

# **HOWARD**

# **700**

## **OWNERS HANDBOOK**

### **INSTRUCTION BOOK AND SPARE PARTS LIST**



*By Appointment  
to Her Majesty the Queen  
Manufacturers of  
Agricultural Equipment  
Rotary Hoes Ltd.*

**ROTARY HOES LIMITED  
WEST HORNDON · ESSEX  
ENGLAND**

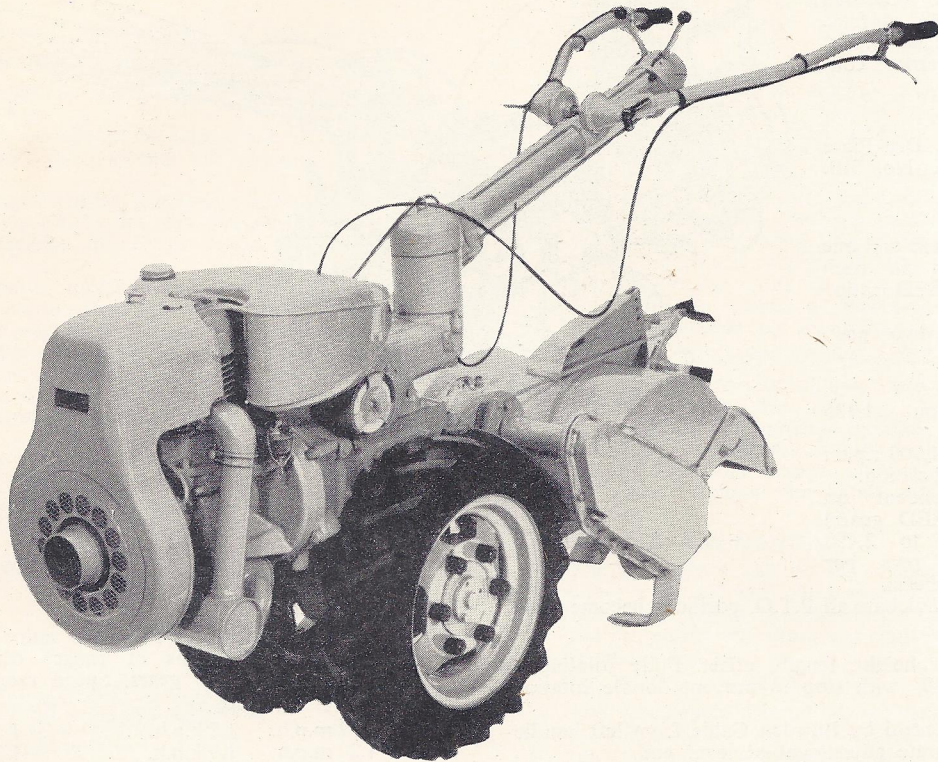
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## Description

The Howard 700 is a Tractor designed as a mobile power unit, the basic component of a machine that can vary in size and weight and can provide for any speed necessary, any implement suggested and any application required.

It has been designed both to pull and to drive implements. To obtain the necessary grip, track grip tyres are fitted and wheel and front weights, wheel girdles and/or extra large wheels are available. For power driven implements two power take off shafts are available running at various speeds and a three-directional P.T.O. drive unit is among the additional equipment.

Two forward speeds and one reverse speed are obtained by lever control in each SELECTASPEED ratio and this can be changed at will to give speeds from approximately  $\frac{1}{2}$  to 11 m.p.h. (depending on the engine and wheels fitted).

The machine can be driven either in a forward or reverse direction with the implement leading or following as required and with the operator at any position desired, in front, rear or to the side.

The HOWARD 700 is not just a two-wheeled Tractor, it is a new conception in small-scaled mechanization.



# Specification

## ENGINE:

Villiers 28B. Capacity 353 cc. 7 b.h.p. at 2,800 r.p.m. 2-stroke. Governor controlled.

or

Hirth Diesel (German origin) type D22. 447 cc. 7 b.h.p. at 2,200 r.p.m. 2-stroke Governor controlled.

## Clutch:

Borg & Beck, Dry Plate 6 $\frac{1}{4}$ " dia. Ref. No. BB. 6/55.

## Gearbox:

2 forward speeds and one reverse speed in each SELECTASPEED ratio. P.T.O.

Rear P.T.O. two positions.

## Speed:

High position 1,135 r.p.m.

Low position 1,900 r.p.m.

Low P.T.O. position. Speeds (dependent on SELECTASPEED gears) between 455 to 2,480 r.p.m. or 35 revs. per one rev. of wheels.

By turning handlebars all P.T.O. positions become front.

## Handlebars:

Adjustable for height, length, offset. Fully rotating in segments of 30° with stop to prevent double rotation.

## Controls:

- (1) Clutch control by Bowden Cable from left handlebar, separate adjustment at lever end.
- (2) Gear control, rod operated by lever from rear end main control column.
- (3) Differential lock control, operated by rod control from handle at rear end main control column.
- (4) Throttle control, cable operated from lever on handlebar right hand side.
- (5) Indexing control (i.e. handlebar swivel) by rod from handle on end of control column.
- (6) Free wheel controlled by lever on top of offside axle housing.

## Fuel Tank:

Capacity 19 imperial pints. 10.4 litres maximum.

## Wheel and Tyre Sizes:

5 x 12 or 600 x 16 Track grip pneumatics. Alternative steel wheels.

## Wheel Spacings:

5 x 12 Standard wheel centres 12 $\frac{1}{2}$ " and 17"—standard equipment.

5 x 12 Expanding centres minimum 12 $\frac{1}{2}$ " up to 32" in 1" stages with spacer. Overall width minimum 17" up to 37" in 1" stages—extra equipment.

600 x 16 centres of 19", 23" and 31" (with spacer). Overall width minimum 25" up to 37"—extra equipment.

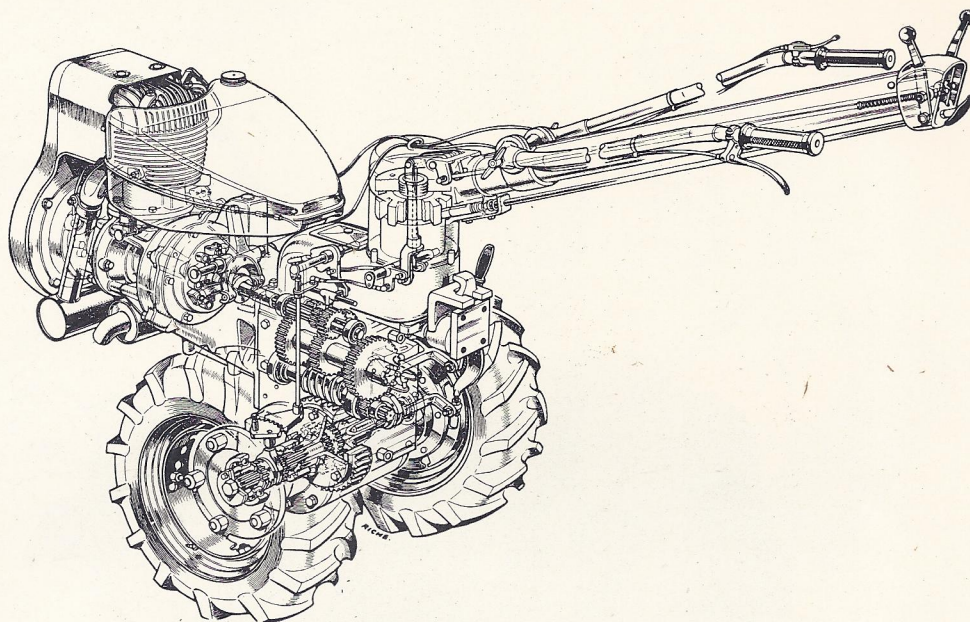
## STRONG POINTS

Implement mounting pads with  $\frac{3}{8}$ " U.N.C. tapped holes are provided on either side of the gearbox and under the clutch housing.

## GROUND CLEARANCES

On 12" wheels 5 $\frac{1}{4}$ ".

On 16" wheels 9 $\frac{1}{4}$ ".



## TRAVEL SPEEDS

The 2 forward and 1 reverse ratios in gearbox remain constant. Variations of ranges obtained by use of SELECTASPEED gears. Speed ranges as follows:

5 x 12		600 x 16	
.72 m.p.h.	1.2 k.p.h.	1 m.p.h.	1.6 k.p.h.
1.2 m.p.h.	1.9 k.p.h.	1.7 m.p.h.	2.7 k.p.h.
1.5 m.p.h.	2.3 k.p.h.	2 m.p.h.	3.3 k.p.h.
2.2 m.p.h.	3.5 k.p.h.	3.1 m.p.h.	5 k.p.h.
2.4 m.p.h.	3.9 k.p.h.	3.4 m.p.h.	5.5 k.p.h.
3.7 m.p.h.	5.9 k.p.h.	5.1 m.p.h.	8.2 k.p.h.
4.5 m.p.h.	7.2 k.p.h.	6.2 m.p.h.	10.1 k.p.h.
7.5 m.p.h.	12 k.p.h.	10.5 m.p.h.	16.7 k.p.h.

The reverse speeds are the same as the first forward speed in each range.

## WEIGHT

450-lbs. on 5 x 12 tyres and wheels (without fuel or ballast).

## TYRE PRESSURES

18-lbs. p.s.i. for 5 x 12 tyres.

12-lbs. p.s.i. for 600 x 16 tyres.

8-10 lbs. p.s.i. for water ballasted tyres.

## EXTRA EQUIPMENT

600 x 16 Wheels and Tyres.

Expanding wheel centres for 5 x 12 wheels.

Brakes.

Quick Hitch.

Axle Extensions.

Steel wheels 5 x 12.

Bumper Bar.

Belt Pulley and Extended P.T.O.

Wheel Weights.

Front End Weights.

"Fixed Ratio" gears.

Toolbox.



## THE NEW MACHINE

On receipt of your HOWARD 700 check for damage in transit, tighten any loose nuts or bolts, lubricate according to the chart and study both engine and machine Instruction Books before use.

The machine should be "run in" over a period of 50 to 60 hours on light to medium work, gradually increasing the loads. During this period check regularly for loose nuts and bolts including wheel nuts, check oil levels and lubrication, the condition and seating of the air filter.

After the first 50 hours drain and refill the gearbox.

## STARTING THE ENGINE

Detailed instructions are given in the separate Engine Instruction Books.

The Fuel tap should be unscrewed to the stop but not beyond this point as this will unscrew the locking sleeve.

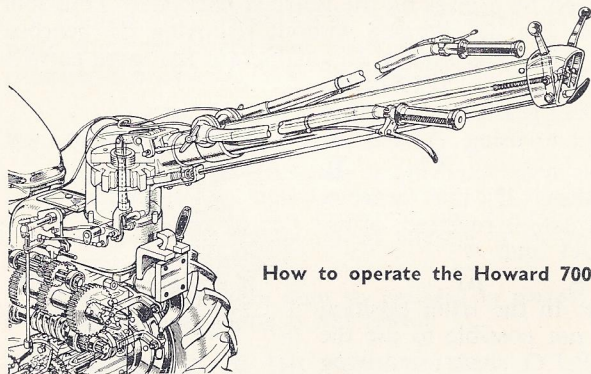
On the petrol engine, the engine is choked when the air strangler lever is to the rear. Remember that should the engine backfire the choke might inadvertently be closed.

On the petrol engine, rope starting is provided and a strong pull on the rope should be given. This is made easier if the engine is "rocked" against compression before attempting the final pull on the rope.

On the two-stroke engine, on finishing work, switch off the fuel and allow the engine to run until the carburettor is emptied unless special two-stroke oil is being used.

Normally keep the fuel tank full as this will prevent condensation within the tank overnight.

The Sediment Bowl under the fuel tank will trap dirt and water and should be cleaned regularly, but all air must be excluded. Turn on petrol and allow the bowl to fill before fully tightening.



How to operate the Howard 700

### (a) CLUTCH LEVER

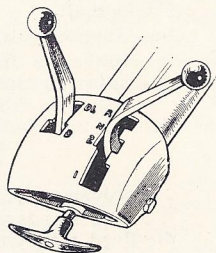
The engine clutch (dry plate type) is operated from the lever on the left handlebar. The lever must be fully lifted to stop movement on the clutch shaft before the gears are engaged. If gears are not freely obtainable release clutch momentarily to allow the gears to mesh.

### (b) THROTTLE CONTROL

The throttle control is on the right handlebar and controls the engine governor.

### (c) DIFFERENTIAL CONTROL

The left hand lever of the pair on the control column is for the differential lock. Push forward (position D.L.) to lock both wheels together for ploughing, etc. This can be done when the machine is in motion. To release press sideways on the handlebars to relieve load on the engaging gear and then pull lever back, (position D). Do not try and force the lever to the rear.



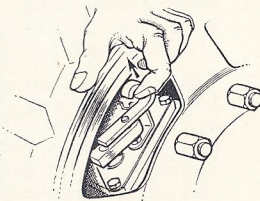
### (d) GEAR CONTROL LEVER

The right hand lever of the pair on the control column is the gear lever.

First gear is the rearmost notch. Forward one notch for second gear, then a neutral position and the front notch is for reverse. These are marked 1, 2, N and R on the quadrant casting.

### (e) FREE-WHEEL CONTROL LEVER

This lever is on the right hand axle housing and is used to disconnect the drive should the machine be required to be pushed about without starting the engine or when the machine is used with the power take off for stationary work. To give free-wheel the differential control lever must be to the rear (position D) and the free-wheel lever moved away from the gearbox. To re-engage the drive, the lever should be pushed towards the gearbox. Swivelling the machine or slight rotation of the right-hand wheel will align splines on the shaft, and enable the drive to be engaged. A space is provided on the wheels to facilitate access to the lever when the wheels are set in the narrow position.



### (f) CONTROL COLUMN SWING LOCK

Beneath the two control levers is a handle, which, when pulled towards the operator, releases the locking plunger of the control column. With this handle pulled out, the column may be swung through the complete circle from stop to stop with locking positions every 30°. Release the handle at the desired locking position.

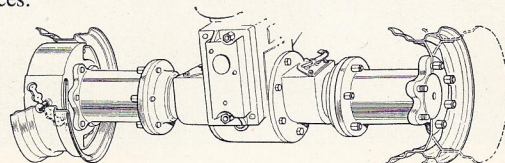
### (g) HANDLEBAR WINGNUTS

The handlebars can be set independently by releasing either wing nut until the serrated ends are free to move. Also by releasing the same wing nut, the sliding block can be positioned along the control column to suit the implement in use.

### (h) USE OF HANDLEBARS

The handlebars should be adjusted to give the best possible control of the machine. In addition they can be used as a balancing jack. Turn the handlebars at right angles to the machine, weigh down on them and raise the far side wheel clear of the ground with the weight of the machine on the handlebars. The wheel can now be changed. With the control column over the engine and the handlebars turned vertically to the ground the machine can be supported for alteration of the SELECTASPEED gear ratio or to change an implement.

With the control column to the front of the machine, it will be found very easy to reverse into confined spaces.



### (i) WHEEL ADJUSTMENT

The standard 5 x 12 wheels of the HOWARD 700 have dished centres. These give a 12½" centre when dished inwards and 17½" centres when dished outwards. Furthermore, 6" wheel extensions can be fixed to the axle and these are necessary for ploughing and other work where a wide wheel setting is required.

Adjustable wheel centres have helical slots cut into the rim and when the three-coned nuts are loosened, the wheel rim can be rotated thus altering its setting in ½" stages. Wheel centres from 12½" to 32" are obtainable.

When using the 600 x 16 wheels the minimum setting gives 19½" centres with the wheel dished outwards. By addition of 6" spacers further settings of 23" to 31" are available.



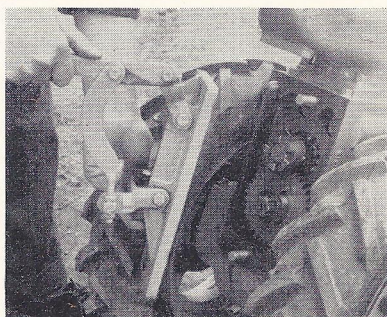
# SELECTASPEED Ratio Changing

To enable the Howard 700 to have sufficient range of gears to satisfy all types of use without complication, the SELECTASPEED system is used which gives a simple method of obtaining any speed desired.

## TO CHANGE THE SELECTASPEED RATIO

- (1) Remove implements from the SNAP-LOCK coupling.

- (2) Unscrew the two large retaining nuts of the Gearbox backplate using box spanner provided and then remove the backplate from the gearbox. This will expose the SELECTASPEED gears.



- (3) Press the retaining pins of the dog and the gear retaining collar against their springs and withdraw both dog and collar to the rear.

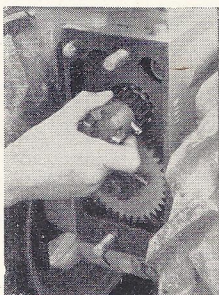
Note: If the pin is twisted it may obstruct easy withdrawal. The small retaining split pin should be in line with the splines.

- (4) Replace the gears with those required or transpose the gears as necessary. Replace the dog and retaining collar by depressing the retaining pins so that they will slide over the shafts.

Note: The retaining collar should be repositioned with the "stepped" side towards the gear.

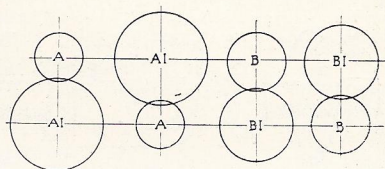
- (5) Replace the Gearbox backplate and fit whatever implement is desired.

With practice the routine of SELECTASPEED changing will convince you of the rapidity and simplicity with which this operation may be effected.



The SELECTASPEED gears are used in pairs, the total number of teeth on a pair of gears always add up to 49. The standard pairs are marked

A and A1 (14 and 35 teeth)  
B and B1 (22 and 27 teeth)



When the smaller gear is above the larger, the lower range of speeds are obtained. The following chart will show you the speeds (at 2,800 r.p.m. engine speed) obtained with these two pairs of gears in the four possible positions.

## FIRST SELECTASPEED RATIO

A (14 tooth)  
A1 (35 tooth)

5 x 12 wheels 600 x 16 wheels

1st gear .7 m.p.h. (1.2 k.p.h.) 1 m.p.h. (1.6 k.p.h.)  
2nd gear 1.2 m.p.h. (1.9 k.p.h.) 1.7 m.p.h. (2.7 k.p.h.)

NOTE: Reverse speeds are the same as the first forward gear in every ratio.

## SECOND SELECTASPEED RATIO

B (22 tooth)  
B1 (27 tooth)

5 x 12 wheels 600 x 16 wheels  
1st gear 1.5 m.p.h. (2.3 k.p.h.) 2 m.p.h. (3.3 k.p.h.)  
2nd gear 2.4 m.p.h. (3.9 k.p.h.) 3.4 m.p.h. (5.5 k.p.h.)

## THIRD SELECTASPEED RATIO

B1 (27 tooth)  
B (22 tooth)

5 x 12 wheels 600 x 16 wheels  
1st gear 2.2 m.p.h. (3.5 k.p.h.) 3.1 m.p.h. (5 k.p.h.)  
2nd gear 3.7 m.p.h. (5.9 k.p.h.) 5.1 m.p.h. (8.2 k.p.h.)

## FOURTH SELECTASPEED RATIO

A1 (35 tooth)  
A (14 tooth)

5 x 12 wheels 600 x 16 wheels  
1st gear 4.5 m.p.h. (7.2 k.p.h.) 6.2 m.p.h. (10.1 k.p.h.)  
2nd gear 7.5 m.p.h. (12 k.p.h.) 10.5 m.p.h. (16.7 k.p.h.)

## FIXED RATIO GEARBOX

If required a fixed ratio gearbox can be used in place of the straight SELECTASPEED gears. A pair of cluster gears are used on the shafts, and ratio is engaged by a lever on the gearbox backplate. Thus four speeds can be obtained without removing the gearbox backplate. The speeds obtainable are the same as with the standard SELECTASPEED gears but are equivalent to using A and B1

A1 and B together, if the gearbox backplate is reversed, of using A and B1

Note: In the latter position it is not possible to use the top P.T.O. shaft for driving implements. Thus, using the fixed ratio box, the following speeds are obtained on standard 5 x 12 wheels.

.7 m.p.h. (1.2 k.p.h.)  
1.2 m.p.h. (1.9 k.p.h.)  
2.2 m.p.h. (3.5 k.p.h.)  
3.7 m.p.h. (5.9 k.p.h.)

These speeds are available when using the top P.T.O. shaft.

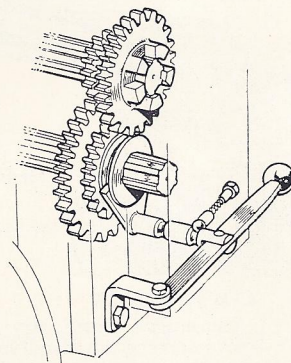
Reverse gears .72 m.p.h. and 2.2 m.p.h.

With the Gearbox backplate and gears inverted the following speeds are obtainable:

1.5 m.p.h. (2.3 k.p.h.)  
2.4 m.p.h. (3.9 k.p.h.)  
4.5 m.p.h. (7.2 k.p.h.)  
7.5 m.p.h. (12 k.p.h.)

Reverse gears 1.5 m.p.h. and 4.5 m.p.h.

The standard SELECTASPEED gears can replace the fixed ratio cluster gears when desired, in the normal method.





## Power Take Off

There are two power take off shafts on the HOWARD 700. These are the shafts which carry the SELECTASPEED gears. The top shaft has two fixed speeds of 1,135 to 1,900 r.p.m. depending on whether first or second gear is used. When reverse gear is engaged 1,135 r.p.m. will be given but in a reverse direction.

The lower shaft gives speeds directly related to the SELECTASPEED gear used, in other words related to the wheel speed of the tractor. This gives the following speeds on the lower shaft.

SELECTASPEED ratio A	1st gear and reverse	455 r.p.m.
A1	2nd gear	760 r.p.m.
SELECTASPEED ratio B	1st gear and reverse	926 r.p.m.
B1	2nd gear	1,550 r.p.m.
SELECTASPEED ratio B1	1st gear and reverse	1,392 r.p.m.
B	2nd gear	2,340 r.p.m.
SELECTASPEED ratio A1	1st gear and reverse	2,840 r.p.m.
A	2nd gear	4,750 r.p.m.

Note: when forward speeds are engaged the top P.T.O. shaft rotates in an anti-clockwise direction, the lower P.T.O. in a clockwise direction. All these speeds can be obtained with your tractor moving or stationary. When stationary work is required, free-wheel position must be used.

When the lower P.T.O. shaft is required, the position of the dog and retaining collar must be reversed and the backplate inverted.

N.B. When the backplate is used in the inverted position the SNAPLOCK handle must be reversed. Remove the two long pivot bolts and replace the whole SNAPLOCK mechanism so that the handle on the right side of the backplate point upwards.

The top P.T.O. shaft must be used with both SELECTASPEED gears in position. Failure to do this may result in inefficient lubrication to the gearbox.

The HOWARD 700 is supplied with a SNAPLOCK coupling for quick attachment of power-driven implements. The corresponding housing on the implement contains a spigot which is engaged through the aperture of the gearbox backplate and is centralised by two dowel pins for correct positioning. Adjustment is obtained by locking nuts on the SNAPLOCK connecting rod and these should be set so that the implement is always held firmly in position.

Should the SNAPLOCK not be used the cover plate must be inserted in order to prevent dirt from entering the SELECTASPEED gear compartment.

### D.P. QUICK HITCH

As an optional attachment a DP quick hitch can be fastened to two tapped holes on the rear top side of the gearbox and two underneath the control column pedestal. This enables instant hitching of trailers and other equipment.

A safety chain must be provided to prevent accidental disconnecting at high speeds.

### ADDING WEIGHT TO THE HOWARD 700

Any two wheeled tractor depends largely on weight to obtain draw-bar pull. The HOWARD 700 has been designed so that extra weight can be fitted rapidly and in such a way as to maintain easy handling. The total weight of the machine must never exceed 1,000-lbs. Failure to observe this rule may cause premature break-down of the machine.

The tractor fitted with 5 x 12 tyres weighs approximately 450-lbs. With 600 x 16 tyres approximately 500-lbs. Tyres may be water ballasted and wheel weights may be fitted to both sizes of wheel. These weights are fitted by sliding a "horseshoe" shaped casting on to the inside of the rim and bolting the outside weights to it through the wheel aperture. One or more weights can be fastened to the outside of each wheel, each weight bolting to the one nearest it. The overall width of the weights should not be such as to interfere with ploughing.

A bumper bar can be fitted to the engine of the Howard 700 to carry front end weights, which are also used to counter-balance the weight of a heavy implement. These weights are hitched over the bumper bar and locked by a set screw, in a position of balance.

## HANDLING THE HOWARD 700



The possibilities opened up by the design of the swinging handlebars calls for a new technique in handling, which results in the most effortless operation and reduces fatigue to a minimum.

The two main points to remember are:

- (1) The further the handlebars are from the axle the easier it is to lift the rear end weight of the machine and,
- (2) The further to one side the handlebars are from the centre line the easier it is to control any lateral instability.



A position should be used, giving good lateral control as well as the ability to lift the rear weight, and this is normally found on the first or second notch on either side of the centre position on the control column. The vertical setting of the handlebars contributes to ease of handling and they are capable of individual adjustment. When reversing for any distance, it is often preferable to balance the machine by swinging the handlebars over the engine and pressing down. This is particularly effective in limited areas or confined spaces and enables the implement to be backed right up to any obstruction and to work away from it. The handlebars can then be swung to a more natural position when the machine is moving.

On extremely rough or sideling ground complete control is maintained by using the handlebars at 90° to the line of travel and on sideling ground it is generally easier to control the machine from the "down-hill" side. At the 90° position it is not possible to lift

the rear end of the machine, but if the machine is turned by reversing, the reaction on the wheels will lift the implement clear of the ground and the machine can be swung round without effort. Remember to disengage the differential lock at headlands, by slight sideways pressure on the handlebars to release the gear loading, then pulling back the differential lock lever.

When reversing it is recommended that the handlebars are always to one side of the machine in case the operator stumbles, in which case he would not get pinned by the machine. If required to reverse the tractor on to a truck, swing the handlebars over the engine for safety's sake.

Remember (1) Do not force the control levers or gears into mesh.

(2) Use the control column and handlebars to obtain the most comfortable working position.

(3) Make the machine do the work.

## Lubrication and Maintenance

The HOWARD 700 has been designed so that the minimum of attention is necessary. Nevertheless, regular lubrication and maintenance will ensure trouble-free running.

### DAILY OR EVERY EIGHT HOURS' WORK

- (1) Clean air cleaner element if in very dusty conditions.
- (2) Check engine oil, where engine with separate oil level is used.
- (3) Check over machine for loose items or oil leaks.

### MONTHLY OR EVERY 50 HOURS' WORK

- (1) Lubricate the following points with an oil can:
 

<ol style="list-style-type: none"> <li>(a) Control cables for clutch and throttle.</li> <li>(b) Gear and differential control rods at quadrant end.</li> <li>(c) Control column indexing control at slides.</li> <li>(d) Quick hitch tongue at hinge (if fitted).</li> <li>(e) SNAPLOCK hitch at all pivots.</li> </ol>	} Wipe off excess oil
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- (2) Check gearbox oil level. The machine should be horizontal and the level plug is beneath the gearbox backplate.
- (3) Clean air cleaner.
- (4) Check tyre pressure.

### EVERY 500 HOURS WORKED

- (1) Drain and refill gearbox. Use gear oil S.A.E. 90. Clean magnetic chip collector.
- (2) Check and adjust clutch operating cable if necessary.
- (3) Check and adjust governor operating cable if necessary.

### EVERY 1,000 HOURS WORKED

- (1) Drain, flush out and refill gearbox.
- (2) Drain, flush out and refill fuel tank.
- (3) Adjust gear and differential lock control levers if necessary.
- (4) Adjust control column swivel to maintain rigidity, if necessary, by tightening large circular retaining nut.

### AIR CLEANER

The air filter is of a dry paper type and should be cleaned regularly. Remove the wing nut and cap securing the filter element, withdraw the element and shake out the dust by gentle tapping or by blowing air from the inside to the outside of the element. If dust is firmly seated it can be released by using a fine hair paintbrush.

Never attempt to wash the element in any liquid.

Renew the filter element after 600 hours work.

N.B. Take particular care in replacing the element to ensure that it fits closely over the air intake spigot and that the cap effectively seals the entry of air by being a tight fit against the plastic end of the element.



### GEAR BOX

#### CHECKING OIL LEVEL

To check the oil level of the gearbox stop the engine and allow the oil in circulation to drain to the bottom. After a few minutes standing, with the machine horizontal, remove the magnetic drain plug situated just below the gearbox backplate. The level is correct if the oil just seeps over the threads when the gearbox is perfectly upright. If the level is low remove the rectangular pressed cover on the control column pedestal and pour in sufficient oil to correct the level. Clean the magnetic chip collector on the drain plug of any metal particles and replace the oil filler cover securely with the metal strip properly seated in the recesses inside the pedestal.

#### TO DRAIN AND REFILL GEARBOX

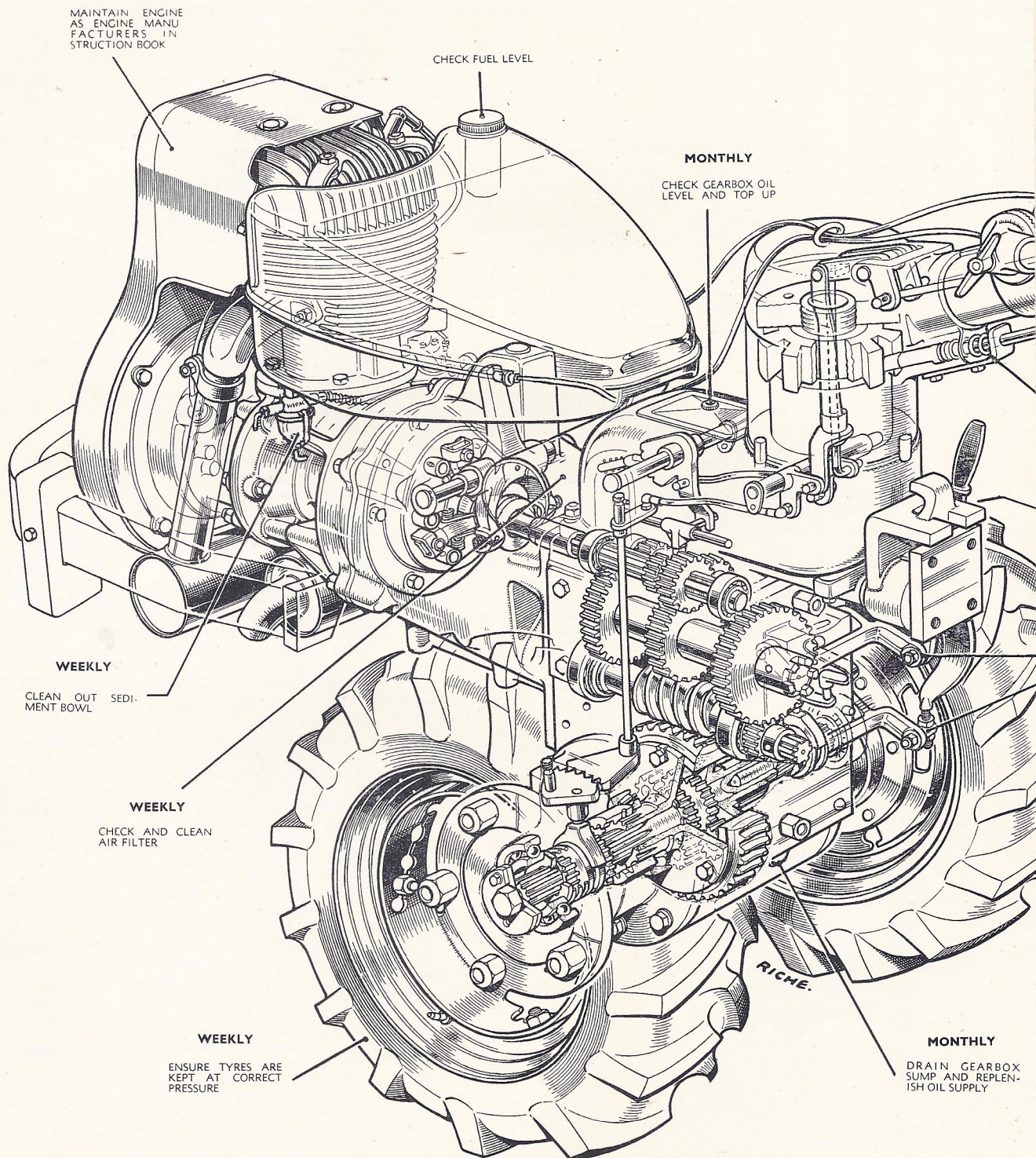
Remove the combined drain and level plug when the oil in the gearbox is warm from use, and tilt the whole machine backwards so that the drain plug is at the lowest point of the gearbox. When the oil has stopped running, clean and refit the plug and refill with 2½ pints of high quality S.A.E. 90 gear oil.

#### TO DRAIN, FLUSH OUT AND REFILL GEARBOX

Drain oil as described above and refill with flushing oil. Start the engine, put the free wheel lever into free-wheel position, engage a forward gear and allow the gears to turn over with the engine running slowly for about two minutes when the whole of the inside of the box would have been flushed. Stop the engine, drain off the flushing oil, clean and refit the plug and refill with 2½ pints high quality S.A.E. 90 gear oil. Start the engine with the free-wheel lever still in the free-wheel position and allow the gearbox to run to ensure full lubrication within the box.

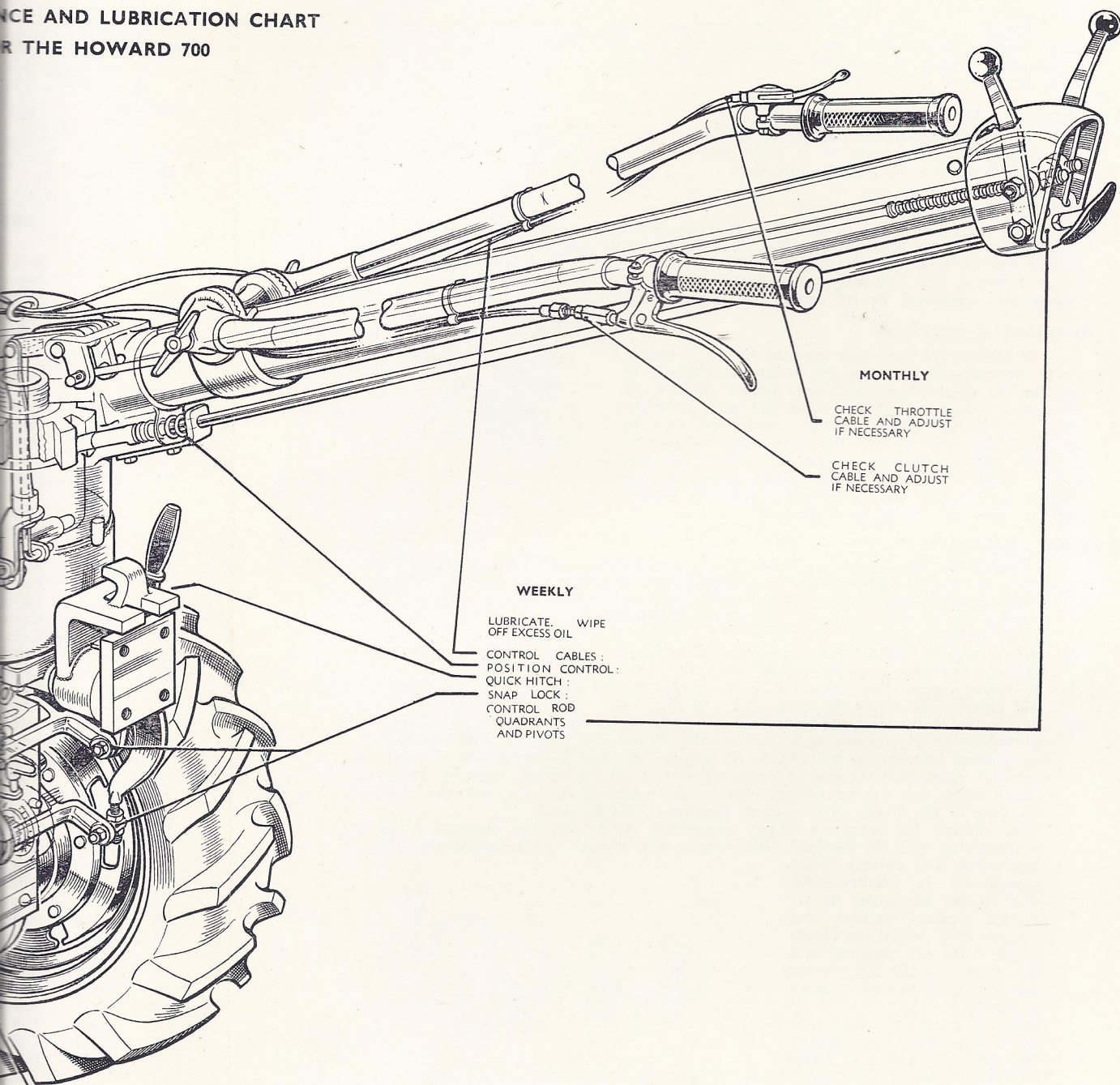


# **MAINTENANCE AND LUBRICATION FOR THE HOWARD 700**





# ANCE AND LUBRICATION CHART R THE HOWARD 700



## MONTHLY

CHECK THROTTLE  
CABLE AND ADJUST  
IF NECESSARY

CHECK CLUTCH  
CABLE AND ADJUST  
IF NECESSARY

## WEEKLY

LUBRICATE. WIPE  
OFF EXCESS OIL

CONTROL CABLES :  
POSITION CONTROL :  
QUICK HITCH :  
SNAP LOCK :  
CONTROL ROD  
QUADRANTS  
AND PIVOTS

## MONTHLY

DRAIN GEARBOX  
SUMP AND REPLEN-  
ISH OIL SUPPLY

## Recommended Lubricants

GEARBOX	S.A.E. 90
OIL POINTS	S.A.E. 90



## CONTROL ROD AND CABLE ADJUSTMENT

### (1) CLUTCH LEVER ADJUSTMENT

The clutch requires no attention excepting to ensure that there is  $\frac{1}{8}$ " free play on the cable at the hand lever. This is the amount the lever may be moved, measured at the stop, before resistance is felt.

Should the clutch cable be tight, excessive wear, overheating and possibly clutch failure may result. A cable adjuster is fitted on the front of the clutch lever bracket with a long adjuster end and a short lock washer to lengthen or shorten the cable as required.

### (2) THROTTLE CABLE

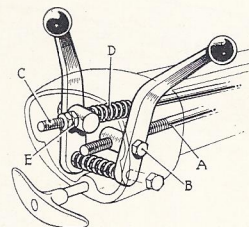
Any slackness of this cable can be taken up on the adjuster situated above the carburettor and secured by a small lock nut. Ensure that the throttle flap or "butterfly" is not affected by the adjustment.

### (3) GEAR SHIFT LEVER

The correct meshing of the gears is controlled by a spring-loaded detent close to the selector in the gearbox. The notches on the control column quadrant are purely a guide, and the lever can be set accordingly by positioning the small trunnion along the threaded control rod. The rods and levers in the control column are lubricated by oil mist from the gearbox.

### (4) DIFFERENTIAL CONTROL

The differential lock lever operates against a spring, which automatically actuates the locking mechanism as soon as the appropriate teeth are aligned. Should the differential lock not disengage when the lever is pulled back, the effective length of the control rod may be shortened by screwing in the two locknuts by the necessary amount. Remember that the differential lock should never be forcibly disengaged, swinging the machine sideways an inch or so will free the mechanism and the lever can be easily withdrawn.



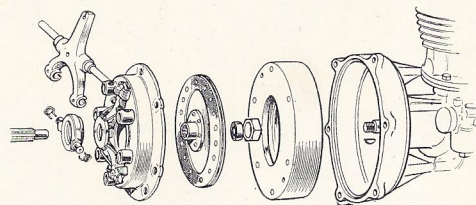
## TO RENEW CLUTCH DISC

Should the clutch disc or carbon thrust pad become badly worn (which could be caused by incorrect clutch cable adjustment) replacements can be made as follows:

- (1) Remove petrol tank and air cleaner hose. Undo the six bolts securing the flywheel housing to the clutch housing, and remove engine complete with flywheel housing and clutch assembly.
- (2) Inspect carbon thrust pad and replace if necessary. Ensure that the spring retaining clips are carefully refitted.
- (3) To renew clutch disc, undo the six setscrews holding the clutch to the flywheel, and remove the clutch pressure plate and the loose clutch disc.
- (4) Renew the clutch disc complete or allow your dealer to fit new linings. It is not advisable for an amateur to fit new linings. When replacing, the short section of the splined hub should be towards the engine. Having placed the disc in position refit the clutch over the disc and secure loosely to the flywheels. Now, by using the clutch shaft, line up the splined hole in the centre of the disc, with the central aperture in the clutch shaft support bearing in the flywheel.

Then tighten the setscrews. When assembled check that the pressure plate is running true with the flywheel. Otherwise excessive wear on the carbon thrust pad will ensue and correct clutch adjustment be unobtainable. Should this alignment be incorrect special gauges and equipment to adjust the clutch toggle arms are required and the work should be carried out by a competent service engineer.

Refit the engine complete with the clutch shaft, by passing the shaft through the thrust pad and oilseal so that the sleeve engages on the splines of the gearbox drive shaft. Bolt up engine and fit tank and aircleaner hose. Then reset clutch lever clearance.



## WHEELS

To remove a wheel, turn off petrol, swing the control column opposite the wheel and weigh downwards until the handlebars touch the ground and the machine is balanced.

Undo the six cone nuts and remove the wheel. When refitting, remember that the V of the tread should point forward when viewed from above.

Tyre pressure should be maintained at 18-lbs. per square inch for 5 x 12 tyres, and at 12-lbs per square inch for 600 x 16 tyres.

Tyres may be water ballasted if required, using calcium chloride additive to prevent freezing. For 75% water ballasted tyres, the tyre pressure should be 8-10-lbs. per square inch.



# Parts List

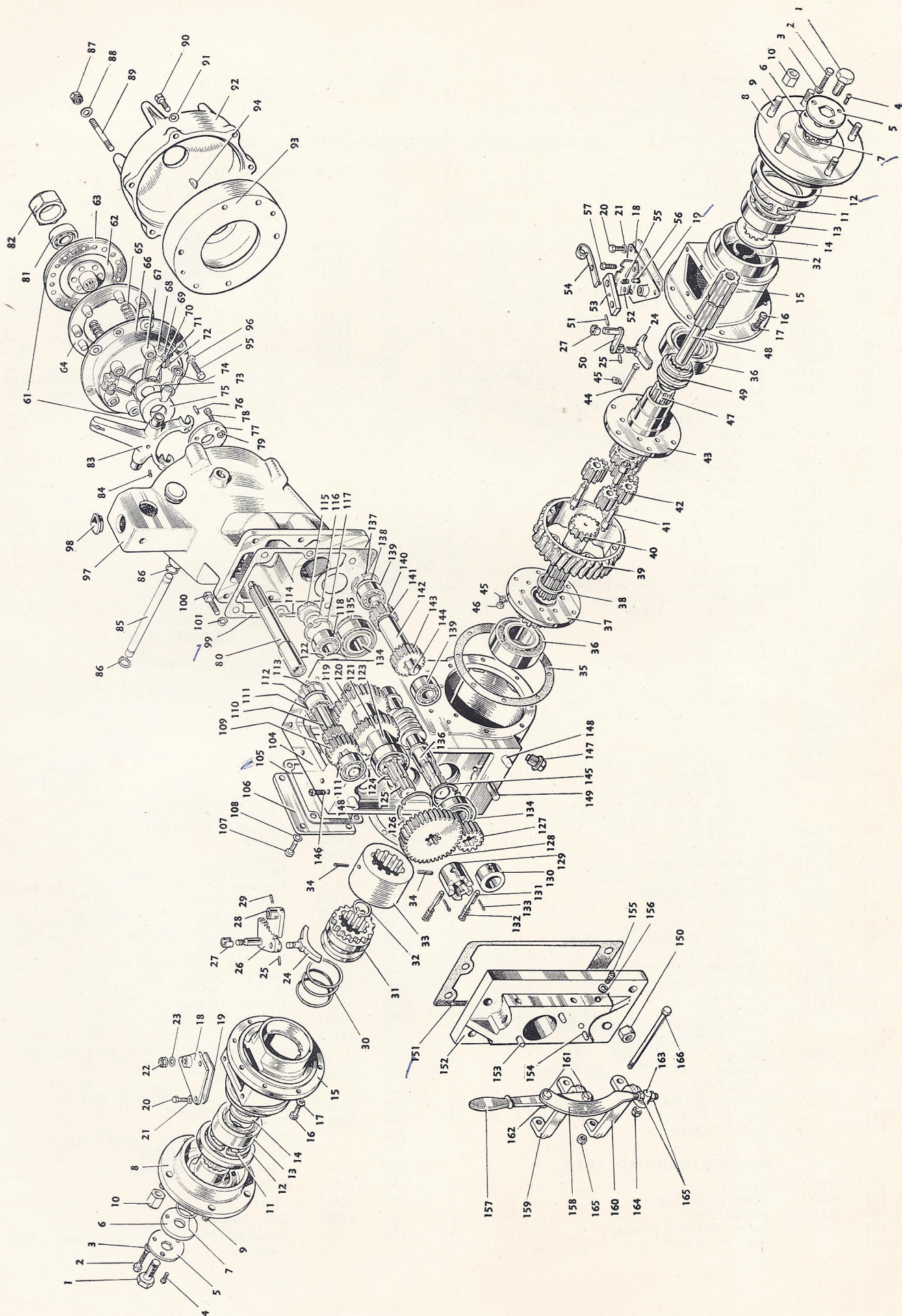
IMPORTANT. When ordering spare parts always give the serial number of your machine. This number is stamped on the control column main spar (Illus. No. 199). Then give the part number (not the illustration number) and description. We cannot guarantee that correct parts will be supplied unless these numbers are quoted.

In the following parts list all directions are given left or right looking forward from the back of the machine

Illus. No.	Part No.	Description	No. off	Illus. No.	Part No.	Description	No. off
<b>DIFFERENTIAL ASSEMBLY</b>				57		Setscrew $\frac{1}{4}$ " U.N.C. x $\frac{3}{8}$ " long, Hex Head	2
				58-60		Not Allocated	
1		Bolt $\frac{5}{16}$ " U.N.F. x $1\frac{1}{4}$ " long	2	<b>CLUTCH ASSEMBLY</b>			
2		Bolt $\frac{1}{4}$ " U.N.F. x 1" long	2	61	44844	Clutch Assembly complete (Borg and Beck $6\frac{1}{2}$ " A.G.)	1
3		Spring Washer $\frac{1}{4}$ " dia.	2			comprising:—	
4		Plug, $\frac{1}{4}$ " U.N.F. x $\frac{3}{8}$ " long, socketed head	2	62	45586	Driven Plate Assembly Rigid Type $\frac{7}{8}$ "	1
		Grub Screw, Hex.	2			Spline	
5	53405	Locking Disc	2	63	45546	Facing Package (2 Facings 44831 Moulded Type and 18 Rivets 40028)	1
6	53406	Hub Retaining Washer	2		45684/11	Cover Assembly	1
7		'O' Ring (Pioneer P.O./150/125/13)	2			comprising:—	
	53796	Hub Sub-Assembly	2	64	40834	Pressure Plate and Stud Assembly	1
		comprising:—			40807	Pressure Plate	1
8	53842	Hub	2		40809	Stud	3
9	53845	Stud	12		K.19507	Shakeproof Washer	3
10	53843	Nut	12		41666	Thrust Spring	6
11		Circlip, 90 mm. dia. Internal	2	65	44823	Cover and Fulcrum Assembly	1
12		Oilseal (Western 492.400.50)	2	66	44816	Cover	1
13		Ballbearing, Hoffman 150	2		40801	Fulcrum	3
14	52540	Hub Thrust Washer	2		K.21230	Rivet	6
15	52427	Axle Housing	2	67	48702	Spring Cup	6
16		Bolt $\frac{3}{8}$ " U.N.C. x 1" long	16	68	48054	Bearing Plate	3
17		Spring Washer $\frac{3}{8}$ " dia.	16	69	48778	Tab Washer	3
18	53413	Cover Plate	2	70	40813	Nut	3
19	53287	Cover Plate Gasket	2	71	40810	Release Lever	3
20		Setscrew $\frac{1}{4}$ " U.N.C. x $\frac{5}{8}$ " long, Hex Head	6	72	40804	Release Lever Plate-Spring Retainer	3
21		Spring Washer $\frac{1}{4}$ " dia.	6	73	42060	Release Lever Plate	1
22		Nut $\frac{3}{8}$ " U.N.F.	1	74	47999	Release Bearing Retainer	2
23		Washer $\frac{3}{8}$ " dia. Flat Bright	2	75	46858	Release Bearing and Cup Assembly	1
24	52548	Selector	2	<b>CLUTCH SHAFT AND GEAR BOX ASSEMBLY</b>			
25	51640	Locking Pin	1	76		Mills Pin $\frac{1}{4}$ " dia. x $\frac{1}{2}$ " long G.P.2	2
26	53400	Selector Quadrant	1	77	25069	Oilseal	1
27	53951	Selector Spacer	2	78		Setscrew $\frac{1}{4}$ " U.N.C. x $\frac{1}{2}$ " long, Hex Head	3
28	53399	Diff. Lock Quadrant	1	79		Spring Washer $\frac{1}{4}$ " dia.	3
29	53392	Control Rod Pin	1	80	52612	Clutch Shaft	1
30	53952	Spring	1	81		Ballbearing F.B.C. DN.201	1
31	52544	Diff. Lock Gear	1	82	52611	Flywheel Nut	1
32		Circlip $1\frac{1}{2}$ " dia. External	2	83	48/5762	Clutch Fork	1
33	53407	Diff. Locking Ring	1	84		Grub Screw $\frac{1}{4}$ " U.N.F. x $\frac{3}{8}$ " long, Hex.	1
34		Grover Pin $3/16$ " dia. x $11/16$ " long	2	85	51538	Clutch Fork-Shaft	1
35	51664	Axle Housing Gasket	2	86		Circlip $\frac{1}{2}$ " dia. External	2
36		Tapered Roller Bearing (Timken 3720-377)	2	87		Locknut $\frac{3}{8}$ " U.N.C.	4
37	52539	Diff. Housing	1	88		Washer $\frac{3}{8}$ " dia. Flat Bright	4
38	52554	Thrust Ring	2	89	53409	Engine Stud	4
39	53401	Worm Wheel	1	90		Bolt, Clutch Housing to Flywheel Housing, $\frac{3}{8}$ " U.N.C. x $1\frac{1}{4}$ " long	6
40	53345	Half Shaft L.H.	1	91		Spring Washer $\frac{3}{8}$ " dia.	6
41	53341	Diff. Pinion Spindle	6	92	51509	Flywheel Housing	1
42	53342	Diff. Pinion	6	93	51530	Flywheel	1
43	53365	Diff. Housing	1	94		Woodruff Key B.S. 606	1
44		Bolt $\frac{3}{8}$ " U.N.F. x $2\frac{3}{8}$ " long	6	95		Setscrew $5/16$ " U.N.C. x $\frac{3}{4}$ " long	6
45	51642	Tab Washer	12	96		Spring Washer $5/16$ " dia.	6
46		Nut $\frac{3}{8}$ " U.N.F.	6	97	51508	Clutch Housing	1
47	53343	Inner Stub Axle	1	98	44/5707	Grommet S.I.C. 4988	2
48	53344	Outer Stub Axle	1	99	51621	Bell Housing Gasket	1
49	53933	Diff. Lock Sleeve	1	100		Bolt, $\frac{3}{8}$ " U.N.C. x 1" long	6
50	53934	Free Wheel Selector	1	101		Spring Washer $\frac{3}{8}$ " dia.	6
51		Mills Pin $\frac{1}{8}$ " dia. x $\frac{3}{4}$ " long G.P.1	1	102/3		Not allocated	
52	53950	Selector Gate	1	104	51511	Gearbox	1
53	53931	Selector Arm	1				
54	53930	Selector Lever	1				
55	53319	Spring	1				
56		Rivet $3/16$ " dia. x $\frac{7}{8}$ " long, C/sk. Head	1				



Diagram—Gearbox Assembly





105	51659	Inspection Cover Gasket ...	1
106	51637	Inspection Cover ...	1
107		Setscrew, Inspection Cover to Gearbox	
		$\frac{3}{8}$ " U.N.C. x $\frac{3}{4}$ " long ...	4
108		Spring Washer $\frac{3}{8}$ " dia. ...	4
109	51513	Cluster Gear ...	1
110	51512	Drive Shaft ...	1
111		Ballbearing $\frac{3}{4}$ " i.d. x $1\frac{7}{8}$ " o.d. x $9/16$ " w. (Hoff.LS.8.) ...	2
112	25684	Shim ...	As required
113		Circlip $1\frac{1}{8}$ " dia. Internal ...	1
114		Split Pin $\frac{1}{8}$ " dia. x 2" long ...	1
115	51639	Slotted Nut ...	1
116	51548	Washer ...	1
117		Circlip 2" dia Internal ...	1
118		Ballbearing $\frac{7}{8}$ " i.d. x 2" o.d. x $9/16$ " w. (Hoff.LS.9.) ...	1
119	51533	Pinion 37 Tooth ...	1
120	51519	Spacer ...	1
121	51532	Pinion 31 Tooth ...	1
122	53288	Shim ...	As required
123	51520	Spacer ...	1
124		Ballbearing $1\frac{1}{8}$ " i.d. x $2\frac{1}{2}$ " o.d. x $\frac{5}{8}$ " w. (Hoff.LS.11) ...	1
125	53851	Layshaft ...	1
126		Circlip $2\frac{1}{2}$ " dia. Internal ...	1
127	51517	Pinion 14 Tooth ...	1
128	51518	Pinion 35 Tooth ...	1
	51515	Pinion 22 Tooth } Alternatives	1
	51516	Pinion 27 Tooth }	1
129	52615	P.T.O. Dog ...	1
130	51535	Locking Disc ...	1
131	53825	Retaining Pin ...	2
132	53826	Spring ...	2
133		Split Pin $5/64$ " dia. x $\frac{1}{2}$ " long ...	2
134		Tapered Roller Bearing, Timken Cone 14125A-Cup 14276 ...	2
135	53945	Shim ...	As required
136	52607	Worm Shaft ...	1
137		Circlip $1\frac{1}{8}$ " dia. Internal ...	1
138	25684	Shim ...	As required
139		Ballbearing $\frac{3}{4}$ " i.d. x $1\frac{7}{8}$ " o.d. x $9/16$ " w. (Hoff.LS.8.) ...	2
140	51547	Pinion 15 Tooth ...	1
141	52610	Shim ...	As required
142	51521	Spacer ...	1
143	51557	Pinion 21 Tooth ...	1
144	51529	Reverse Shaft ...	1
145		Circlip 69 mm. Internal ...	1
146		Setscrew $\frac{3}{8}$ " U.N.C. x $\frac{1}{2}$ " long ...	2
147		Magnetic Drain Plug $\frac{3}{8}$ " B.S.P. ...	1
148	51638	Dowel Pin ...	2
149	52634	Stud ...	2
150	50303	Domed Hub Nut ...	2
151	51660	Gearbox Gasket ...	1
152	52605	Gearbox Backplate ...	1
153	53955	Dowel Pin ...	2
154		Cork ...	1
155		Setscrew $\frac{3}{8}$ " U.N.C. x $\frac{1}{2}$ " long ...	2
156	10580	Fibre Washer ...	2
157	53801	Clamping Handle ...	1
158	53800	Clamping Lever ...	1
159	53419	Clamp L.H. ...	1
160	53418	Clamp R.H. ...	1
161		Setscrew $5/16$ " U.N.F. x $\frac{7}{8}$ " long ...	2
162		Locknut $5/16$ " U.N.F. ...	2
163	53802	Trunnion ...	1
164		Philidas Nut $5/16$ " U.N.F. (Ref. No. G.U.F.P.) ...	1
165		Locknut $\frac{3}{8}$ " U.N.F. ...	4
166		Bolt $\frac{3}{8}$ " U.N.F. x $4\frac{1}{2}$ " long ...	2
167-179		Not Allocated	

#### PEDESTAL AND MAIN SPAR

180	52647	Pedestal ...	1
181	51665	Pedestal Gasket ...	1
182	53386	Special Stud ...	4
183		Spring Washer $\frac{3}{8}$ " dia. ...	4
184		Nut $\frac{3}{8}$ " U.N.C. ...	4

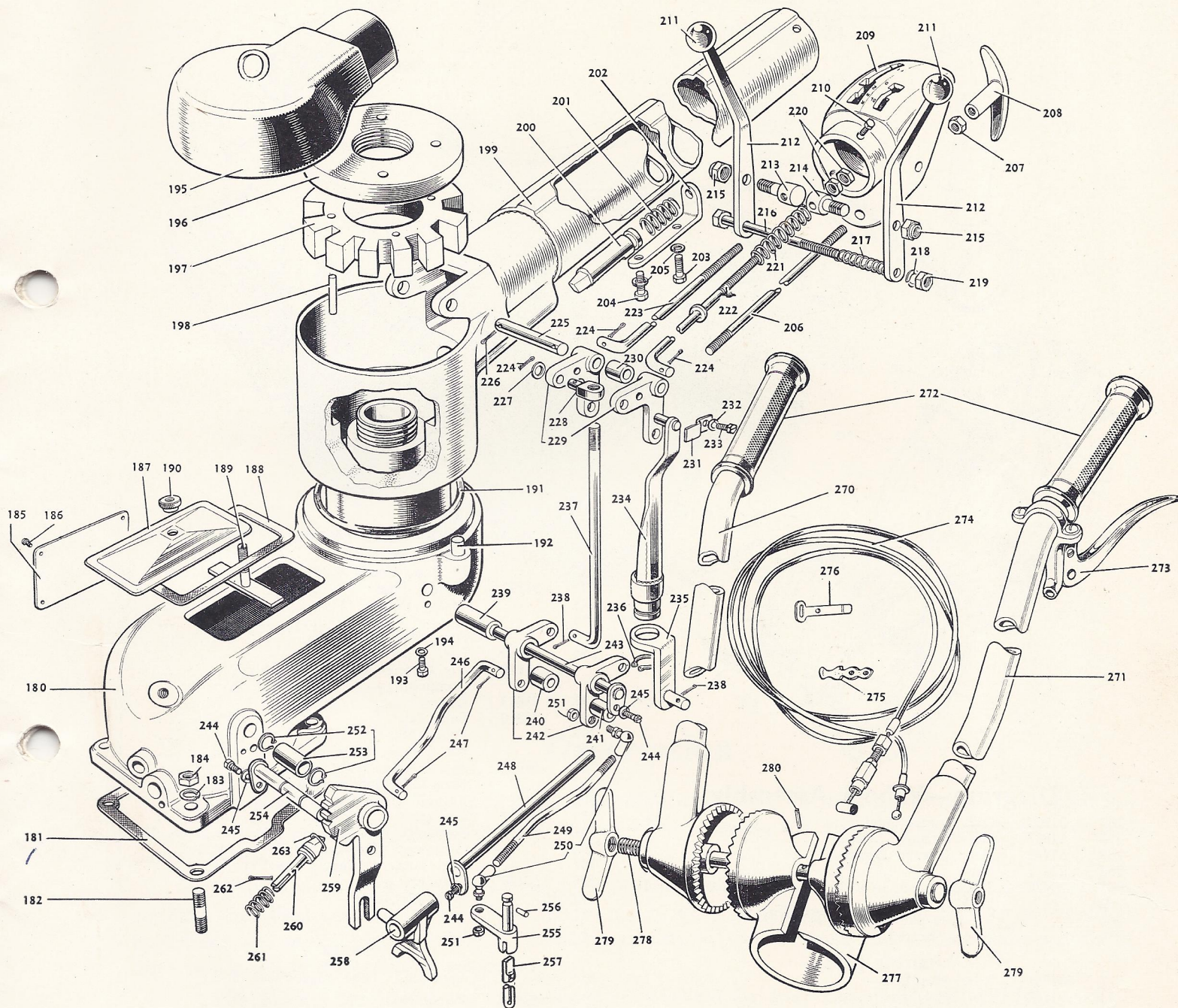
185	53366	Patent Plate ...	1
186		Parker Kalon Screw, Type 'U' $3/16$ " dia. x No. 4 ...	4
187	53387	Pedestal Inspection Cover ...	1
188	53388	Gasket ...	1
189	53827	Clamp ...	1
190	53830	Clamp Nut ...	1
191		'O' Ring, Dowty P.P.51-45 ...	1
192		Swivel Stop, Mills Pin $\frac{3}{8}$ " dia. x $\frac{7}{8}$ " long, GP.2. ...	2
193		Setscrew $\frac{3}{8}$ " U.N.C. x $\frac{1}{2}$ " long, Hex. Head	2
194	10580	Fibre Washer ...	2
195	53944	Headstock Cover ...	1
196	52627	Special Nut ...	1
197	51632	Index Plate ...	1
198		Mills Pin $\frac{1}{4}$ " dia. x $\frac{7}{8}$ " long G.P.2. ...	4
199	51983	Main Spar ...	1
200	51634	Plunger ...	1
201	51666	Spring ...	1
202	53416	Anchor Plate ...	1
203		Setscrew $\frac{1}{4}$ " U.N.F. x $\frac{1}{2}$ " long, Hex. Head	1
204		Setscrew $\frac{1}{4}$ " U.N.F. x $\frac{5}{8}$ " long Hex. Head	1
205		Spring Washer $\frac{1}{4}$ " dia. ...	2
206	53414	Rod ...	1
207		Locknut $5/16$ " B.S.W. ...	1
208	C/3378	Plunger Handle ...	1

#### GEAR CHANGE AND DIFF. LOCK

209	52314	Control Lever Gate ...	1
210		Setscrew $\frac{1}{4}$ " U.N.C. x $\frac{1}{2}$ " long, Hex Head	2
211	16/5942	Plastic Knob ...	2
212	52313	Control Lever ...	2
213	51978	Gear Change Trunnion ...	1
214	53859	Diff Trunnion ...	1
215		Nut $5/16$ " U.N.F. Philidas Thin Type (Ref. G.U.F.J.) ...	2
216		Bolt $5/16$ " U.N.F. x $3\frac{3}{4}$ " long ...	1
217	53940	Spring ...	1
218		Spring Washer $5/16$ " dia. ...	1
219		Nut $5/16$ " U.N.F. ...	1
220		Locknut $5/16$ " U.N.F. ...	2
221	G.794	Diff. Spring ...	1
222	53803	Diff. Rod ...	1
223	51649	Control Rod ...	1
224		Split Pin $1/16$ " dia. x $\frac{3}{4}$ " long ...	3
225	52626	Fulcrum Pin ...	1
226		Split Pin $3/32$ " dia. x $\frac{3}{4}$ " long ...	2
227		Washer $5/16$ " dia. Flat Bright ...	1
228	52311	Control Rod Trunnion ...	1
229	51988	Control Bell Crank ...	2
230	53411	Spacer ...	1
231	53286	Clip ...	1
232		Spring Washer $\frac{1}{4}$ " dia. ...	1
233		Setscrew $\frac{1}{4}$ " U.N.F. x $\frac{1}{2}$ " long, Hex. Head	1
234	51994	Control Tube ...	1
235	52312	Swivel Bracket ...	1
236		Circlip $\frac{3}{4}$ " dia. External ...	1
237	53394	Control Rod ...	1
238		Split Pin $1/16$ " dia. x $\frac{3}{4}$ " long ...	2
239	52614	Fulcrum Spacer ...	1
240	52620	Fulcrum Spacer ...	1
241	52621	Fulcrum Spacer ...	1
242	53861	Control Bell Crank ...	2
243	52622	Fulcrum ...	1
244		Setscrew $\frac{1}{4}$ " U.N.F. x $\frac{3}{8}$ " long, Hex. Head	3
245		Spring Washer $\frac{1}{4}$ " dia. ...	3
246	51648	Control Rod ...	1
247		Split Pin $1/16$ " dia. x $\frac{3}{4}$ " long ...	2
248	52691	Selector Slide Bar ...	1
249	52616	Control Rod ...	1
250		Ball Joint. Pin No. 2-5/16" U.N.F. ...	2
251		Locknut $5/16$ " U.N.F. ...	2
252		Circlip $\frac{1}{2}$ " dia. External ...	2
253	52617	Bush ...	1
254	52618	Pivot ...	1
255	51987	Diff. Fulcrum ...	1
256		Retaining Pin $\frac{1}{8}$ " dia. x 1" long (Mills G.P.2.) ...	1

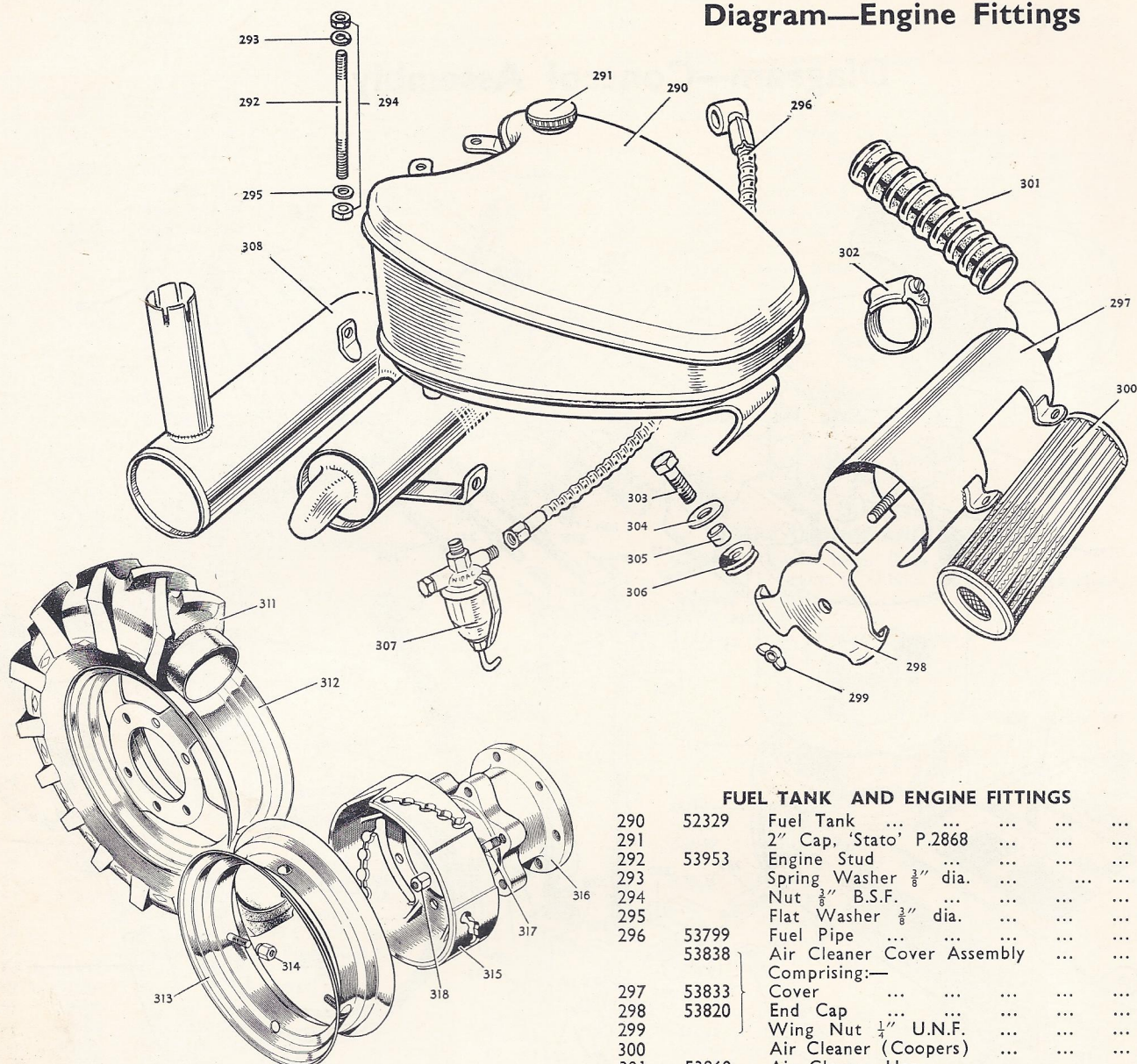


## Diagram—Control Assembly





# Diagram—Engine Fittings



## Diagram—Wheel Assembly

257	51993	Diff. Control Rod	...	...	...	1
258	52507	Gear Change Selector	...	...	...	1
259	51989	Gear Change Quadrant	...	...	...	1
260	52619	Pawl	...	...	...	1
261	20470	Spring	...	...	...	1
262		Locking Wire	...	...	...	1
263		'O' Ring Pioneer PO.04303107	...	...	...	1
264-269		Not Allocated				

### HANDLE BARS

270	51984	R.H. Handlebar	...	...	...	1
271	51982	L.H. Handlebar	...	...	...	1
272	16803	Handle Bar Grip	...	...	...	2
273	16736	Clutch Lever	...	...	...	1
274	53831	Cable Assembly	...	...	...	1
275	85/5931	Cable Clip (John Bull Size 'S')	...	...	...	2
276		Buckle Clip C3	...	...	...	3
277	52606	Handle Bar Clamp	...	...	...	1
278	53818	Stud	...	...	...	1
279	13/5934	Wing Nut	...	...	...	2
280		Mills Pin 3/32" dia. x 1" long (GP.8)	...	...	...	1
281-289		Not Allocated				

### FUEL TANK AND ENGINE FITTINGS

290	52329	Fuel Tank	...	...	...	1
291		2" Cap, 'Stato' P.2868	...	...	...	1
292	53953	Engine Stud	...	...	...	2
293		Spring Washer 3/8" dia.	...	...	...	2
294		Nut 3/8" B.S.F.	...	...	...	4
295		Flat Washer 3/8" dia.	...	...	...	2
296	53799	Fuel Pipe	...	...	...	1
	53838	Air Cleaner Cover Assembly	...	...	...	1
		Comprising:—				
297	53833	Cover	...	...	...	1
298	53820	End Cap	...	...	...	1
299		Wing Nut 1/4" U.N.F.	...	...	...	1
300		Air Cleaner (Coopers)	...	...	...	1
301	53860	Air Cleaner Hose	...	...	...	1
302		Hose Clip (Jubilee Size 2)	...	...	...	2
303		Bolt 3/8" U.N.F. x 3/4" long	...	...	...	1
304	53791	Washer	...	...	...	1
305	53862	Spacer	...	...	...	1
306		Grommet (Dowty PP.59A-8-13)	...	...	...	1
307		Fuel Filter (Wipac Type 50)	...	...	...	1
308	52637	Silencer	...	...	...	1
309-310		Not Allocated				

### WHEELS

311		Tyre and Tube (Goodyear 5.12)	...	...	...	2
312	53849	Wheel Rim	...	...	...	2
313	52316	Rim	...	...	...	2
314	52315	Special Nut	...	...	...	6
315	52522	Wheel Disc	...	Optional	...	2
316	53948	Axle Extension	...	Equipment	...	2
317	52296	Wheel Extension Stud	...	...	...	12
318	53843	Wheel Extension Nut	...	...	...	12
319-321		Not Allocated				

The rights to alter and/or amend all designs, specifications and/or prices quoted without prior notice is strictly reserved.



### HOWARD SIDE-DRIVE ROTAVATOR UNIT

The Howard Rotavator unit is supplied either with a 15" or 20" working width. It is quickly attached to the HOWARD 700 Tractor by the SNAPLOCK Coupling and a foot operated clutch is provided.

Always disengage the engine clutch when putting the rotor dog in or out of gear.

#### DEPTH CONTROL

Depth is controlled by raising or lowering the skid with the hand lever; two holes in the skid can be used. This skid also carries the furrowing attachment when fitted.

#### WORKING HINTS

The Rotavator unit is capable of heavy duty work fitted either with standard blades or with a picktine rotor for very compacted or stony ground. The Rotavator will cultivate to a depth of approximately 9" (23 cms.) on most soils but this may not be obtained in a single pass. Where cultivation in depth is needed the first pass should be shallow to break the surface and depth should be increased in successive passes. To avoid an accumulation of soil choking the rotor and absorbing unnecessary power, the rear hinged shield should be raised sufficiently to allow the soil to escape to the rear.

#### USE OF GEARS AND SELECTASPEED RATIOS

The speed of the rotor depends on the gear chosen. In first gear it is rotating at 142 r.p.m. (at 2,800 r.p.m. engine speed and in second gear at 237 r.p.m. As the road speed increases in proportion to the rotor speed between first and second gear the "cut" of each blade remains the same in each SELECTASPEED ratio, but the higher velocity of the blade as it enters the soil will produce a finer tilth in second gear than in first.

To obtain a coarser tilth use a higher SELECTASPEED ratio, e.g. use  $\frac{B}{B1}$  gears instead of  $\frac{A}{A1}$ .

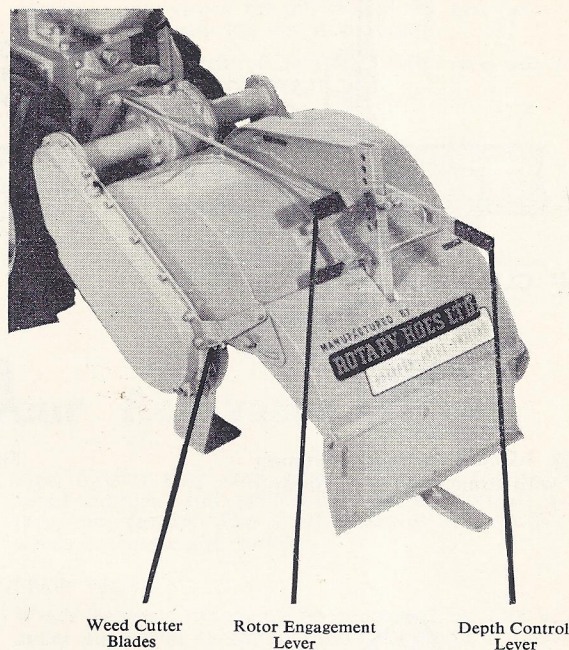
lowest gears should be chosen for deep and heavy work, the higher ones for faster and shallower operation.

Do not try and force the rotor into the ground. If the depth control is suitably set and the correct working speed chosen the blades will pull the machine into work.

The design of the dog clutch ensures that it is impossible to use the rotor in reverse, since not only would the blades be facing the wrong way but undue strain would be put on the chain tensioner. The dog will automatically disengage the rotor if this is attempted.

#### LUBRICATION

- (1) The bevel gearbox of the Rotavator contains approximately  $\frac{1}{2}$  pint S.A.E. 90 gear oil. Fill to the top mark on the dip stick.
- (2) The chain case contains approximately  $\frac{1}{4}$  pint S.A.E. 90 gear oil. Fill until oil runs from the small level plug at the rear when the blades are resting on the ground.
- (3) The rotor stub axle is oiled by an oil can through the small setscrew hole situated on the rotor inside the right-hand flange.



#### ADJUSTMENTS

##### CHAIN ADJUSTMENT

- (a) The chain should be adjusted to give approximately  $\frac{3}{8}$ " (9 mm.) total up and down movement measured through the oil filling plug. Test the chain for free movement by inserting a screwdriver between the links and twisting it so that it locks against the chain and then moving it up and down. Adjust the chain by screwing up the external chain adjuster situated beneath the chain case. Tighten the lock nut after adjustment and replace the oil filler plug.

##### ROTOR FLANGE WEED CUTTERS

The weed cutter blades at either end of the rotor are provided to prevent long grass or weeds from binding around the end rotor flanges. To adjust, slacken the two setscrews securing the weed cutter blade and tap the blade until it is within  $\frac{1}{32}$ " (1mm.) of the rotor flange. Then revolve the rotor by hand to make sure that the blade does not foul. Retighten screws.

##### ROTOR FRICTION DRIVE

The rotor is driven through a spring-loaded friction clutch which absorbs the shocks when the blades encounter a large obstacle. The normal setting of clutch is to fully tighten the four nuts which compress the springs and then release each half a turn. The clutch must on no account be so loose as to slip under normal working loads.

##### BLADES

The Rotavator unit is normally delivered with the blades already fitted. If it is necessary to fit your own blades, this is the way it should be done.

- (a) Identify left and right-hand blades.
- (b) The left-hand end flange carries two right-hand blades. The right-hand end flange carries two left-hand blades.
- (c) The centre flange carries two left-hand and two right-hand blades. Bolt the blades to the flange with the left-hand blades leading. All blades should be fitted to the left-hand side of this flange.



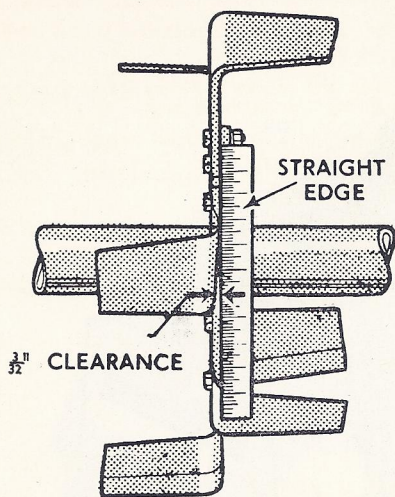


Fig. 1. Checking blade alignment with straight edge (or setting bar.)

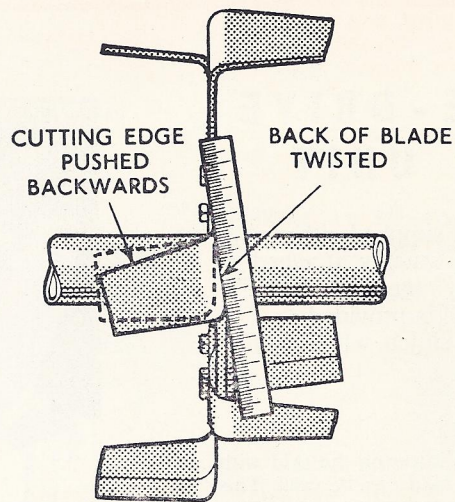


Fig. 2. Showing bent blade.

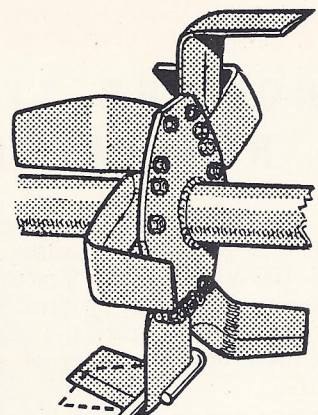


Fig. 3. Straightening bent blade with setting bar.

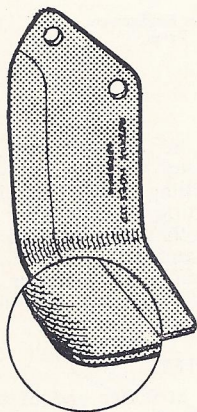


Fig. 4. Enlarged view of blade with cutting edge turned inwards.

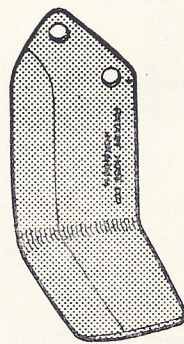


Fig. 5. Normal blade.

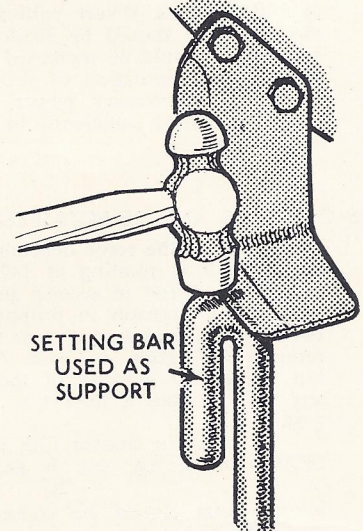


Fig. 6. Restoring turned up edge.

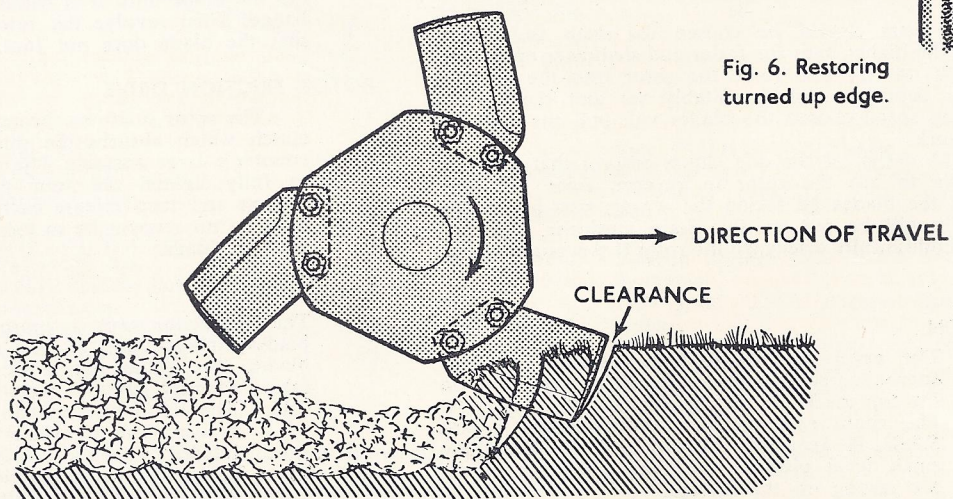


Fig. 7. Correct blade setting showing clearance at back of blade.



## BLADES (cont.)

In each case the head of the bolt should be in contact with the blade and the spring washer fitted under the nut. Blades should be examined daily. Any bent blades should be straightened with the Blade Setting Bar. When land that has become hard panned through persistent ploughing to a constant depth, or land that is very stony is being rotavated for the first time, the cutting edges of the blades may become slightly turned. This may be corrected by putting the end of the blade setting bar behind the blade and restoring the cutting edge to its correct position with a hammer.

Blades will then cut cleanly with only the cutting edges touching the ground and the back of the blade having clearance.

Important: Before attending to the rotor, switch off the engine.

## MAINTENANCE

- Daily: All nuts and bolts, especially blade bolts should be checked daily.
- Weekly:
- (a) Check the oil level of the bevel gearbox and top up if necessary.
  - (b) Check oil level in chain case and top up if necessary.
  - (c) Oil rotor stub axle.
  - (d) Check chain tension and adjust if necessary.
  - (e) Check weed cutter blades and adjust if necessary.
  - (f) Check safety clutch and adjust if necessary.

# Making the most of your Rotavator

## GENERAL PRINCIPLES

The Rotavator unit can produce a fine or coarse seed bed as desired by correct use of the shield and SELECTASPEED ratio.

Heavy land should not be rotavated too finely and left bare for winter rains or the soil will run together and spring cultivation will be difficult. On heavy land which is to be laid up for the winter the surface should be left rough. This may be done either by ploughing or by rotavating and using a high SELECTASPEED ratio. Alternatively, the furrowing attachment may be used during the final or late autumn cultivation, so that the land is left in ridges to promote better drainage and expose a larger surface area to weathering.

On light land the ground may either be left rough or cultivated to minimum depth and sown to a green crop, e.g. rye. The green crop will prevent the leaching out of the soil nitrogen.

In the early part of the year the crop is rotavated in and a week or 10 days later the seed bed may be prepared. This second rotavation should be more shallow than that which worked in the green crop, in order not to bring up fresh weed seeds to germinate.

## SEED BEDS

In ground which has been cultivated properly, seed beds should seldom exceed 2" (5 cms.) in depth except for certain crops. Seeds require a well-aerated soil with a firm bottom. Some small seeds require a seed bed to be lightly consolidated. This is particularly important on light soil where consolidation will bring moisture nearer to the seedling plant.

Weeds are at their most dangerous when the crop is in the seedling stage. To obtain weed-free seed beds the ground should be prepared a few weeks in advance of the sowing dates. Rotavation should be carried out at a depth of 4" (10 cms.) and this causes any weed seeds to germinate. These weeds may be turned in by a second Rotavation which will prepare the seed bed at the same time. It is most important that this second Rotavation is more shallow. Remember that the ground is now more open and the machine will consequently tend to dig more deeply.

## WEED CONTROL

Rotary cultivation produces well-aerated warm seed beds in which germination takes place readily. Inevitably these conditions also favour weed seeds. Weeds are eliminated by preventing them from reaching flower or from feeding the deep tap roots or rhizomes. Weeds are killed most easily and inexpensively by rotavating

them directly they show green. Annual weeds will be killed outright and perennials will be reduced until they, too, die out. This is true even of such persistent weeds as couch and twitch.

## ROW-CROP WORK

Weeds between rows may be controlled by rotavating under almost all conditions while the weeds are small. Normally a high SELECTASPEED ratio is chosen.

This will not prevent weeds growing in the rows themselves. Such weeds must be controlled by hand-hoeing when small. Should land become filthy because these weeds have been allowed to seed the following crop should be a cleaning crop, e.g. roots or potatoes, which will give a period of several weeks in the early part of the year when the weed seeds will shoot and can be killed by rotavation.

In planning your crop so that the best use may be made of your HOWARD ROTAVATOR 700, two or three inches over the effective width should be allowed on either side of the machine. This means that the minimum planting or sowing distance is about 20" (51 cm.) where the 15" rotor is used and about 25" (64 cms.) where the 20" rotor is used. Such a sowing would allow only one cultivation for hoeing.

Crops which are grown in rows of narrower spacing should be hoed with the toolbar which covers several rows at a time for more economic work.

## GREEN MANURING

Land not immediately required may be sown to such crops as mustard or rye grass during the spring or summer or rye during the winter. These crops should be allowed to mature if they are to be used as green manure. They will then have the best effect on the land, but a winter cover crop will preserve plant foods which would otherwise be leached away and need not be allowed to mature.

To turn in the green manure crop the SELECTASPEED ratio and gear will be determined by the maturity of the crop and nature of the ground. Low SELECTASPEED ratio would normally produce the best results.

## LAND RECLAMATION

The HOWARD ROTAVATOR 700 may be used for bringing back derelict land under cultivation. When virgin land is being cultivated the first pass should be at shallow depth. Depth can be increased by subsequent passes made at intervals of about a week or 10 days. Low SELECTASPEED ratio will probably give the best results for work of this kind.

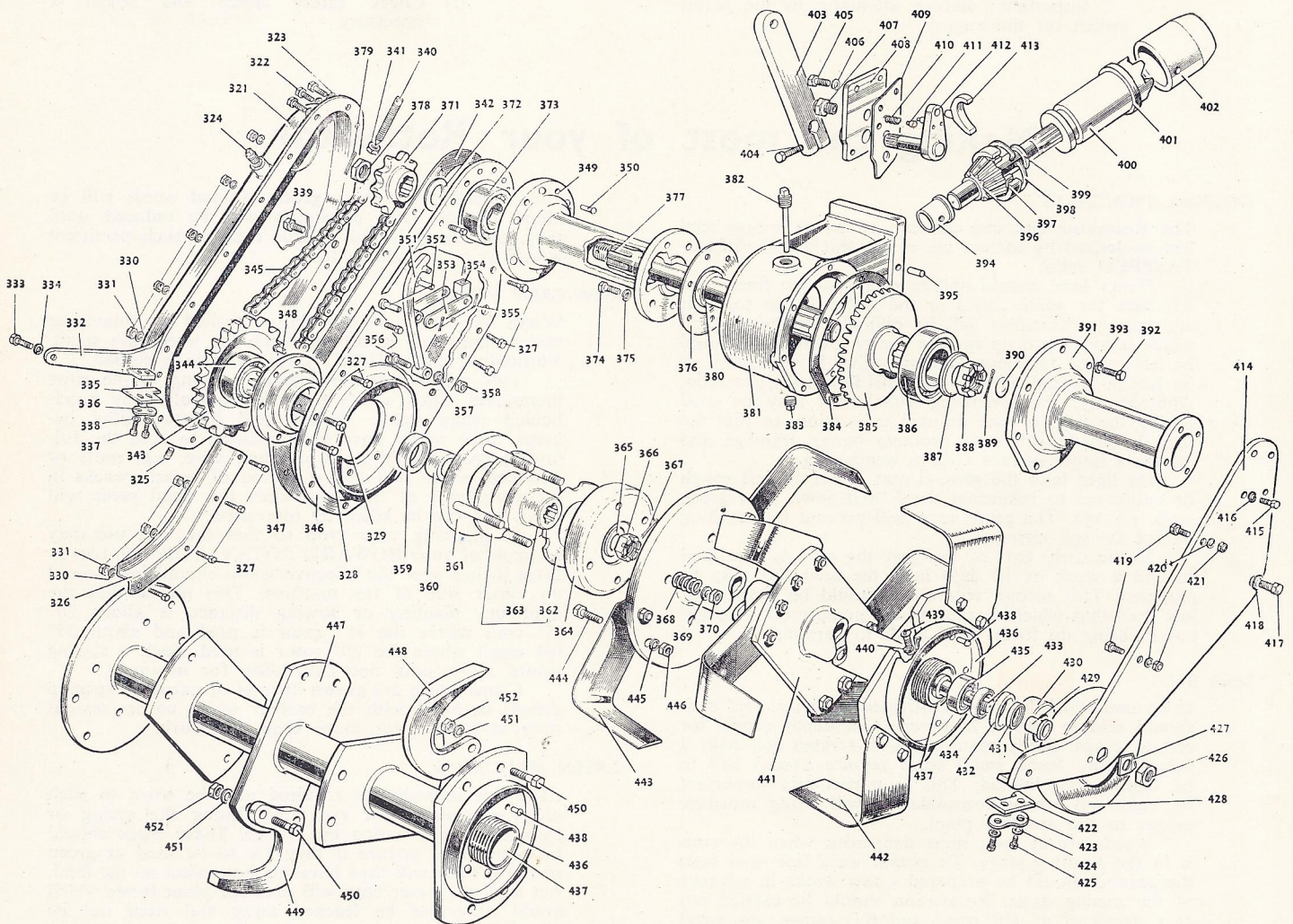


# Parts List

IMPORTANT. When ordering spare parts always give the serial number of your Rotavator. This number is stamped on the clamp plate of the Bevel Box (Illus. No. 381). Then give the part number (not the illustration number) and description. We cannot guarantee that correct parts will be supplied unless these numbers are quoted.

In the following parts list all directions are given left or right looking forward from the back of the machine.

## Diagram—Rotor Assembly



Illus. No.	Part No.	Description	No. off	Illus. No.	Part No.	Description	No. off
321	52629	Chaincase	1	332	51997	Shield Support L.H.	1
322		Bolt $\frac{1}{4}$ " U.N.C. x $\frac{3}{4}$ " long	3	333		Bolt $\frac{3}{8}$ " U.N.F. x $\frac{3}{4}$ " long	1
323		Spring Washer $\frac{1}{4}$ " dia.	3	334		Spring Washer $\frac{3}{8}$ " dia.	1
324		Plug $\frac{3}{8}$ " B.S.P. Sq. Head	1	335	16765	Scraper Blade L.H.	1
325		Plug $\frac{1}{8}$ " B.S.P. Sq. Head	1	336	G.830	Keeper Plate	1
326	16570	Wearing Shoe	1	337		Bolt $\frac{1}{4}$ " U.N.F. x $\frac{1}{2}$ " long	2
327		Bolt $\frac{1}{4}$ " U.N.F. x $\frac{1}{2}$ " long	12	338		Spring Washer $\frac{1}{4}$ " dia.	2
328		Bolt $\frac{1}{4}$ " U.N.F. x $\frac{1}{2}$ " long	1	339		Bolt $\frac{7}{16}$ " U.N.F. x $\frac{3}{4}$ " long	1
329		Bolt $\frac{1}{4}$ " U.N.F. x $\frac{1}{2}$ " long	1	340	51544	Adjusting Screw	1
330		Spring Washer $\frac{1}{4}$ " dia.	14	341		Nut $\frac{5}{16}$ " U.N.F.	1
331		Nut $\frac{1}{4}$ " U.N.F.	14	342	52630	Gasket	1



# BACKPLATE AND ROTOR DRIVE

343	51963	Rotor Drive Shaft ... ..	1
344	Hoff.330	Ballbearing 30 mm. i.d. x 72 mm. o.d. x 19 mm. w. ... ..	1
345	16783	Drive Chain ... ..	1
	53885	Backplate Rivet Assembly for 15" Rotor	1
	53886	Backplate Rivet Assembly for 20" Rotor comprising:—	1
346	51985	Backplate ... ..	1
347	53402	Bearing Housing ... ..	1
348		Rivet, $\frac{1}{4}$ " dia. x $\frac{5}{8}$ " long, Round Head ...	6
349	53874	Jackshaft Housing for 15" Rotor ...	1
349	53875	Jackshaft Housing for 20" Rotor ...	1
350		Rivet $\frac{1}{4}$ " dia x $\frac{3}{4}$ " long, Round Head ...	6
351	25917	Chain Skid ... ..	1
352	25914	Connecting Pin ... ..	2
353	25919	Connecting Link ... ..	2
354	25920	Sliding Block ... ..	1
355		Split Pin $\frac{1}{16}$ " dia. x $\frac{5}{8}$ " long ... ..	1
356		Bolt $\frac{5}{16}$ " U.N.F. x $\frac{1}{2}$ " long ... ..	1
357		Washer $\frac{5}{16}$ " dia. Flat Bright ... ..	1
358		Locknut $\frac{5}{16}$ " U.N.F. ... ..	1
359		Oilseal $\frac{1}{2}$ " i.d. x 2" o.d. x $\frac{3}{8}$ " w. ...	1
360	53404	Spacing Sleeve ... ..	1
361	51542	Drive Plate ... ..	1
362	16135	Friction Disc ... ..	2
363	53403	Rotor Drive Disc ... ..	1
364	16551	Wearing Plate ... ..	1
365		Washer $\frac{3}{4}$ " dia. Flat Bright ... ..	1
366		Nut $\frac{3}{4}$ " U.N.F. Slotted ... ..	1
367		Split Pin $\frac{1}{8}$ " dia. x $\frac{1}{2}$ " long ... ..	1
368	G.602	Spring ... ..	4
369		Washer $\frac{7}{16}$ " dia. Flat Bright ... ..	4
370		Nut $\frac{7}{16}$ " U.N.C. ... ..	4
371	16874	Jackshaft Sprocket 10T. ... ..	1
372	G.462	Shim ... .. As required	
373	Hoff.MS.10	Ballbearing 1" i.d. x $2\frac{1}{2}$ " o.d. x $\frac{3}{4}$ " w. ...	1
374		Bolt $\frac{5}{16}$ " U.N.F. x $\frac{3}{4}$ " long ... ..	6
375		Spring Washer $\frac{5}{16}$ " dia. ... ..	6
376	16757	Gasket ... ..	1

## BEVEL BOX

377	53876	Jackshaft for 15" Rotor ... ..	1
377	53877	Jackshaft for 20" Rotor ... ..	1
378	51656	Special Nut ... ..	1
379		Split Pin $\frac{1}{8}$ " dia. x $\frac{1}{2}$ " long ... ..	1
380		Oilseal $\frac{1}{8}$ " i.d. x $1\frac{3}{8}$ " o.d. x $\frac{5}{16}$ " w. ...	1
381	52501	Bevel Box ... ..	1
382	54657	Dipstick ... ..	1
383		Plug $\frac{1}{4}$ " B.S.P. Sq. Head ... ..	1
384	53844	Gasket ... .. As required	
385	52497	Crown Wheel ... ..	1
386	Hoff.140	Ball bearing 40 mm. i.d. x 80 mm. o.d. x 18 mm. w. ... ..	1
387	16759	Washer ... ..	1
388	51655	Special Nut ... ..	1
389		Split Pin $\frac{1}{8}$ " dia. x $\frac{1}{2}$ " long ... ..	1
390	52441	Welsh Plug ... ..	1
391	53872	Staytube for 15" Rotor ... ..	1
391	53871	Staytube for 20" Rotor ... ..	1
392		Bolt $\frac{1}{4}$ " U.N.F. x $\frac{3}{4}$ " long ... ..	7
393		Spring Washer $\frac{1}{4}$ " dia. ... ..	7
394	16728	Bush ... ..	1
395		Mills Pin $\frac{1}{4}$ " dia. x $\frac{5}{8}$ " long (G.P.4.) ...	2
396	52493	Pinion ... ..	1
397	Hoff.125	ACD. Ballbearing 25 mm. i.d. x 52 mm. o.d. x 15 mm. w. ... ..	1
398		Circlip 52 mm. dia. Internal ... ..	1
399		Nu-Lip Ring, Pioneer Ref. No. 4-017 ...	1
400	51568	Selector Dog ... ..	1
401		Nu-Lip Oilseal, Pioneer Ref. No. 4-031 ...	1
402	53954	Spigot Tube ... ..	1
403	53356	Selector Lever ... ..	1
404		Bolt $\frac{1}{4}$ " U.N.F. x 1" long ... ..	1
405		Bolt $\frac{5}{16}$ " U.N.F. x $\frac{3}{4}$ " long ... ..	4
406		Spring Washer $\frac{5}{16}$ " dia. ... ..	4
407	52642	Spring Holder ... ..	1
408	52640	Selector Guide ... ..	1

409	53393	Gasket ... ..	1
410	51652	Spring ... ..	1
411	52699	Plunger ... ..	1
412	52643	Selector Arm ... ..	1
413	52639	P.T.O. Selector ... ..	1

## SIDE PLATE

414	51569	R.H. Side Plate ... ..	1
415		Bolt $\frac{5}{16}$ " U.N.C. x $\frac{3}{4}$ " long ... ..	4
416		Spring Washer $\frac{5}{16}$ " dia. ... ..	4
417		Bolt $\frac{7}{16}$ " U.N.F. x $\frac{3}{4}$ " long ... ..	1
418		Spring Washer $\frac{7}{16}$ " dia. ... ..	1
419		Bolt $\frac{1}{4}$ " U.N.F. x $\frac{5}{8}$ " long ... ..	2
420		Spring Washer $\frac{1}{4}$ " dia. ... ..	2
421		Nut $\frac{1}{4}$ " U.N.F. ... ..	2
422	16764	R.H. Scraper Blade ... ..	1
423	G.830	Keeper Plate ... ..	1
424		Spring Washer $\frac{1}{4}$ " dia. ... ..	2
425		Bolt $\frac{1}{4}$ " U.N.F. x $\frac{1}{2}$ " long ... ..	2

## ROTOR STUB AXLE

426		Locknut $\frac{5}{8}$ " U.N.F. ... ..	1
427	G.648	Tab Washer ... ..	1
428	G.640	Dust Cover ... ..	1
429	16557	Spacing Sleeve ... ..	1
430	G.632	Bearing Cap ... ..	1
431	G.629	Felt Dust Seal ... ..	1
432	G.637	Oilseal Holder ... ..	1
433	52648	Rotor Stub Axle ... ..	1
434		Oilseal $\frac{7}{8}$ " i.d. x $1\frac{1}{2}$ " o.d. x $\frac{13}{32}$ " w. ...	1
435	Hoff.MS.7	Ball Bearing $\frac{5}{8}$ " i.d. x $1.13/16$ " o.d. x $\frac{5}{8}$ " w. ... ..	1

## ROTOR AND BLADES

436	53390	Dust Cover ... ..	1
437	G.635	Back Plug ... ..	1
438		Rivet $\frac{3}{16}$ " dia. $\frac{1}{2}$ " long, Round Head ...	6
439		Setscrew $\frac{1}{4}$ " U.N.F. x $\frac{1}{2}$ " long, Round Head	1
440		Spring Washer $\frac{1}{4}$ " dia. ... ..	1
441	53878	Rotor 15" ... ..	1
441	53880	Rotor 20" ... ..	1
442	16793	Hoe Blade L.H. for 15" Rotor ... ..	4
442	G.900L	Hoe Blade L.H. for 20" Rotor ... ..	4
443	16792	Hoe Blade R.H. for 15" Rotor ... ..	4
443	G.900R	Hoe Blade R.H. for 20" Rotor ... ..	4
444		Bolt $\frac{7}{16}$ " U.N.F. x 1" long ... ..	16
445		Spring Washer $\frac{7}{16}$ " dia. ... ..	16
446		Nut $\frac{7}{16}$ " U.N.F. ... ..	16

## PICKTINE ROTOR

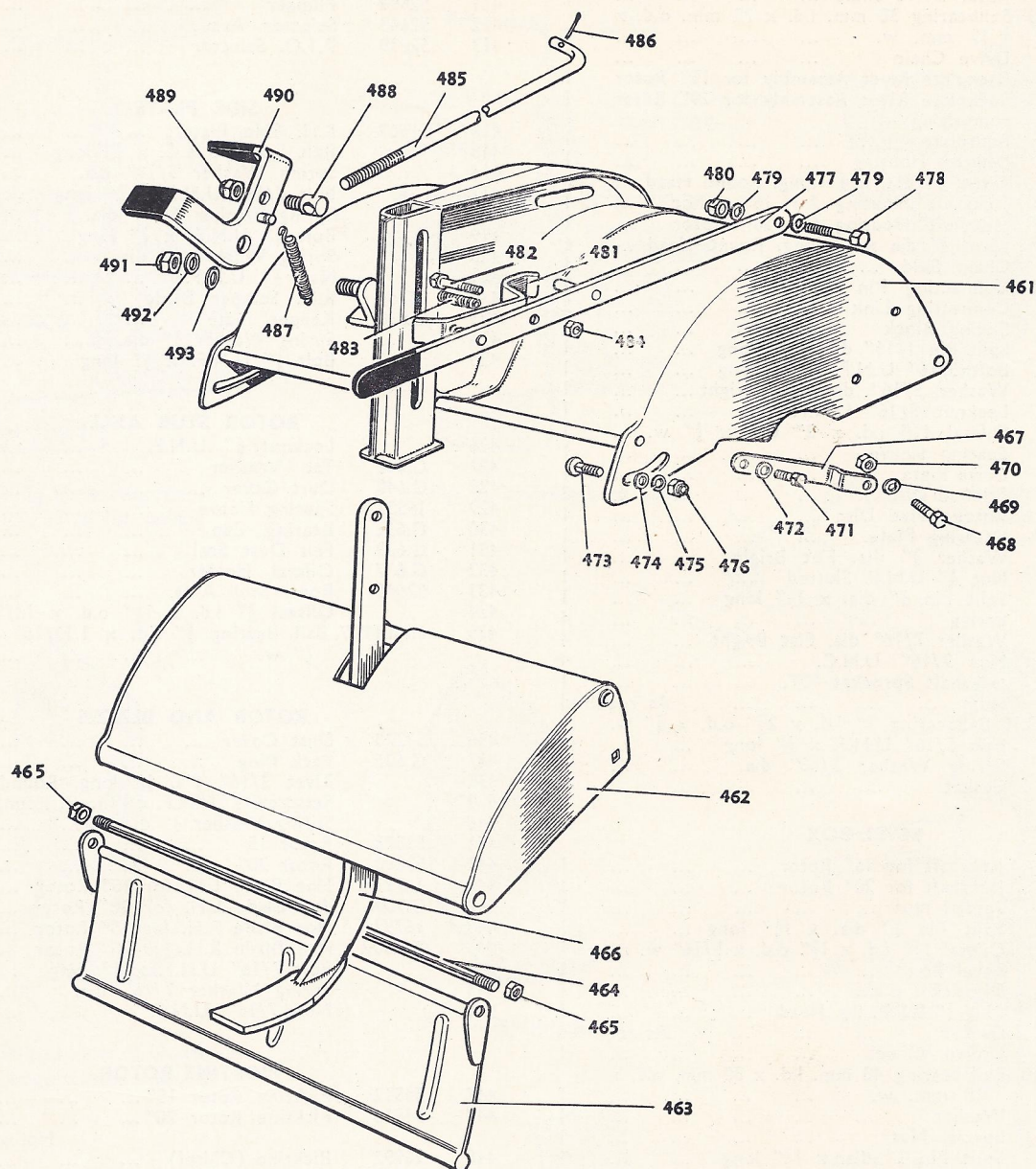
447	54512	Picktine Rotor 15" ... ..	1
447	54516	Picktine Rotor 20" ... ..	1
		No. off 15" 20"	
448	26992	Picktine (Chisel) ... ..	10 12
449	G.991	Picktine (Lucerne) ... ..	10 12
450	55271	Special Bolt ... ..	20 24
451		Spring Washer $\frac{7}{16}$ " dia. ... ..	20 24
452		Nut $\frac{7}{16}$ " U.N.F. ... ..	20 24
453-460		Not Allocated	

## SHIELDS AND DEPTH CONTROL

461	53922	Main Shield for 15" Rotor ... ..	1
461	53923	Main Shield for 20" Rotor ... ..	1
462	53907	Rear Shield for 15" Rotor ... ..	1
462	53908	Rear Shield for 20" Rotor ... ..	1
463	16539	Trailing Board for 15" Rotor ... ..	1
463	53895	Trailing Board for 20" Rotor ... ..	1
464	53890	Trailing Board Rod for 15" Rotor ... ..	1
464	53891	Trailing Board Rod for 20" Rotor ... ..	1
465		Locknut $\frac{5}{16}$ " U.N.F. ... ..	2
466	53352	Depth Control Skid ... ..	1
467	53839	R.H. Shield Support ... ..	1
468		Bolt $\frac{1}{4}$ " U.N.F. x $\frac{3}{4}$ " long ... ..	1
469		Spring Washer $\frac{1}{4}$ " dia. ... ..	1



## Diagram — Shield Assembly



470	Nut $\frac{1}{4}$ " U.N.F. ...	1	482	Bolt $\frac{1}{4}$ " U.N.C. x $1\frac{1}{2}$ " long	1
471	Bolt $\frac{3}{8}$ " U.N.F. x $\frac{3}{4}$ " long	1	483	Clip Spring ...	1
472	Spring Washer $\frac{3}{8}$ " dia.	1	484	Locknut $\frac{1}{4}$ " U.N.C. ...	1
473	Bolt ...	2	485	Rod ...	1
474	Washer $\frac{7}{16}$ " dia. Flat Bright	2	486	Split Pin $\frac{3}{32}$ " dia. x 1" long	1
475	Spring Washer $\frac{3}{8}$ " dia.	2	487	Tension Spring ...	1
476	Nut $\frac{3}{8}$ " U.N.F. Philidas Ref. No. JUF1	2	488	Trunnion ...	1
477	Depth Control Lever ...	1	489	Nut $\frac{5}{16}$ " U.N.F. Philidas GUFJ	1
478	Bolt $\frac{3}{8}$ " U.N.F. x $1\frac{3}{8}$ " long	1	490	Lever ...	1
479	Washer $\frac{3}{8}$ " dia. Flat Bright	2	491	Nut $\frac{3}{8}$ " U.N.F. Philidas Ref. No. JUF1	1
480	Nut $\frac{3}{8}$ " U.N.F. Philidas Ref. No. JUF1	1	492	Spring Washer $\frac{3}{8}$ " dia.	1
481	Depth Control Clip ...	1	493	Washer $\frac{3}{8}$ " Flat Bright	1
			494-500	Not Allocated	

Follow the instructions in this handbook and your Howard 700 will give long and trouble-free service. In case of difficulty apply in the first instance to your dealer who will help you, or write to:

The Service Department, ROTARY HOES LIMITED, WEST HORNDON, ESSEX, ENGLAND.

*The rights to alter and/or amend all designs, specifications and/or prices quoted without prior notice is strictly reserved.*



### Soil Shredder

The Soil Shredder is designed for preparing potting soils and composts for horticultural use. Fine, medium and coarse screens are available to produce different qualities of work.

#### FITTING

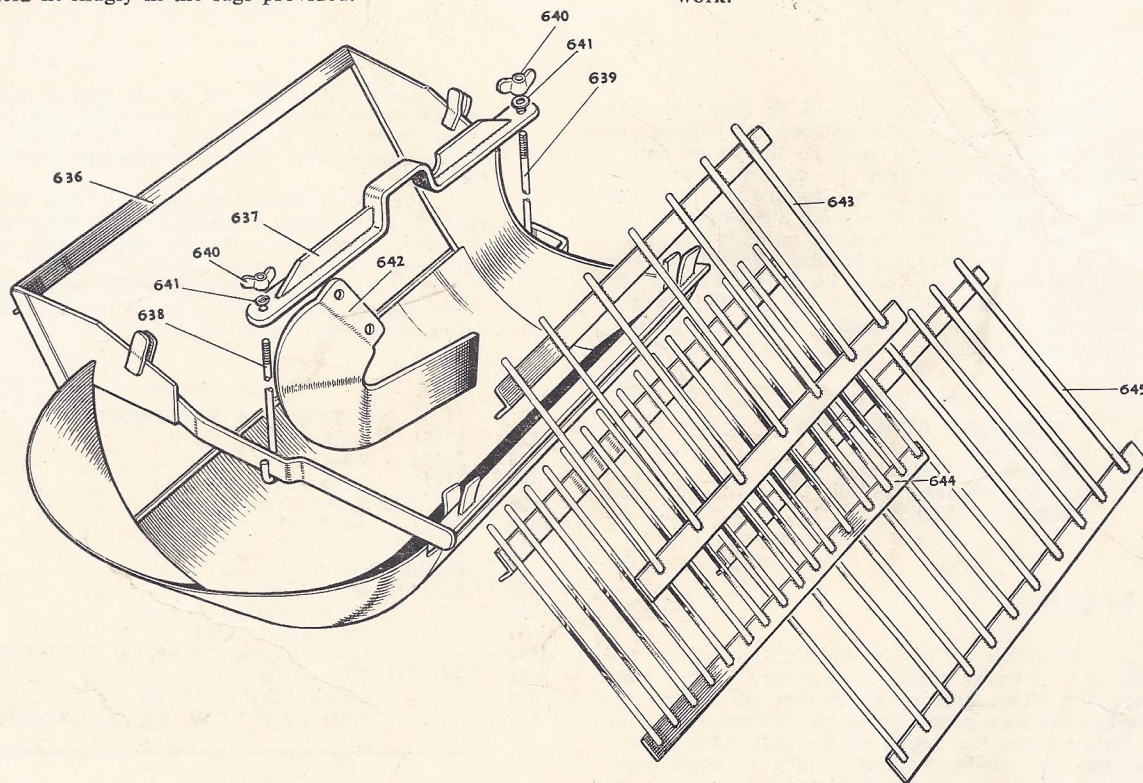
Remove the depth control skid and the two blades from the right hand flange and replace with the two special feeder blades provided. Place the required screen in position and lift the back of the machine sufficiently high to pass the shredder into position under the rotor. Lower the machine into position ensuring that the staytube and shield fit snugly in the lugs provided.

#### OPERATION

Fit the securing beam under the rotor clutch rod and across the top of the shield and secure with the rods and wing nuts.

Select first or second gear as required. Put the differential control lever into "Differential" and the freewheel lever into "Free Wheel" in order to ensure lubrication. Engage the rotor and set the engine to run at a fair working speed. Feed the raw material into the hopper at a steady rate and clear the shredded product sufficiently quickly to avoid blocking the screen. It is advantageous to position the machine at a higher level than the ground where the soil will fall.

Any Selectaspeed ratio may be used, but  $35/14 \frac{A1}{(A)}$  will ensure maximum gearbox lubrication for stationary work.



Illus. No.	Part No.	Description	No. off
<b>SOIL SHREDDER ATTACHMENT</b>			
636	54647	Hopper 15" ...	1
636	54676	Hopper 20" ...	1
637	54641	Securing Beam 15" ...	1
637	54686	Securing Beam 20" ...	1
638	17523	Hook Rod R.H. ...	1
639	17522	Hook Rod L.H. ...	1
640		Wing Nut 5/16" B.S.W. ...	2
641		Spring Washer 5/16" dia. ...	2
642	AG.1001	Feeder Blade ...	2
643	17520	Coarse Screen 15" ...	1
643	54685	Coarse Screen 20" ...	1
644	17515	Fine Screen 15" ...	1
644	54681	Fine Screen 20" ...	1
645	17519	Medium Screen 15" ...	1
645	54684	Medium Screen 20" ...	1

### Furrower

#### FITTING

The furrowing attachment is fitted on to the depth control skid of the standard side drive Rotavator. First remove the skid by pivoting the lever clip, allowing the control lever to be pulled sideways until the pin retaining the skid is withdrawn: then pull out the skid from under the rotor shield.

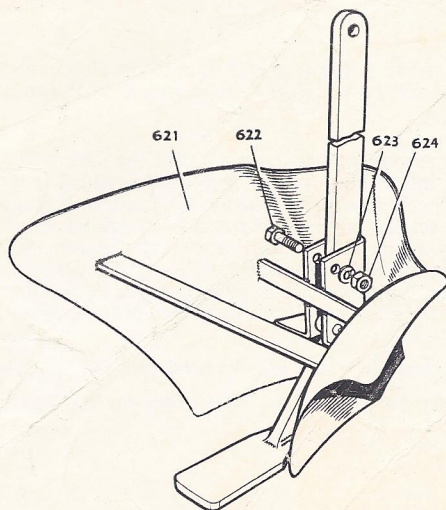
Assemble the furrowing attachment onto the depth control skid leaving the bottom of the attachment

about  $\frac{1}{2}$ " above the foot of the skid, or as required for the crop to be planted and tighten the locking nut. Refit the assembly to the machine and re-connect the depth control lever.

#### USING THE FURROWER

The furrowing attachment is used with the rotor engaged so that the combined operations of cultivating and furrowing are carried out. The depth of the furrow is controlled in the same way as the depth of cultivation. For deep work the skid is raised so that the furrower is as close to the underside of the shield as possible and the skid well up. Bottom gear in lowest ratio (14/35 or A/A1 Selectaspeed gears) is recommended.





After a little experience it will be found easy to maintain the planting width required by judging the distance between the wheel and the thrown-up soil.

When "splitting the ridges" for covering potatoes, it is easier if alternate ridges are split first, so that each wheel is resting equally, either on the slopes of the ridge which is being straddled or partially supported on soil thrown up each side by the adjacent furrows. In this way the wheels will be level. Further by swinging the control column at 60° or 90° to one side complete control and stability can be maintained with the utmost ease.

Illus. No.	Part No.	Description	No. off
<b>FURROWER ATTACHMENT</b>			
621	54611	Furrower ... ..	1
622		Bolt, 5/16" U.N.F. x 1 1/4" long ... ..	1
623		Spring Washer 5/16" dia. ... ..	1
624		Nut 5/16" U.N.F. ... ..	1

## D. P. Hitch

As an alternative to the SNAPLOCK coupling and especially for trailer work, a secondary "D.P." hitch is available. This enables attachment of trailer etc., while keeping some power driven attachments in position.

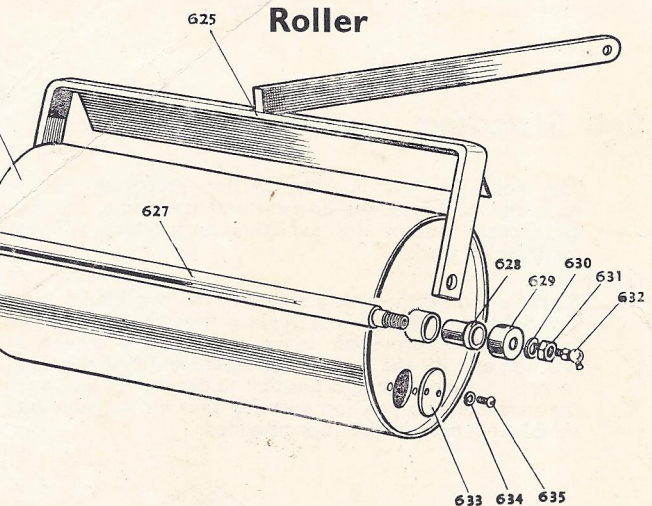
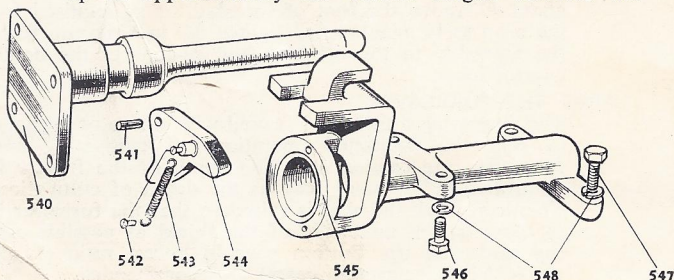
Furthermore, the design of the D.P. hitch permits instantaneous coupling without having to align draw-bar holes etc. It also gives articulated movement to the attachment, unless a special positioning lug is engaged within the fork of the hitch body.

### FITTING

The locating bar of the hitch is attached by 4 setscrews to the trailer or other implement. The D.P. hitch body is attached to the tractor by 4 setscrews, two on the top of the gearbox and 2 on the underside of control column pedestal.

### COUPLING

The trailer or implement should be jacked or blocked up at approximately the correct height. Reverse the



The Roller, either 15" or 20", is used in place of the depth control skid of the Howard 700 side drive Rotavator unit, and is intended to consolidate the land. If required it may be loaded with sand to increase the weight.

The Rotor should be engaged when the roller is used and the depth controlled in the same way as for ordinary cultivation, though full depth cannot be obtained when the roller is used.

The Roller axle bearing should be lubricated with light grease, giving several shots to the grease nipple after every eight hours work.

Illus. No.	Part No.	Description	No. off
<b>ROLLER ATTACHMENT</b>			
625	54551	Frame 15" ... ..	1
625	54555	Frame 20" ... ..	1
626	17475	Roller Drum 15" ... ..	1
626	AG.1005	Roller Drum 20" ... ..	1
627	54552	Axle 15" ... ..	1
627	54556	Axle 20" ... ..	1
628	AG.1005/6	Bush ... ..	2
629	AG.1013	Dust Cover ... ..	2
630		Spring Washer 1/2" dia. ... ..	2
631		Locknut 1/2" U.N.F. ... ..	2
632		Grease Nipple 1/4" B.S.F. Ref. TEC.NA.5791/1	2
633	AG.1011	Filler Plate ... ..	1
634		Spring Washer 1/2" dia. ... ..	2
635		Setscrew 1/4" B.S.W. x 1/2" long, Round Head	2

tractor so that locating bar enters the hitch body and drives right home, until the latch "clicks" right down into the retaining groove.

THEN FIT SAFETY CHAIN OVER THE BODY HOOK.

### UNCOUPLING

- Release safety chain.
- Jack up or block up trailer or implement.
- Lift "latch" of hitch body and drive away the tractor.

Illus. No.	Part No.	Description	No. off
<b>QUICK HITCH ATTACHMENT</b>			
540	52355	Locating Bar ... ..	1
541		Dowel 3/16" dia. x 1 1/4" long ... ..	1
542		Self Tapping Screw, Round Head Type 'Z' No. 4 dia. x 3/16" long ... ..	2
543	52357	Tension Spring ... ..	1
544	52356	Retaining Lever ... ..	1
545	52354	Quick Hitch Body ... ..	1
546		Bolt 3/8" U.N.C. x 1" long ... ..	2
547		Bolt 1/2" U.N.C. 1 1/4" long ... ..	2
548		Spring Washer 3/8" dia. ... ..	4



HOWARD 700 CUTTER BAR ATTACHMENT FITTING,  
WORKING & LUBRICATION INSTRUCTIONS.

CUTTER BAR

The Howard 700 cutter bar is a heavy duty implement, for mowing hay and long grass and general cutting work. It is simple and sturdy yet incorporates essential articulating movement to ensure close contour cutting and all requirements of a full agricultural mowing machine.

FITTING

The cutter bar fits directly onto the Snaplock coupling. When fitting ensure that the dog clutch is disengaged.

Swing the control column of the Howard 700 over the engine and operate the machine in reverse gear.

When used with a diesel engine model, the additional counterweight must be fitted to the cutter bar tube.

WORKING INSTRUCTIONS.

Choose the Selectaspeed gear to suit the conditions. Under good conditions 27/22 (B1/B) may be best, in heavier going 22/27 (B/B1) and for exceptionally rough conditions even 14/35 (A/A1) may be required.

The ground should be free from stones, bricks, wire etc. If the blades jam on something solid, the cutter bar dog-clutch should be disengaged before re-versing the machine and clearing the obstruction.

Where the grass or weeds are long or tangled the end swath-boards should be removed to allow the cut mass to fall without obstruction.

LUBRICATION AND MAINTENANCE.

1. Cutting Head.

(a) Blades. A film of oil should be kept between the blades and the knife caps. Oil hourly during use. The blades should be kept sharpened and on no account should excessive pressure on the knife cap be used to compensate for blunt blades.

(b) Fingers. These should occasionally be checked for alignment and correct level and "set-up" to the knife when needed. This is best done by a qualified service engineer. The edges of the ledger plates should be clean, sharp and free from burrs.

(c) Knife caps. These are provided to maintain the blade in contact with the ledger plates on the fingers. The central countersunk screws should be equally adjusted by the Allen Key to give about .006" clearance between the pad and the blade, (approx. the thickness of a single sheet of writing paper), thus allowing the blade to be moved freely in its correct reciprocating path without jumping. Test movement by hand.

(d) End shoes. Skids on the end shoes give height adjustment. Do not set the cutting head too low on uneven ground, or ground full of suspected obstructions.

The end shoes can also carry optional swath boards, for clearing a small path at the extremities of the cut, thus preventing binding of loose grass on the end fingers in subsequent runs.

(e) Connecting rod big end. The self-aligning bearing is packed with grease and sealed. The cover should be removed and the bearing packed with fresh grease yearly.



## 2. Drive Mechanism.

- (a) Gearbox and dog clutch. This should be filled with gearoil (S.A.E.90) to the top of the filler plug. When engaging the clutch ensure that it is fully home.
- (b) Connecting rod. The trunnion attaching the connecting rod to the actuating rod should be oiled hourly.
- (c) Actuating rod pivot bearing. A grease nipple is provided. Use gearoil S.A.E. 90 in the grease gun, every 4 hours work.
- (d) Blade actuating block. The hardened steel block which actuates the moving blade assembly should be oiled hourly during use.

## 3. Sharpening.

To remove the moving blade assembly, remove lynch pin from the actuating rod pivot and then the pivot pin itself. Slide the actuating rod sideways and lift clear of the blade. Unscrew the knife cap from one side only and slide the blade assembly clear.

Sharpen with special grindstone or mower file. Always maintain the same cutting angle and blade shape when sharpening.

Sections that have worn or been filed until they are short from point to base cannot cut clean in a thick bottom. They should be replaced by placing the knife back on an anvil with the section hanging over the edge and given a sharp blow against the base of the section. The rivets are sheared across to be afterwards punched out head first.







T.S.P./H700/1B/9/58