

THE
HOWARD

ROTAVATOR

Tractor Attachment

OWNER'S HANDBOOK

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ROTARY HOES LIMITED

HORNDON, ESSEX

ENGLAND

CONTROLS

The Depth Control Handle and Rotor Gear Lever are within easy reach of the driver's seat. The very precise degree of depth-setting obtainable enables the machine to be worked close up to orchard and other trees.

POWER LIFT

The Rotavator is linked to the Tractor Power Lift, which can therefore be used for normal transport of the machine along roads, etc. When the Rotor is put out of gear the Rotavator rides automatically on the surface of the land without using the Power Lift, and can be transported in this manner for short distances.

SAFETY CLUTCH

The Automatic Safety Clutch in the drive to the revolving blades enables stumpy or stony ground to be worked with the minimum risk of damage to the working parts of the Rotavator from striking hidden obstructions.

FITTING

The Rotavator may be fitted to the Tractor by any ordinary farm hand. No special skill is needed.

HOWARD REDUCTION GEAR

IMPORTANT—When the Rotavator is in use the four additional low gears provided by the Reduction Gearbox do not put additional strain on the rear axle of the tractor, as the tractor rear wheels are not pulling forward, but are, in fact, holding the tractor back.

The tractor rear wheels act as an anchor to absorb the forward thrust exerted by the Rotavator.

When, however, the Rotavator is taken off the tractor these four additional low gears must only be used for the lighter pulling work where very slow speeds are required. The rear axle of the tractor is designed to give adequate strength when the Standard Gears are used and it will be appreciated that these very low gears could, when adhesion is good, put up strains that the tractor axle was never designed to carry.



THE HOWARD ROTAVATOR TRACTOR ATTACHMENT

ROTAVATION

Whenever the ground requires to be thoroughly tilled the Rotavator will do this work in the most effective and economical way. Rotavation provides a unique method of breaking virgin land and dealing effectively with weeds and heavy growths; it is invaluable for cutting up and working into the ground manures and fertilizers, Combine straw and stubbles, maize, mustard, sugar cane trash and the like; and for eradicating such noxious growths as blackberry, bracken fern, etc. By varying the speed of the tractor in relation to that of the Rotavator a coarse or fine tilth is obtainable as required, and seed-beds are brought to perfection in the shortest possible time.

THE ROTAVATOR

The Rotavator will do more than ordinary agricultural implements. It combines the shearing and turning action of the plough with the stirring and breaking effect of harrows and discs. Since power is applied directly from the power-take-off to its blades, the Rotavator will easily cultivate steep hillsides or loose natured soils, where other means of tillage are not practicable. The reaction to the rotating blades as they enter the soil gives a forward thrust to the tractor, using less energy and fuel, and reducing wheel pressure.

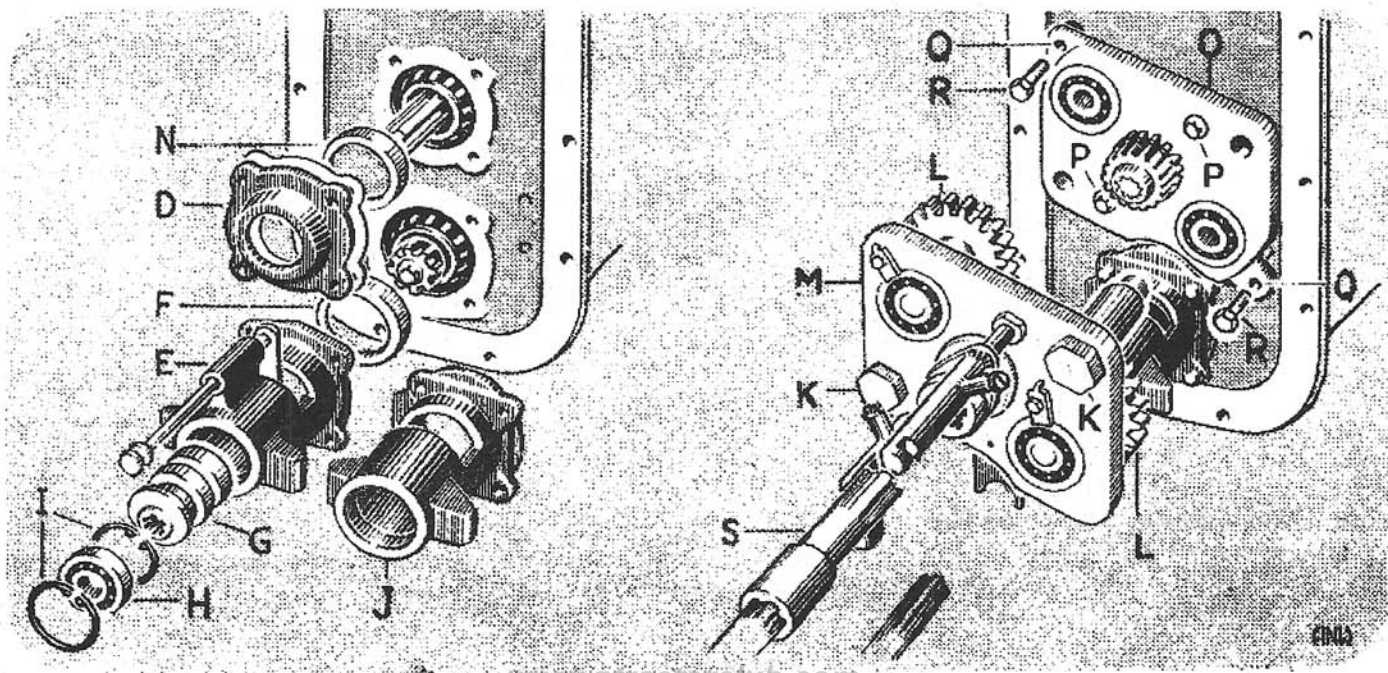
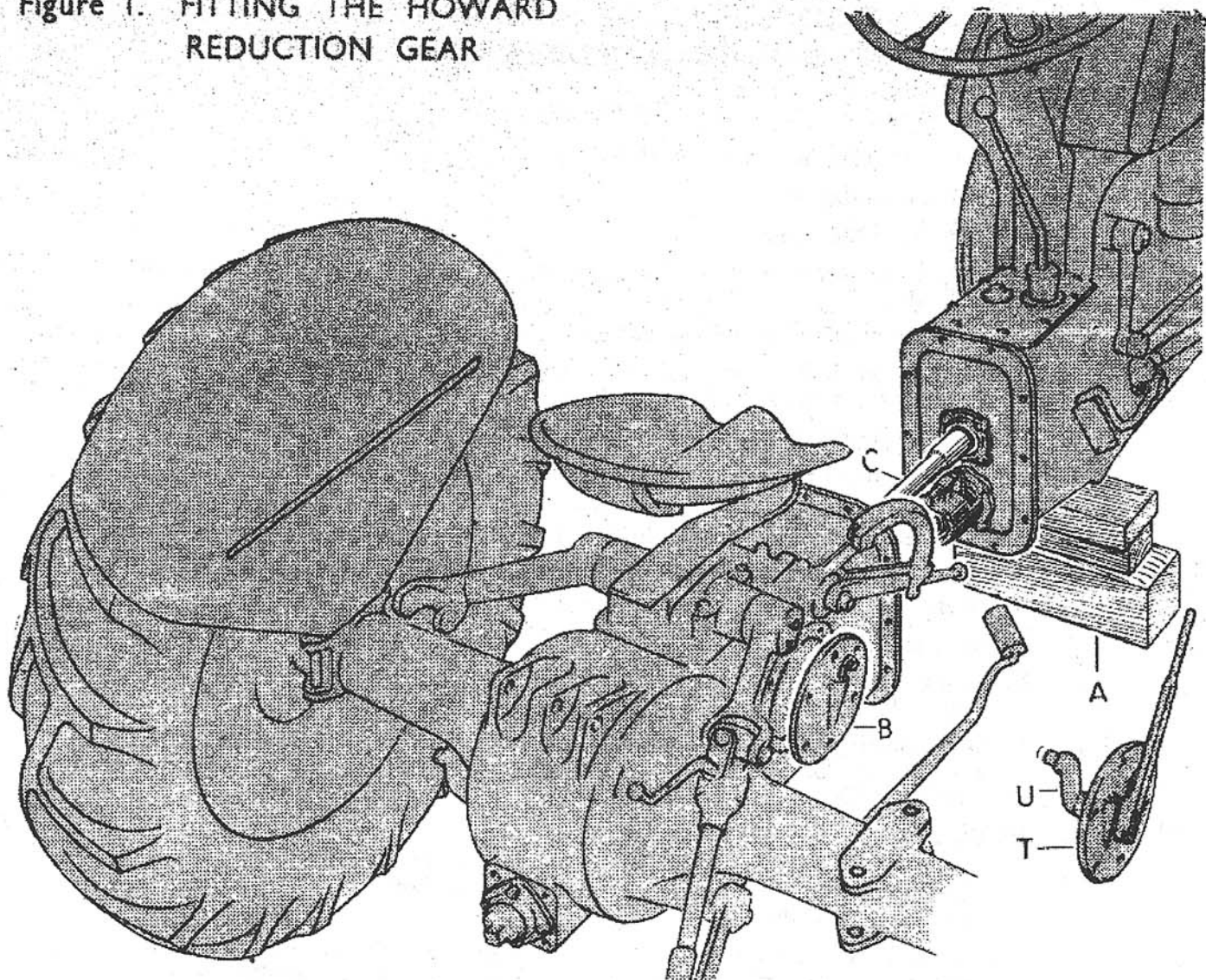
INSTRUCTIONS FOR FITTING THE HOWARD REDUCTION GEAR

(See Figure 1)

1. Drain the oil from the tractor gearbox.
2. Remove the footboards.
3. Remove the exhaust pipe.
4. Pack blocks of wood 'A' under the gearbox to support it whilst the tractor body is divided.
5. Remove the circular Cover Plate 'B' on both sides of the rear body.
6. Remove the ten bolts in the rear body joint flange and divide the tractor, withdrawing the splined shafts carefully.
7. Remove the coupling shaft 'C'.
8. Remove the upper Bearing Housing 'D' and its shims.
9. Remove the lower casting 'E' containing the Gearbox Roller Bearing Outer Ring 'F', the Sliding Dog 'G', the Ball Bearing 'H' and the Circlips 'I'.
10. Dismantle and reassemble F, G, H and I in the casting 'J' supplied.
N.B.—Do not forget the bearing ring 'F'.
11. Fit the assembly to the tractor. Shimming is required for bearing adjustment.
12. Remove the two large Retaining Bolts 'K' of the Reduction Gearbox supplied and divide the unit, keeping the Layshaft 'L' mounted in the Rear End Plate 'M'.
13. From the Bearing Housing 'D' remove the Roller Bearing Outer Ring 'N' and refit this into the Bearing Housing in the front of the Reduction Gearbox Front End Plate 'O'.
14. Fit the plate 'O' to the tractor, using two of the bolts and washers 'P' which held the Bearing Housing, and sufficient of the original shims to prevent over-tightening of the Roller Bearing Ring 'N' when bolts 'P' are tightened. Note the thickness of the shims required.
15. Tighten bolts 'P' whilst keeping the plate 'O' turned as far clockwise as the bolts will allow, then drill the tractor gearbox through the holes 'Q' and tap $\frac{1}{2}$ " A.N.C. for bolts 'R'.
16. Fit the bolts 'R' placing the supplied spacers and sufficient of the laminated shims between the plate 'O' and the tractor gearbox face. Lock the bolts with the tab washers supplied.
17. Reassemble the Reduction Gearbox and wire up the two bolts 'K'. It is imperative that the driven gear (Illus. No. D10) is in mesh with the small layshaft gears, ensuring correct timing.
18. Fit the supplied replacement Coupling Shaft 'S' to the rear half of the tractor.
19. Rejoin the tractor body, ensuring that the splines of both shafts fit correctly. (To register those of the upper shaft it may be necessary to turn the engine starting handle slightly whilst in gear.)
20. Fit the supplied right-hand side Cover Plate 'T' in place of the original, making sure that the Crank 'U' engages the selector inside the tractor body.
21. Refit the original left-hand side Cover Plate, engaging its crank with the power take-off selector inside the tractor body.
22. Jack up one rear wheel and test by running the engines slowly to ascertain that all the gears are correct and that the selectors are working properly.
23. Fill up the gearbox and replace the exhaust pipe and footboards.

N.B.—All parts removed should be preserved and stored carefully.

Figure 1. FITTING THE HOWARD
REDUCTION GEAR



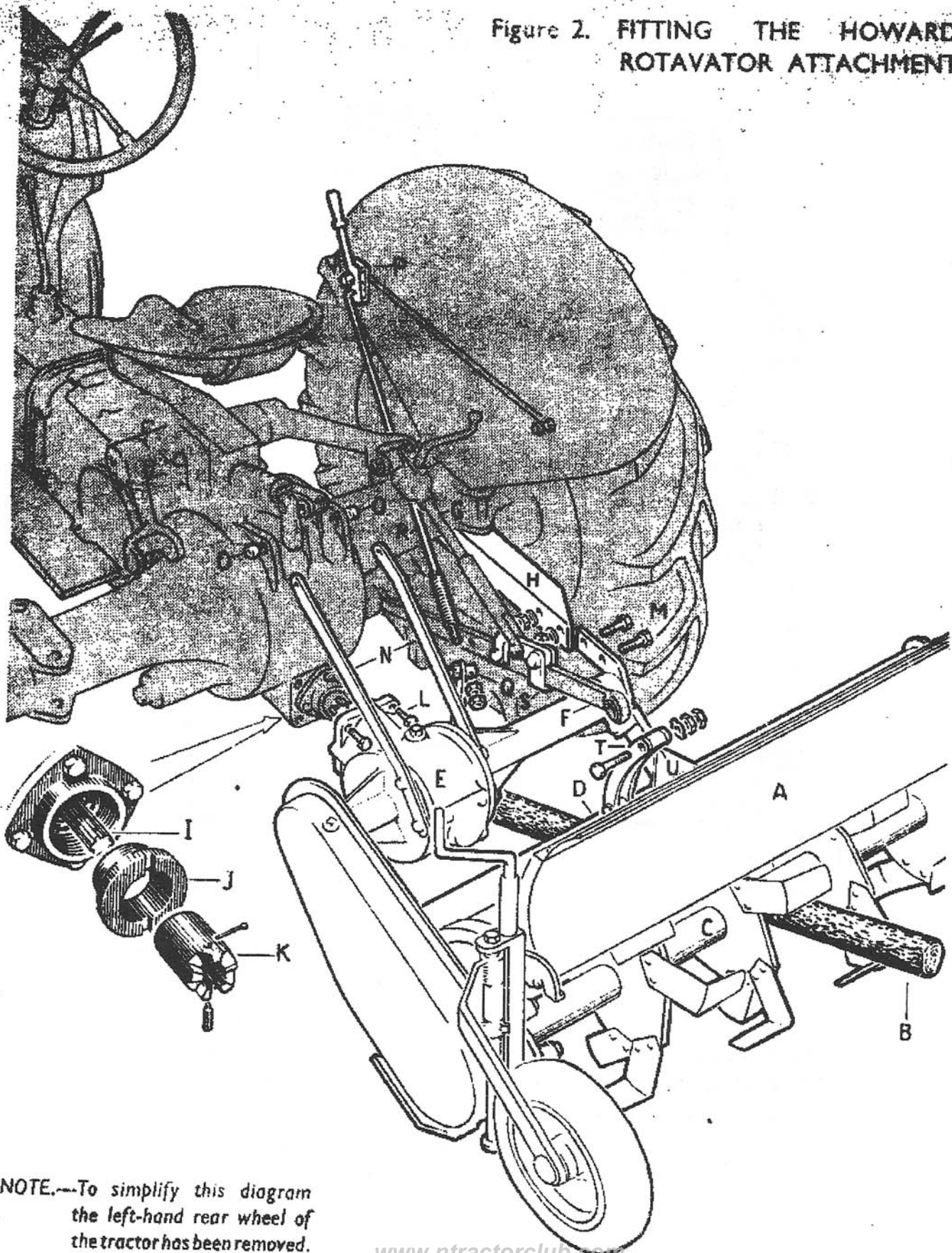
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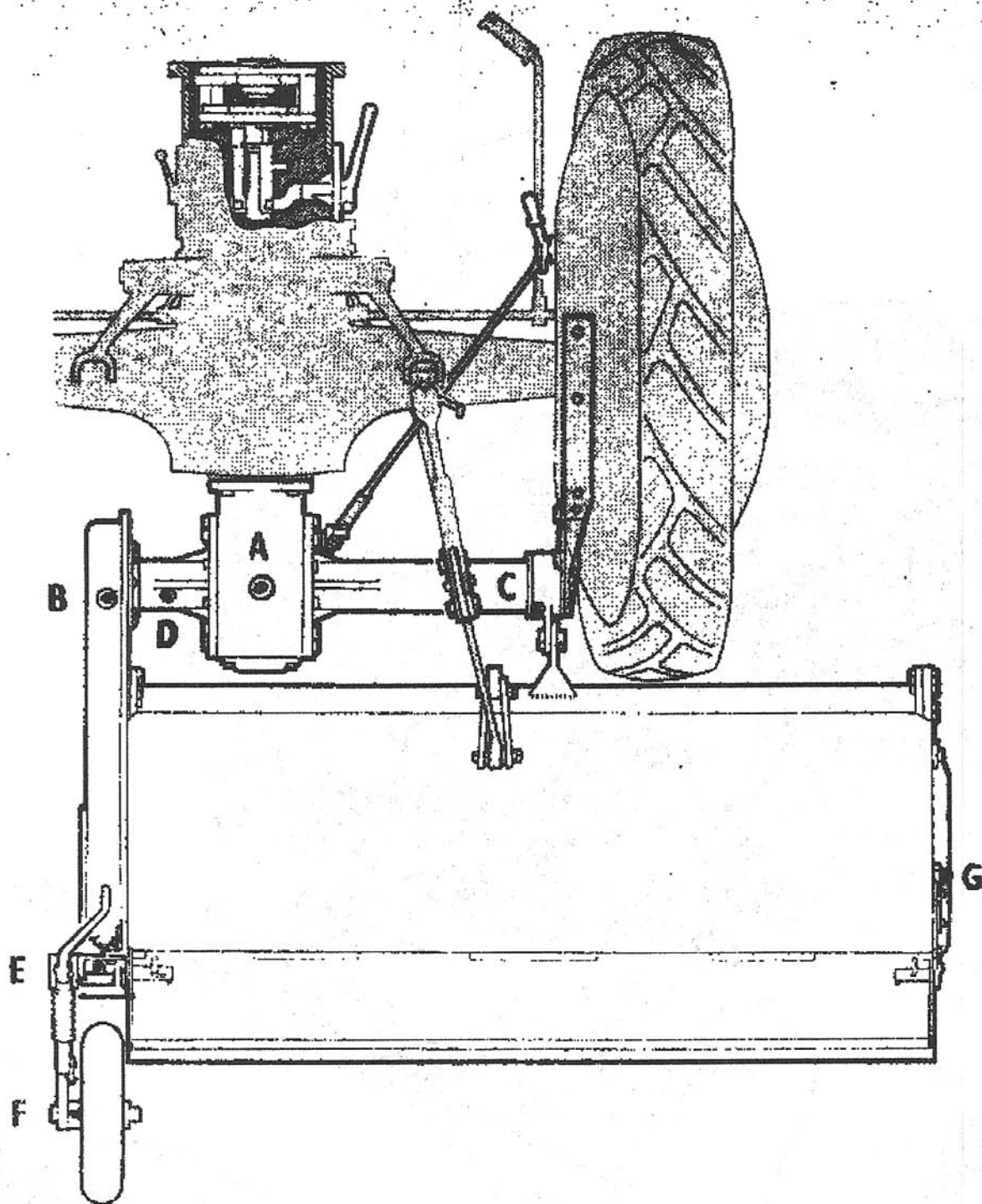
N.B.—All parts removed should be greased and stored carefully.

Figure 2. FITTING THE HOWARD ROTAVATOR ATTACHMENT



NOTE.—To simplify this diagram the left-hand rear wheel of the tractor has been removed.

Figure 3. LUBRICATION CHART



RECOMMENDED LUBRICANTS

	U.K.	OVERSEAS
GEARBOX ('A')	SAE 140 EP	SAE 140 EP
CHAINCASE ('B')	SAE 140 EP	SAE 140 EP
GREASE NIPPLES ('C'-'G')	Agricastrol Grease Light	Castrollease CL
	Shell Tractor Grease	Shell Retinax CD
	Mobiland Tractor Grease	Mobilgrease No. 2

LUBRICATION

(See Figure 3)

Put one quart of oil in the chain case 'B' and 1½ pints in the gearbox 'A'. Maintain the oil level in the chain case and the gearbox up to the level plugs provided, i.e. keep the oil level not more than two inches from the bottom of each box.

Oil the hinge line of the shield and the shield adjustment bolts as required. Also oil the moving parts of the Depth Setting gear and other parts not provided with greasing points.

INSTRUCTIONS FOR WORKING

The machine is now ready for work. The depth of work is controlled by adjusting the wheel on the Rotavator. The depth limit skid on the right-hand side should be adjusted so that it is about one inch clear of the ground at working depth. This skid is not intended for controlling the depth, but limits the depth when the right-hand tractor wheel enters a depression. The Reduction Gear of the tractor should be used for practically all Rotavator work. First gear is required for putting heavy cover crops into the ground, but higher gears can be used for practically all other purposes.

TO START WORK. Screw the depth control wheel up so that it allows the blades to enter the ground to the required depth.

Engage the appropriate Tractor Gear and let the Clutch in slowly, at the same time place the Power Lift Lever in the down position.

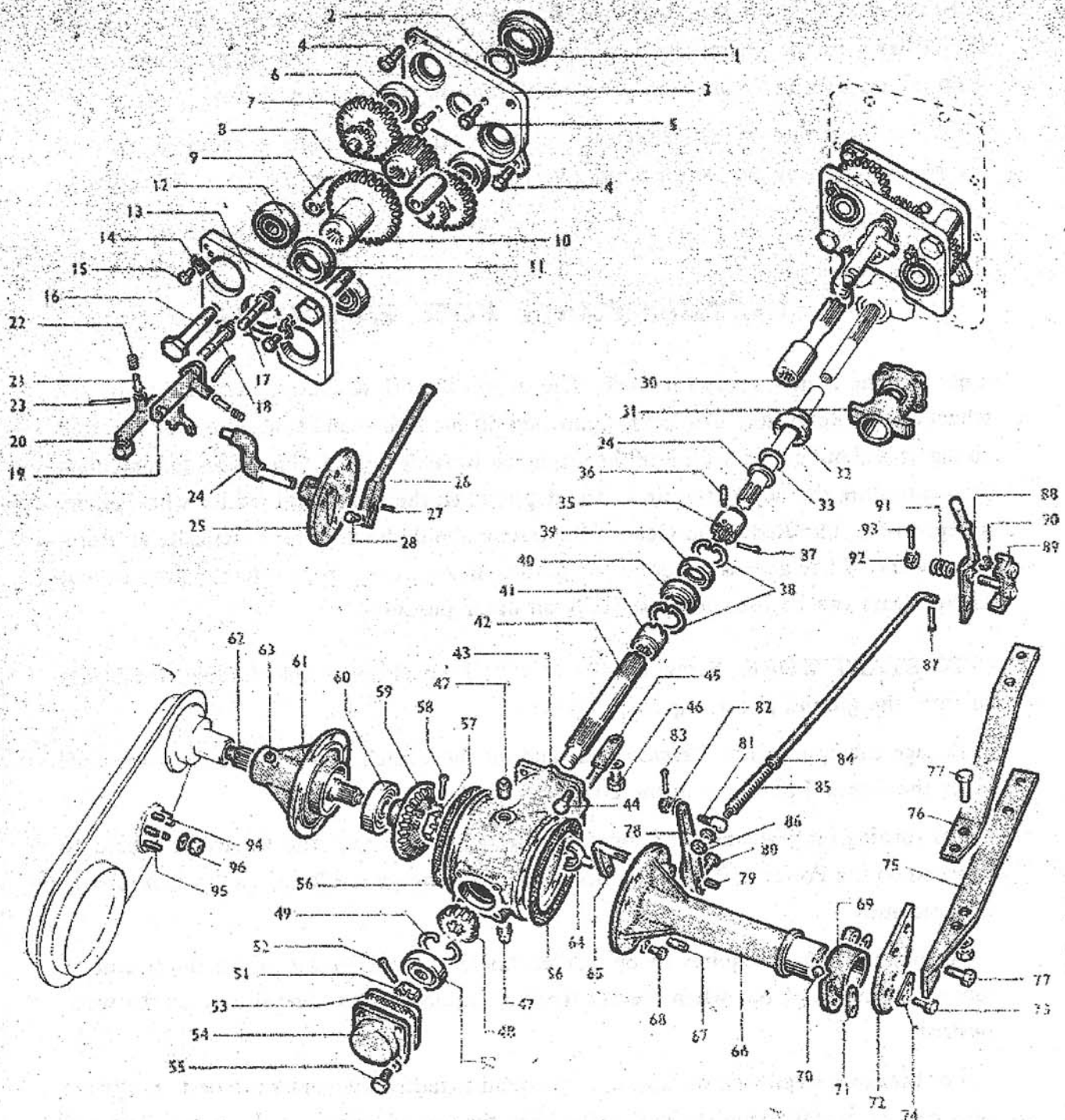
For turning on headlands and for transporting the machine, the Rotavator should be elevated on the Power Lift. It is not necessary to disengage the Rotor Gear when turning on headlands.

When the ground requires to be worked finely, it is necessary to put the tractor in low or second gear, but when coarser work is required, higher gears may do the work desired.

For breaking virgin soil or land tightly bound together with grass the best results are obtained by first working shallow just to take the top off, leaving it for a few days and then working to the required depth.

RATOONING. The centre flange of the special sugar cane rotor is adjustable. By removing the blades the desired gap can be arranged to allow the row of cane to pass through untouched.

Diagram No. 1



TRACTOR REDUCTION GEAR, ATTACHMENT TRANSMISSION

LIST OF PARTS FOR THE HOWARD ROTAVATOR ATTACHMENT

WHEN ORDERING PARTS IT IS NECESSARY TO QUOTE THE NUMBER OF THE ROTAVATOR AND THE APPROPRIATE PART No. (NOT THE ILLUSTRATION No.) AND SUFFIX LETTERS.

The number of the Rotavator is found stamped on the left-hand Jackshaft Housing Support Bracket and on the brass plate on the inner side of the chain case at the rear of the shield.

We cannot guarantee that correct replacements will be supplied unless this number and the correct part number are quoted.

In the following parts list all directions are given left or right locking from the back of the Rotavator.

Metric bearings are now being used on some Rotavators. Their presence is indicated by the addition of the letter 'M' to the serial number of the machine.

Diagram No. 1 Illust. No.	Part No.	Description	No. off.
D 1	3225	Location Housing	1
D 2	—	Circlip, External $1\frac{1}{2}$ " dia.	1
D 3	3220	Reduction Gear Front End Plate	1
D 4	—	Reduction Gear Attachment Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{4}$ "	2
D 5	—	Reduction Gear Attachment Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{4}$ "	2
—	3253	Tab Washer, special $\frac{1}{2}$ "	2
D 6	RRILL	Front Roller Bearing 1" bore x $2\frac{1}{2}$ " O.D. x $\frac{1}{2}$ "	2
D 7	3228	Layshaft	2
D 8	3226	Driving Gear	1
D 9	3222	Distance Piece	2
D10	3229	Driven Gear	1
D11	3251	Driven Gear Bush	1
D12	RRMI	Rear Roller Bearing 1" bore x $2\frac{1}{2}$ " O.D. x $\frac{1}{2}$ " W... ..	2
D13	3221	Reduction Gear Rear End Plate	1
D14	3231	Bearing Retaining Plate	2
D15	3256	Bearing Retaining Plate Bolt, special	2
D16	3223	Reduction Gear Securing Bolt, special	2
—	—	Locking Wire	1
D17	3233	Selector Fork Stud Upper	1
D18	3248	Selector Fork Stud Lower	1
D19	3259	Selector Fork Upper	1
D20	3243	Selector Fork Lower	1
D21	2027	Selector Fork locating Pawl Pin	2
D22	2028	Spring	2
D23	2921	Retaining Wire $\frac{3}{32}$ " dia.	2
D24	3236	Selector Crank	1
D25	3260	Cover Plate	1
D26	3237	Hand Lever	1
D27	G711	Key	1
D28	—	Clamping Bolt $\frac{1}{8}$ " A.N.C. x $1\frac{1}{2}$ "	1
D30	3245A	Connecting Shaft (Ford BN)	1
— or	3265A	Connecting Shaft (Ferguson)	1
D31	3249	Bearing Housing	1
D32	3601	Adaptor Ring... ..	1
D33	3315	Shims (as required)	—
D34	3327	Spacing Washer (reqd. only with Fixed Dog No. 3617)... ..	1
D35	3617	Fixed Dog (5 dog type)	1
— or	3623	Fixed Dog (3 dog type)	—
D36	3618	Fixed Dog Pin (for use with Fixed Dog No. 3617)	1
— or	3624	Fixed Dog Pin (for use with Fixed Dog No. 3623)	—
D37	—	Split Pin $\frac{3}{32}$ " dia. x $\frac{1}{2}$ "	1
D38	—	Circlip, Internal 3" dia.	2
D39	—	Oilseal, $2\frac{1}{2}$ " bore x 3" O.D. x $\frac{1}{2}$ " W	1
D40	3604	Bearing Ring	1
D41	3619	Sliding Dog (5 dog type)	1
— or	3622	Sliding Dog (3 dog type)	—
D42	3430	Extension Shaft	1
D43	3656	Gearbox Casing	1
D44	—	Gearbox Attachment Bolt $\frac{1}{8}$ " A.N.C. x $1\frac{1}{2}$ "	4
—	—	Spring Washer $\frac{1}{16}$ " dia.	4
D45	3331	Gearbox Tension Bolt	2
—	—	Gearbox Tension Bolt Locknut	8
D46	—	Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	2
—	—	Spring Washer $\frac{1}{2}$ " dia.	2
D47	—	Gearbox Filler Plug and Drain Plug $\frac{1}{2}$ " B.S.P.	2

Diagram No.	Part No.	Description	No. off.
D48	3613	Pinion (Extension Shaft)	1
D49	—	Circlip, Internal 90 mm. dia.	1
D50	BRH030	Ball Bearing (Extension Shaft) 30 mm. bore x 90 mm. O.D. x 23 mm. W	1
D51	2635	Nut, Special (Extension Shaft)	1
D52	—	Split Pin $\frac{3}{16}$ " dia. x 2"	1
D53	3621	End Cover Gasket	1
D54	3620	End Cover	1
D55	—	End Cover Bolt $\frac{1}{8}$ " A.N.C. x 1"	4
—	—	Spring Washer $\frac{1}{16}$ " dia.	4
D56	3651	Side Plate Gasket	2
D57	2638	Nut Special (Jackshaft)	1
D58	—	Split Pin $\frac{3}{16}$ " dia. x 2"	1
D59	3614	Crown Wheel	1
D60	—	Ball Bearing (Jackshaft) 2 $\frac{1}{2}$ " bore x 4 $\frac{1}{2}$ " O.D. x $\frac{1}{2}$ "	1
* D61	3650	Gearbox Side Plate, Left (Standard "Orchard" Model)	1
* D— or	3652	Gearbox Side Plate, Left ("FIELD" Model)	—
* D62	3500	Jackshaft (Standard "Orchard" Model)	1
* D— or	3501	Jackshaft ("FIELD" Model)	—
D63	—	Jackshaft Grease Nipple $\frac{1}{4}$ " B.S.F. Straight	1
D64	3636	Clutch Yoke	1
—	—	Split Pin $\frac{1}{16}$ " dia. x $\frac{1}{2}$ "	1
D65	3014	Clutch Arm	1
D66	3660	Gearbox Side Plate, Right	1
D67	—	Gearbox Oil Level Plug $\frac{1}{4}$ " B.S.P.	1
D68	—	Gearbox Side Plate, Bolt, Short $\frac{1}{16}$ " A.N.C. x 1"	12
—	—	Gearbox Side Plate, Bolt, Long $\frac{1}{16}$ " A.N.C. x 1 $\frac{1}{2}$ "	4
—	—	Spring Washer $\frac{1}{16}$ " dia.	16
D69	3450	Staytube Trunnion	1
D70	—	Staytube Trunnion Grease Nipple $\frac{1}{4}$ " B.S.P. Straight	1
D71	3451	Staytube Trunnion Spacer	1
D72	3453	Staytube Trunnion Keeper Plate	1
D73	—	Staytube Trunnion Keeper Plate Bolt $\frac{1}{16}$ " A.N.C. x 1"	3
D74	3217	Staytube Trunnion Locking Plate	1
D75	3351	Staytube Support Angle	1
D76	3352	Staytube Support Strap	1
D77	—	Staytube Support Assembly Bolt $\frac{1}{2}$ " A.N.C. x 1 $\frac{1}{2}$ "	4
—	—	Spring Washer $\frac{1}{2}$ " dia.	4
—	—	Nut $\frac{1}{2}$ " A.N.C.	4
D78	3257	Clutch Lever	1
D79	G711	Clutch Lever Key	1
D80	—	Clutch Lever Clamping Bolt $\frac{1}{16}$ " A.N.C. x 1"	1
D81	3258	Trunnion	1
D82	—	Slotted Nut $\frac{1}{16}$ " A.N.C.	1
—	—	Washer, Flat $\frac{1}{16}$ " dia.	1
D83	—	Split Pin $\frac{3}{16}$ " dia. x $\frac{3}{4}$ "	1
D84	3575	Clutch Operating Rod	1
D85	G324	Spring	1
D86	—	Locknut $\frac{1}{8}$ " A.N.C.	2
D87	—	Splitpin $\frac{3}{16}$ " dia. x $\frac{3}{4}$ "	1
D88	G781	Clutch Hand Lever	1
D89	3580	Clutch Hand Lever Quadrant	1
D90	—	Quadrant Mounting Bolt $\frac{3}{8}$ " A.N.C. x 1 $\frac{1}{2}$ "	2
D91	G792	Clutch Hand Lever Spring	1
D92	—	Nut Slotted $\frac{1}{8}$ " A.N.C.	1
D93	—	Split Pin $\frac{3}{16}$ " dia. x $\frac{3}{4}$ "	1
D94	3116	Stud, Short (Staytube Attachment to Chaincase Backplate)	7
D95	3117	Stud, Long (Staytube Attachment to Chaincase Backplate)	1
D96	—	Nut $\frac{1}{2}$ " A.N.C.	8
—	—	Spring Washer $\frac{1}{2}$ " dia.	8
D97	—	—	—
D98	—	—	—
D99	—	—	—

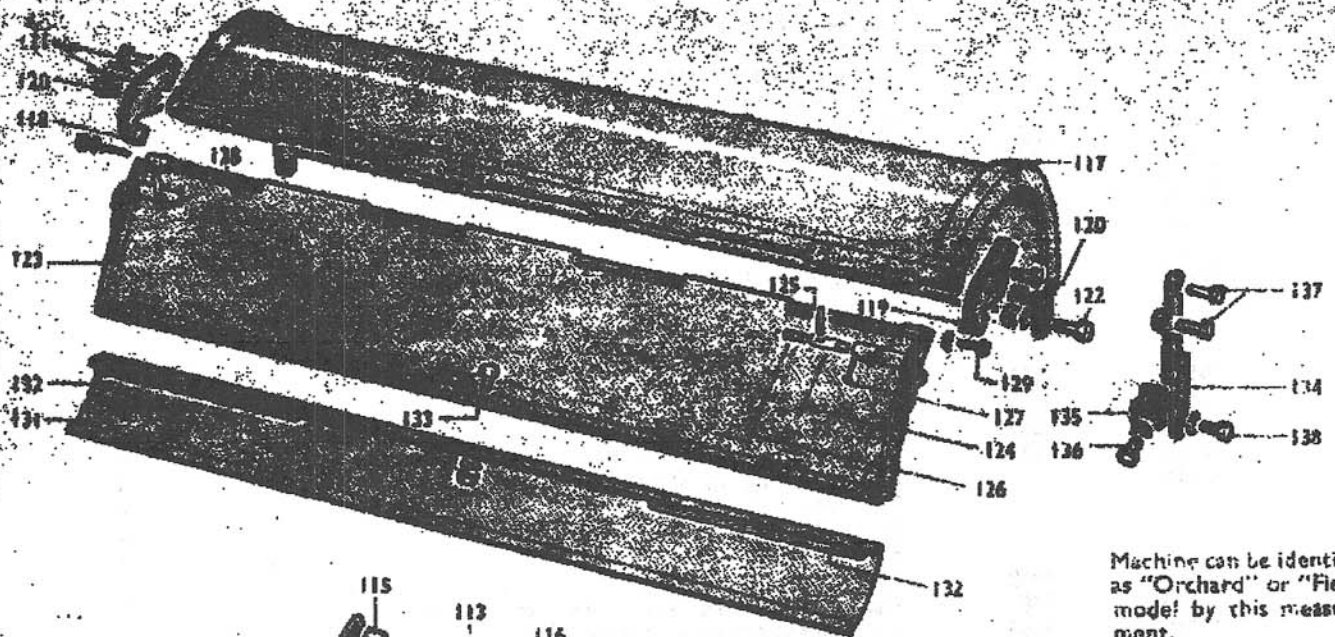
Diagram No.	Part No.	Description	No. off.
* D100	3412	STAYTUBE (Standard "Orchard" Model)	1
* D — or	3416	STAYTUBE ("Field" Model)	—
D101	—	Staytube Trunnion Bolt $\frac{1}{2}$ " A.N.C. x 1 $\frac{1}{2}$ "	2
D102	3218	Locking Strip	2
—	—	Nut $\frac{1}{2}$ " A.N.C.	2

*Check model by measurements shown in inset to Diagram 2.

Diagram No. 2 (cont.)
 Part No.

Part No.	Description	No. off.
D103	Connecting Link Bolt Lower $\frac{1}{2}$ " A.N.C. x $2\frac{1}{2}$ "	1
—	Nut $\frac{1}{2}$ " A.N.C.	1
D104	Tab Washer Special	1
D105	Connecting Link	2
D106	Connecting Link Bolt Upper $\frac{1}{2}$ " A.N.C. x $2\frac{1}{2}$ "	1
—	Spring Washer $\frac{1}{2}$ " dia.	1
—	Nut $\frac{1}{2}$ " A.N.C.	1
D107	Lifting Arm End Bush	1
D108	Lifting Arm Clamp	1
D109	Lifting Arm Clamp Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	1
—	Spring Washer $\frac{1}{2}$ " dia.	1
—	Nut $\frac{1}{2}$ " A.N.C.	1
D110	Lifting Arm Bracket	1
D111	Lifting Arm Bracket Attachment Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	1
—	Spring Washer $\frac{1}{2}$ " dia.	1
—	Nut $\frac{1}{2}$ " A.N.C.	1
D112	Gearbox Support Arm—right	1
D113	Gearbox Support Arm—Small Bush	1
D114	Gearbox Support Arm—left	1
D115	Gearbox Support Arm—Large Bush	1
D116	Gearbox Support Arm Bolt $\frac{1}{2}$ " A.N.C. x $2\frac{1}{2}$ "	2
—	Flat Washer $\frac{1}{2}$ " dia.	2
—	Spring Washer $\frac{1}{2}$ " dia.	2
—	Nut $\frac{1}{2}$ " A.N.C.	2
D117	Forward Shield	1
D118	Rear Shield Hinge Quadrant—right	1
D119	Rear Shield Hinge Quadrant—left	1
D120	Hinge Quadrant Attachment Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	2
D121	Depth Setting Gear to Shield Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	2
—	Spring Washer $\frac{1}{2}$ " dia.	4
—	Nut $\frac{1}{2}$ " A.N.C.	4
D122	Bolt, Forward Shield to Staytube, $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	1
—	Spring Washer $\frac{1}{2}$ " dia.	1
—	Nut $\frac{1}{2}$ " A.N.C.	1
D123	Rear Shield Complete with Locking Pins	1
D124	Rear Shield Locking Pin	2
D125	Rear Shield Locking Pin Handle	2
D126	Rear Shield Locking Pin Spring	2
D127	Split Pin $\frac{3}{8}$ " dia. x $1\frac{1}{2}$ "	2
D128	Rear Shield Hinge Rod	1
D129	Rear Shield Hinge Rod Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	2
—	Spring Washer $\frac{1}{2}$ " dia.	2
—	Rear Shield Hinge Rod Left End Stud $\frac{3}{4}$ " A.N.C.	1
D131	Screed Plate	1
D132	Screed Plate Support Strip	2
D133	Screed Plate Attachment Bolt $\frac{1}{8}$ " A.N.C. x $\frac{1}{2}$ "	7
—	Spring Washer $\frac{1}{8}$ " dia.	7
—	Nut $\frac{1}{8}$ " A.N.C.	7
D134	Shield Support Strut	1
D135	Cutter Blade	1
D136	Cutter Blade Attachment Bolt $\frac{1}{8}$ " A.N.C. x $\frac{1}{2}$ "	2
—	Spring Washer $\frac{1}{8}$ " dia.	2
D137	Shield Support Strut Top Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	2
—	Spring Washer $\frac{1}{2}$ " dia.	2
—	Nut $\frac{1}{2}$ " A.N.C.	2
D138	Shield Support Strut Bottom Bolt $\frac{1}{8}$ " A.N.C. x $1\frac{1}{2}$ "	1
—	Spring Washer $\frac{1}{8}$ " dia.	1
D139	Rotor Support Arm	1
D140	Rotor Support Arm Attachment Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	5
—	Spring Washer $\frac{1}{2}$ " dia.	5
—	Nut $\frac{1}{2}$ " A.N.C.	5
D141	Depth Skid	1
D142	Depth Skid Forward Bolt $\frac{1}{8}$ " A.N.C. x $1\frac{1}{2}$ "	1
—	Spring Washer $\frac{1}{8}$ " dia.	1
D143	Depth Skid Adjustment Bar	1
D144	Depth Skid Rear Bolt $\frac{1}{8}$ " A.N.C. x $1\frac{1}{2}$ "	1
—	Spring Washer $\frac{1}{8}$ " dia.	1
D145	Depth Skid Adjustment Bolt Special	1
—	Spring Washer $\frac{1}{8}$ " dia.	1
D146	Rotor Stub Axle Grease Nipple	1

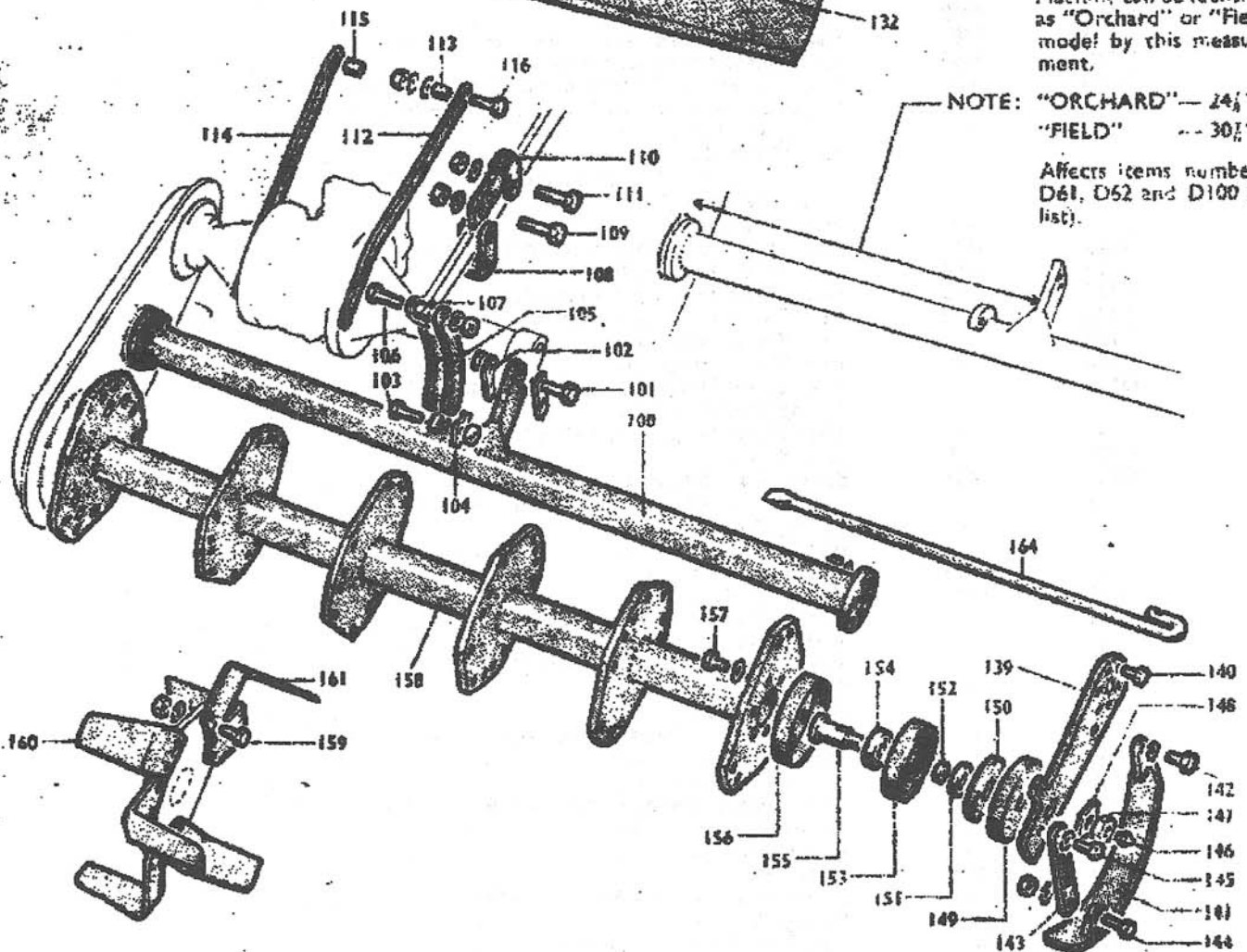
Diagram No. 2



Machine can be identified as "Orchard" or "Field" model by this measurement.

NOTE: "ORCHARD"—24½"
"FIELD"—30½"

Affects items numbered D61, D62 and D100 (see list).



ROTOR BLADES, STUB AXLE, ROTOR SHIELDS AND FRAME

Diagram No. 2 (cont.)

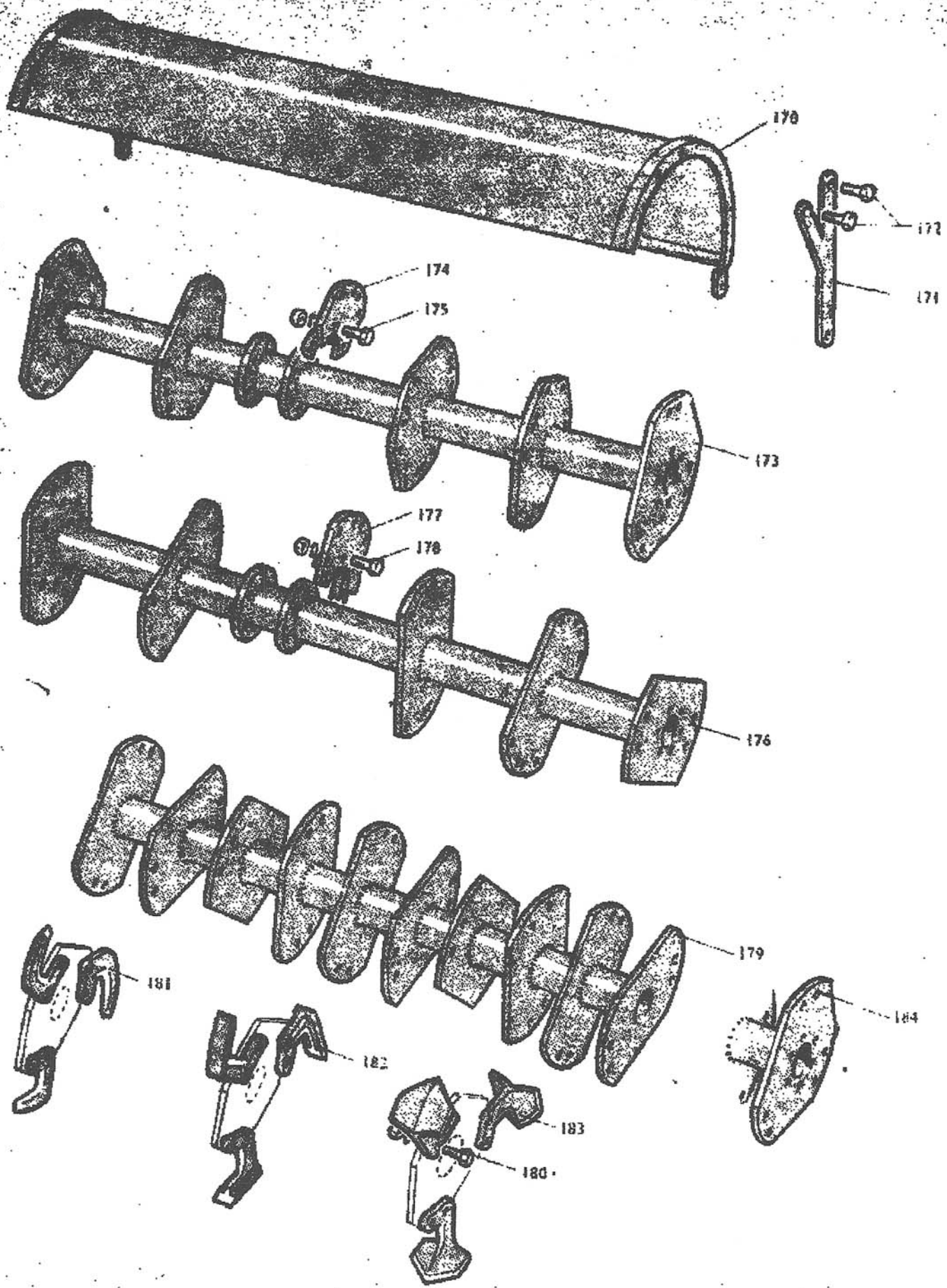
Illust. No.	Part No.	Description	No. off.
D147	2233	Rotor Stub Axle Nut, Special	1
D148	2518	Rotor Stub Axle Tab Washer	1
D149	3334	Rotor Stub Axle Inner Dust Cover	1
D150	3335	Rotor Stub Axle Centre Dust Cover	1
D151	—	Rotor Stub Axle Oilseal 2 1/8" O.D. x 1 1/2" I.D. x 1/2" W	1
D152	3338	Rotor Stub Axle Spacer	1
D153	3330	Rotor Stub Axle Bearing Housing	1
D154	BAL 1 1/2	Rotor Stub Axle Ball Bearing 1 1/2" bore x 2 1/2" O.D. x 1/2" W	1
D155	3340	Rotor Stub Axle	1
D156	3333	Rotor Stub Axle Outer Dust Cover	1
D157	3337	Bearing Housing Bolt, Special 1/8" A.N.C. x 1" drilled head	6
D158	3400	Rotor, Hoe (Standard 3 point type)	1
D159	3902	Hoe Blade Attachment Bolt, Special	60
—	—	Spring Washer 1/8" dia.	60
—	—	Nut 1/8" A.N.C.	60
D160	3900	Hoe Blade—Left Hand	15
D161	3901	Hoe Blade—Right Hand	15
D164	3904	Hoe Blade—Setting Bar	1
Diagram No. 3			
D170	3524	Fixed Shield	1
D171	3530	Fixed Shield Support Stay	1
D172	—	*Fixed Shield Support Stay Top Bolt 1/2" A.N.C. x 1 1/2"	2
—	—	*Spring Washer 1/2" dia.	2
—	—	*Nut 1/2" A.N.C.	2

*NOTE: These parts are not required if converting from Standard Model being same as fitted with hinged type of shield.

ALTERNATIVE ROTOR ASSEMBLIES AND SPARES

—	3059	Rotor, Hoe 2 point type. Assembly comprises the following items:—	
—	3329	Rotor, Hoe (2 point type) not illustrated same as standard Rotor but with 2 point flanges as used on Ratooning Rotor Illust. No. 176	
See 159	3902	Hoe Blade Attachment Bolt 1/8" A.N.C. x 1 1/2"	40
—	—	Spring Washer 1/8" dia.	40
—	—	Nut 1/8" A.N.C.	40
See 160	3900	Hoe Blade—Left Hand	10
See 161	3901	Hoe Blade—Right Hand	10
—	3278	Rotor, Ratooning 3 point type. Assembly comprises the following items:—	
D173	3590	Rotor, Ratooning (3 point type)	1
D174	3591	Detachable Flange Segment	3
D175	—	Flange Attachment Bolt 1/2" A.N.C. x 2 1/2"	6
—	—	Spring Washer 1/2" dia.	6
—	—	Nut 1/2" A.N.C.	6
See 159	3902	Hoe Blade Attachment Bolt 1/8" A.N.C. x 1 1/2"	60
—	—	Spring Washer 1/8" dia.	60
—	—	Nut 1/8" A.N.C.	60
See 160	3900	Hoe Blade—Left Hand	15
See 161	3901	Hoe Blade—Right Hand	15
—	3277	Rotor, Ratooning 2 point type. Assembly comprises the following items:—	
D176	3592	Rotor, Ratooning (2 point type)	1
D177	3593	Detachable Flange Segment	2
D178	—	Flange Attachment Bolt 1/2" A.N.C. x 2 1/2"	6
—	—	Spring Washer 1/2" dia.	6
—	—	Nut 1/2" A.N.C.	6
See 159	3902	Hoe Blade Attachment Bolt 1/8" A.N.C. x 1 1/2"	40
—	—	Spring Washer 1/8" dia.	40
—	—	Nut 1/8" A.N.C.	40
See 160	3900	Hoe Blade—Left Hand	10
See 161	3901	Hoe Blade—Right Hand	10
—	3062	Rotor Picktype 2 point type. Assembly comprises the following items:—	
D179	3328	Rotor Picktype (2 point type)	1
D180	3903	Tyne Blade Attachment Bolt 1/2" A.N. Fine x 1 1/2"	40
—	—	Spring Washer 1/2" dia.	40
—	—	Nut 1/2" A.N. Fine	40
D181	3906	*Lucerne Tyne	20
D182	3905	*Picktype	20

Diagram No. 3



ALTERNATIVE SHIELD AND ROTOR PARTS

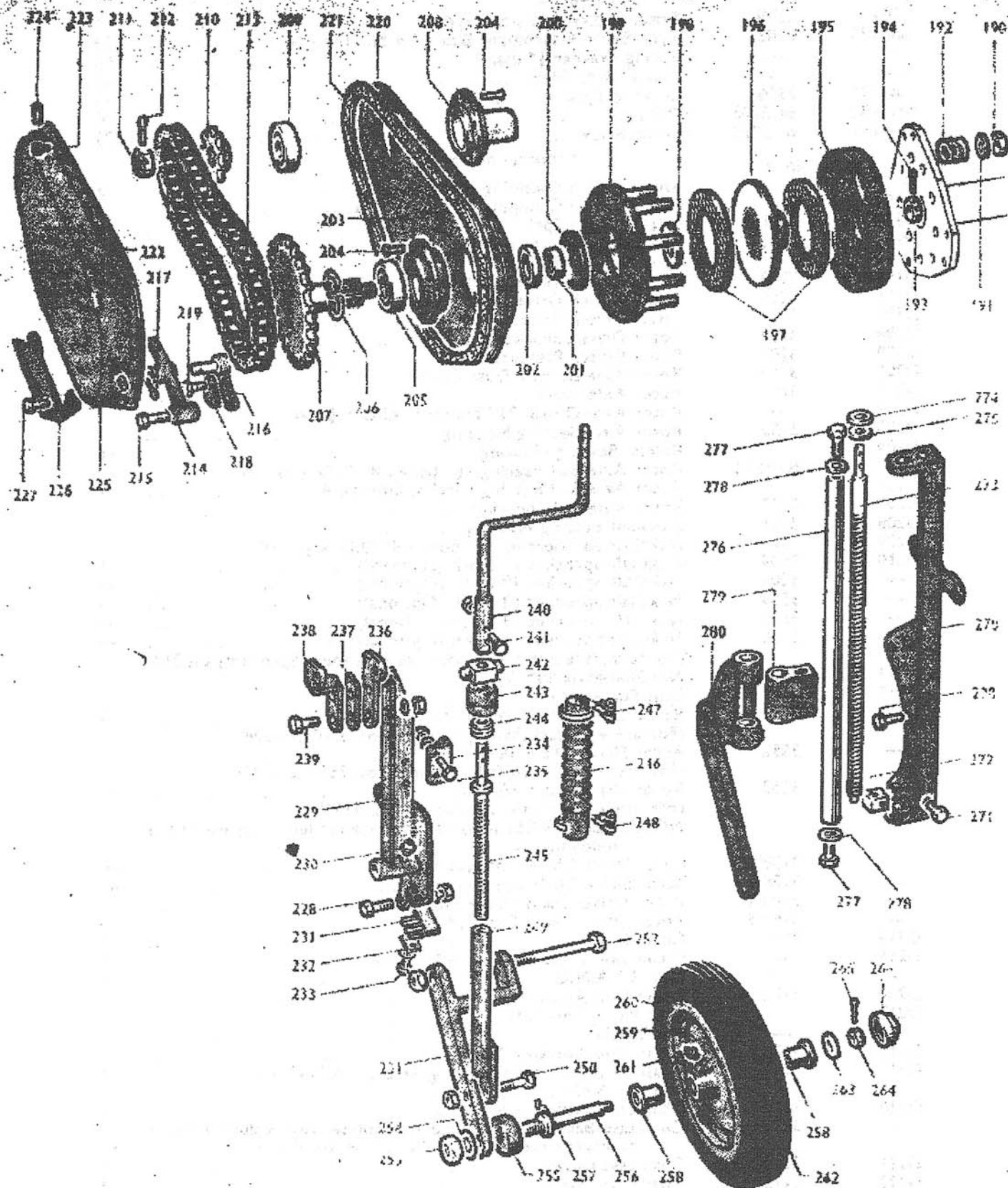
Diagram No. 3 (cont.)	Part No.
Illustr. No.	
D183	3721
—	3019
D184	3199
See 180	3903
—	—
See 181	3906
See 182	or 3905
See 183	or 3721

Description	No. off.
*Stone Blade	28
Rotor Picktype 3 point type. Assembly comprises the following items:—	
Rotor Picktype (3 point type)	1
Tyne Blade Attachment Bolt $\frac{1}{2}$ " A.N. Fine x $1\frac{1}{2}$ "	60
Spring Washer $\frac{1}{2}$ " dia.	60
Nut $\frac{1}{2}$ " A.N. Fine	60
*Lucerne Tyne	30
*Picktype	30
*Stone Blade	30

Diagram No. 4

Diagram No. 4	Part No.	Description	No. off.
D190	—	Safety Clutch Clamping Nut $\frac{1}{2}$ " A.N.C.	9
D191	—	Safety Clutch Clamping Washer $\frac{1}{2}$ " dia.	9
D192	G602	Safety Clutch Spring	9
D193	2635	Nut Special (Rotor Axle)	1
D194	—	Split Pin $\frac{3}{16}$ " dia. x 2"	1
D195	3209	Safety Clutch Wearing Plate	1
D196	3200	Safety Clutch Drive Disc	1
D197	3210	Safety Clutch Friction Disc	2
D198	3158	Rotor Drive Sprocket Spacer	1
D199	3201	Safety Clutch Pressure Plate	1
D200	3160	Rotor Axle Bearing Dust Cover	1
D201	3159	Rotor Axle Spacer	1
D202	—	Rotor Axle Oilseal $2\frac{1}{4}$ " bore x 3" O.D. x $\frac{1}{2}$ " W	1
D203	3156	Rotor Axle Bearing Housing	1
D204	—	Rivets, Bearing Housing	16
D205	BAM 1 $\frac{1}{2}$	Rotor Axle Ball Bearing $1\frac{1}{2}$ " bore x 4" O.D. x $\frac{1}{2}$ " W	1
D206	—	Rotor Axle Ball Bearing Circlip, Internal 4"	1
D207	3150	Rotor Axle and Sprocket	1
D208	3111	Jackshaft Bearing Housing	1
D209	—	Jackshaft Ball Bearing $1\frac{1}{2}$ " bore x 4" O.D. x $\frac{1}{2}$ " W	1
D210	3504	Jackshaft Sprocket 11 teeth (Standard)	1
—	3502	Jackshaft Sprocket 10 teeth (Optional)	—
—	3503	Jackshaft Sprocket 12 teeth (Optional)	—
—	3505	Jackshaft Sprocket 13 teeth (Optional)	—
—	3506	Jackshaft Sprocket 14 teeth (Optional)	—
D211	2635	(For correct length of Chain for use with above Sprockets see 213)	
D212	—	Nut Special (Jackshaft)	1
D213	3188	Split Pin $\frac{3}{16}$ " x 2"	1
—	3552	Rotor Drive Chain 54 Link (Standard)	1
—	3553	(For use with Jackshaft Sprockets Nos. 3502 & 3504)	
—	3552	Rotor Drive Chain 55 Link	—
—	3553	(For use with Jackshaft Sprockets Nos. 3503 & 3505)	
—	3553	Rotor Drive Chain 56 Link	—
—	3553	(For use with Jackshaft Sprocket No. 3506)	
—	3188:2	NOTE: Standard Chain may be increased in length by use of the following:—	
—	3188:3	Rotor Drive Chain Connecting Link	—
—	3188:4	Rotor Drive Chain Inner Link	—
—	3188:5	Rotor Drive Chain Outer Link	—
D214	3669	Rotor Drive Chain Cranked Link	—
D215	—	Chain Skid	1
—	—	Chain Skid Pivot Bolt $\frac{1}{16}$ " A.N.C. x 2"	1
D216	3672	Nut $\frac{1}{16}$ " A.N.C.	1
D217	—	Chain Skid Adjuster	1
—	—	Split Pin $\frac{3}{16}$ " dia. x $1\frac{1}{2}$ "	1
D218	3673	Flat Washer	1
D219	—	Chain Skid Adjuster Cam	1
—	—	Chain Skid Adjuster Clamping Bolt $\frac{1}{16}$ " A.N.C. x $1\frac{1}{2}$ "	1
D220	3110	Nut $\frac{1}{16}$ " A.N.C.	1
—	3112	Chaincase Backplate only	—
D221	3113	Chaincase Backplate. Assembly complete with welded Attachments and riveted items Illust. Nos. 203 & 208	—
D222	3115	Chaincase Gasket	1
D223	—	Chaincase Cover	1
—	—	Chaincase Cover Bolt (except for Bolts also attaching Ground Skid and D.S. Gear) $\frac{1}{16}$ " A.N.C. x $\frac{1}{2}$ "	16
—	—	Spring Washer $\frac{1}{16}$ " dia.	16
—	—	Nut $\frac{1}{16}$ " A.N.C.	16

Diagram No. 4



CHAIN CASE, ROTOR DRIVE, SAFETY CLUTCH, AND DEPTH SETTING WHEEL

Diagram No. 4 (cont.)	Part No.	Description	No. of
D224	—	Chaincase Filling Plug $\frac{1}{2}$ " B.S.P. x $\frac{1}{2}$ "	1
D225	—	Chaincase Oil Level Plug $\frac{1}{2}$ " B.S.P. x $\frac{1}{2}$ "	1
D226	3663	Chaincase Ground Skid	2
D227	—	Chaincase Ground Skid Attachment Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	2
—	—	Spring Washer $\frac{1}{8}$ " dia.	2
—	—	Nut $\frac{1}{8}$ " A.N.C.	2
D228	—	Depth Setting Gear to Chaincase Bolt $\frac{7}{16}$ " A.N.C. x $1\frac{1}{2}$ "	4
—	—	Spring Washer $\frac{1}{8}$ " dia.	4
—	—	Nut $\frac{7}{16}$ " A.N.C.	4
D229	3698	Depth Setting Gear Body	1
D230	—	Grease Nipple $\frac{1}{2}$ " B.S.P. Straight	1
D231	3683	Cutter Blade	1
D232	3678	Cutter Blade Backing Strip	1
D233	—	Cutter Blade Attachment Bolt $\frac{1}{2}$ " A.N.C. x $\frac{1}{2}$ "	2
—	—	Shakeproof Washer	2
D234	3686	Depth Setting Gear Support Bracket	1
D235	—	Bracket Attachment Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	2
—	—	Spring Washer $\frac{1}{2}$ " dia.	2
—	—	Nut $\frac{1}{2}$ " A.N.C.	2
D236	2386	Trunnion Support Straight	1
D237	3682	Trunnion Support Spacer Plate	1
D238	2387	Trunnion Support Cranked	1
D239	—	Trunnion Support Attachment Bolt $\frac{1}{2}$ " A.N.C. x 2 "	2
—	—	Spring Washer $\frac{1}{2}$ " dia.	2
—	—	Nut $\frac{1}{2}$ " A.N.C.	2
D240	2790	Depth Setting Gear Handle	1
D241	—	Depth Setting Gear Handle Attachment Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	2
—	—	Nut $\frac{1}{2}$ " A.N.C.	2
D242	2385	Depth Setting Gear Trunnion	1
D243	2399	Depth Setting Gear Dust Cap	1
D244	SFL $\frac{1}{2}$	Depth Setting Gear Thrust Bearing $\frac{1}{2}$ " bore x $1\frac{1}{2}$ " O.D. x $\frac{1}{2}$ "	1
D245	3685	Depth Setting Gear Screw	1
D246	2398	Depth Setting Gear Screw Gaiter	1
D247	3395	Gaiter Clip, Long	1
D248	3394	Gaiter Clip, Short	1
D249	3689	Depth Setting Gear Screw Tube	1
D250	—	Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	1
—	—	Locknut $\frac{1}{2}$ " A.N.C.	1
D251	3692	Depth Setting Gear Wheel Arm	1
D252	3693	Wheel Arm Pivot Bolt, Special	1
—	—	Locknut $\frac{1}{2}$ " A.N.C.	1
D253	—	Depth Setting Wheel, Axle Nut $\frac{1}{2}$ " A.N.C.	1
D254	—	Depth Setting Wheel, Axle Shakeproof Washer	1
D255	9705	Depth Setting Wheel, Axle Dust Cover	1
D256	3326	Depth Setting Wheel, Axle	1
D257	3714	Depth Setting Wheel, Axle Nib	1
D258	3701	Depth Setting Wheel, Bush	2
D259	3324	Depth Setting Wheel, Centre	1
D260	3700. 2	Depth Setting Wheel, Rim	1
—	—	Depth Setting Wheel, Rim Bolt $\frac{1}{8}$ " A.N.C. x 1 "	6
—	—	Spring Washer $\frac{1}{8}$ " dia.	6
D261	—	Depth Setting Wheel Grease Nipple $\frac{1}{2}$ " B.S.P. Straight	1
D262	3704	Depth Setting Wheel Tyre	1
D263	3703	Depth Setting Wheel Axle Washer, Special	1
D264	—	Depth Setting Wheel Axle Nut $\frac{1}{2}$ " A.N.C. Slotted	1
D265	—	Split Pin $\frac{3}{16}$ " dia. x $1\frac{1}{2}$ "	1
D266	3706	Depth Setting Wheel Axle Cap	1
ALTERNATIVE DEPTH SETTING GEAR (CASTORING TYPE)			
D270	3053	Depth Setting Gear Frame	1
D271	—	Depth Setting Gear Bearing Bolt $\frac{1}{8}$ " A.N.C. x 1 "	1
—	—	Depth Setting Gear Bearing Spring Washer $\frac{1}{8}$ " dia.	1
D272	3716	Depth Setting Gear Bearing Block	1
D273	3717	Depth Setting Gear Screw	1
D274	3741	Depth Setting Gear Washer, Special	1
D275	3740	Depth Setting Gear Thrust Collar	1
D276	3712	Depth Setting Gear Guide Bar	1
D277	—	Depth Setting Gear Guide Bar Attachment Bolt $\frac{1}{2}$ " A.N.C. x $1\frac{1}{2}$ "	2
D278	—	Depth Setting Gear Guide Bar Attachment Washer $\frac{1}{8}$ " dia.	2
D279	2750	Depth Setting Gear Block	1
D280	3023	Depth Setting Gear Hinge and Arm	1

MAINTENANCE AND ADJUSTMENTS

BLADES

Examine the hoe blades daily. If any are bent out of line so that the backs of the blades are rubbing hard on the soil, straighten them with the hooked bar provided, which is carried in the centre tubular member of the Rotavator.

If the blades are found to be badly worn they should be renewed or heated in a forge and drawn out.

It is essential that the cutting edge only should touch the soil and the back have clearance. If the edge of the blade wears thin and tends to turn inwards, leaving a heavy shoulder rubbing on the ground, place the end of the setting bar behind the blade and tap the edge into position with a hammer. The efficiency of the machine depends largely on the condition of the hoes. If the blades become bent through striking solid obstacles in the ground and are not straightened they will take more power to drive, the quality of the work will be poor and the blades will wear quickly.

A keen look-out, therefore, should be kept for bent blades, which should be straightened as soon as they are noticed.

SAFETY CLUTCH (Diagram 4)

Keep the springs of the safety clutch on the rotor adjusted so that the clutch will drive the blades through anything you may want to cut, but will slip when striking stumps and similar obstacles. The safety clutch will work rather stiffly at first, and must be adjusted shortly after the machine is put to work.

To adjust the safety clutch, tighten hard all nine nuts on the Safety Clutch Springs and then slacken each half a turn. If the clutch is adjusted too loosely, Safety Clutch wear will occur.

DRIVE CHAIN

The cover should normally be taken off the Drive Chain Box once a year, the box thoroughly cleaned out and the tension of the chain adjusted by the chain adjusting skid (Diagram 4. Illus. No. 214).

ROTOR CLUTCH OPERATING ROD (See Fig. 2)

When the Rotor Clutch Hand Lever, 'P', is in the rear notch (neutral position) of the Gear Quadrant, the Rotor should turn freely by hand. If it fails to do so, the Clutch Operating Rod, 'R', should be adjusted by the locknuts on the rear end of the rod. When the correct neutral position is obtained, the locknuts should be securely tightened.

GENERAL

Take care to keep all nuts well tightened.