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THE CARE AND MAINTENANCE OF BINDERS

The need for proper care and maintenance of farm machinery cannot be stressed too strongly. This timely article on the binder has been prepared by the National Institute of Agricultural Engineering, England, and appeared in the Journal of the British Ministry of Agriculture. Farmers are urged to put into practice the advice and instructions given in this article.

There are over one hundred lubrication points on a modern tractor binder. Grease all round first thing in the morning and once again during the day; but, on a long day, lubricate fast-moving parts at least three times. Start at one point and work systematically round the machine so that no parts are missed. Where oil-baths are fitted, see that the oil is maintained at the proper level with the correct grade of oil; used sump oil must not be used for binder lubrication. Chains should not be lubricated in very dusty conditions, especially where the soil is of a "cutting" nature.

Canvases.—Check over all canvases before harvest and attend to any necessary repairs at once. When putting canvases on see that they run buckles first, and that the flaps are well laced down. Make sure that all straps are tightened evenly, or the canvas will creep towards the tight side. Do not run canvases too tight; run them tight enough to drive without putting undue strain on the rollers. If, after the above points have been followed, a canvas still does not run true, check the rollers to see that they are parallel. This is done by measuring diagonally from the left-hand edge of one roller to the right-hand edge of the other, and vice versa. These two measurements should be the same. If they are not, adjustment can be made by lengthening or shortening the cross members that brace the frame carrying the canvas.

Chains and Gears.—Be sure that all chains are fitted to run the right way round (see Fig. 1). With a roller chain, the clip holding the joining link should be fitted as shown in Fig. 2.

Do not run chains too tight; they should be slightly slack, but not so slack that the chain can flap against a part of the machine or jump a tooth on the sprocket. If chains keep coming off, and the tension is correct, make sure that all the sprockets are in line. Keep all gears free from rubbish. An accumulation of dirt, straw and similar material between the teeth may prevent them from meshing correctly. When properly adjusted there should be just a little play or "back-lash" in the gears. (This should be checked in a number of places by turning the gears round a little at a time.)
Cutter Bar and Knife.—Note that each section centres on every other finger (6-in. travel), whereas a mower knife section centres on each finger (3-in. travel). The general condition of this part of a binder is not so vital as is the case with similar parts in a mower; but the following points should be noted:—

(a) All rivets should be kept tight, especially on the knife head. Where a rivet has become slack in its hole, fit a new one.
(b) See that all the knife sections and fingers are in line. Any that are not can be adjusted carefully with a hammer.
(c) The clips should hold the knife firmly on the ledger plates; but do not tap them down too far so that they bind.
(d) Excessive wear, usually found on the older wooden pitman bearings, will cause loss of motion, and the sections will not centre on the appropriate fingers.
(e) Lubricate the pitman bearings thoroughly; but do not oil the cutter bar or knife where grit can get on them.
(f) Never use a blunt knife, especially when there is any quantity of greenstuff in the bottom of the crop.

Twine Tension and Knife.—Twine tension is most important for the correct operation of the knotter, and should be checked with an ordinary spring balance as shown in Fig. 3.

Do not use tensions greater than those shown in the diagram, as the twine may break or become unthreaded, and strain is imposed on the knotter, leading to sheaves being discharged untied. Before the beginning of a season's work the twine-knife should be removed and sharpened with a carborundum stone.

During Use.—If satisfactory work is to be done there must be an operator on the binder unless it is fitted with levers within the tractor driver's reach. Do not work a binder too fast, especially over rough ground. About 3-4 m.p.h. should be the absolute maximum on level ground, using pneumatic tyres; but the tractor should be throttled down before crossing furrows, etc. More binders are shaken to pieces behind tractors than are worn out in normal work. If any stoppage occurs during work, back before restarting, so that the machine can gather speed before entering the crop.

Never let the fingers dig into the ground; this is likely to occur when there is a ridge in the land between the main wheel and the outside divider, or when crossing furrows. To get the required length of stubble, set the height of the binder on the main wheel and outside divider wheel, using the tilting lever mainly to make adjustments for unevenness in the land.

In a heavy crop the ears tend to go up the elevator before the butts, so lower the machine and tilt up the front to retard the ears. On some makes of binder there is a strap of metal provided to run over the platform canvas, and this should be used to serve the same purpose. In a laid or tangled crop, neater sheaves can often be
made by frequent adjustments of the reel—both backwards and forwards, as well as up and down. Care should be exercised in doing this, to ensure that the crop is not thrown over the back of the platform. Where there is a great deal of greenstuff in the bottom of the crop it is better to leave longer stubble, so that the sheaves dry out more easily.

**Powershafts.**—When hitching a tractor to a power-driven binder, the powershaft should run, as nearly as possible, in a straight line, parallel to the direction of travel. Guards should always be used to prevent straw from winding round the shaft, as well as to reduce the danger of accidents.

It is very important to make sure that all bearings, particularly universal joint bearings, on a powershaft receive frequent and thorough greasing. Safety clutches should never be tightened down so that they cannot slip. If a clutch starts to slip after a long period of normal work, it is due to some trouble in the binder which should be found and corrected. The clutch should not be tightened without such an investigation.

**Tying Sheaves.**—While at work constant attention should be paid to the binding lever to ensure that the sheaves are tied as near the middle as possible. Any variation from the centre should tend towards the butts, rather than towards the ears. This applies particularly to winter oats, which tend to slip out of the bands if tied nearer the ears than the butts. The binding lever should be used to adjust the tying position of the sheaf; the buttor should not be used for this purpose, except in very short crops.

**Varying Sheaf Size.**—Where the trip and compressor arm are separate, the size of the sheaf should be varied by adjusting the positions of the compressor arm and trip lever, and not by increasing the trip spring tensions.

Where the trip and compressor are in one, slight variation in the tension of the trip spring will be needed in addition to the adjustment of the position of the compressor arm.

For a Small Sheaf: Move the compressor arm in and decrease the tension of the trip spring.

For a Large Sheaf: Move the compressor arm out and increase the tension of the trip spring.

**Varying Band Tension:** Variation in band tension is effected by adjusting the trip spring tension; on no account by variation of the twine tension.

For a Tight Sheaf: Increase the trip spring tension.

For a Loose Sheaf: Decrease the trip spring tension.

**Knotter Troubles.**—If a new machine throws occasional untied sheaves there is no need to make adjustments at once. After half a day’s work, when paint and general stiffness have worn off, the trouble will probably have ceased. Normally, if untied sheaves occur, it may be due to a weak place in the twine, rust on the knotter, a grain of corn in the bills, or rubbish temporarily blocking the knotter. In addition, a blunt twine knife can give rise to a number of troubles. No adjustment should be made to the knotter itself, until it is clear, by the frequent recurrence of some trouble, that the knotter is really at fault.
Before investigating knotter troubles the following points should be grasped:—

The operation of any knotter depends on correct timing (timing marks are provided on all gears for correct assembly).

(a) The needle is timed to deliver the twine into the twine retainer at the correct time.

(b) The twine retainer is timed to move on to grip the twine as soon as the needle lays it in the proper groove.

(c) The knotter bills are timed to turn when the twine retainer has gripped the twine.

(d) The bills are timed to open and close, to grip the twine, when it has been wrapped round them by their own rotation.

(e) The knife is timed to cut the twine while it is being held by the bills.

(f) Finally, the stripper and discharge arms are timed to pull the finished knot off the bills, so drawing it tight.

If any one movement in this sequence of events is interrupted by wear, damage, or faulty adjustment, the knotting mechanism will fail to tie the sheaf properly. It is important, therefore, that this sequence should be observed by turning the knotting mechanism slowly (by hand) in order that faults may be traced.

If this fails to reveal the fault the binder should be put to work and stopped immediately an untied sheaf is thrown; then, by finding the band and examining the ends, the fault may be traced in the following way:—

In this case a slip knot is tied round the sheaf, and the free end of the twine runs back to the needle (A).

This is due to the twine not being placed in the retainer by the needle for any of the following reasons:—

(a) The needle was timed too late, so that the twine retainer had moved before the twine was there to be gripped.

(b) The needle was bent and did not put the twine in the correct place.

(c) Greenstuff or other rubbish blocked the twine retainer or needle, so preventing entry of the twine.

The remedy lies in clearing away any rubbish if present, or adjusting the needle in one of two ways:—

(i) See that the needle moves as far as possible into the mechanism without fouling anything; that is, have the needle “timed early.” This is done by shortening the needle pitman, half a turn at a time, until the desired position is reached.

(ii) If the needle does not place the twine centrally in the notch of the twine retainer, the needle itself may be bent until it does so. (It is a malleable casting.)

Here the twine retainer is too loose, and one end of the band has been pulled from it before the knot was formed (B).
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16. Internal Parasites.

(a) Studies on Anthelmintics.—(i) Phenothiazine. — It was mentioned last year that very finely ground phenothiazine appeared to be more effective than commercial grades of the drug. Trials carried out during the year have shown clearly that large particle size greatly detracts from efficiency. A sample in which 98 per cent. of the particles ranged from 46 to 76 microns in diameter was of such low efficiency that a dose of 20 g. left large residual infections with *Haemonchus contortus*, whereas 10 g. is usually highly effective against this parasite; a finely ground sample, in which 99 per cent. of the particles were 10 microns or less in diameter was highly efficient, not only against *H. contortus* but also against less susceptible worm parasites such as *Trichostrongylus* spp. (black-scour worms) and *Oesophagostomum columbianum* (nodule worms). It was also found that commercial grades are less effective.

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Tighten the retainer tension a little at a time until the trouble stops.

Here the twine retainer is too tight, and has "chewed" one end of the band in two before the bills made the knot (C).

Slacken the retainer tension until normal bands are formed, and check the twine tension on the retainer as shown in Fig. 3.

When slip knots of the type (B) and (C) above are found on the bills the twine tension is too great; when found with sheaf the twine tension is correct.

In (D) the retainer tension was so great that both ends were "chewed off" before the knot was formed. This is often caused by excessive tightening of the retainer tension in correcting fault (B), above. Slacken the retainer tension.

In (E) both ends show signs of bending, as a knot had been formed and had come undone. This is due to the tension on the knotter bills being too slack, and allowing the knot to slip out before being completed.

Tighten the bill tension a little at a time until the trouble is corrected.

The same trouble may also be due to the knob on the end of the upper bill hook becoming worn, and allowing the twine to slip out (F).

Fit a new hook or complete bills if they are badly worn.

If the binder casts a number of small sheaves, or sheaves of irregular size, it is a sign that the tying mechanism is not waiting, on the completion of a sheaf, until it is tripped for the next one; but carrying straight on without a pause. This is due to a fault in the locking and actuating mechanism situated at the front of the binding deck. It may occur because of any of the following reasons, and the remedy is usually the fitting of new parts:

(a) Worn trip dog and stop (old ones may be ground into shape if not too badly worn).

(b) A broken dog spring.

(c) Worn rollers, etc., on the packer drive.

After Work.—A binder should never be left after a day's work unless covered with a sheet; usually it will be found necessary to use a few sheaves to ensure that rain does not drive under the sheet. If a binder is left overnight, or for a similar period, the canvases must be slackened.
Travelling.—When any long distance has to be covered always pack up the binder for travelling. Pull the reel back as far as it will go and turn it, if necessary, to ensure that no arms project beyond the general line of the machine; if any do, they should be removed. Unless pneumatic travelling wheels are provided, do not haul at high speeds on roads or rough surfaces. Great care should be exercised in passing through gateways.

Do not load the platform with a heavy weight of string, fuel or spare parts; this leads to distortion of the platform and damage to the canvas. Nothing should be placed on the platform unless the canvas is removed beforehand; it is not sufficient just to slacken it.

Storage.—A binder must always be stored under cover, in a place where poultry cannot roost on it, rain drive in on it, or odd things like sacks, oil-drums, etc., be put on it. Clean the whole binder down, using paraffin and a brush where necessary—for example, on the knotter and roller gearing. Remove the canvases and go over them for any breakages; have these repaired. Store canvases in a dry place away from rats and mice. Remove all chains and soak them in paraffin, clean them and store in waste oil until next season. Remove the knife, see that both this and the spare knife are sharp, and grease them thoroughly before packing away. Grease all fingers and similar bright parts to prevent rusting—especially the knotter bills—and grease all bearings thoroughly.

Where pneumatic-tyred wheels are fitted they should have all the weight taken off them by screwing down the main wheel, blocking up the binder to keep it level, and finally screwing up the main wheel again.

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