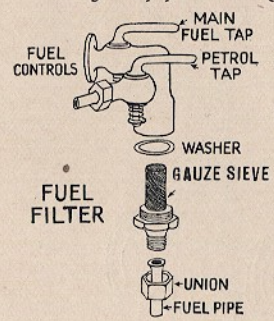

Fig. 2.

GEAR LUBRICATION AND UPKEEP.

The lubrication of the gears must be attended to after about every twenty hours' work.

The *miller gearbox* is internally connected with the *main gearbox* so that when oil is fed to the *main gearbox* as will be described below, the *miller gearbox* is automatically provided with its share of lubricant.

The gearboxes hold jointly half a gallon of oil.

The *knurled cap*, painted red, situated on the right-hand side of the *main gearbox* near the magneto, can be unscrewed by hand and enables you to pour in the gear oil (preferably Wakefield's " D " Gear Oil).

The *knurled cap* carries a twisted wire which penetrates down into the gearbox and enables you to check the level of the oil in the gearbox.

Avoid any dirt, dust, water or foreign matter from being admitted to the gearbox when proceeding with the lubrication.

Do not fill to the brim, ¾ full is enough.

In cold weather, warm up your oil can before pouring the oil in so as to obtain a free running of the oil along the duct leading to the inside of the gearbox.

There is no other attention required by the gearbox except an occasional drainage of all the oil contained and replacement of fresh oil. Do this when the machine has been working and the oil has been made fluid by the work. Proceed as follows :—Remove the hexagonal *drain plug* situated underneath the *gearbox* on the left-hand side, a little to the rear.

Then put the machine " nose-up." When no more oil runs out, put the machine " nose-down " near the vertical position so as to get the oil left in the *Miller gearbox* to run to the *main gearbox*.

After a few minutes, place the machine again " nose-up " and wait for the rest of the oil to come out.

Then replace the *drain plug* and fill with fresh oil as described above.

Breather.

The *main gearbox* is fitted with a *breather* which is a part of the *knurled cap*. This breather is provided to avoid the warming up of the oil from creating a pressure in the gearbox which would mean escape of oil at the bearings.

The *breather* consists of a light plate and spring which will let air out but not in.

These parts are all protected and require no attention except that they should be occasionally cleaned by washing in paraffin the whole of the *knurled cap* without otherwise dismantling the *breather*.

OTHER LUBRICATION.

Steering.

Besides the above, there is no other lubrication required except a few drops of oil from time to time on the controls, on the friction parts of the steering, viz., the *swivel* (where an *oil cup*, painted red, is provided) and on the pin and grid of the arrangement for changing the position of the *steering arm*. An oil can for this purpose is supplied with the machine.

II. Controls

Under the heading of controls we shall describe all such parts of the machine as are to receive the attention of the driver in the course of the manipulation of the machine.

The following controls are to be found within easy reach of the steering arm :—

Gear Control.

On the left of the driver is a rod fitted with a T-shaped grip (painted green) which controls the clutching and declutching of the gears transmitting the engine motion to the wheels, and which we call the *gear control* throughout these instructions.

By pushing this control forwards the *bottom speed* becomes engaged and if the engine is in motion the machine will then start forwards at slow speed. By pulling it back the *top speed* becomes engaged and if the engine is in motion, the machine will then start forwards at top speed. The middle position between the two is the *neutral* position where no speed is engaged and the machine remains at a standstill even if the engine is running.

When the *gear control* is in *neutral* the wheels are free and it is made possible to wheel the machine forwards or backwards without effort.

It is essential for the safety of the mechanism not to engage a speed, in other words, not to pass from neutral to top or bottom speed when the machine is being moved about by hand. It is not possible to start the engine by giving the machine a push forward and engaging a speed or by running the machine free on an incline and engaging a speed. The gears being irreversible the only result will be that the machine will stop dead and a considerable strain on the gears will take place for which we decline all responsibility.

The *top speed* is to be used for road travel as well as for surface cultivation. The *bottom speed* is meant for deeper tillage.

Steering side position control.

In the middle between the *steering arms* is a loop grip terminating a rod acting on the locking device. This device enables the *steering arm* to be placed in a left, a right or a middle position.

We call it the *steering side position control* throughout these instructions. This control is to be used to select a position for the driver so that he should walk on the solid ground beside the track of the machine whenever this is possible.

By pulling the rod back the *steering arms* are released and can be moved sideways to the left or to the right position where they will lock themselves automatically.

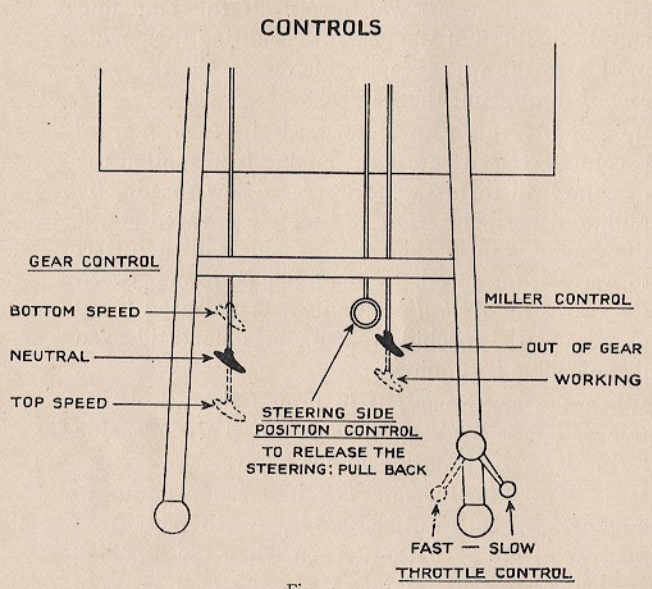

Fig. 3.

This control can be used when the engine and the machine are running as well as when they are at a standstill.

Miller Control.

On the right of the driver is a rod fitted with a T-shaped grip (painted red) which controls the clutching in and declutching of the miller and which we call the *miller control* throughout these instructions.

When this control is pulled backwards it connects the engine to the working tool and by pushing it forwards it will disconnect the miller. In other words, in the rear position the miller is *working*, and in the forward position, the miller is at a *standstill*. This control is to be used when the machine is travelling under power.

Throttle Control.

On the right-hand steering arm is a Bowden lever which by means of a flexible cable is connected with the carburettor. We call this the *throttle control* throughout these instructions.

By turning this control anti-clockwise, the speed of the engine is being reduced ; in other words, it is being throttled down. By turning it in the reverse direction, viz., clockwise, the throttle opens and the speed is increased.

The further controls on the machine are :—

Steering Height Position Control.

On the right-hand side of the lower cross piece of the guiding arm is a vice-like tension nut with a cross bar which enables you to loosen the circular ratchet and to place the *steering arm* to a height convenient for the driver and for the work which is to be done. We call this control the *steering height position control* throughout these instructions.

The deeper the machine is required to work, the higher should the steering arms be placed.

Arrange for the *crossbar* of this control to be so placed that it should be out of the way of the wheels.

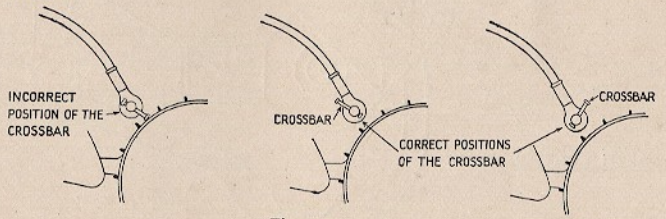

Fig. 4.

This is always possible.

The *crossbar* should be pushed back so that it will be held in place by the spring hidden inside the head which catches in the recesses provided at the end of the crossbar. This control is not to be used when the engine is running.

Magneto Control.

On the magneto is a lever with sector marked " Starting " and " Running " which we call the *magneto control* throughout these instructions.
For starting, place it on the position marked " Starting." When the engine is running release it so that it indicates " Running."

Depth Control.

The bar hinged at the front end of the *miller gearbox* and which can be set to stand nearer to or further from the *miller gearbox* is called the *depth bar*.
This *depth bar* is held in place at the rear of the miller gearbox by means of a pin, the *depth setting pin*, and constitutes the *depth control*.
By lowering the *depth bar* in respect to the *miller gearbox* shallower tillage is obtained.
The deepest tillage is obtained when the depth bar is immediately adjacent to the *miller gearbox*.

MILLER ADJUSTMENTS

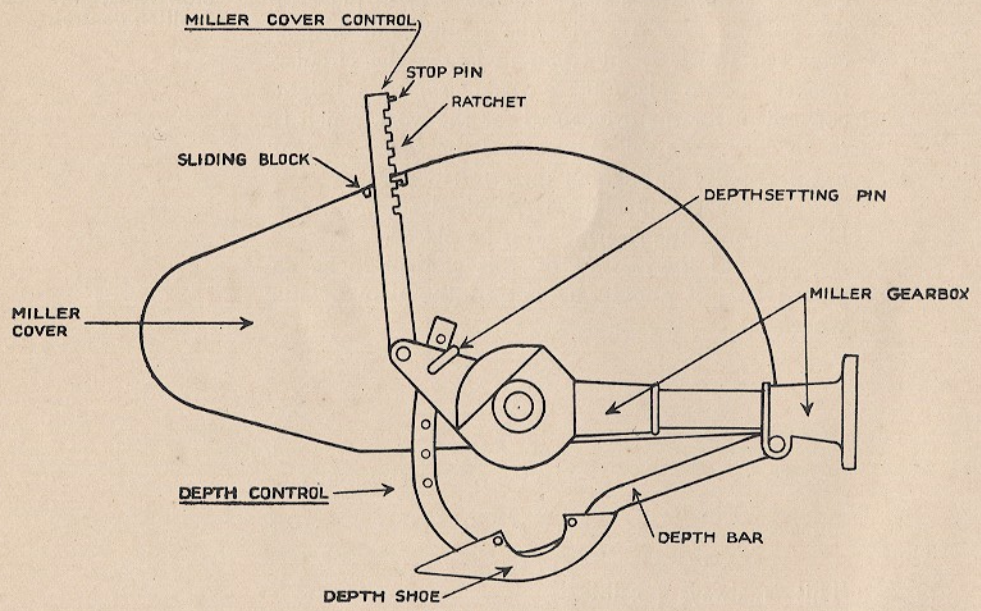

Fig. 5.

The *depth setting pin* can be removed by hand, and to do so first twist it back so that its upper hook is released from the boss on the *miller gearbox* and then slip it out. The depth should always be regulated correctly.

If the machine has a tendency to jump forward during the work it shows that the *depth bar* is not sufficiently lowered.
It may happen that on soft soil the *depth bar* even if set for shallow work, is found to cut through the soil, and does not sufficiently prevent the miller from sinking into the ground. The consequence of this inefficiency of the depth control on soft soil is that shallow work is unobtainable. To cope with this particular case an auxiliary *depth shoe* is supplied with each machine. This *depth shoe* is a cast part which fits on the depth bar by means of two bolts. This *depth shoe* provides a wider bearing surface and is able to prevent the burrowing of the miller in soft soil. The *depth shoe* should be used on light soil ; it should be removed and put aside when working on very hard soil.
Should the soil be so extremely and exceptionally light in texture that the *depth shoe* is still found to be unable to obtain the required shallow work, recourse can be had to two other means : a specially wide depth shoe can be supplied on request, or the machine can be used in conjunction with the roller which in this case will serve as a regulator of the depth of work. The roller and wide depth shoe are described in Chapter **IX** dealing with accessories.

Miller Cover Control.

Protruding above the miller cover is a notched bar or *ratchet* which is made secure in the frame of the miller cover by means of a *sliding block* provided with wings enabling it to be gripped with the hand. This *ratchet* is hinged on the *miller gearbox*.
The miller cover can be so adjusted that its sides are level with the ground preventing any projection of soil sideways.

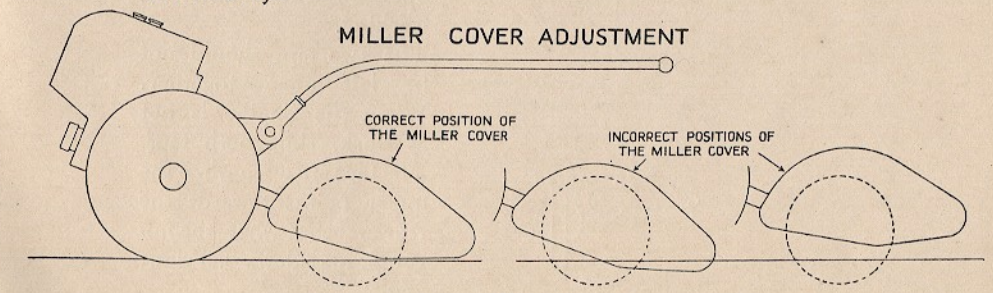

Fig. 6.

To release the *sliding block* it should be pulled up by hand, then slide the miller cover on the ratchet, select a position where you then engage in one of the notches and replace the *sliding block* pressing it down hard.

Air Intake Control.

By removing the *bonnet* forming the front part of the machine, you will obtain access to a knurled knob which is placed on the *air pipe* leading to the carburettor (see Fig. 1 on p. 11). This knob acts on a butterfly which enables the amount of air admitted to be reduced and consequently if half closed, will enrich the mixture. By turning the knob clockwise you close the butterfly. We call this knob the *air intake control* throughout these instructions.

The *air intake control* must be nearly closed for starting and also for a short while after starting so as to ensure an intensified lubrication at the start. In very cold weather it can also be kept slightly closed, otherwise it should be left wide open.

Fuel Controls.

These consist of two taps shutting off the fuel from the respective tanks. We call the *petrol tap* the one which controls the *auxiliary tank* situated in front and the *main fuel tap* the one controlling the *main tank*. The *petrol tap* should be opened for starting the engine during the first 10 minutes of running and also during a few minutes before stopping the engine. The *main fuel tap* is to be opened during the normal working.

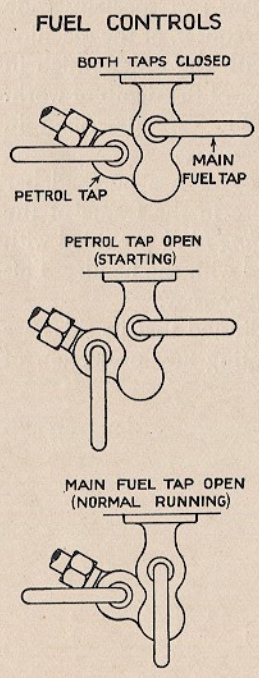

Fig. 7.

The two taps should not be left open together. When the engine is not at work, shut both taps. The taps are open when the finger points towards the rear and shut when the finger points sideways, at right angles.

Drain Tap.

A tap is to be found under the bottom of the engine crankcase.

This tap enables the crankcase to be drained of any fuel or oil which might have accumulated inside.

We call this tap the *drain tap* throughout these instructions.

To drain the crankcase, open the *drain tap*, then turn the *starting pulley* by hand until all the liquid in the crankcase has been ejected ; then close the *drain tap*.

Care should be taken never to work with the machine with the drain tap open as this would lead to dust being sucked into the crankcase.

The *drain tap* is shut when the finger is horizontal ; it is open when the finger is vertical.

III. *Carburettor*

Recommendation. We strongly recommend the beginner who is not well acquainted with the carburettor to avoid changing the setting of the carburettor without making a preliminary note of the original adjustment and setting of the *needle rod* so as to enable him always to return to the original position.

In order to avoid the necessity of altering the position of the *needle rod* when starting from cold, the air pipe preceding the carburettor is fitted with an air intake control (see preceding chapter) which in the ordinary way is sufficient to secure satisfactory starting without further attention being given to the setting of the carburettor needle rod.

Tuning. Access to the carburettor is obtained by removing the *bonnet* forming the front part of the machine. The carburettor is fitted with a special *rubber cap* for the purpose of preventing any dust from getting access to the air passages.

This particular detail shows clearly the pains we have taken to obviate any trouble arising out of dust. It is on the other hand essential that the *rubber cap* should be kept in good order, properly fitted on the carburettor and replaced if perished. By slipping the *rubber cap* away from the top ring of the carburettor, access is obtained to the *needle rod* fitted with a small *cross bar*.

The *needle rod* extends inside the carburettor and carries the *needle*.

The *needle rod* can be turned by hand and serves to increase or reduce the proportion of fuel admitted. When unscrewing the *needle rod*, viz., turning it to the left (anti-clockwise) looking at the top of the carburettor, the amount of fuel is increased ; by screwing it down, viz., turning it to the right (clockwise) looking at the top of carburettor, the amount is reduced.

The machines when delivered are tuned up and should consequently require no further attention concerning the *needle rod*.

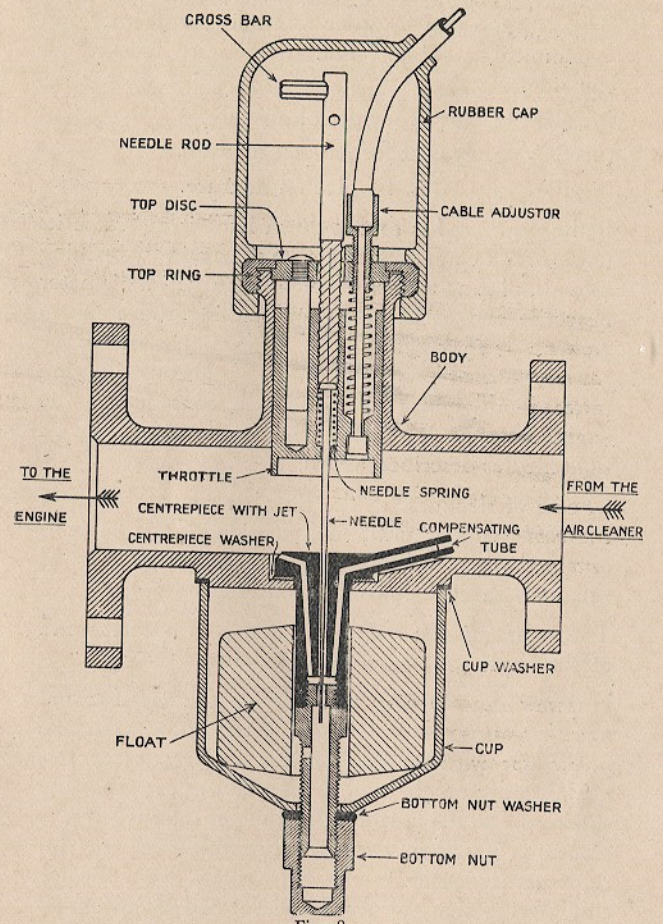

Fig. 8.

However, subsequent tuning may be found necessary and we summarise a few hints on this subject.

If the engine "spits" it is proof that the mixture is too weak ; the *needle rod* should be unscrewed until a normal running of the engine is obtained. If the engine "fourstrokes" even when it is under load, in other words, if only one explosion is taking place out of 2 or 3 compression strokes, it is proof that the mixture is too rich and the *needle rod* should be screwed down.

We have already mentioned that the carburettor *needle* must be different according to the fuel used. This is important in order to obtain satisfactory and economical running. The needles are marked on the side.

Needle No. 2 is fit for petrol mixture.

Needle No. 2½ is fit for paraffin mixture.

Needle No. 3 is fit for alcohol mixture.

Needle Rod Working Loose.

If the *needle rod* is forced down hard it may lose its tension, but can easily be tightened again by opening its ends, placing a piece of rod about 3/32 in. diameter near the end of the slots and closing the ends together. It may occasionally happen that the *needle rod* if somewhat loose will, under the effect of vibration move round and the tuning will consequently be altered. If this is observed the needle rod should be tightened as described above.

Carburettor Control Adjustment.

In case of slackness in the Bowden control, unscrew the *cable adjustor* until such tension of the cable is obtained which will enable the engine to be stopped when the throttle control is fully turned out.

The *cable adjustor* is located at the carburettor end of the cable.

To Change Needle.

Unscrew the *top ring* and remove the *top disc* and *throttle ;* unscrew the *needle rod ;* now take the *needle* out with its small *needle spring ;* place this *needle spring* on the new *needle,* taking care that the small coil of the spring is at the top of the *needle ;* place the *needle* in *throttle,* screw the *needle rod* in, replace the *throttle* in the *body,* screw down the *top* ring (seeing that the *top disc* is located by means of the pip in its slot).

Hints on Dismantling for Cleaning.

The carburettor will be best dismantled after first detaching it from the engine. Remove the *throttle,* turn carburettor upside down and unscrew the *bottom nut,* take off the *bottom nut washer,* lift the *cup* off, take the *float* off, lift out the fuel needle (not shown on the picture), remove the *cup washer* and unscrew the *compensating tube.* The *centre piece with jet* and the *centre-piece washer* will now drop out. Do not unscrew jet from centre piece.

Assembling.

First see that every part is clean. Place the *centre piece* in position with the washer under the head ; screw the *compensating tube* in and make quite sure that it is tightly home. A loose *compensating tube* may be sucked into the engine with the consequence of heavy damage. Place the *cup washer* in position ; place the *fuel needle* (not shown on the picture) in position, making sure it is the right way up.

Place the *float* in position ; place the *cup* on, then the *bottom nut* with *washer,* and tighten same with spanner without using much force and making sure beforehand that the *compensating tube* is properly lodged in the space provided for it inside the *body.*

IV. Working

In this present chapter, we have summarised the essential points concerning the practical handling of the machine. The following chapter (V) supplements the present one by giving further details.

Before Starting the Engine.

Remove the road rims and road travelling wheels and put them aside. Then proceed to make a thorough inspection of the machine, making sure that everything is in order. In particular ascertain :—

That the contents of the tanks consists of fuel mixed preliminarily with the correct amount of oil.

That the air cleaner is in proper working condition, viz., that the canvas bag is clean and sound ; that the wood shavings are sufficiently clean and properly soaked with oil.

This having been done, proceed as follows :—

Place the *gear control* in neutral ; it is in neutral when the machine can be moved to and fro by hand.

Place the *miller control* in the forward position. You can ascertain this by trying to move the miller by hand ; if it turns freely the position is right.

Place the *throttle control* in an intermediate position about a quarter of an inch from the closed position.

Place the *magneto control* on starting.

Place the *depth control* and the *miller cover control* at the required positions for the work you intend to do.

Place the *steering height position control* to the height of the steering suitable for the driver and the work intended.

If it is surmised that fuel has accumulated in the crankcase drain the crankcase as described before on page 21, and do not forget to shut the *drain tap* after the operation.

Place the *petrol tap* in the open position (see page 20).

Flood the carburettor by pressing on the tickler until petrol appears.

Place the *air intake control* in nearly closed position and in cold weather in the fully closed position.

Starting and Running the Engine.

Wind the starting belt clockwise round the *starting pulley* taking care that the catches on the steel piece fitted on the end of the belt are engaged in holes provided on the pulley ; then place one foot against the right-hand driving wheel and pull slowly on the belt so as to give a few idle turns of the engine in order to admit gas in the cylinder. Then rewind the belt and pull sharply to start.

As soon as the engine runs place the *magneto control* at " *running* " ; regulate the engine speed by means of the *throttle control* and after a while open the *air intake control*.

The machine is then ready for work.

The starting belt can conveniently be looped over the upper cross member of the steering arms.

After 10 minutes' work switch over to the *main fuel tank* by closing the *petrol tap* and opening the *normal fuel tap*. (See page 20.)

Recommendations concerning the Running of the Engine.

The engine is designed for heavy duty. It is very robust and will give excellent service provided proper care is given. Its life will be practically unlimited if attention is given to the following recommendations :—

Correct air-cleaning : on which we cannot too strongly insist, is described in Chapter I.

Correct lubrication : on which we cannot too strongly insist, is described in Chapter I.

Running-in of a new engine : In addition to what has been said in this respect, we may mention that it is good practice on a new engine to increase the oil contents of the petrol in the *main tank* up to 8% and always to start the engine and to stop on the *auxiliary tank* as will be described further in this book.

In doing so the engine will be slightly over-lubricated during the running-in period. When a machine is given its first run it will be noticed that power is somewhat lacking for a certain period. The reason for this is that the engine is somewhat stiff. A progressive improvement will take place in the course

of time. It is most important in the early life of a new engine to abstain from excessive engine speed, to allow the frictional surfaces to get thoroughly run in and thus avoid the possibility of damage and seizure.

It is a great mistake to drive the machine under full load before say 30 or 40 hours work have been completed.

During the running-in period, the engine must be carefully watched for signs of piston seizure, and if it should happen no attempt should be made to continue running.

Warming up : When the engine has been started as described above, it is advisable to let it run idle at slow speed a few minutes and during that time to keep the *air intake control* nearly closed. By doing this the deposit of oil in the engine is temporarily increased and ensures a thorough lubrication of all its elements before it is placed under actual load.

Engine speed : It is bad practice to race the engine and particularly to do so when the engine is cold. Generally speaking avoid letting the engine run at an excessive speed especially when not under load.

Labouring of the engine : Although the engine is designed for heavy duty and every precaution in its construction has been taken to enable it to sustain any overload, it is nevertheless not a sound practice systematically to require from the engine its full working capacity and to make it labour and possibly knock under a permanently extreme load. The work in hand will not in that way be finished any sooner and on the contrary more soil will be turned within the same time if the engine is allowed to have its free run at a normal number of revolutions even if the field has to be gone twice over to obtain the required depth.

Working. Engage a speed by pushing the *gear control* for *bottom speed* or pulling it for *top speed.*

Use the *steering side position control* to choose a position for the steering arms best suited for the work.

Engage the miller by pulling the *miller control,* at the same time holding the rear of the machine, viz., the miller, clear of the ground, then let the miller get a progressive grip with the soil by releasing your support and at the same time increasing the engine speed by opening progressively the throttle control. Remarks concerning the working : Certain wrong practices are liable to endanger the safety of the mechanism, more especially when working on stiff soil, and we call your attention to the following important recommendations :—

Do not engage speeds or miller whilst the engine is racing.

Do not engage miller whilst tines are in contact with the ground.

Do not engage speeds whilst moving the machine about by hand.

CONTROLS

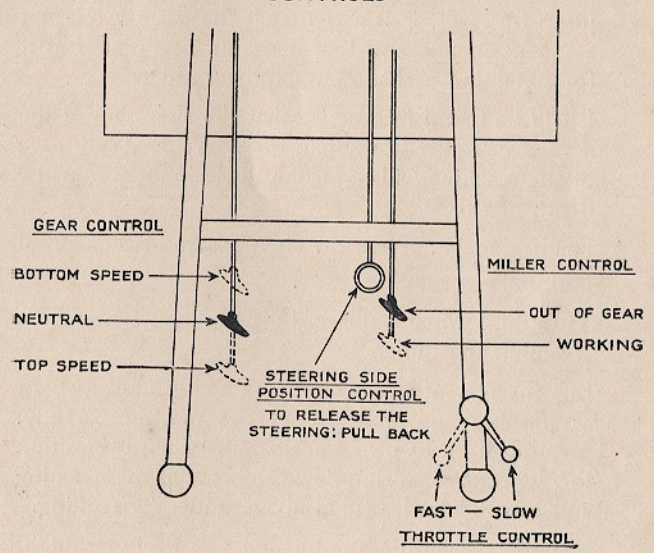

Fig 9.

Depth Regulation. **The proper setting of the *depth bar* is not only necessary in order to obtain a tillage at the required depth but is also necessary in order to prevent the slipping of the driving wheels.**

The *depth bar* (whether it is or is not fitted with the *depth shoe*) acts as a regulator of the forward motion and prevents the possibility of the machine jumping forward. On the other hand if the braking action of the *depth bar* is exaggerated it may tend to stop the forward motion, creating wheel spin.

It is important that the driver should clearly understand this function and that he should remember the following points which will considerably facilitate his work.

If the driving wheels labour in carrying the machine forwards or have the tendency to dig themselves into the ground, it is proof that the *depth bar* is set too deep and that it should be brought nearer the miller casing.

If the opposite happens, in other words, if the driving wheels are unable to keep the machine back at the proper pace, and the machine has a tendency to jump forwards, it is a sign that the *depth bar* is not set deep enough and that it should be lowered as if for obtaining a shallower depth of tillage.

It will be found in practice that the alteration of the *depth bar* required to obtain the desirable steady pace of the machine will have only little influence on the depth of tillage.

Turning at the end of a row.

For beginners : Place the *steering arm* in the central position.

Throttle down but not so far as to stall the engine. Declutch the miller.

Lift the rear of the machine off the ground as high as possible and walk round the machine briskly, pivoting it on its own wheelbase. When in position for the next row bring down the rear of the machine and proceed as described above under " Working."

Remarks concerning the turning : A beginner might have the tendency to try and guide the machine round but this is not the proper way of turning.

What has to be done is to pivot the machine on its own wheel base, the driver turning round the machine and not following it in a curve.

For trained drivers : Throttle down sharply, and instantly after doing so lift the rear of the machine out of the ground ; then place the *throttle control* so that the engine runs smoothly at reduced speed.

Then walk round the machine keeping the steering arms as high as possible. When in the right position for starting on the next row bring the rear of the machine down, progressively attacking the ground with the miller and simultaneously and progressively opening the throttle until it is fully open.

A further point of importance is the lifting of the machine as high as possible so as to reduce the exertion required. In fact, the more the nose of the machine points downwards, the less weight is left to be carried by the driver and the driver has further a much better position of the body to carry this remaining weight as he is thus able to keep the arms stretched.

To Stop.

To stop the machine first declutch the miller by pushing the *miller control.*

Throttle down by acting on the *throttle control.*

Place the *gear control* in neutral.

Switch over from main fuel to petrol.

If using paraffin mixture or alcohol let the engine run for another 5 minutes on petrol or work with the machine for another 5 minutes on petrol.

To stop the engine close the *petrol tap* **and let the carburettor run dry.** By doing so, instead of stopping the engine dead you will enable the engine to cool down and you will guard against the petrol evaporating, and leaving in the carburettor a deposit of oil which may perhaps render restarting from cold somewhat difficult. Should this precaution have been forgotten, restarting will be helped by a generous flooding of the carburettor.

Road Travel.

Fit the road rims on to the wheels.

Fit the pair of road travelling wheels on to the rear of the miller.

Start the engine.

Put into top speed.

Do not travel too fast on the hard road in order to avoid excessive vibration.

After Use.

When the work is completed and the machine is put away for a while, it is essential that it should be cleaned and inspected and those parts subject to rust, coated with oil. Tighten the nuts, screws bolts, etc., which might have become loose under vibration.

Dirt is no good to anything—least of all to mechanism and the mere fact of cleaning a machine frequently draws one's attention to some small defect of mal-adjustment, which, if neglected, might result in accident or damage.

V. Recommendations and Hints concerning the use of the Machine

Engine Lubrication.

Insufficient lubrication of the engine either on account of the fuel being used without the right proportion of oil mixed therewith or the use of poor quality oil may not cause engine trouble immediately, but it is bound to create abnormal wear, especially of the piston, piston rings and cylinder. Once the abnormal wear has begun it will develop gradually, even if proper lubrication is subsequently provided for. It is consequently obvious that the engine itself should not, in every case, be expected to show symptoms of improper lubrication at the time of default in the lubrication otherwise than perhaps by a slight overheating.

Consequently, checking the mixture of oil and fuel at the time of an accident to the engine due to lack of lubrication can give no valid proof of the cause, as the damage may have been started long before the time of the final refusal to work.

The use of poor quality oil may be compensated for by increasing the quantity of oil per unit of petrol, but the practice of using anything but first class oil is a doubtful one and cannot be recommended, neither can we accept any responsibility for the results of its use. A further recommendation already mentioned is to thoroughly mix the oil with the fuel before introduction into the tanks.

It is good practice to prepare in advance the bulk of fuel mixture for the day or the week's work and to supply to the driver exclusively fuel mixture to the exclusion of fuel not preliminarily mixed with the right proportion of oil.

Concerning Gear and Miller Controls.

A reckless use of the *gear and miller controls* will obviously lead to the repair shop in the same way as if this is done on a motor car.

All precautions have been taken in designing the machine to prevent abnormal strain, such as for instance, the insertion of friction hubs which will absorb any excessive effort put on the gears.

Nevertheless, a careful driver should make a rule of the following advice :—

Do not try to force the *gear control* **or the** *miller control* **to the required positions ;** use skill and decision but no force.

Do not engage the miller before a speed has been engaged and do not disengage a speed before the miller has been declutched.

Do not engage speeds or miller whilst the engine is racing. A few words of explanation in this connection are necessary. When the gears are being engaged, the momentum of the machine has to be overcome and the effort on the gears is in proportion to the speed of the engine at the time of clutching.

The gears are protected against strain by the possibility of the slipping of the hubs and they are so built that they are quite strong enough to sustain the effort at a normal speed of the engine. This recommendation applies also when about to travel on the road. The same applies to a lesser extent to the clutching in of the miller. In consequence, it is advisable to make it a rule to throttle down the engine to a lower number of revolutions when engaging the gears or the miller.

A further useful hint is to exert a slight pressure forward on the steering arm whenever engaging or disengaging a speed.

This hand pressure reduces the effort sustained by the mechanism in overcoming the momentum and facilitates the slipping in and out of the dogs.

Do not engage the miller whilst the tines are in contact with the ground. The miller gears are so designed that they are able to transmit the full engine power to the miller, but if the miller control is being engaged when the miller tines are in contact with the ground, the effort represents the sum of the momentum and the maximum tillage work, and may become dangerous for the transmission.

Do not engage speeds whilst moving the machine about by hand. By engaging speeds whilst moving the machine about by hand or down a slope, it is not possible to transmit a motion to the engine (as on a motor-cycle), because the gears are irreversible.

The only result obtained will be a sudden stop of the machine and an absorption of its momentum by the gears, with the danger of an exaggerated strain.

Do not try to get the utmost power out of the engine on stiff soil during the first few weeks of work with a new machine. This item is obvious and as is the case with the points mentioned above, is closely related to what is expected of the driver of a car, who should not for example engage the bottom speed when the car is travelling free down hill with the engine stopped, and who should not try to get the utmost performance out of his engine before the first 500 miles or so have been covered.

Practising to Drive and Work the Machine.

Before attempting to deal with special conditions of work such as working between rows in plantations, it is advisable to acquire good practice in driving by working the machine on open land and preferably on light soil.

The driver after a certain time will become so used to the machine that he will " feel " exactly what the miller is doing. An experienced driver can deal with rough soil and dig up large stones without breaking a tine. A few weeks' intelligent practice will enable a willing driver to obtain from the machine the fulfilment of astounding tasks.

Do not try to make a sharp turn with the miller engaged in the ground, as an abnormal strain would thus be put on the tines and the work would be uneven and unsatisfactory.

Do not let anybody who has not been trained on the machine drive it without supervision. It is not safe.

Do not attempt to manipulate the miller or its cover in any way, either with the hand or with the foot, whilst the tines are rotating.

Do not let anybody come near the machine except the driver—it is possible that an inexperienced person could get a limb entangled in the miller.

Guiding the Machine Straight.

A beginner may meet some difficulty in getting the machine to follow a straight course and in bringing the machine in the straight, once it has been deviated. The best method to bring the machine back into the straight consists of pulling back the machine as though to prevent it from moving forward and of taking advantage of the slight slipping of the driving wheels which then takes place to bring the wheels back into a straight line by exerting a side pressure on the steering arm at the same time as the backwards pull. In other words, the machine is more or less being pivoted round the miller as its centre and can consequently be brought back into the proper line without necessitating biting into the side of the track with the miller.

Working on Uneven Ground.

It is difficult to get good results on ground which is very uneven, such as a ploughed field or a partly dug plot. The difficulty is increased when the work is required to be accurate, as for instance, between rows of plants leaving only just enough room for the machine to go between. The holes in the ground bring about a rocking motion of the machine and in consequence render accurate steering difficult.

It is consequently advisable to arrange for the various operations on the land to be so organised as to leave the soil as even as possible before the machine is applied to tillage or cultivation work.

Mud Accumulation on Miller Cover.

When working on sticky and muddy soil, it may happen that earth will accumulate on the miller cover and dustboard. This accumulation may reach such an extent that it will render the rear of the machine very heavy and prevent an easy management of the machine.

This nuisance can be considerably reduced by carefully washing and drying the miller cover and dustboard and coating them with thick oil.

Obsolete engine or gear oil may fulfil this purpose satisfactorily.

The miller cover is easily removable from the machine thus rendering this operation an easy one.

Farmyard Manure.

When dealing with farmyard manure spread over the field, it is advisable to go over the ground first at *top speed* and shallow depth, subsequently getting the required depth of tillage by a second operation on *bottom speed.*

Working on Slopes.

Slopes can be tilled by working up and down hill or they can be worked by following a level track along the slope.

When **working up and down** it will be for the driver to choose the best speed and procedure according to the nature of the ground. It can be said that when going uphill on soft soil the top speed will give less tendency to wheelslip.

Deep tillage can consequently efficiently be tackled by going uphill on top and down on bottom speed covering the previous uphill track. It is recommended not to race the engine above normal limits when going down hill.

When **working on a level track along the slope** it is essential to begin work at the top of the slope. In so doing it will be much easier for the driver to redress the course of the machine should a driving wheel fall in the already tilled ground. The slope itself will help him to redress the machine. This remark applies even for very small gradients, which are practically inappreciable.

Considerable inconvenience will be avoided in always choosing the layout of the work so that the machine should never, in working along a slope, have to cover ground which is on a higher level than that already tilled.

Wheel Slip.

On loose soil of a very light texture or in particularly slippery and waterlogged fields it may happen that " wheelslip " takes place; the driving wheels rotate without driving the machine forward and they bury themselves into the ground.

In this connection it must be remembered that the machine is so designed that the miller must help the forward motion in order to secure the maximum efficiency and the explanations given below are the outcome of this principle. If wheel slip takes place it means generally that the miller is not helping forward the motion of the machine to the extent that it should do.

If **shallow work** is required it is advisable to work on loose soil at top speed and to regulate the *depth bar* until the proper depth is attained. A further help consists of fitting the wide *depth shoe* which is

supplied on request, and is described in Chapter **IX** dealing with accessories. The roller which is also described in the chapter on accessories can also be used as a depth regulator in order to enable shallow work on very light soil to be carried out.

If **deep work** is required it is necessary to use the bottom speed. In this case a wise use of the depth bar must be made in order to avoid wheel slip. If the depth bar is set to stand away from the miller gearbox it will work as a brake and prevent or overcome the effort of the miller to push the machine forward. It is consequently advisable to keep the depth bar near the miller gearbox. In so doing the depth bar will not work as a brake and on the other hand the miller will get a chance to get a good grip on the subsoil which will help to push the machine forward.

In connection with this question of wheelslip it is to be noted that besides applying correctly the above advice, **a further element of importance resides in the skill of the driver** who, with a slight pressure forward or upward applied at the proper moment on the steering arm will prevent wheelslip.

While it is difficult to overcome wheelslip once it is already engaged in burying the wheels, it is on the other hand a light job to prevent it if action is taken in time.

A further remark is that **the wheelslip will more readily take place if the engine is being raced** and it is recommendable to run it at a steady pace to avoid wheelslip.

Should the wheelslip not be curable by the above mentioned suggestions, resort should be taken to fitting **rim extensions,** which are described among the accessories.

Straying.

The novice driver will be faced with some difficulty at the beginning in keeping a straight line.

The difficulty will increase when the work in hand is flat work on the open land where one track has to overlap slightly the preceding one. If the first track is twisted and broken it will be difficult to follow with

the next track securing the proper overlapping without falling with the driving wheels into the already tilled ground. A few hints in this connection might prove useful for the layman.

1.—To follow a straight course the driver should look ahead of the machine so as to immediately feel when the machine tends to come out of the straight line, and so be able to act in time.

2.—Immediately the driver feels this tendency he should straighten the course by pulling the machine back and forcing it to pivot round the miller.

3.—If it happens that one of the driving wheels falls into the already tilled ground, and if by following the method under 2 above the driver is unable to bring it back into proper position, with both wheels on the solid ground, he will have to swing round at a sharp angle going far into the already tilled ground with the miller. Subsequently the driver will have to cover the small stretch left untilled, and will have to do this as a separate operation.

4.—A beginner will have a better chance to keep the machine straight if he chooses to walk behind the machine with the steering in the middle position. This, however, has the drawback of compelling him to walk on the tilled ground.

Weeds.

The eradication of weeds in general and especially of weed described as couch, twitch, wicker, and elephant grass, is a very vexed question for the agriculturist.

The Rototiller wisely applied to this task will enable it to be executed to the best of satisfaction.

In the first place, however, it is necessary to remember that the fine preparation of soil by rototillage creates the best conditions for the growth or the germination of plants and this applies equally well to the crops as to the weeds. It is obvious in consequence that rototillage should be applied with carefully studied method to land infested with weeds, in order to obtain the destruction of these weeds and not their propagation.

For weeds which propagate more readily through seeds than through their roots, the best method consists in going over with the Rototiller at shallow

depth choosing a dry spell of weather when the bruised plants left on the surface of the soil will dry in the sun and become sterile.

The next problem concerns the weed seeds. These seeds are spread in various layers in the ground, those located in deeper layers will wait their chance to grow until the tillage operations have brought them to a layer nearer to the surface of the soil.

If the agriculturist wishes to eliminate this potential cause of weeds he should after having eliminated the existing weeds, work the Rototiller deep, choosing for this purpose the best season for quick germination. The weed seeds are thus given their best chance to grow and very soon the land will be covered with a dense crop of weeds which will appear to the layman as if the Rototiller had actually sown the weeds instead of eradicating them.

If, however, the machine is put over the ground again before this new crop of weeds has had the chance to form new seeds it will be found that subsequently the land will be really cleared from weeds.

According to the conditions of the land it may be found necessary to repeat this operation consisting in fostering the germination of the weed seeds, subsequently destroying these new weeds in their infancy.

If these operations are done in the correct way it will be found that whereas it has entailed an appreciable amount of work during the first year, the land will be so thoroughly cleaned that during subsequent years very little work will be necessary in connection with the fighting of weeds.

The case of weeds with propagating roots such as couch grass, etc., has to be dealt with in a somewhat different manner.

If the first place it is not much use to work the Rototiller on land overgrown with couch grass, if the couch grass is thick and attains heights of more than 6 ins. or 7 ins. It is best to cut down this harvest of couch grass and to burn it. Once this has been done, or if the couch infested soil is dealt with very early in the season, the Rototiller can be put over it fitted with normal tines and working at a depth of

3 to 4 ins. This operation will extract the roots, and in order that these roots should be left as much as possible on the surface of the soil, the dust board of the machine should be turned up or removed.

The next operation will consist in gathering the roots together by means of a light harrow.

The land can be then left until such time when the roots which have been missed by the harrow have again shooted by a few inches. The second passage with the Rototiller will extract this second growth of couch grass which again can be gathered together and burned. These subsequent operations could progressively be done at a greater depth so as to extract such parts of roots which are located deeper in the ground.

If it is found impossible to go to the expense of first cutting and burning the couch grass the best method will consist in going over the ground with the Rototiller using the mixed outfit of normal tines and antichoke tines, and using the machine more to chop off the grass than to till the ground to any depth.

Here again the best method will be to collect the chopped grass after the passage of the machine and to burn it. If during this operation with the Rototiller clogging takes place, it will be necessary to fit the miller exclusively with antichoke tines, and otherwise operate in the same way.

Practical tests have shown that the Rototiller will enable infested land to be cleaned at what can be safely stated to be a minimum expense, but we repeat that the procedure requires careful survey of the general conditions, viz., nature of land, moisture of the soil, choice of the season, amount of sunshine, etc. An incorrect method or an incomplete campaign against the weeds may have effects more detrimental than beneficial.

VI. Tines and Springs

Tines and Springs.

The working tool is known as the tine. It is mounted on an elastic holder known as the spring which serves as a safety valve to take up all the jerks transmitted to the spring when a tine meets an obstacle of any sort. To fit the spring on the miller sleeve, engage the two free ends of the spring in the sockets provided on the miller sleeve and push the spring in until the ends are so far engaged that the holes in the same are clear of the sockets. Then fit a pin across the two ends of the spring and bend the ends of the pin so that it cannot get loose. To remove a spring it is not necessary to remove the pin as the latter will shear quite easily by gently hammering the free ends of the spring.

To fit a tine on the spring follow the procedure as shown by Fig. 10 and properly secure it in position by hammering it in as shown in Fig. 11, taking care to hold a block of wood behind the loop of the spring.

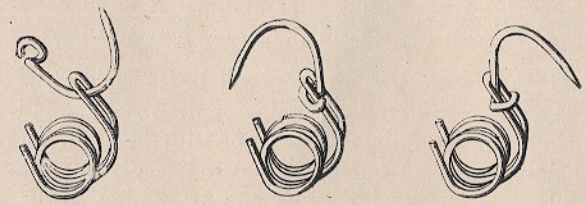

Fig 10.

To fit a tine it is not necessary to remove the spring from the miller as there is sufficient clearance for any tine to be removed from the miller and replaced.

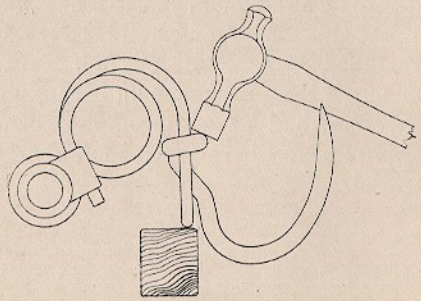

Fig. 11.

Care should be taken to fit specially shaped tines on the springs nearest to the miller gearbox on each side of the miller; this is necessary to obtain thorough tillage work under the miller casing. How this should be done will be described below.

There are various classes of tines and in each class different types.

The Tines Various Classes.

The various classes are the following :—

The normal miller tines : These tines are fitted as standard to the machine. The primary use of these tines is for deep tillage, but they are equally useful for shallow work.

Fig. 12.

Normal tines can be used until they are entirely worn, but the depth of cultivation will begin to be reduced after about three inches have been worn away. Worn out tines can be profitably used when, in working between narrow rows, it is required to reduce the depth of cultivation at the extremities of the miller in order to avoid the danger of damaging roots.

Antichoke tines. These tines are supplied for dealing with abnormally weedy ground. These are special tines with a straight shaft and cutting edge, and have been designed to prevent the choking of the miller. Their action consists of cutting the long fibres which are in consequence prevented from accumulating on the hook-shaped tines, rendering them self-cleaning. These tines can also be effectively employed for rejuvenation of pasture-land. The antichoke tines should not be used for deep work on stiffer soil on account of the exaggerated strain which they would put on the spring and the consecutive danger of excessive spring breakages.

Fig. 13.

Curved antichoke tines. A further class of tine is available which is similar to the antichoke tine, except that the shaft is bent at the end approximately at right-angles. These tines will be found of use for moderately deep tillage especially where a coarser tilth is desired than that which is obtained with the normal tines, while there is no tendency to choke in cases where

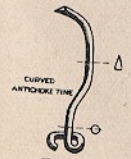

Fig. 14.

weedy land has to be dealt with. They can also be used in preference to the normal antichoke tine, where shallow cultivation is wanted on land over-run with weeds.

Scuffling tines. Two distinct classes of tines are supplied for purposes of surface scarifying.

The use of the broad scuffling tines leaves no portion of the ground surface undisturbed.

The narrow scuffling tines will penetrate a little more deeply into the soil surface than the broad scuffling tine. Both types will be found very effective for

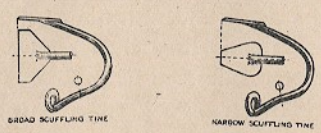

Fig. 16.

cleaning the surface of the land from weeds, and for disturbing the top soil, and maintaining a dust mulch. The scuffling tines, whether of broad or narrow type, can be used as normal tines once the scuffling plates have been worn out.

Tines. Various types of tines in each class.

The illustration on page 45 shows clearly each class of tine and in each class the various types which for purpose of reference have been designated by a reference letter.

The tines under letters B, C, E, F, I, K, are of a shape allowing for their passage as near as possible to the tube of the miller gearbox and enable an evenly deep tilth to be obtained without leaving an unworked ridge under the miller casing.
It is specially recommended not to fit these tines on the extremities of the millers where owing to their shape they would become liable to catch and damage the sides of the miller cover.

It is consequently important to fit each type of tine in its proper place and for the purpose of guidance we give in the tables appearing overleaf the normal setting of tines and a few of the combinations which might be used in practice.

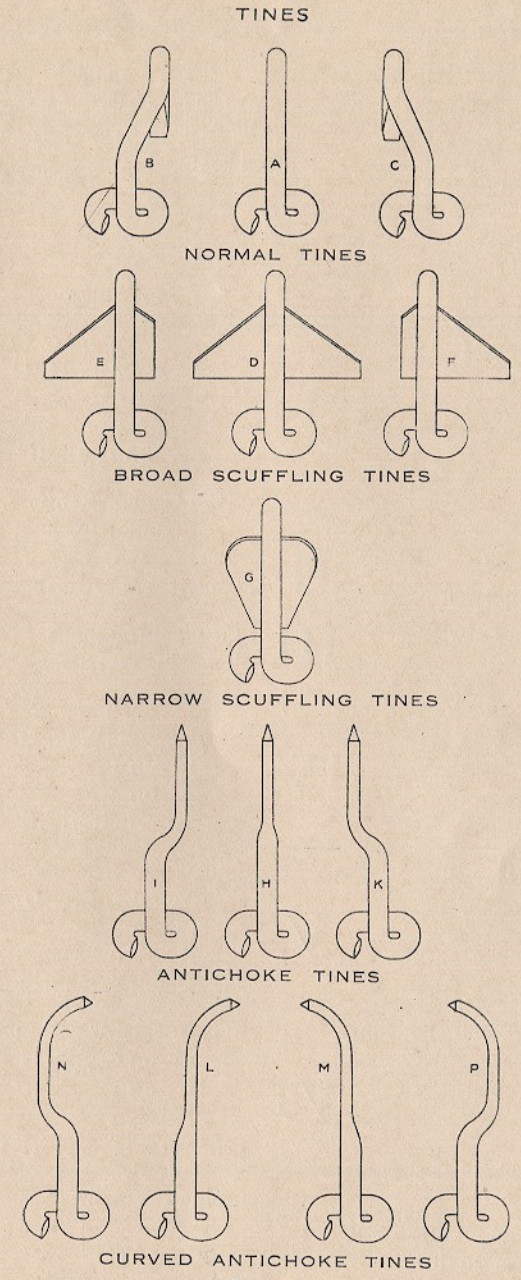

Fig. 17.

The letters A.B. etc., appearing on this page denote the various types of tines illustrated on page 45.

STANDARD MILLER

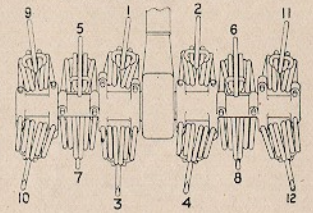

Fig. 18.

12 Tines.

Normal Tines	I	Fit A on 2, 3, 5, 6, 7 8, 9, 10, 11, 12 B on 1 C on 4 One Set = 10A–1B–1C
Broad Scuffling Tines	II	Fit D on 2, 3, 5, 6, 7, 8 E on 1, 10, 12 F on 4, 9, 11 One Set = 6D–3E–3F
Narrow Scuffling Tines	III	Fit G throughout One Set = 12G
Antichoke Tines	IV	Fit H on 2, 3, 5, 6, 7 8, 9, 10, 11, 12 I on 1 K on 4 One Set = 10H–1I–1K
Curved Antichoke Tines	V	Fit L on 2, 7, 8, 9, 10 M on 3, 5, 6, 11, 12 N on 4 P on 1 One Set = 5L–5M–1N–1P
Mixed Normal and Antichoke Tines	VI	Fit A on 2, 3, 5, 8, 10, 11 H on 6, 7, 9, 12 I on 1 K on 4 One Set = 6A–4H–1I–1K

For:—	Use combination marked:—
Deep or medium tillage on clean soil	**I**
Deep or medium tillage on dirty soil	**VI**
Tillage on very dirty soil	**IV**

NARROW MILLER

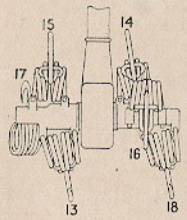

Fig. 19.

6 Tines.

TWIN MILLER

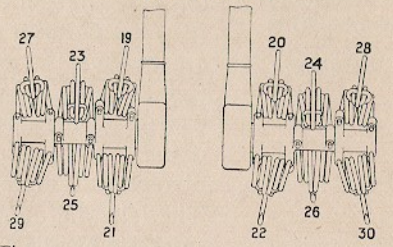

Fig. 20.

12 Tines.

Fit A on 15, 16, 17, 18 B on 13 C on 14 One Set = 4A–1B–1C	Fit A on 20, 21, 23, 24, 25, 26 27, 28, 29, 30 I on 19 K on 22 One Set = 10A–1I–1K
Fit D on 15, 16 E on 13, 18 F on 14, 17 One Set = 2D–2E–2F	Fit D on 20, 21, 23, 24, 25, 26 E on 19, 28, 30 F on 22, 27, 29 One Set = 6D–3E–3F
Fit G throughout One Set = 6G	Not to be fitted.
Fit H on 15, 16, 17, 18 I on 13 K on 14 One Set = 4H–1I–1K	Fit H on 20, 21, 23, 24, 25, 26 27, 28, 29, 30 I on 19 K on 22 One Set = 10H–1I–1K
Fit L on 15, 18 M on 16, 17 N on 14 P on 13 One Set = 2L–2M–1N–1P	Fit L on 20, 25, 26 M on 21, 23, 24 N on 22, 27, 28 P on 19, 29, 30 One Set = 4L–4M–4N–4P
Fit A on 15, 16, 17, 18 I on 13 K on 14 One Set = 4A–1I–1K	Fit A on 20, 21, 23, 26, 28, 29 H on 24, 25, 27, 30 I on 19 H or. 22 One Set = 6A–4H–1I–1H

For:—	Use combination marked:—
Deep scuffling	**III** or **V**
Surface scuffling	**II** or **V**
Coarse tilth	**V**

Preventing Abnormal Tine and Spring Breakages.

On very stiff soil or soil in which heavier stones or roots are frequent some care should be exercised in order to avoid an excessive strain on the working tools and consequent breakages, which are in no way a damage to the machine but which constitute a loss of the time required for the exchange and the expense of replacement.

The following hints will help a conscientious driver to obtain excellent results under all conditions.

It is not advisable to fit one spare new tine on a miller where the others are worn down as this new tine will have to sustain a heavier work than the others.

It is better in such a case to change one tine out of two.

Do not go on working if you hear an unusual noise in the miller, but stop the machine and look at the miller when you will find probably that a tin box, a piece of iron wire or some other refuse of this kind has been caught by the miller ; remove it before continuing your work.

Do not go on working if a tine has been strained and put out of shape. The consequence of this is an increase of the rake or clearance angle and unsatisfactory work.

Replace the strained tine and get the strained tine back into shape by holding it in a vice and bending it back, using for the purpose a piece of gas pipe or a similar tool.

Do not attempt to use the machine too deep in top gear; this gear is intended for purposes of surface work. When working the machine close to fruit trees, it is important not to attempt to work too deep, as if the tines catch on to thick roots, this is a likely cause of spring breakage, particularly if the *throttle control* is not carefully controlled.

Good advice for this type of work is to fit worn tines to the outside springs.

When breaking up the surface crust of the land, it is advisable not to attempt to work the machine too deep. Once this crust has been broken, then the depth shoe may be set down for deep tillage.

Do not let the miller into the ground too suddenly with the engine racing and the miller engaged.

When driving the machine on stony land the driver should glance straight forward. Should he see big surface stones he should lift miller when passing them.

When turning on rough headland lift the miller very clear from the ground. Otherwise if the driver lets the miller drop when walking over rough ground, this may cause spring breakage.

Check the springs and tines every few hours. Occasionally an outside spring which has become bent may be changed before doing damage to the miller casing or miller cover.

In driving the machine the operator should set the guiding handles so that his arms are stretched downwards and not bent at the elbow. By this method he is able to react more readily to the shock of meeting any obstacle hidden in the soil which might cause spring breakage.

The throttle should never be open any more than is necessary to obtain the required power for the actual work in hand, as any excess in this respect is delivered to the miller and is borne by the springs.

VII. Occasional Adjustments, Overhauls and Treatment of Accidents

Do not continue working if you have the slightest suspicion that anything is wrong. Take steps to ascertain that everything is in good order.

ENGINE

Tightening Cylinder Head.

It may happen that after some time of use a certain amount of slack takes place between the cylinder and cylinder head. This may lead to the escape of gas and to oil deposits being formed round the joint of the cylinder head.

In order to get access to the nuts fixing the cylinder head it is necessary to uncover the cylinder which should be done as follows :—

Remove the bonnet.

Release the Bowden control at the throttle lever and slip it out.

Release the union connecting fuel pipe to fuel tap.

Release the nut fixing the air pipe on its support.

Release the four nuts fixing the upper aluminium casing on the crankcase. (The upper aluminium casing is the part carrying the tank.)

You will then be able to slip out this upper aluminium casing together with the tank and side plates and the cylinder will become accessible from all sides.

Tightly screw down the four nuts holding the cylinder head, after having ascertained that the copper and asbestos joint is in good condition.

The screwing down of the four nuts of the cylinder head should take place at the rate of a small fraction at a time in rotation so as to gradually and evenly increase the pressure.

Decarbonising.

After extensive use, the power of the engine may be found to drop to a certain extent and knocking may take place. This is due to carbon deposits in the

compression chamber, exhaust ports and exhaust manifold. The removal of these carbon deposits will restore full power to the engine.

To do this uncover the cylinder as described above.

Remove the four nuts fixing the cylinder on the crankcase.

Proceed to slip out the cylinder. Exercise great care not to damage the piston skirt. Do not use force in this process.

Make sure that the piston is near the bottom of its stroke.

Take special care not to bend the connecting rod sideways.

Place a piece of perfectly clean cloth round the connecting rod so as to protect the aperture of the crankcase against the fall of dirt or foreign matter of any sort into the crankcase.

Proceed to scrape off the carbon deposit on the piston head.

For this purpose use a blunt soft scraper or failing this a screw-driver. Take care not to burr the edges of the piston or its polished surface. On no account use emery cloth or sand-paper.

Inspect the piston rings and make sure that they have their normal play in their grooves and that they are not worn. Inspect the pegs holding the piston rings in position and make sure that they are not loose. This is a very important point as a defective peg may lead to ring breakages and possibly to an engine smash.

Then turn to the cylinder.

Remove the cylinder head fixed on to the cylinder by four nuts.

Remove the manifold, and from the manifold the carburettor and exhaust pipe.

Scrape off the deposit in the cylinder, on the cylinder head, in the manifold and the exhaust pipe, always taking care not to burr the faces on which the copper-asbestos joints are to rest, nor the polished surface inside the cylinder.

Carefully wash the cylinder, manifold and cylinder head in paraffin.

Reassemble the cylinder head and manifold on the cylinder.

Fit a new paper joint on the joint of the crankcase on which the cylinder will rest and coat the surface of the paper joint with Hermeticoll, Gold Size, or a similar product taking care to prevent any of it from getting access inside the crankcase.

Slightly lubricate the inside of cylinder and surface of the piston and after removing the cloth protecting the crankcase, reassemble the cylinder taking great care to slip the piston rings smoothly into the cylinder. When tightening the nuts fixing cylinder head on cylinder proceed gradually as described before under "Tightening Cylinder Head."

Subsequently reassemble the carburettor and exhaust pipe on manifold and the upper aluminium casing carrying the tank on the crankcase.

Piston Rings.

If the piston rings are worn and must be exchanged proceed as follows. Test the ring for fit in the ring grooves; it must be quite an easy push fit all round. The gap between the ends of the ring when it is compressed in the cylinder should allow for the width of the peg and a surplus of at least ten thousandths of an inch.

Cylinder Grinding.

If a piston has been worn, and requires exchanging it is very important to see that the bore of the cylinder is dead accurate and the walls parallel and round.

This can be ascertained by any reputable garage having a properly equipped repair shop ; and if it is found necessary, regrinding should be carried out.

MAGNETO

Timing of Magneto.

The magneto should not be removed unnecessarily and it is advisable not to touch it except in the presence of one of our service men. However, to help such users who may be unable to follow this advice we may state that the timing of the magneto is to be set so that the contact breaks with fully retarded magneto control when the piston is at the top of its stroke.

Care should be taken before replacing the magneto in position that the joint between magneto and the casing is perfectly tight so as to avoid the escape of gear oil or the introduction of dirt or water.

Magneto Defects.

Other details concerning the magneto will be found in the special magneto booklet supplied with each machine.

On the other hand the remedy chart (Chapter **VIII**) will be of use in tracing troubles to the magneto. If the user is not successful in tracing the fault of the magneto we advise him to apply to the nearest of the Service Depots which are listed on the magneto leaflet.

If an important fault is traced on the magneto of machines used in the United Kingdom the best course to resort to is to send this magneto back to our London Works who will immediately send another service magneto in exchange and who will subsequently send a report about the fault observed and its cause if the same is found to be of some importance.

MILLER

Cleaning the Miller Shaft.

From time to time and especially when putting the machine aside after the season it is advisable to clean the miller shaft and sleeves.

To do this, first remove the miller cover and thoroughly wash the miller (including the springs and tines) clean from dirt.

Then proceed to remove the miller sleeves which are the cast steel tubes on which the springs are mounted. To do so first extract the pins which fix the sleeves on the shaft, then slip out the sleeves along the miller shaft without using force. A tool such as a hammer is not necessary for the purpose.

The felt washers which you will find in the sleeves should be extracted, cleaned carefully and oiled. Then thoroughly clean by means of paraffin the miller shaft which has thus been uncovered. Take care that all grit is removed and coat the surfaces with clean oil.

Clean and oil the inside of the miller sleeves and replace the felt washers. Then fit the sleeves back on the miller taking care that the relative position of the sleeves is maintained as originally fitted, viz., according to the sketches given in the chapter dealing with tines and springs.

HUBS

Driving Wheels and Slip Hubs.

The driving wheels are mounted on *slip hubs* for the purpose of absorbing any abnormal strain or shock. The *centre plates* of the wheels are fitted with linings made of friction composition and are held under pressure in the hub by a coil spring located in the hub.

It is advisable occasionally to check the proper working of the slip hubs. This can be done as follows :—

The pressure given by the *hub spring* is calculated so that a certain amount of slip will take place when clutching in the top speed, the machine standing on a

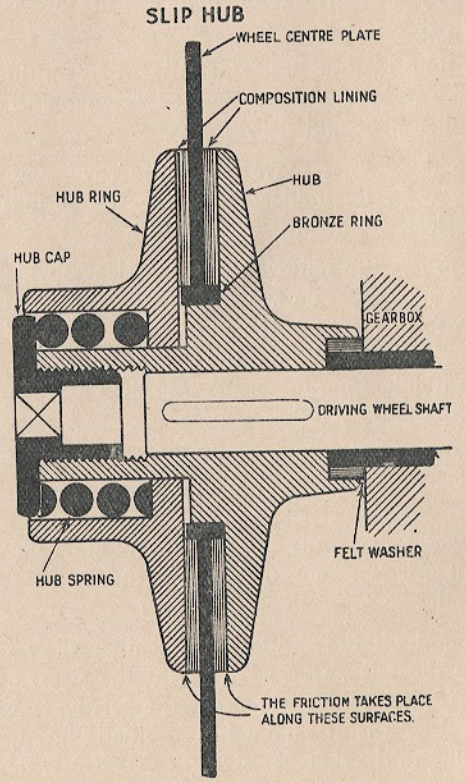

Fig. 21.

path or on stiffish soil. It is easy to observe this displacement by marking the hub and wheel centre plate with a corresponding line of chalk or pencil. If no displacement takes place after clutching in and declutching, even if the engine at the time of clutching is running at a good speed it is a sign that the hub is holding the wheel too stiffly ; the hub should be taken down, the flanges cleaned and polished and the surface of the composition on the wheel well cleaned. If on the other hand, in the course of the working of the machine an abnormal slipping of the wheels is observed, the hub should be dismantled, cleaned and the friction surface rubbed with rough emery paper.

The removal of the driving wheels is necessary for the purpose of the above described adjustment, and also when reducing the wheels to narrow gauge or when exchanging the normal wheels for the small diameter wheels. To remove the wheel it is necessary to slacken and remove the *hub cap*. For this purpose a special square section wrench is supplied in the toolkit. Subsequently remove the *hub spring* and the *hub ring*.

For extracting the wheel care should be taken that the *bronze ring* is not slipped out accidentally, or if it is removed, it should be carefully cleaned and replaced before the wheel is refitted. When re-assembling the hub, coat the steel part with thick oil and take care to tighten the *hub cap* hard. It is further recommended not to interchange the parts of one hub with those of the other. It is a good practice to fill the square hole in the *hub cap* with thick grease or a greased piece of clean rag, this will prevent internal rusting.

THREADS

Screws, Nuts and Bolts.

The threads used on the machine are of the S.I. Metric system except on the magneto and on the carburettor. When replacing a nut, bolt, or screw on the machine make sure that it is the correct thread.

SERVICE

Please remember that we are at your service for information and advice. We shall endeavour to help you to the full extent of our capabilities to obtain full satisfaction out of your machine.

Customers in the British Isles requiring their machine overhauled, decarbonized, or repaired would best bring or send it to our Works, carriage paid, with a label or note attached giving name and address, at the same time writing giving full instructions.

Customers abroad would best apply to our respective Distributors who will advise them of the best course to be adopted.

We strongly recommend whenever possible that the placing of the machine in the hands of local mechanics should be avoided, unless it has been possible to ascertain that they are fully qualified and competent to handle the machine with every care. Make sure that only genuine spare parts will be fitted.

VIII. Remedy Chart for Engine Trouble.

It is not practical to enumerate all the possible happenings which might require adjustment but the more common have been listed in the chart appearing on pp. 60-61, and the remedy shortly explained. The user by searching each point stated on the chart will find his work facilitated of locating the trouble.

Sparking Plug and H.T. Wire.

1. Sparking plug defective or of inferior quality—replace it. Or the gap of the plug points too small—put it right.
2. Remove sparking plug and clean it with petrol and a coarse brush.
3. The gap of the plugs points is too wide ; bring the points nearer together.
4. Change the plug, decarbonise the cylinder and piston—probable cause is bad quality oil.
5. Insulate the faulty lead or renew the lead.
6. Dismantle the terminal and clean it.

* * * * * * * *

Bowden Wire.

7. Change the cable and see that the outer member is intact.

* * * * * * * *

Magneto.

8. Release lever with a little paraffin ; then oil lightly. Do not oil too much.
9. Clean the platinum points carefully with a very clean rag, or with very fine emery cloth. Never use a file for this. If points are found defective change them.
10. Replace the defective carbon brush.
11. Adjust the gap of the platinum points and use for this the gauge fitted on the magneto spanner, giving the right distance required between the points.
12. Magneto control is in a wrong position, viz., on " Starting " position instead of " Running."

13. Clean the magneto **without removing it.** Do not clean the inside of the magneto either with petrol or alcohol. Only the contact breaker can occasionally be cleaned with a little pure paraffin.

* * * * * * * * *

Carburettor.

14. Press on the float tickler and let fuel drip out until you are sure that all the fuel left in the float chamber has gone and has been replaced by petrol mixture.

15. Unscrew the cup of the carburettor. Clean it, remove any foreign matter, and reassemble after cleaning all parts.

16. Unscrew the needle rod and adjust the jet until your engine runs perfectly.

17. The correct carburettor needles are :—

    No. 2 for Petrol.

    No. 2½ for Paraffin-Benzol mixture.

    No. 3 for Alcohol.

18. Screw the needle rod down to the limit, then release it completely so that the jet is fully open. Start the engine with the jet fully open and screw the needle rod again to the right tuning.

* * * * * * * * *

Fuel.

19. Open the petrol tap. It is open when the finger is pointing sidewise.

20. Refil the tank with fuel **mixed with oil in the stated** proportions.

21. Clean each vent.

22. Too much oil mixed with fuel—or the mixture is not of a regular consistency—stir up the contents of the tank.

23. Unscrew the union on the carburettor end of the fuel pipe. Let the fuel flow awhile and re-fit.

24. Remove the fuel pipe from the machine and blow it. Re-fit after cleaning all parts.

25. Clean the sieve of the fuel filter. To do so unscrew the union on the fuel pipe leading from the fuel filter to the carburettor. Then unscrew the bottom part of the fuel filter which is provided with a large hexagon. The part so released carries the gauze sieve which should be carefully washed with petrol.

* * * * * * * * *

Air.

26. Open the air inlet control by turning anti-clockwise the knurled knob on the air inlet pipe.

27. The air cleaner canvas bag is dirty or wet, or the wood shavings are too much compressed or excessively soaked with oil.

* * * * * * * * *

Crankcase Drain.

28. Open the drain tap situated underneath the crankcase, turn the engine slowly by hand to empty the crankcase, and close the drain tap.

29. Close the drain tap.

* * * * * * * * *

Engine.

30. Allow the engine to cool, inject paraffin through sparking plug hole and try to ease the piston. If you do not succeed send the engine back to our Works. You have probably used insufficient oil in your petrol, or oil of an inferior quality.

31. The engine should have the attention of a Specialist. Probable causes :—Insufficient lubrication, bad quality oil, neglect of air filter.

32. Inject some paraffin in the cylinder and move the pulley by hand until you are sure that the oil deposits on the piston rings have been dissolved.

33. Tighten up the nuts fixing the cylinder head on the cylinder and those fixing the cylinder on the crankcase, together but do not tighten them too much, breaking the studs. Make sure that the copper asbestos washer between cylinder and cylinder head is not leaking ; if it is change it.

- **Difficulty in starting the engine**
  - Petrol reaches the carburettor
    - Needle screwed in too tightly; mixture too weak 16
    - Paraffin or alcohol mixture has been allowed to remain in carburettor 14
    - Fuel has been allowed to accumulate in crankcase 28
    - The plug sparks when removed and placed in contact with machine
      - The spark is weak in appearance 1
      - The spark is too weak 1
      - Short Circuit at the Sparking Plug 1
      - Short Circuit at H.T. Lead 1
      - Short Circuit at the H.T. Terminal 5
    - No spark at the sparking plug 6
      - Spark at the H.T. Terminal
        - Broken Insulation of Plug 1
        - Dirty Plug Points 2
      - No spark at H.T. Terminal
        - Contact Breaker Arm Stiff 8
        - Contact Breaker arm free
          - Dirty or Defective Platinum Points 9
          - Wrong Gap of Platinum Points 11
          - Broken Carbon Brush 10
  - Petrol does not reach the carburettor
    - The Petrol Tap is Closed 19
    - The Petrol Tap is Open
      - The Auxiliary Tank is Empty 20
      - There is Fuel in the Tank
        - Air Lock in the Petrol Pipe 23
        - Seized Carburettor Float 15
        - Petrol Pipe stopped up 24
        - Vent in Petrol Tank Cap stopped up 21
        - Fuel Filter stopped up 25

- **The engine spits and possibly stops**
  - Excess of oil deposited in crankcase 28
  - Engine seized 30
  - Mixture too weak 18
  - Stoppage in Petrol Supply 24
  - Wrong Carburettor Needle 17
  - Vent in Petrol Tank Cap stopped up 21
  - Fuel Filter stopped up 25
  - Air Inlet Control Closed 26

- **The Engine knocks**
  - Pre-ignition or Carbon deposited in Cylinder 4
  - Faulty Sparking Plug 1
  - Play in Big End 31
  - Magneto wrongly advanced 12

- **The Engine "fourstrokes"**
  - Excess of Oil in the Fuel 22
  - Mixture too rich 18
  - Air Inlet Obstructed in the Air Filter 27
  - Air Inlet Control Closed 26

- **The Engine stops**
  - Tank Empty 20
  - There is Fuel in the Tank connected with the Carburettor
    - The Plug is Sparking
      - The Compression is good
        - Carburettor is functioning
          - Insufficient Lubrication 30
          - Bowden Cable Broken 7
        - Carburettor in not functioning
          - Dirty Jet 18
          - Dirty Fuel Filter 25
          - Petrol Float Stuck 15
      - Lack of Compression
        - Piston Ring Stuck 32
        - Drain Cock Open 29
        - Leakage from Cylinder or Crankcase 33
    - The Plug does not spark
      - No Spark at the Magneto
        - Contact Breaker Stuck 8
        - Contact Breaker Free
          - Defective Platinum Points 9
          - Water in Magneto 13
          - Dirty Contact Points 9
          - Displaced Platinum Points 11
          - Broken Carbon Brush 10
      - Magneto Sparks
        - Defective H.T. Lead 5
        - Defective H.T. Terminal 6
        - Dirty Plug 2
        - Defective Plug 1

IX. Accessories.

Narrow Miller.

To change over from the standard track of 20 in. to a narrow track of 14 in. proceed as follows :—

Remove the miller cover which is held in place by two wing nuts and two spring catches.

Remove the frame of the miller cover:
To do so first remove the stop pin fitted at the free end of the ratchet bar.
Then slip out the sliding block.
Subsequently remove the split pins fixing the bosses of the miller cover frame to the transverse bar on the tube of miller gearbox and slip out these bosses, thus liberating the frame.

Remove the miller sleeves which carry the working tools and which are held on the miller shaft by pins which are themselves secured by split pins. By removing the pins you will be able to slip the sleeves out without force.

Make sure that the entire surface of the miller shaft and bushes are clean and that the narrow sleeves are also clean inside. Put some clean thick oil on these surfaces.

When changing over from standard (20 in) miller to narrow (14 in.) track or *vice versa*, note that the felt washers which you will find in the sleeves and which are intended to exclude dirt from gaining access to the working parts of the miller should be removed, cleaned and oiled and replaced in the sleeves before the latter are refitted to the shaft.
Slip the narrow miller sleeves in place on the miller shaft and secure them with the pins, taking care to safeguard alternance of the high spring bosses.
Place the frame of the narrow miller in place.
Place the narrow miller cover in position.
Reverse each wheel so that the rims extend inwards towards the machine, and not outwards as before. Keep each wheel to its original side of the machine.

To do this proceed as described on page 55, chapter **VII**.

We repeat the important recommendation that when the wheels are set on narrow gauge the steering height position control should be properly placed and secured so that no chance should be given to it to come into contact with the wheel and to jam it.
This is always possible as shown on the illustration on p. 17. The crossbar should be pushed right back so that the catch provided inside the vice should be able to hold it in position.

It is not possible to use the road rims when the driving wheels are set on the narrow gauge; in consequence if a short journey has to be covered on the road care should be taken to run the engine very slowly in order to avoid vibration. If a longer journey is required reverse the wheels to normal gauge and fit the road rims or else cart the machine.

The arrangement of the tines is described in Chapter **VI** dealing with tines and springs.

For users who have a frequent need of changing over from wide to narrow miller and *vice versa* we recommend the purchase of a complete narrow miller unit enabling the change-over to be made in less time. In this case the conversion takes place in the same way as for the twin miller.

Twin Miller.

The twin miller is a complete unit replacing the normal miller and consequently connected to the rest of the machine by two bolts only. The exchange is quite simple.

Most important in the course of this operation is to avoid any dirt, grit, water or foreign matter of any sort from getting access to the parts uncovered in the course of the exchange.

In the first place thoroughly clean the part of the machine which is in the neighbourhood of the flange connecting the main gearbox to the miller gearbox.

Make sure that the miller is declutched (miller control in the forward position).

Remove the wood block protecting the face of the flange on the twin miller gearbox and put it aside together with its two bolts.

Then remove the nuts fixing the miller gearbox to the main gearbox taking care to support the weight of the miller so that it should not bear on the studs. Remove the miller unit.

Replace it by the twin miller unit and bolt it tight. Before storing away affix the wood block for protection on the face of the flange of the normal miller gearbox.

The depth regulation on the twin miller is obtained by means of depth bars similar to that on the normal miller fixed by pins which should be removed to place the bar at the required depth.

The arrangement of the tines is described in Chapter **VI** dealing with tines and springs.

Wide Depth Shoe.

The normal depth shoe as supplied on the machine has a bearing surface of a width of one inch.

For specially light soils where this bearing surface is insufficient it can be replaced by a wide depth shoe which has a width of about two inches.

The depth shoe is fitted on the depth bar by two bolts, which are easily removable.

Shield.

For working between narrow rows of bush plants it is advisable to use the shield which is supplied as an accessory.

The shield consists of two side wings which are bolted on the machine and of a front guard which engages vertically in two slots provided on the side wings.

The front guard should be slipped out when starting the engine or when otherwise attending to the air cleaner or carburettor.

The shield is designed to be used exclusively with the driving wheels placed as described above for work on narrow gauge, viz., with the rims extending towards the machine.

The shield can be mounted on a standard or a narrow miller at choice, the only difference residing in the two sizes of miller cross bar and distance rod.

It is not possible to use the road rims in conjunction with the shield. It is recommended consequently for longer journeys on the road to cart the machine or to use the transport truck.

Special instructions concerning the fitting will be supplied to users who should order the shield outfit otherwise than already assembled on the machine.

Wheel Protectors.

These protectors are mounted on the hubs of the wheels and can be pivoted round the wheels.

This motion is controlled from the steering arm by means of a rod.

The front part of the protectors can consequently be dropped down to soil level during the work and lifted at the end of the row in order to enable the tipping of the machine for turning.

To fit the protectors proceed as follows :—

Remove the hub caps and replace them by the special caps. This is, however, only necessary when the wheels are to be used on normal track (see foot note).

Fit the pivot provided on the protector wing in the square hole of these caps.

Fasten together the two protector wings by means of the connecting pieces, viz., flat iron in front and U-iron (with protection pad and buckle) in rear.

Fit the control rod and its collar on the cross member of the steering arm. This collar is fitted with a brake spring which holds the control and hence the protectors in the desired position.

N.B.—The connecting pieces are made in two sizes to fit standard track (20 in.) or narrow track (14 in.) and should be changed if transferring from one of these tracks to the other. The special caps are not required when the machine is used on narrow track (14 in.) in which case the wheel protector pivots fit direct into the square holes of the normal hub caps.

Small Diameter Driving Wheels

These driving wheels of smaller diameter are to be used when working on particularly stiff soil or when unusual depth of tillage is required.

The smaller diameter of these special wheels means that the machine will travel along at a lower speed for a given number of revolutions of the engine.

The power available for a given surface of land will consequently be bigger, hence the possibility with these wheels to work deeper or alternatively to work stiffer land to the same depth as is obtained on lighter soil with the standard wheels fitted.

The small wheels are fitted with protruding strakes enabling a strong grip on the ground to be obtained.

The small wheels are to be used exclusively on the normal gauge, that is with the rims extending to the outside.

The exchange of these wheels takes place easily as described in Chapter **VII** on page 55.

Rim Extensions. For working on very light soil it is advisable to increase the bearing surface of the driving wheels. For this purpose rim extensions can be fitted.

Roller. Whenever the prepared soil is needed to be in a more compressed state than the aerated texture obtained after the passage of the miller, use should be made of the roller which we supply as an accessory to the machine.

The roller fits on the rear of the miller cover in exactly the same way as the road travelling wheels and can be placed to various heights corresponding to the depth of the tillage and the nature of the soil.

The roller might also prove useful for regulating the depth of work on abnormally light soil.

Occasionally lubricate the roller shaft.

Ridger. The ridger fits on the ratchet bar. It should be set at the proper height for the work at hand and properly bolted so as to avoid the possibility of it working loose and getting caught in the miller.

The ridger must be used in conjunction with the miller. In other words the tilling and ridging must be done in one operation.

No good results can be obtained if the ridger is used with miller declutched.

It is preferable to choose a time for ridging when the soil is not too sticky and wet.

Under hard soil conditions it may sometimes be necessary to first till without the ridger to a depth of about 6 in., and to subsequently go over the ground a second time tilling to a greater depth and ridging at the same time.

Pulley Attachment.

Assembling.

The pulley attachment consists of three separate units :—

The pulley with bearing, dog and yoke.
The platform made of hard wood.
The bracing, which is made of a U-iron bar with wooden blocks.

Assemble the pulley unit to the platform, (loose for the time being) taking care that the dog is on the long side of the platform and the pulley consequently over the shorter end of the platform.

Thoroughly clean the part of the machine which is in the neighbourhood of the flanges connecting the speed gearbox to the miller gearbox.

Make sure that the miller is declutched (miller control in forward position).

Then remove the nuts fixing the miller gearbox to the main gearbox, taking care to support the weight of the miller so that it should not bear on the studs. Remove the miller unit.

Make sure that the gear control is in neutral (driving wheels free) ; then remove the gear control from the machine so as to avoid the possibility of using it whilst the machine is at work with the pulley. The use of the gear control in this case could lead to damage to the machine The gear control is the rod fitted with a T-shaped grip and situated on the left of the driver. To remove it, it is necessary to take off the split pin fixing the rod to the lever and you will then be able to slip the rod out.

The bracing being removed from the platform, rear the machine on to the platform until the flange at the back of the machine connects with the flange on the pulley unit ; then replace the nuts and tighten them.

Place the bracing across the wheels between two spokes in such a way that the blocks on the bracing rest properly on the rims, and bolt the crosspiece to the platform.

Subsequently tighten up the nuts fixing the yoke of the pulley to the platform, so that the whole outfit is made rigid.

To take off the pulley attachment reverse the above instructions.

Working.

Place the machine with the pulley attachment assembled on firm ground and fix the platform in the ground by means of strong bolts or pins which are to be inserted in the holes provided for on the frame of the platform.

Place the pulley of the tool (saw, chaff cutter, etc.) which is to be driven, in the same vertical plane as the pulley on the Rototiller, and with the axes of the two pulleys parallel and at a correct distance as required by the length of the endless belt which is to transmit the power.

Then start the engine as per the detailed instructions given on this subject.

When the engine is started, clutch in the connection between engine and pulley by pulling what we have previously referred to as the miller control, this control being the rod situated to the right of the driver.

In doing this the pulley will commence revolving.

If you wish to stop the working of the driven tool push home the miller control.

Upkeep.

Fill the pulley bearing occasionally with Wakefield Castrol gear oil "D."

To do so remove the hexagonal plug painted red situated at the top of the bearing.

Occasionally wash the bearing with paraffin, and after removing all traces of paraffin fill with fresh gear oil.

Belt speed.

The belt pulley which is normally supplied has a diameter of $5\frac{1}{2}$ in. which at normal speed of the engine turns at 600/650 revolutions per minute, giving a belt speed of five to six feet per second.

Traction Hitch

A traction hitch can be fitted to the machine in order to use it as an ordinary light tractor.

It should be however noticed that in order to avoid increasing abnormally the weight of the machine the gears transmitting the power to the driving wheels have not been designed to transmit more than a fraction of the engine power.

It is consequently recommended to use the machine on traction work only on light duties such as seed-sowing, weed eradication and such like

The guarantee is not applicable to gear breakages or wear taking place as a consequence of not following this advice.

To fit the traction hitch remove the miller unit as described for fitting the twin miller on page 63 and replace it by the traction hitch, tightening each nut progressively.

Paraffin Outfit.

The paraffin outfit consists of one *distance piece*, one *copper asbestos joint*, four *long studs* and a $2\frac{1}{2}$ carburettor needle.

The alteration consists of removing the *cylinder head* and *copper asbestos joint*, inserting between the *cylinder* and *cylinder head* the special *distance piece* and a second *copper and asbestos joint* comprised in the outfit of additional parts. The original *copper and asbestos joint* will also be re-inserted and the *cylinder head* replaced, using for the purpose the *long studs* which are supplied with the additional parts. Screw the studs tightly down. Owing to the higher position now occupied by the *cylinder head*, it will be found that the fins on the *cylinder head* will foul the sheet-steel cover situated round the cylinder, and to avoid this it is necessary to file down these aluminium fins by about $\frac{1}{4}$ in.

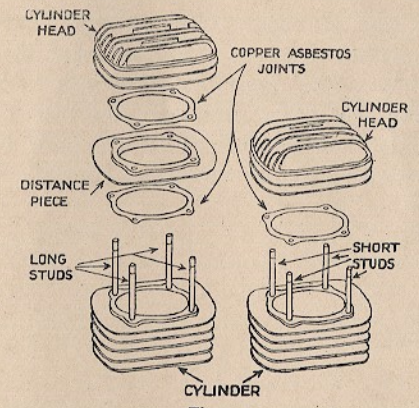

Fig. 22.

The method which is to be followed to uncover the *cylinder* in order to get access to the cylinder head is described in Chapter VII, page 50.

The method for changing the carburettor needle is described in Chapter III, page 24.

The way to use paraffin as fuel is described in Chapter I, page 9.

Dual Purpose Truck.

This truck is mounted on wheels fitted with pneumatic balloon tyres. It enables quick transport over roadways and prevents the wear consecutive to the vibration sustained by the machine when taken for long distances over hard surface roads.

This truck is so constructed that in addition to carrying the machine it can be used for ordinary carting. The very large tyres enable heavy loads to be moved over rough or soft ground.

The scoop-like form of the body, the front edge of which can be made to rest on the ground, facilitates loading or unloading.

Waterproof Cover.

This waterproof cover is specially made and fits over the entire machine. It is advisable to use it whenever the machine, for lack of shelter, has to be left in the open, or when it is stored in sheds insufficiently protecting it against weather or dust.

Mowing Attachment.

Special instructions are supplied with each mowing attachment.

Special Accessories.

Readers who are confronted with problems other than those discussed in this leaflet are invited to write to us. *The Simar Rototillers* can be applied to a variety of other uses than those described in this booklet, and we shall be glad to study any such problems with a view to offering advice and assistance.

Guarantee :

We give the following guarantee which is given in place of any implied conditions, warranties, or liabilities whatsoever statutory or otherwise, all such implied conditions, warranties and liabilities being in all cases excluded.

In the case of machines from which the trade mark, name or manufacturing number has been removed, no guarantee of any kind is given or is to be implied.

We guarantee subject to the conditions mentioned below, that all reasonable precautions have been taken and every endeavour made to secure excellence of material and workmanship, and we undertake to replace at our Works any part or parts which in the opinion of the Company is proved to be defective and which is advised to us within a period of twelve months commencing from the date of despatch.

Despatch is deemed to have been effected :—

(*a*) In the case of machines delivered to destinations within the British Isles, on the date when the machine leaves one of our British Depots.

(*b*) In the case of machines delivered direct from a Colonial Depot, on the date when the machine leaves such Colonial Depot.

(*c*) In the case of machines shipped direct to overseas customers, on the date when the machine leaves the European port.

This Guarantee does not extend to the Miller Springs and Tines nor to outside wearing parts.

As the Simar Rototillers are liable to derangement by neglect or misuse, this guarantee does not apply to defects caused by wear and tear, misuse, neglect or lack of lubrication.

It is particularly remarked that the Guarantee shall not extend to wear or damage sustained to the internal engine parts due to the admission of dust owing to insufficient attention given to the air-cleaner.

This Guarantee is only applicable whilst the machine remains the property of the first purchaser, and automatically ceases on a re-sale being effected.

Any machine sent to us to be repaired will be repaired upon the following conditions, *i.e.*, we guarantee that all precautions which are usual and reasonable have been taken by us to secure excellence of material and workmanship, such guarantee to extend and be in force for three months only from the time such work shall have been executed or until the expiration of the twelve months above referred to and this guarantee is in lieu and in exclusion of any common law or statute warranty or condition and the damages recoverable are limited to the cost of any further work which may be necessary to amend and make good the work found to be defective.

If a defective part should be found in our machine or in any part supplied by way of exchange before referred to it must be sent to us *carriage paid*, and accompanied by an intimation from the Owner that he desires to have it repaired or exchanged free of charge under our guarantee, and he must also furnish us at the same time with the number of the machine, date of the purchase, or the date when the alleged defective part was exchanged, as the case may be.

Failing compliance with the above, such articles will lie at our depot *at the risk of the owner*, and this guarantee and any implied guarantee warranty or condition shall not be enforceable.

Guarantee does not cover cost

of labour in replacing parts

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