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Number 1

Smith, J.M., 1921, **Plows and Plowing**, Scientific Agriculture, Vol 1, pp 149-153

Plows and Plowing

By J. MACGREGOR SMITH
Professor of Agricultural Engineering, University of
Alberta, Edmonton.

NOTE: (The author of this article realizes that the information it contains covers the subject in a very brief manner. He has tried to make it essentially practical. More questions have come in for solution on the subject of plows, and especially on the draft of plows, than on any other one branch of Agricultural Engineering. Information along similar lines to that which is contained here, should be brought to the attention of every Agricultural College student at some time in his college course.)

"Why plow; when to plow; how to plow; are three questions of vital interest to the tillers of the soil. During the past two hundred years plows and plowing have been discussed by a thousand brainy farmers, who knew the art from actual experience between the plow handles, and by 10,000 others, whose only experience was watching a sturdy farmer turn the soil while they rested under a shade tree."

The above quotation hits the nail on the head. "Having been there," the writer realizes that there are many difficulties connected with this—our most important tillage operation. Do you realize that a plow is harder to run right than a binder? Do you realize that plowing takes more power than any other tillage operation? Do you realize that many settlers in Western Canada are plowing under entirely different conditions from those that they were used to "down East", in the Old Country", or "in our country", as our friends from the South so often say?

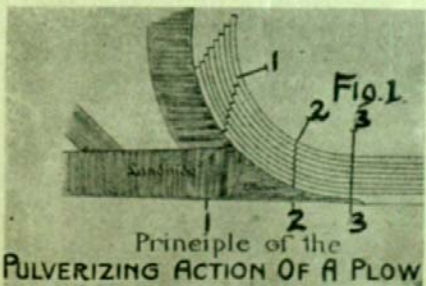
While the subject has been discussed until it is almost thread-bare and shiny, yet by getting together in a systematic manner, and discussing some points, connected with the operation of the implement rather than the work it does, we may be able to help each other.

Whether you agree with the foregoing remarks or not matters little; one thing you have to admit is that there is far too much very poor plowing being done in

Western Canada. The splendid annual Provincial Plowing Match, held in Ontario, is also evidence that the importance of good plowing is fully recognized and encouraged there. Now since the amount of time required for a good or a poor job in this case is practically the same, let us decide to have none but the best. It is only good business.

The Pulverizing Action of a Plow.

We break with a long sloping moldboard. Why? Because we simply want to turn the furrow slice upside down so that the sod will rot. We plow stubble land with a quick turn or steep moldboard. Why? Because we want to get the land into a good physical condition; in other words we want to pulverize the soil. (See Fig. 1.) Take a book and hold one corner between your finger and thumb, then by allowing the leaves to slide over one another you will readily see what happens to the furrow slice as it passes up over the moldboard of a stubble plow. There is a shearing action. Imagine a pin in the position 3-3 and notice how it has been sheared into many parts as it reaches the position 1-1. The steeper the moldboard, the greater the pulv-



Principle of the
PULVERIZING ACTION OF A PLOW

Figure 1.

erizing action. When the soil is very wet, as it often is in the Spring, or very dry as it often is in the Fall, we do not get this finely pulverized condition. There is an ideal condition and in summer following we usually get good results as the soil is neither too wet nor too dry. Perhaps you never realized that a plow had a pulverizing action on the soil at all. We want an even top so that the least possible surface will be exposed to the drying influence of the sun and wind. When the land is ridged it will dry out quicker, because more surface is exposed. We do not want high crowns and deep dead furrows as we had in Ontario, or perhaps, in Scotland, because we have no surface water to get rid of.

The Strike Out.

A fad, you say. Oh, no. You say you have no time. Then I say you are a poor business man. It only means one round more and you get all the weeds and we need to get them and get them young. As one

clear. At a plowing match for example, stakes (which are numbered) are placed at each end of the field. The round dots indicate the feering poles which are set up as desired, to get a straight strike out. There is another method of striking out, but if every farmer would see that his lands are opened up as shown, it would be a long step toward better farming methods.

Unmatched Furrows.

Sometimes called "paired furrows," "uneven furrow backs." In other words a shallow furrow and a deeper furrow in pairs. By considering some of the causes of this very common fault we will now proceed to discuss some practical difficulties which experts have to deal with every day. We will take them in the following order:

1. Front plow cutting too wide.
2. Plows not cutting the same depth.
3. Colters not properly set.
4. Bail support moved.

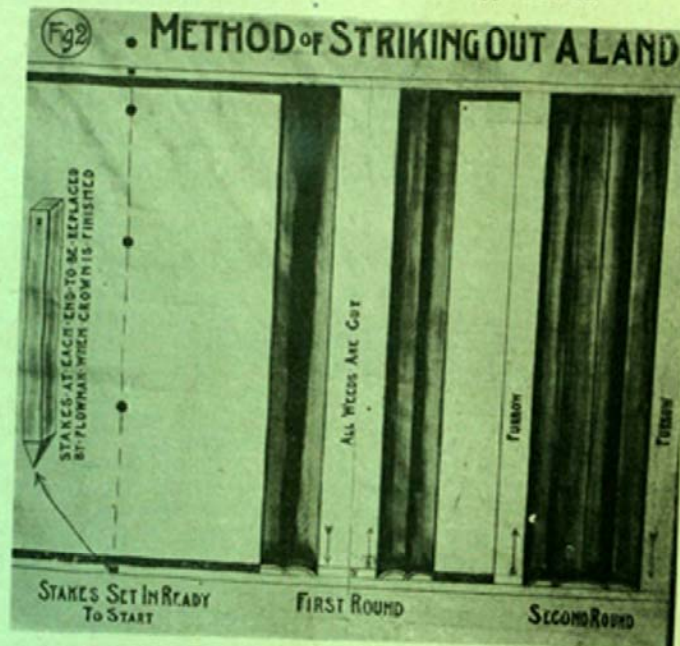


Figure 2.

passes along a road in the middle of winter, on every side there are long rows, very often "crooked as a dog's hind leg", of weeds, indicating that the man had simply driven into the field and let the plow rip any old way. The result—half a day has to be spent finishing up "ends". You know what I mean. (See Fig. 2). Suppose you wish to plow 5 inches deep, then after setting up your stakes you proceed to throw out two furrows about 3 inches deep. "Haw" around and throw out other two furrows. You then have what looks like a shallow finish. Now "Gee" round and throw back the furrows and keep on gathering up the land, gradually increasing the depth. By the time you have reached the third round you should be down to the desired depth. All the weeds are cut and you have a level crown. The illustration will make the point

5. Sprung beams.
6. Hitch not right—side draft.

Front Plow Cutting Too Wide.

In this enlightened age would you believe that a man would be content to sit on a bag of hay for 10 hours a day and see his 14-inch two-furrow gang plow cut 38 inches! The writer saw it. The man had not time to visit a "Better Farming Train", which was visiting his town and was actually at the time within a stone's throw. He knew it all. The weeds were four feet high, the moisture had been all evaporated and "cut and cover" would have been a better name for the operation than plowing. (See Fig. 3.)

Wear at the points XX will allow some play between the front vertical axle and the sleeve casting which supports it. It is an advantage to have a long bearing

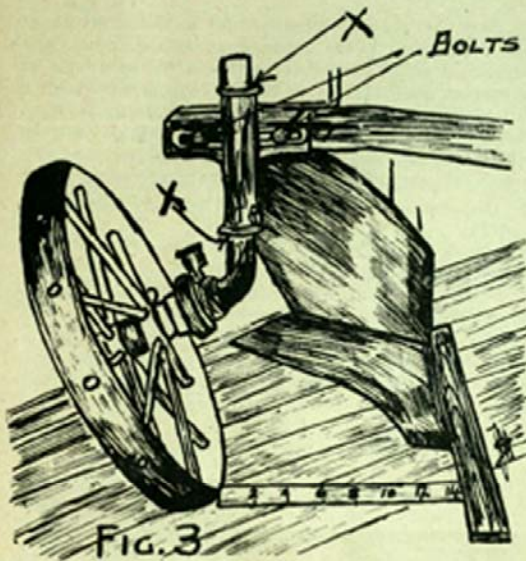


Figure 3.

surface at this point. The result is that the front plow tends to take more "land". The trouble in the above extreme case was that the bolts holding this casting to the frame were both loose. A monkey wrench fixed the plow in two minutes. The plow was all right; was the man behind it all right? Lay a straight edge along the landside and measure 14 inches over as shown; some advocate 13½ inches, and this will depend on the "set" of the implement at work. The set of the colter and the hitch will be dealt with in their proper place.

Plows Not Cutting the Same Depth.

The farmer should very carefully measure the "suction" of the plow when new. It has "suction" under the landside and also on the side, to give penetration and "land". A straight edge and a rule are all that are required to get this information. (See Fig. 6A.) You should scratch the measurements down on the shop door, or in a note book or in your head. The manufacturer gives his particular plow a definite "set" and this "set" must be maintained if the best results are desired. You will know if the village blacksmith has given the share more or less, if you have the figures; some think that an eighth of an inch more or less "suck" makes no difference; it does, and usually too much is given, and it may take 50 per cent. more power to pull the plow. The team have the heavy

THE SET OR ADJUSTMENT OF A PLOW

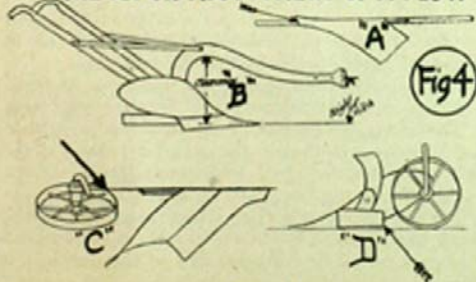


Figure 4.

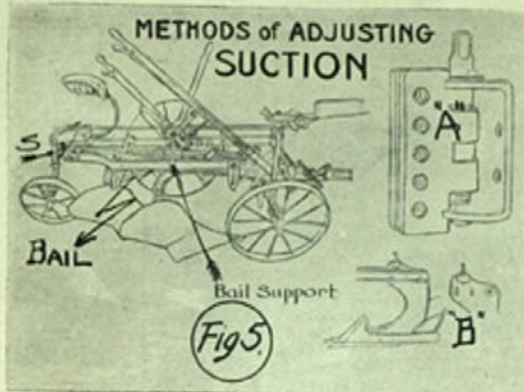


Figure 5.

end to bear; if the plow was an old walking plow you would very soon find out something was wrong and have it fixed. Do not be too hasty in condemning the plow. You or the blacksmith may be to blame. The "suction" can be altered on some plows at the point marked "s" by raising the frame on the rear axles. (See Fig. 5.) The two cuts (5A and 5B) on the right

PLOW SHARES

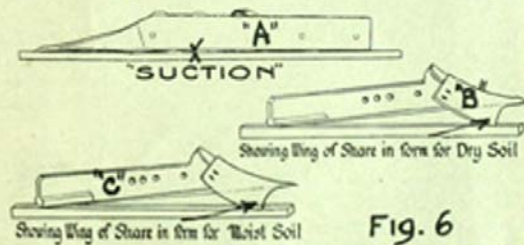


Fig. 6

Figure 6.

hand side of the same illustration show how suction is adjusted in engine plows. However, this should be a last resort. A walking plow is given "bearing" at the wing of the share, more in moist soil than in hard, dry soil. This is required to hold the plow level and prevent it "winging" over. A gang plow share does not require any because the bottom is held up by the bails (the U-shaped bars on which the beams swing). Turn the plow up and lay a straight edge from the heel of the landside to the wing of the share. Figure 6 "A" shows "suction" on bottom of landside. Figure 4 "A" shows suction to the land. Figure 6 "C" shows a share suitable for moist, soft soil. Figure 6 "B" shows a share in form for hard, dry soil or a gang plow. Figure 6 "D" shows a share that would do well for an average gang plow. You can readily see that, if by mistake a shipper sends you one of each kind when you order a new set for your plow, one furrow will be deeper than the other and the source of trouble



Figure 6D.

has puzzled even the best plowmen; perhaps you may have had this experience. In a gang plow the friction on the bottom of the landside is eliminated as far as possible by carrying it on well-oiled bearings. There should be from $3/16$ " to $1/2$ " at the point marked "D" figure 4, and also in Figure 6 "D". The rear furrow wheel is also set outside the line of the landside as shown at "C" in Figure 6. This holds the landside away from the furrow wall to some extent and a small adjustment at this point will give more pressure to the moldboard and the plow will often scour better. Figure 7 shows two methods of adjusting the rear furrow wheel. In some cases two set screws are used for making this adjustment, while some plows have two slotted holes, so that the wheel can be moved one way or the other. See that there are spring washers at every bolt, or else have a hot rivetted frame wherever it is possible. A loose frame will cause no end of trouble.

Keep the Plow Frame as Level as Possible.

Figure 5 shows a bail support — a small iron clip found in different places in different makes of plows. If it gets moved even an inch ahead or back it will do what? It will allow one plow to go too deep or prevent one going in deep enough. Experts have travelled 40 miles from a railroad just to move this little piece of metal one inch. These things are simple, if you know they are the cause of the trouble, but they puzzle the best, if their purpose is not understood.

Every instructor in every course in Farm Machinery in Canada should emphasize the important adjustments that are found on a modern gang plow. The results would be far reaching and much better plowing would result. Let me quote a very typical case:

"At the recent National Tractor Show at Columbus we heard a story that emphasizes again the necessity of knowing every feature of a machine.

A prominent concern manufacturing tractor plows had received numerous complaints that its plows were falling down in a certain section of Iowa, the principal trouble being share breakage. This was hurting business and at the same time one of the company's keenest competitors was increasing its trade. So a plow expert of thirty years' experience was sent to the "battle ground" to scout around and ascertain the trouble.

In a short time the expert returned, but he could give no reason for the share breakage, which seemed to be about the only trouble, except that the section was stony and the stones broke the shares on his plows but did not on the competitor's.

One of the head men of the company happened to listen to his report and forthwith took the expert over to one of the plows.

"Was that bolt in place?" asked the executive, pointing to the device that locks the bottoms rigid in the soil, "or were you floating the bottoms?"

"Sure, the plows were set up all right," replied the expert, "nothing was missing."

"Don't you know, you blamed idiot," rejoined the executive, "that you should remove that bolt in stony ground so that the bottoms can float and have several inches play? Did you suppose we designed this plow to meet just such adverse conditions only to have it fall down because our own salesman and experts don't know the ABC of its adjustment? You'll attend our plow school for the next two weeks."

Upon hearing this story we thought it would be in-

teresting to find out whether the representatives of plow companies at the show were following out the educational spirit of the event, so we called at one of the largest manufacturer's booths in company with a power farming distributor and looked for the locking-down device. A salesman approached and asked if he could show us anything.

"Sure," we said, "where is the adjustment for floating the bottoms when you're working on stony ground?"

He looked pained for an instant; then a look of relief spread over his face and he said:

"Why the bottoms are always floating against this spring (pointing to the lifting spring), they never are locked rigid."

We thanked him for the "information" and then sought out a man with the company who we knew was posted on plows, plowing and everything concerned therewith.

"How about it?" we said. "One of your men says

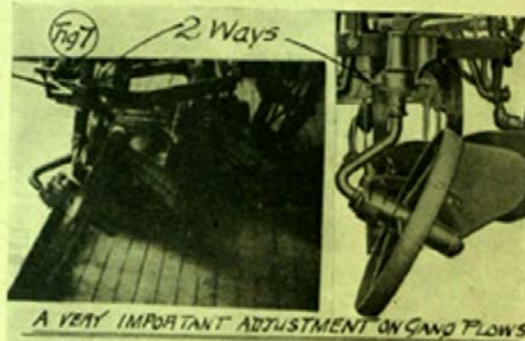


Figure 7.

that your plows can't be locked down, but always float against the lifting spring."

His only reply was a snort, and leading us over to the plow, pointed out the adjustment.

Figures 7 A and B show the two adjustments which were confused. The adjustment, the set screw, to make a plow "float" is not understood as well as it ought to be.

How often have the above and similar simple adjustments caused unnecessary trouble, and expense from breakages?

We will now pass on to the colters.

Colters Not Properly Set.

The importance of the proper set of this attachment cannot be over-estimated. It must be set just right to obtain the best results.

1. Usually the bearing of a colter is set between a point directly over the point of the share and another point about three inches behind it.

2. For plowing down trash or manure so as to give the plow plenty of "clearance" (see Fig. 4 "B").

3. For stony ground it is advisable to set it well ahead and down so that in the event of a plow striking a stone, the tendency will be to raise the plow out of the ground and thus save the point of the share.

4. For stubble plowing the colter should be set about one-half inch outside the line of the landside, and down low enough to cut about one-third of the depth of the furrow slice.

5. In sod run the colter closer to the shin and also down almost to the bottom of the furrow.

6. Sometimes by setting the colter a little "wide" the scouring of the plow is improved.

7. When a badly worn bearing causes the colter to wobble, get it fixed, because it will increase the draft besides doing inferior work. Take as good care of your colter as you do of your shares.

Types of Colters.

There are four common types namely, the fin, knife, rolling, and skim colter (commonly called a jointer). In good scouring soil that is free from stones, the combined rolling colter and jointer gives splendid satisfaction in covering weeds.

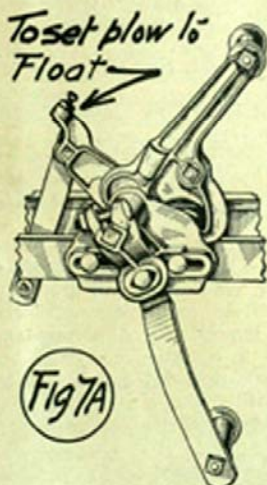


Figure 7A

Jointers are used to cut and turn over the edge of the furrows close to the colter so that when the slice is turned over, all surface growth will be completely buried. It simply turns over a small furrow, which lies on top of the furrow slice. This is turned over by the moldboard, the result being a clear edge between the furrows and no weeds visible. The jointer should be set with its point directly below the hub of the colter and so as to cut not more than two inches deep. The point should be set very close to colter, but a small clearance should be allowed between jointer and colter. This clearance prevents the jointer from catching and retaining trash.

Figure 8 shows a typical combined rolling colter and jointer. So many people have asked if the jointer is to clean the colter that the writer takes this opportunity of saying it is not for this purpose.

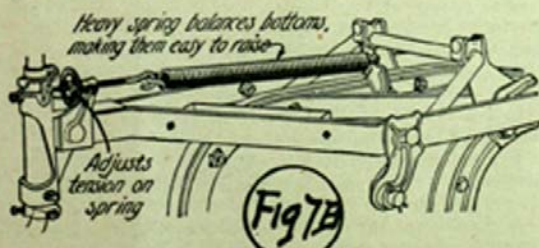


Figure 7B.

Figure 9 shows a jointer and rolling colter attached to the beam independently. Notice the chain for covering the weeds as well as the device for keeping the colter clean.



Figure 8.

Bail Support Moved.

This trouble was dealt with under the heading "Plows not cutting same depth." Again let me call your attention to this very small but very important part of your plow.

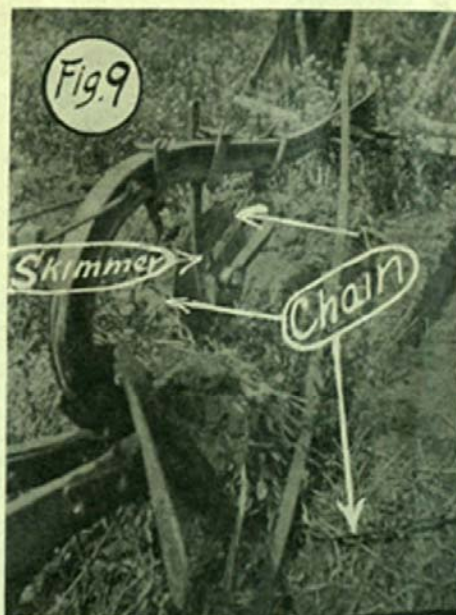


Figure 9.

Sprung Beam.

Many wrong adjustments on a plow are attributed to a "sprung beam." If you had measured the distance the beams were from the share and the distance they were apart when you purchased the plow you would be in a better position to judge this point correctly. Beams are sprung often in stony ground. It is very questionable whether they can be fixed locally or not. It will depend on the quality of the steel and the skill of the blacksmith. My advice is to buy a new beam.

(To be continued.)