The

Manual of Instruction

in the

Use, Care & Maintenance

of

ATCO

ALL BRITISH
MOTOR MOWER

CHARLES H. PUGH LIMITED,
Head Office and Works:
TILTON ROAD, BIRMINGHAM.
Telegrams: "Accuracy, B'ham." Telephone: Victoria 0161 (3 lines)

PLEASE HAND THIS MANUAL TO THE MAN IN ACTUAL CHARGE OF THE MACHINE.

TO BE KEPT IN AN EASILY ACCESSIBLE PLACE FOR READY REFERENCE.

Note:—Instructions which apply only to machines fitted with the four-stroke type of engine are printed in red ink. The bulk of the text applies either to all models or to those fitted with two-stroke engines only.

Introduction.

YOU have in your care a high-grade Motor Mower, every detail of which has been carefully thought out, manufactured, tested, inspected and passed as a sound engineering job.

Like any other mechanical device, it requires a certain amount of care and attention in order that satisfaction may be obtained. Due regard has been given throughout, to the fact that the user would, in very many instances, be possessed of little mechanical experience, so all minor adjustments have been made as simple as possible to carry out.

A " four-stroke " engine is fitted on the 24in. and 30in. machines, and a " two-stroke " engine on the 12in., 14in., 16in., 18in. and 22in. models; the directions given for preparing the fuels and lubricating oils for use with the two types of engines are of very great importance, and should be carefully carried out.

Due attention should be given to systematic lubrication and cleanliness in certain directions as described hereafter. It is not suggested that the operator should undertake any serious repair, but it is hoped that the instructions given in this Manual may prove of real use, and obviate the delay and expense incurred through sending unnecessarily for our Service Men, and in this way save the owner of the mowing machine unnecessary expense.

CHARLES H. PUGH LTD.

IMPORTANT.

We do not authorise any of our Agents or Representatives, other than Managers and Depot Managers, to advertise, incur any debts, or transact any business whatever on our account other than the sale of goods; nor are they authorised to give any warranty, or make any representation on our behalf other than those contained in our forms of guarantee.

Our obligations under the Guarantee have been, so far, willingly and generously recognised, and we shall continue to conduct our business on these lines. **It is important to mention, however, that overcoming minor running troubles (unless due to defects in manufacture) cannot be included in free service under guarantee.** We refer chiefly to engine stoppages due to such simple causes as a dirty carburetter, choked jet, sooted-up plug, accumulation of petrol and oil in crankcase, etc. These troubles can be quickly and easily located and remedied by careful study of the instructions given hereafter in detail.

If our Service Man is called in exclusively through one of the above-mentioned causes or for simply making ordinary running adjustments, the expenses of his journey and time must be met by the owner.

Sparking Plugs, being a speciality not of our design or manufacture, cannot be replaced free under guarantee, but the Plugs we supply are of a reputable make and specially recommended by the manufacturers of the engine fitted to the "Atco."

SERVICE.

The "Atco" Motor Mower is manufactured under ideal production principles only possible where large numbers are being made. Repairs, under guarantee or otherwise, can also be undertaken by the Manufacturers under similar production principles, by the employment of special machinery (not ordinarily available) ensuring a sound job at a minimum cost.

All unnecessary delay is obviated by our comprehensive Service Scheme which we introduced in 1922. Depots have been established conveniently situated throughout the country (addresses hereafter). We wish to encourage the full use of this Service, since it is important that repairs are not placed in the hands of those who, though they may be competent enough in many ways, do not possess the particular experience of this class of mechanism, or the special plant necessary to carry repairs out in the best possible way. Thus, in consequence, our established reputation may be impaired. When, therefore, you require Service or spare parts for your machine please communicate direct with the Service Depot **in your district.** (Address will be found on the label attached to the front of the Tool Box). By so doing you will always save considerable time.

"ATCO" SERVICE DEPOTS.

Complete List of Depots up to date—

LONDON (A)	**London Road, Sutton, Surrey.**
Phone: Sutton 2700-2701.	
CAMBRIDGE (B)...	**Hills Road Bridge.**
Phone: 227.	
BIRMINGHAM (C) ...	**Whitworth Works, Tilton Road.**
Phone: Victoria 0161 (3 lines).	Wires: "Accuracy, Birmingham."
NEWPORT, MON. (D)	**410, Chepstow Road.**
Phone: 3470.	
ORMSKIRK, LANCS. (E)	**New Road.**
Phone: 239.	
SHEFFIELD (F)	**Rotherham Road, Eckington.**
Phone: Eckington 73.	
DARLINGTON (G)	**396, North Road.**
Phone: 2671.	
EXETER (H)	**Alphington.**
Phone: 3882.	
READING (I)	**... 106, Bath Road, Calcot.**
Phone: 1653.	
GLASGOW (K) ...	**...Kilmarnock Road, Newton Mearns,**
Phone: Giffnock 582.	by Glasgow.
DUBLIN	**...37, Great Strand Street.**
Phone: 684.	

GENERAL INSTRUCTIONS FOR WORKING.

LUBRICATION (see chart between pages 8 & 9).

See that all working parts are well oiled every time the machine is used, using any good quality thin lubricating oil for the purpose—**not** engine oil, as this is too thick.

In particular lubricate well:—

(a) All driving chains.

(b) The clutch through the two oil holes, each of which is covered with a flat swivelling spring cap, in the top of the clutch casing.

(c) The clutch plate sprocket boss through the hole drilled in the boss, or through the lubricator cup (marked E1 in the illustration on page 16). Care should be taken, however, in machines fitted with **plate** type clutches, that this is not lubricated to excess, as oil might work up on to the friction disc and ultimately cause clutch to slip. In the case of machines fitted with **conical** type clutches, the clutch lining should be oiled lightly from time to time to keep it working smoothly and properly.

(d) The three rear rollers or drums through the holes drilled in rolling faces of same. (N.B.—The centre roller has two oiling holes and it is convenient to arrange that the hole is in an upright position when oiling. The straight spout of the oilcan should be pushed right down through the holes in outer rims of rollers and the "tip" used to depress the ball valve which closes the end of the tubes conducting the oil to the boss of roller, or to the ratchet box. There are six of these holes on 24in.

and 30in. machines, as all three rollers are driven directly.

(e) The bronze bearings provided at each end of the rear roller shaft.

(f) The sole plate and each blade of the cylindrical cutter, wiping same carefully after use.

(g) The dull nickel-plated caps over the ends of the cutter shaft and countershaft contain the ball bearings on which the shafts revolve, and are filled with vaseline. Inject oil occasionally through the holes pierced in these, and also in the dust caps at the starting socket end of the shaft.

(h) An oil-hole is provided (behind the wheel) in the bush of the large toothed wheel, on the side of which is fixed the **cutter release** cam lever and pawl.

NOTE.—In the case of the 1929, 14in. model, the oil hole in the ratchet wheel boss can be reached through the slot hole pierced specially in the side of the wheel.

(i) On 30in. machines, in addition to the end bearings of countershaft, the central "floating" bearing also requires oil to be injected through holes provided in dirt caps on each side of bearing.

(j) The shaft on which the wooden or cast iron (as the case may be) front rollers revolve.

FUEL.

For two-stroke engines, as fitted to 12in., 14in., 16in., 18in. and 22in. models, the fuel used in the tank should consist of a mixture of petrol and best quality **air cooled** engine oil, in the proportion

of two gallons of petrol to one pint of oil. This should be measured exactly and not guessed at. Water-cooled engine oil, as used for motor car engines, is **not** *suitable*. This mixture is known as "Petroil." The object of the engine oil is to lubricate automatically the internal working parts of the engine, and it is very important that only the best quality and right kind of oil be used and in the correct proportion as given. We can recommend any of the following:—

Price's "B" de Luxe.
Castrol "XL."
Mobiloil "TT."
Adcol New Process Oil "N.P. 3 and 4."
Shell-Mex (Golden).

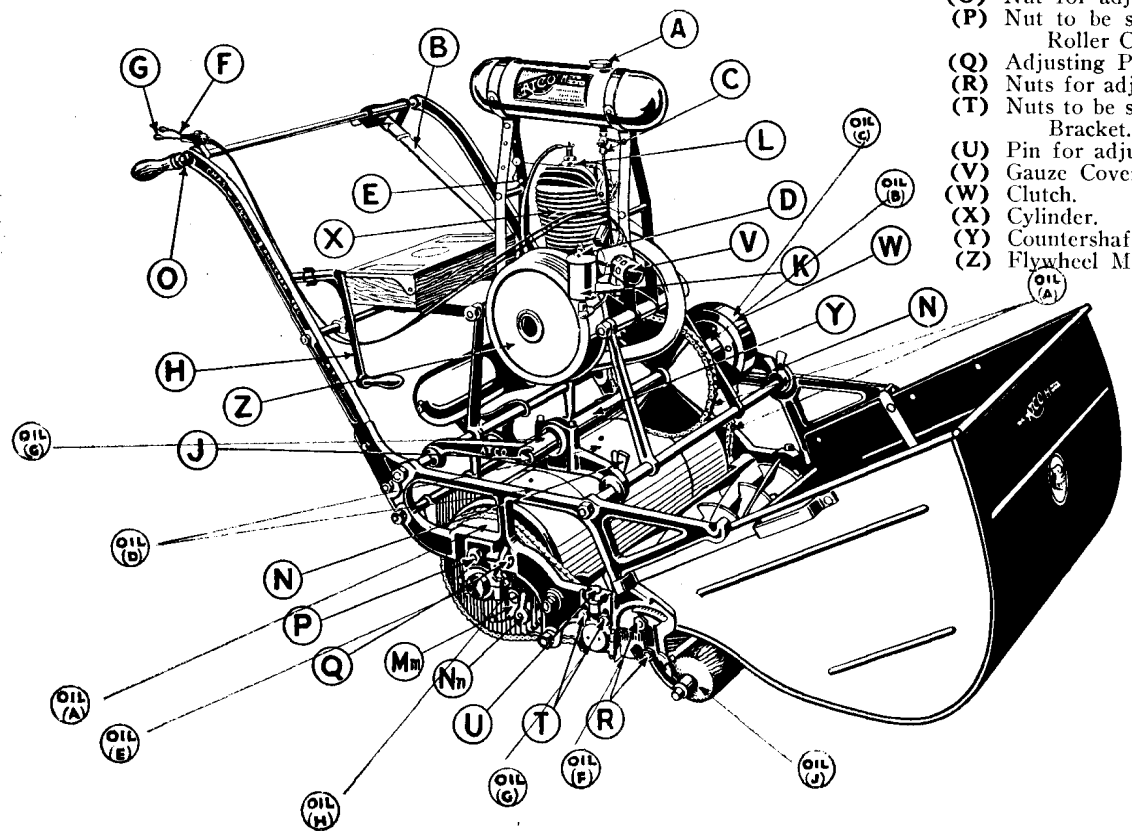
The petroil mixture should not be made in the "Atco" tank, but in a separate vessel, so that it can be thoroughly well mixed by shaking. It will be found convenient to keep permanently a two-gallon petrol tin in which to make the mixture. This tin will always hold another pint of fluid as well as a bare two gallons, and should be well shaken up every time before filling the "Atco" tank from it. **Always pour this mixture through a strainer when filling tank.**

For four-stroke engines, as fitted to the 24in. and 30in. models, the petrol and lubricating oil are contained in **separate compartments** of the tank, which is provided with two filler caps marked respectively "petrol" and "engine oil."

For the latter we can recommend any of the following:—

Price's "B" de Luxe.
Castrol "XL."
Mobiloil "B."
Adcol New Process Oil "N.P. .304."
Shell-Mex (Golden).

(A) Petrol Tank Cap.
(B) Clutch Lever.
(C) Petrol Tap.
(D) Tickler Press Button.
(E) Decompressor Lever.
(F) Air Lever.
(G) Throttle or Gas Lever.
(H) Starting Handle.
(J) Starting Handle Socket.
(K) Float Chamber of Carburetter.
(L) Sparking Plug.
(Mm) Cutter Release Pawl.
(N) Eccentric Levers for adjusting Countershaft.
(Nn) Cutter Release Lever.
(O) Nut for adjusting Handle Grips.
(P) Nut to be slacked off before adjusting Rear Roller Chain.
(Q) Adjusting Pin for Rear Roller Chain.
(R) Nuts for adjusting Wood Roller Bracket.
(T) Nuts to be slacked off before adjusting Cutter Bracket.
(U) Pin for adjusting Cutter Bracket.
(V) Gauze Cover for Air Intake for Carburetter.
(W) Clutch.
(X) Cylinder.
(Y) Countershaft.
(Z) Flywheel Magneto.

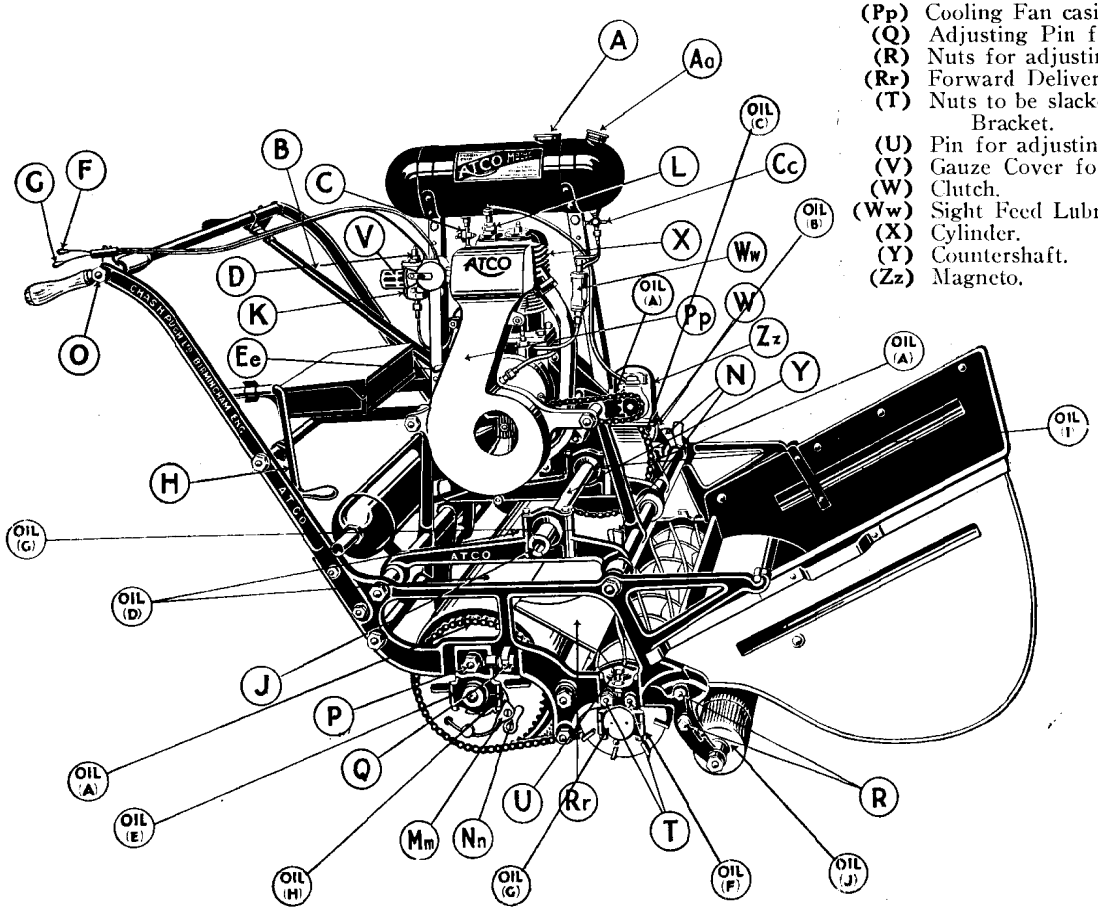


NOTE.—The letters after the words "OIL" refer to the paragraphs on pages 7 & 8.

NOTE.—Cutter Release Mechanism (Mm—Nn) is not fitted on the 12in. Model.

Key Illustration of Machine fitted with 2-stroke type of Engine and Cone Clutch.

(A) Petrol Tank Cap.
(Aa) Engine Oil Tank Cap.
(B) Clutch Lever.
(C) Petrol Tap.
(Cc) Engine Oil Tap.
(D) Tickler Press Button.
(Ee) Exhaust Lifter Lever.
(F) Air Lever.
(G) Throttle or Gas Lever.
(H) Starting Handle.
(J) Starting Handle Socket.
(K) Float Chamber of Carburetter.
(L) Sparking Plug.
(Mm) Cutter Release Pawl.
(N) Eccentric Levers for adjusting Countershaft.
(Nn) Cutter Release Lever.
(O) Nut for adjusting Handle Grips.
(P) Nut to be slacked off before adjusting Rear Roller Chain.
(Pp) Cooling Fan casing.
(Q) Adjusting Pin for Rear Roller Chain.
(R) Nuts for adjusting Rear Roller Bracket.
(Rr) Forward Delivery Scraper.
(T) Nuts to be slacked off before adjusting Cutter Bracket.
(U) Pin for adjusting Cutter Bracket.
(V) Gauze Cover for Air Intake for Carburetter.
(W) Clutch.
(Ww) Sight Feed Lubricator.
(X) Cylinder.
(Y) Countershaft.
(Zz) Magneto.



NOTE.—The letters after the words "OIL" refer to the paragraphs on pages 7 & 8.

Key Illustration of Machine fitted with 4-stroke type of Engine and Cone Clutch.

FOR STARTING.

For two-stroke engines, as fitted to the 12in,. 14in., 16in., 18in. and 22in. models.

(1) Remove cap (A). Put in the tank a supply of the petroil mixture previously mentioned. Replace cap.

(2) Move clutch lever (B) to the left until it engages in the " out " position.

(3) Turn on petrol tap (C) at bottom of tank. The handle will then point downwards.

(4) Keep the (shorter) air control lever (F) of the carburetter control closed, that is, pushed to the right as far as it will go. Move the (longer) throttle control lever (G) at the same time to the left (or inwards) about one-third of its range of motion.

N.B.—In the case of the 12in., 14in. and 16in. machine fitted with " Atco " one lever control carburetters, follow out the instructions given for moving the lever (G) with the 2 lever type of instrument, neglecting all references to the air control lever (F). **If any difficulty is experienced in starting,** however (say, on a cold morning), the small lever on the side of the throttle chamber may be moved so as to cover the small air hole provided. **The lever should, however, be moved into the " open " position, after the engine has run for a minute or so,** as otherwise the mixture will be too rich, and the engine will not " 2 stroke " regularly.

(5) Depress the spring tickler push button (D) on the top of the float chamber (K) for a few seconds.

(6) Insert the starting handle (H) in the socket (J) on the end of the countershaft. Raise the

small decompressor lever (E)—(i.e., the one fitted with a black knob)—to its full extent, and whilst maintaining it in this position with the left hand, rotate the engine by turning handle once or twice rapidly with the right hand. Then, still rotating the engine, with the left hand push the decompressor lever (E) smartly downwards, when the engine should start. Should it fail to do so, repeat the operation. On the 12in. and 14in. 1929 models, which are not provided with a decompressor lever (E), it is merely necessary to turn the starting handle smartly over compression, using the free hand to steady the machine.

(7) When the engine starts, push the air control lever (F) to the left (or inwards) as far as it is possible without causing the engine to spit back, and regulate the speed of the engine by opening or shutting the throttle control lever (G). It will usually be found that the air lever can be opened fully, and left so, once the engine is warm.

(8) With the engine running nicely, and the machine in position on the grass, gently open the throttle with the thumb of the right hand, retaining the grip on the guiding handle, and with the left hand gently release the clutch lever (B) when the machine will move forward; both hands can then be used to guide the machine. Adjust the throttle lever, until the desired speed is obtained.

For the four-stroke engine as fitted to the 24in. and 30in. models the same general instructions apply, but the exhaust valve lifter lever—also fitted with a black knob—provided on the crankcase, takes the place of the decompressor

lever (E). Fill the compartment of the tank which has its filler cap near the middle of the tank with petrol, and the forward compartment with engine oil, **and adjust the sight feed lubricator** as follows:—

(1) Turn the tap on (i.e. downwards) to admit oil from the tank to the sight feed lubricator.

(2) Start up the engine, following out the instructions in paragraphs (2), (3), (4), (5), (6), (7) above. Unscrew the knurled knob (marked from 1 to 4) on top of the lubricator, say, $1\frac{1}{4}$ complete turns, until smoke issues freely from the exhaust pipe; then gradually screw up the regulating screw of the lubricator, thereby reducing the number of drops of oil per minute (which can easily be seen from the driving position, through the glass of the cup) until only the merest trace of smoke shows continuously in the exhaust.

The number of drops per minute required will of course vary with the amount of work the engine is called upon to perform, but, generally speaking, about 20 drops per minute will be sufficient.

(3) The position of the pointers and numbers on the regulating screw can be roughly noted for future setting.

Proceed as in paragraph (8) on previous page.

To stop machine without stopping the engine:— Move the clutch lever (B) into the "out" position, and close levers (F) and (G) until engine runs slowly.

To stop engine:—Move both carburetter control levers (F and G) to the right as far as they will go.

Always keep all petrol taps (C) (and the oil tap between tank and sight feed lubricator, where provided) turned off when machine is out of use, and always turn the petrol taps off before quite finishing the work in hand, and let the engine run until the float chamber is empty, as this prevents difficulty in starting up next time.

Slipping or skidding:—When the machine is used on very uneven ground or on a steep incline, it may be found that the centre rear roller, which transmits the power, "slips" and will not grip the ground sufficiently to propel the machine properly. To overcome this difficulty, in the case of the 22in. and smaller machines, the outer free rollers should be locked to the shaft. By means of the tubular box spanner provided in the tool kit, inserted through the holes drilled in the periphery of the rollers, screw up the square-ended studs tightly on to the shaft. The screws should, however, be slacked back as far as they will go for normal work, as the machine is more easily manipulated when the outside rollers are free.

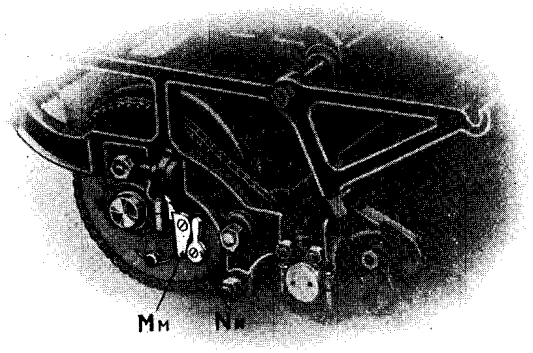
On the 24in. and 30in. machines, all three rollers drive direct through pawls and ratchets.

CUTTER RELEASE MECHANISM.

A Cutter Release Mechanism, to enable the machine to be propelled forward (a) with the cutter stationary, or (b) with the cutter revolving, at the driver's discretion, is embodied on the right-hand end of the rear roller shaft, on all models except the 12in.

To release cutter drive:—With the engine running, and with the main clutch in the "out"

position, move the end of the cam lever (Nn) fitted on side of chain wheel, in a clockwise direction as far as possible. The machine can now be easily pulled or pushed along with the cutter stationary, and propelled forward under engine power.



To drive the cutter:—Rotate the lever (Nn) in the opposite (i.e., anti-clockwise) direction, as far as possible, when, as soon as the clutch is let in, the pawl (Mm) will engage with the teeth of the ratchet wheel and transmit the drive.

(NOTE.—On the 14in. 1929 model the parts Mm and Nn will be found on the *inside* of the toothed wheel and not on the outside).

CARBONISATION OF ENGINE.

In all internal combustion engines, after they have been run for some time, a carbon deposit gradually forms inside the cylinder head, on the top and inside of the piston, behind the piston rings and in the exhaust and bypass ports. This is due to no defect in the engine, but is formed by the organic matter in the lubricating oil becoming burned, due to the high temperatures of the exploded gases in the cylinder, and to dust, etc., taken in from the

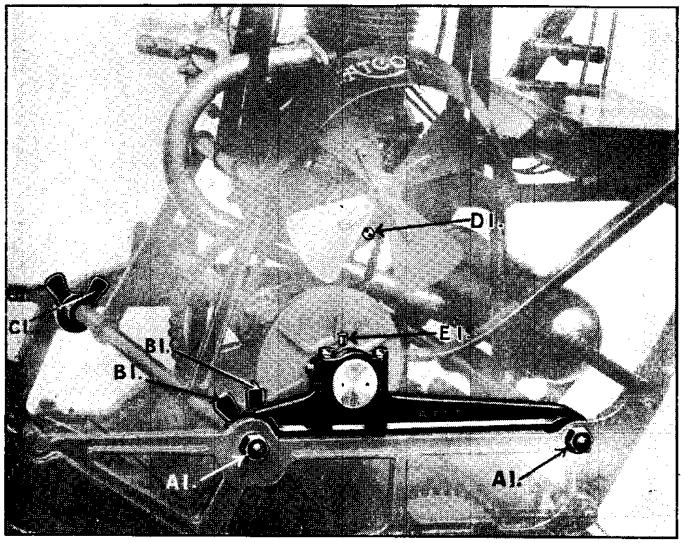
atmosphere through the carburetter. The deposit gradually becomes thicker and thicker, and eventually causes the engine to run hot and the power to fall off. It would eventually stop the engine from running altogether if left long enough. Periodically, therefore, say once in a season, if the mower is only used two days a week, and oftener if it is used daily throughout the season, the process known as **decarbonising** should be carried out. It is partly for work of this description and for regrinding cutters, etc., promptly that our Depots, with their accompanying Service Scheme, have been established. When decarbonising is necessary, your Service Depot should be communicated with and the work will be carried out immediately by one of our experienced mechanics, at a minimum cost.

ADJUSTMENT OF CHAINS.

It is very important that all Driving Chains be kept at just the right tension. In course of time, wear takes place, and if the chain becomes too loose it may jump the teeth of the sprocket wheel and cause damage. At the same time if adjusted too tightly undue strain is thrown on all the bearings and excessive wear takes place. With a properly adjusted chain there should be about ½in. of up-and-down play.

The adjusting of chains from engine to countershaft and from countershaft to rear rollers is done by means of the eccentric levers (B1 and C1). Slack off main frame nuts (A1 and A1), then move the eccentric levers (B1 and B1) on the clutch side backwards and forwards, slowly, either one at a time, or both together, and watch the effect on the chains. A position will quickly be found when both chains are at the correct tension. It is impossible to state any definite position for these levers

relative to each other or to the frame, as the position may vary with each machine; but there is enough movement provided to take up all possible variations.



When the position of the levers is found on the clutch side, set the pair of eccentric levers (C1 and C1) at the other end of the shaft, by eye, in approximately the same position and tighten up the main frame nuts (A1 and A1). In practice, tightening up these nuts, if anything, tends to tighten the chains a little more, so that the chains should be left slightly on the slack side in the first place.

It should be **specially noted** that the 30in. machines have a floating bearing in the centre of the countershaft. This bearing is provided with an additional pair of eccentric levers (C1), exactly the same as those which are fitted at the ends of the countershaft on all other models, and they should be moved into approximately the same position as the levers at the ends of the shaft. Tapping the bracket lightly will assist correct alignments. Failure to secure correct alignment may strain the countershaft and cause damage to both the shaft and the ball race.

To adjust chain from rear roller to cylindrical cutter *slack* off the nut (P) and turn the hex. head of screw (Q). (See chart between pages 8 and 9). This has the effect of drawing the bracket which holds the bearing for the rear roller, towards, or pushing it away from, the cylindrical cutter (depending on whether the screw is turned right or left handed), thereby loosening or tightening the chain as may be required. Lock up the nut (P). The corresponding bracket on the other side of the machine should be altered an equal amount at the same time.

To adjust Magneto Chain on 24in. and 30in. machines. The magneto is fastened to its platform or bracket by four square headed screws underneath the bracket. If these screws are slacked off, it will be found that the magneto can be moved backward or forward, bodily, on its platform until the correct chain tension is obtained, when the screws should be carefully tightened up.

Make sure that the chain alignment is correct, after the screws have been tightened up, before putting the machine to work.

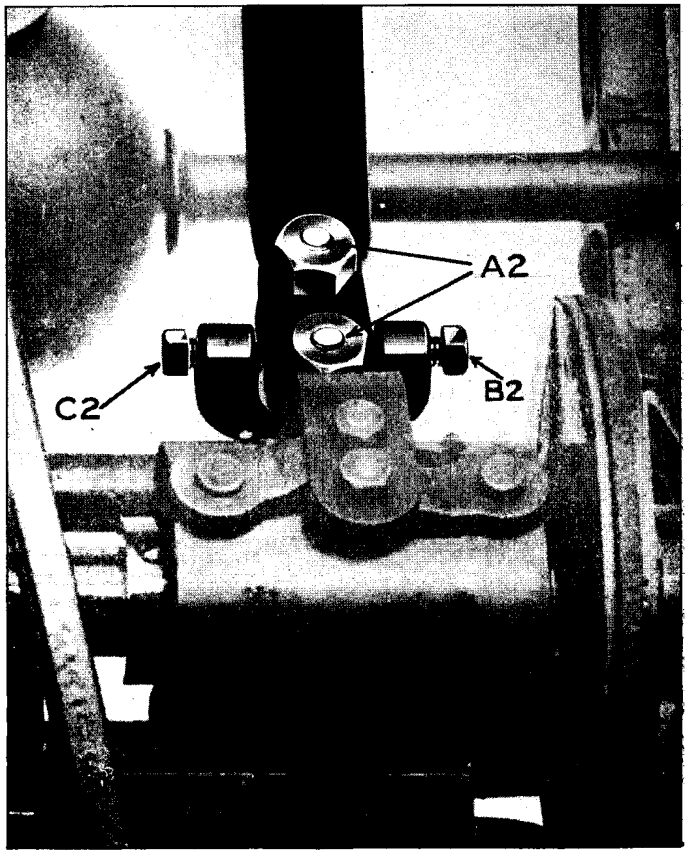
To set cylindrical cutter to sole plate:— Release nuts (T) on both sides of the machine. Unscrew adjusting screw (U) at each end of shaft. This will have the effect of lowering the cutter on to the fixed cutter of the sole plate until they ultimately just touch. As the revolving and fixed blades approach each other, care should be taken to see that both ends of the cutter are evenly adjusted, so that eventually when a piece of paper is inserted between the sole plate and cylindrical

cutter, and the latter rotated slowly, it will cut all along each blade. **The adjusting screw makes a very sensitive adjuster** and as the blades come close together it should only be turned a fraction of a turn at a time—trying to cut paper at each alteration, and when properly adjusted, the cutter should revolve freely (the chain being removed) and should cut paper all along its length without any appreciable grinding noise. The revolving blades must not rub too hard on the fixed blade or undue wear will take place. When correctly adjusted tighten up nuts (T). If the adjustment of the cutters to the sole plate is kept correct, the cutters will not require regrinding, as proper working adjustment will automatically keep the blades sharp. This does not apply of course to a cutter in which a blade has been thrown out of truth, or accidentally damaged, through contact with some hard substance.

Regrinding cutters and sole plate:—Under our Service Scheme cutters and sole plate can be re-ground without putting the machines out of commission for even a day. If you communicate with your nearest Service Depot, a mechanic will be sent immediately with a spare set of cutters and sole plate. These he will fit to your machine, taking away the old ones with him, which will be re-ground by us later in readiness for fitting to the next machine; thus your cutters are re-ground without any delay.

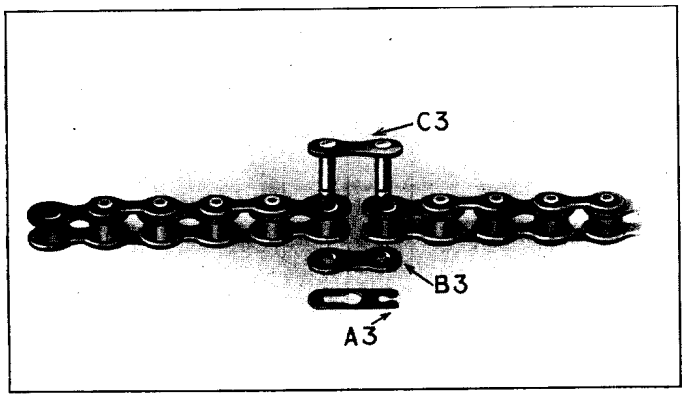
Clutch slipping and refusing to drive the machine when the engine is running and the clutch lever is engaged:—This may be due, in the case of machines fitted with the **plate** type clutch, only to the central composition disc having become greasy. The remedy for this, apart from dismantling the whole countershaft (which we do not recommend

the ordinary "Atco" user to attempt), is to inject **pure** petrol liberally down the sides of the disc, having first put the clutch lever to the out position, and turn the disc round by hand until all dirt and grease is washed away. (Note.—With the **cone** type clutch, the composition liner on the inner clutch member should be slightly oiled from time to time to keep it in good working order). **If it still slips** it is probably necessary to adjust the clutch plate. First—slack off nuts (A2). (See illustration). **Then to make the clutch grip more,**



slack back screw (C2) and tighten up screw (B2) about half a turn at a time. Tighten nuts (A2) and try the machine. If not adjusted sufficiently repeat the operation. If, however, **you over-adjust the clutch so that a "free engine" is not obtained,** when the clutch lever is in the "out" position, reverse the operation, i.e., slack back screw (B2) and tighten up screw (C2), finally locking up nuts (A2).

To uncouple the driving chains:—Turn the wheels round until the spring coupling on side of links is most accessible, then with a penknife blade or end of a screwdriver pressed hard against its projecting ear, the retaining link (A3) can be "sprung" off, and, using the blade again, the side plate (B3) can be prised off and the connecting link (C3) withdrawn from the other side. Connect up in the reverse order.



Note. When replacing the chains be sure and fit the spring link so that it is pushed into place the reverse way to the direction of motion of the chain when working.

ENGINE TROUBLE.

In ordinary running the only difficulties that are likely to occur are:—

(a) Engine will not start.

(b) Engine starts but runs badly, missing fire, and spitting back through the carburetter, etc.

(c) Engine stops suddenly for no apparent reason.

In the following matter we tabulate the order in which search should be made for the cause when the trouble occurs:—

ENGINE WILL NOT START.

(a) **Petrol tank may be empty.**

(b) **See that petrol tap is turned on** and flood the carburetter slightly, particularly when the weather is cold, by depressing small button on the top of the float chamber, holding it down for a few seconds then releasing it.

(c) **Defective plug.** Unscrew sparking plug and, having attached the cable again, lay same on top of cylinder, taking care that the brass piece in end of cable is not touching cylinder. Revolve engine by means of starting handle when there should be a series of strong bright sparks pass from the tip of the centre rod of the plug to the outside point every time that the engine is turned. If there is not, or if the spark is very irregular in action, the points want cleaning. To do this, unscrew the central

hexagonal hollow-nut portion from the main body of the plug—making use of the spanner bracket, fitted on the handle rail of the 12in. and 14in. 1929 models for the purpose, and of the special double ended spanner provided on all other models—when the central rod (or electrode) of the plug can be withdrawn. Any carbon deposit should then be removed from it with a bit of smooth emery paper (taking care not to rub the conical portion, which is made of mica, too hard). The inside of the main body of the plug, to which the hooked point itself is attached, should be scraped and cleaned out, when the parts are ready for re-assembling. Replace plug, and connect up cable.

(d) **Points of plug not correct distance apart.** If the points are set too far apart or too close together, the plug will not work well. The correct distance apart is the thickness of a visiting card (1-32in.). They can usually be "set" to the correct distance by hand.

(e) **The crankcase of a two-stroke engine may contain liquid petrol and lubricating oil.** Unscrew the drain screw on the bottom left-hand side of the crankcase (marked D1 in illustration on page 16) and let any liquid in the crankcase run into a tin. Turn the engine round half-a-dozen times and replace screw.

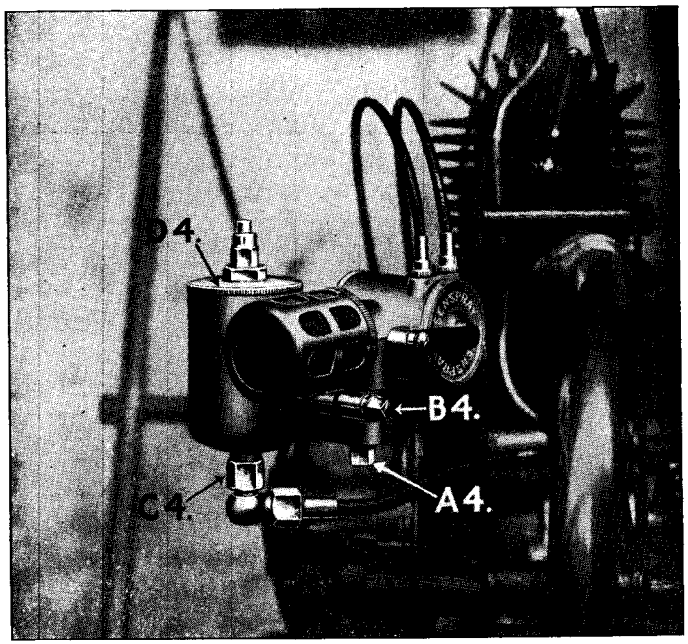
NOTE.—It is quite a good plan to drain the crankcase periodically whether trouble is experienced or not.

The above procedure is not necessary in the case of the four-stroke engine, fitted to the 24in. and 30in. machines. Though it has no connection with the failure of the engine to start, we would here state it is advisable, once or twice in the season (depending on the

number of hours the engine has been at work) to drain the crankcase of all oil. Remove the drain plug (which will be found underneath the bottom of the crankcase) and revolve the engine by hand until all the oil is drained out. Replace the drain plug, and insert about half-pint of paraffin through the filling plug provided on top of the right angled union, where the oil pipe enters the crank case, and again rotate the engine by hand. This flushes out the crankcase, and when the dirty paraffin has been allowed to drain away (again through the drain plug) and the plug replaced, the crankcase should be re-charged with about half-pint of fresh lubricating oil. Care should be taken to circulate this round the engine—by revolving the engine by hand—the filling plug having been connected up.

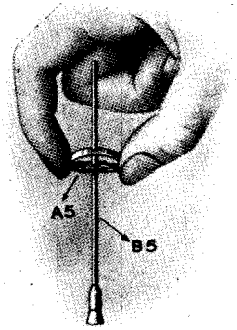
(f) **Magneto points may be dirty.** On the correct setting of these points depends very largely the proper running of the engine and, when once adjusted, they should last a very long time without being re-adjusted, but must be kept clean. **It is a big mistake and a very expensive one to clean these points by filing.** It is often quite sufficient to draw a piece of paper between them two or three times when the points are together. If this is not sufficient, use a piece of the finest possible grade emery paper, reversing the paper so that both points get brightened up. Then carefully wipe with a bit of clean rag. Oil must on no account be allowed in the contact breaker box of either make of magneto fitted.

(g) **Stopped petrol pipe.** Remove same and blow through it to see that it is clear.



(h) **Stopped-up jet.** Unscrew jet holder (A4) at base of float chamber. This withdraws the jet with it, which may then be unscrewed from holder (see illustration). Examine the inside of both jet and holder for any small particle of foreign matter and remove same. If there is dirt inside the jet it will be advisable to examine and clean out the inside of the Float Chamber at the same time. Unscrew petrol pipe union nut (C4) and remove float chamber cap (D4). Gently pinch together the ends of the needle valve spring clip (A5) as illustration (below) when it may easily be drawn off the valve stem. The needle valve (B5) may then be slipped out downwards and the float and

support for same lifted out, when any dirt in the float chamber can be removed. Push a pipe cleaner, or similar article, from end to end of the petrol hole which runs the length of the float chamber arm, from the taper seating of the jet holder into the float chamber. When replacing, great care must be taken to see that the needle valve clip (A5) registers properly in the nick cut round the stem of the valve to receive it, as this fixes the petrol level at the correct height.



Note: On some engines, clip (A5) will be found fitted in the reverse position to the one illustrated; this position has then been found to give the most satisfactory results during test.

If necessary, the Float Chamber can be detached from the body of the carburetter by removing bolt (B4) when the float chamber may be withdrawn downwards. The bolt (B4) must be taken right out, not merely slackened, before the float chamber can be removed, and vice-versa when replacing.

(i) **The timing of the engine may not be correct,** due to, in the case of the two-stroke engine, the fly-wheel magneto having slipped round on its shaft, or, in the case of the four-stroke engine, to the magneto sprocket having also slipped round on the armature spindle. To check the timing proceed as described in following matter.

TIMING OF THE TWO-STROKE ENGINE.
As Fitted to the 12in., 14in., 16in., 18in. and 22in. " Atco " Machines.

The satisfactory working of the engine depends primarily on the correct timing of the magneto, which has, for purposes of lawn mowing, proved to be as follows :—

The contact points of the make-and-break mechanism should just be opening when the top of the piston has reached a point which is 3/32in. from the top of the upward, or compression stroke.

The back (or stationary plate) of the magneto is anchored, by a metal clip, to the crank case, when the machines are assembled, in such a position that if the piston is brought to the top of its stroke, the contact maker points will open at the correct time **only** when the **arrow** on the brass arm of the rotating flywheel, points exactly vertically upwards. If it does not, **the hexagon nut securing the flywheel to the engine shaft must be slackened back, and the flywheel turned round gently on the engine shaft until it does point as described,** when the nut must be well tightened up, hitting the end of the spanner with a hammer. During this operation the piston must be kept on the top of its stroke, as first mentioned.

Note.—To ascertain when the piston is at the top of its stroke, remove the sparking plug, and insert a pencil, or straight stiff piece of wire, down the sparking plug hole on top of the cylinder, and " feel " for the top of the piston, rotating the engine slowly at the same time with the other hand.

Alternatively, if you look closely at the outside end of the engine shaft, in the centre of the nut which fastens the flywheel to the shaft, it will be found to be marked with a nick or sawgate. When this mark is vertical, the piston is on top of its

stroke, and when *both* this mark on the engine shaft, *and* the arrow on the brass flywheel are pointing vertically upwards, the timing is correct.

TIMING OF THE FOUR-STROKE ENGINE.
As fitted to the 24in. and 30in. " Atco " Machines.

The satisfactory working of a four-stroke engine depends not only on the timing of the magneto, but on the correct timing of the valves. As this latter timing depends entirely on the proper assembling of certain internal parts of the engine, which are only accessible when the crank case is dismantled, and which cannot get out of adjustment when assembled, it is not necessary to worry with instructions for timing the valves, beyond stating that the inlet valves begin to open when the piston is 1/16th inch from the top dead centre before starting the suction stroke. The spark which is produced just as the contact maker points start to open, must be timed to occur when the piston is 5/32in. to 3/16in. from the top of the *compression* stroke, which is the upward stroke made by the piston when the inlet valve has shut. If the magneto driving wheel has slipped round accidentally, so as to upset the timing, the small hexagon headed screw, which secures the 20T. sprocket to the magneto shaft, should be slackened off, and the sprocket tapped at the back until it is quite free on the shaft. Then, having removed the cap from the contact maker box at the other end of the armature, turn the armature until the points are just starting to open. See that the piston is in the position described above. This is best done by removing the small priming cock from the top of the cylinder, and inserting a piece of stiff wire down the hole, rotating the engine *slowly* with the right hand, till the top of the piston when in its highest position can be felt. A mark can then be made on the wire, level with the

cylinder face, and another mark made 5/32in. to 3/16in. below it, and the piston placed in the correct position as indicated above.

Note.—Great care must be taken not to nip off the end of the feeler wire, through the upcoming piston trapping the wire against the edge of the port, which may happen if the engine is rotated too quickly.

All that remains to be done now is to gently tighten up the screw which secures the 20T. sprocket to the magneto.

It is advisable to check it all over again when everything is tightened up.

ENGINE RUNS BADLY, MISSES FIRE, ETC.

This may be caused by :—

(a) Partially stopped jet or petrol pipe (see pages 23 and 24).

(b) Dirty or defective plug, or plug points not set correct distance apart (see pages 21 and 22).

(c) Dirty magneto contact points (see page 23).

(d) Water in petrol. This must be got rid of immediately.

(e) With "petroil" fuel, the mixture may not have been correctly made, or have been recently well shaken up (see pages 8 and 9).

(f) Air lever kept too far open, particularly on a cold day or before the engine has warmed up. (See Note 4 page 10).

(g) Piston rings may want renewing (see decarbonising, page 14).

(h) Cable from magneto to sparking plug being loosely connected or having developed a "short circuit," from such a cause as the insulation having been burnt off through the cable touching the hot cylinder.

(i) Engine timing has altered (see pages 26 to 28).

Engine stops suddenly. This may be due to any of the causes given in "Engine will not start," or "Engine runs badly" hints (pages 21 to 28), and if the cause is not at once obvious, a methodical examination, as detailed previously, should not fail to reveal the cause of the trouble.

DONT'S.

(1) **Don't** send for the Service Man until you have made sure that the stoppage is not due to some simple trouble, which you can easily deal with yourself, as described in foregoing pages.

(2) **Don't** forget to lubricate working parts, as described on page 7, every day before starting work, or as may be found necessary. (See chart between pages 8 and 9).

(3) **Don't** make the **petroil** mixture in the "Atco" tank, but thoroughly mix it first (see pages 8 and 9) in a separate tin.

(4) **Don't** leave the engine running idle any longer than can be helped. It causes unnecessary wear and tear and expense. Close the throttle well down when you do run it in the free position.

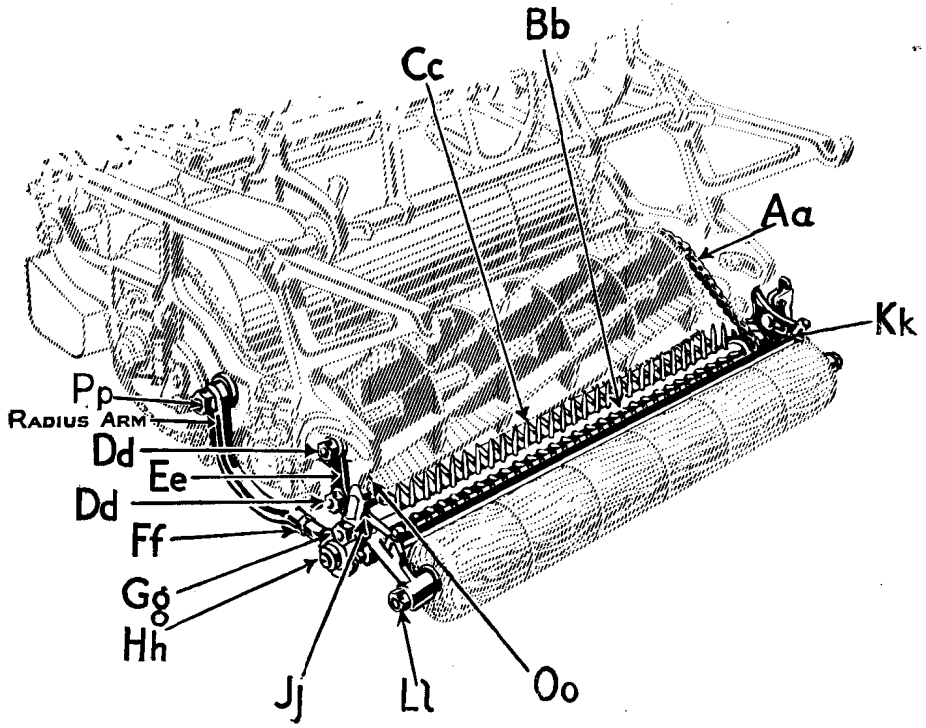
(5) **Don't** run with the chains either too tight or too loose.

(6) **Don't** forget to turn the petrol tap (and oil tap also in the case of the 24in. and 30in. machine) "off" when the work is done.

(7) **Don't** store the machine too near a stove, or in a damp place, or leave it in the rain continuously. It will repay careful handling.

(8) **Don't** "race" the engine under any circumstances. Nothing is gained by driving at too great a speed, especially over rough ground. The most satisfactorily speed will be found to be about three miles per hour.

INSTRUCTIONS
FOR FITTING AND ADJUSTING THE IMPROVED "ATCO" CULTIVATOR.



To fit Cultivator:

(1) Remove the standard front roller "unit" complete. This is done by undoing and removing the four bolts (Dd) which fasten the front roller brackets to the sides of the main frame of the mower, when the unit comes straight away.

(2) Place the cultivator unit as supplied, in an exactly corresponding position to the standard unit just removed.

(3) Remove altogether the upper tee-headed conveyor bolts (Pp) and substitute the longer tee-headed bolts supplied threaded through the radius links of the cultivator unit.

(4) Connect up the radius arms as shown in the illustration, and assemble and tighten up the bolts (Dd).

To adjust Cultivator:

(1) Set the Cultivator Shaft (Bb) in which the teeth (Cc) are fastened, into the highest position, by slacking off nut (Gg) on both sides of the machine, and moving the brackets (Jj) which support the shaft, up, as far as possible. Tighten up the nuts (Gg).

(2) Slack off nuts (Dd) on both sides of the machine, and set the wooden or cast iron (as the case may be) front rollers of the machine into the position which cuts the grass to the desired length. (The graduated scale is provided so that both ends can be set level). Tighten up the nuts (Dd).

NOTE.—The blades should not be set very low when the Cultivator is being used.

(3) Lower the Cultivator Shaft into the desired position by slacking off nuts (Gg) at both ends of the shaft. (A graduated scale-plate is provided, so that the amount of movement is registered). Take care to see that both ends of the shaft are set to the same mark. Tighten up the nuts (Gg).

When the desired position of the shaft has been arrived at, it will be found a great convenience to set the stop screw (Oo) down on to the front roller bracket (after slacking back the corresponding clip screw), so that the Cultivator can be quickly and accurately reset to the same depth if it is desired in the mean-

time to use the machine for mowing and not cultivating. Tighten up the clip screw.

(4) **Adjust the tension of driving chain (Aa),** as follows :—

Slack off nut (Gg) on both sides of the machine, and screw up, or unscrew, as is required, the hexagon-shaped adjusting stud (Ff). Adjust the similar stud on the other side of the machine by the same number of turns or parts of a turn in the proper direction. Tighten up nut (Gg).

NOTE.—It is important that the chain is adjusted correctly whenever the setting of the Cultivator is altered.