The Oliver No. 23-B Reversible Sulky Plow

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ABSTRACT AND INTRODUCTION

The Oliver no. 23-B reversible sulky plow is a horse-drawn riding plow that can be set to turn the soil to either side, thus allowing the use of highly-efficient plowing "patterns". The machine was manufactured by the Oliver Chilled Plow Works of South Bend, Indiana, over the period from about 1917 through 1934. It has a very ingenious mechanism, the crafty geometry of which obscures its principles of operation.

Many authorities consider this machine to represent the pinnacle of design for plows of its type.

In this article I describe the Oliver 23-B and explain its mechanism and the way it supports the many special features of the machine. Some background is first given on the concepts of plowing.

MEET OLLIE

In figure 1 we see Ollie, an Oliver no. 23-B reversible sulky plow owned and restored by the author. She is on exhibit at the author's home, *Dos Palmas*, in Alamogordo, New Mexico, "where the desert meets the mountains". We do not know her year of manufacture.

Figure 1. Ollie

The phrase "reversible" in its description refers to its ability to selectively turn the earth to one side or the other as needed in the efficient performance of its duties. "Sulky" alludes to the fact that the plowman[1] rides the plow which, in that regard, is a two-wheeled cart, evocative of the light "sulkies" used in the sport of harness racing.

But this sulky weighs about 550 lbs.

ABOUT PLOWING

Introduction

Plowing[2] is a common traditional way to perform *primary tillage*, the first stage of preparing soil for planting a crop. We will speak here in particular of *moldboard plowing*, which gets its name from a key component of the plowing "tool" (as we will see shortly).

The basic process

In moldboard plowing, the plowing "tool" (called a *bottom*, or sometimes a *base*) continuously makes a horizontal cut 12-16 inches wide perhaps 6 to 8 inches below the surface of the undisturbed land, thus freeing a "slice" of the soil. It then curls this slice away from the underlying earth and finally flips it over to land alongside its original position.

One result of this during each pass is to leave a trench (usually called a *ditch*) from which the earth slice was lifted. In fact, the earth that is lifted and "turned" completely or partially falls into the ditch generated by the previous pass. Figure 2 shows this process in idealized form; the result of two prior passes are to the right.

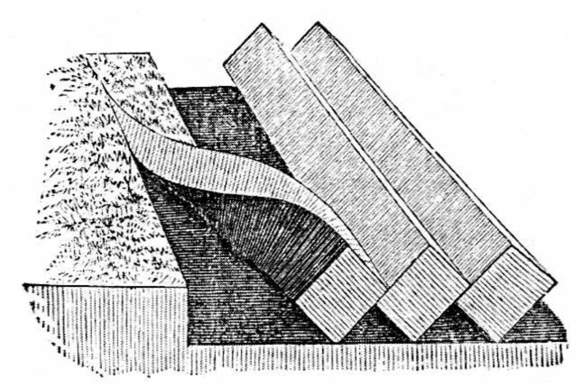

Figure 2. Turning the earth slices

Reproduced from *Horsedrawn Plows and Plowing* by Lynn R. Miller

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[1] A gender-neutral term. This office does not countenance the wholly unnecessary use of such awkward neologisms as "plowperson" or "plower".

[2] Often spelled *ploughing*, in the British fashion (thus also *plough*).

Figure 3 shows the process in a more realistic way, in stages as the bottom progresses away from us.

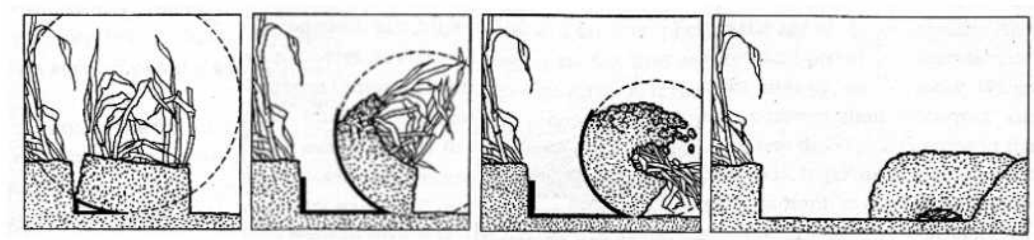

Figure 3. Turning the earth

Reproduced with adaptation from *Horsedrawn Plows and Plowing* by Lynn R. Miller

Often the moldboard contour is very nearly a portion of the surface of a cone. The dotted outline on the figure shows the section of that cone at the plane where we see the turning process.

The objects of the exercise

This process has two primary objects:

- As the earth slice is curled, its various layers shear apart, loosening the soil, and as well some "dead air" is trapped under each turned slice, overall in effect "aerating" the soil. This:
    - Makes the soil receptive to the seeds that will be deposited.
    - Makes the soil receptive to the propagation of the roots of the individual plants.
    - Facilitates the propagation of water through the soil.
- The stubble from the previous season's crop, and the weeds that may be growing among it, are buried, where they can peacefully decompose, returning nutrients to the soil, while staying out of the way of the emerging new crop (and eliminating the prospect of the weeds prospering at the expense of the crop).

Directionality

A basic plow is made so as to always turn the earth either to the right or to the left. In North America, it is most common to use "right-hand' plows, but almost every model could be ordered in either hand. Often a farmer would use right-hand plows for most of the work, but might also have a left-hand plow to use when needed in certain special situations.

Of course, the principle of consistently turning the earth into the ditch created by the previous pass means that, for example, in a certain part of the field, the earth must always be turned in the same absolute direction—let's say "to the east". Thus, with a right-hand plow, we must plow to the north. In the simplest (and not very efficient) scheme, after one "pass" the plow would then be driven (with its "tool" raised so it does not actually plow) back around to the south edge of the field to begin the next pass. This involves a lot of non-productive walking on the part of the horses (and the plowman, if using a "walk-behind plow").

There are of course many schemes to minimize this wasted travel, but they all have their limitations.

The reversible plow

With a "reversible" plow, such as the Oliver 23-B, the plowman can, with the plow set for "right-hand operation", make one pass to the north (turning the earth to the east), turn the plow around, shift the plow to "left-hand operation", and make the next pass to the south (again turning the earth to the east, as required).

The mechanisms that arrange this simple-sounding maneuver involve numerous working parts, operating in a very clever scheme.

The furrow

In discussions of plowing or of plowed fields, we often hear of *furrows*. What is the furrow? In some usages it is the ditch from which the earth is taken to be turned. In other usages it refers to the slice of earth that is turned over, and the ditch is called the *furrow sole*. Or sometimes its floor is called the furrow sole. Other times furrow refers to the entire result of one pass with the plow. Often in literature, "furrows" is used as a metaphor for farm field.

So I won't use the term very often.

About the word "land"

We should not be surprised to find the word "land" used in connection with plowing. After all, farms and field are made of "land" (as in, "Harry owns a nice piece of land in central Virginia"), and we work the land, and we plow the land. But the word takes on a special meaning in connection with the formal discussion of plowing, and a number of other terms flow from that.

In this context, "**a** land" is a module of land (!) for which there is an established pattern of plowing. Thus, a farmer may have a 40-acre field, but may divide it into three "lands", each one of which has its own plowing pattern, and is plowed as a "project".

Now, taking the next step, if we stand behind a right-hand plow making a pass, to its left is "unplowed land"; to its right are the furrows created by previous passes, and most immediately to its right is the ditch from the prior pass. So in this case, the left side of the plow is the "land side", and the right side is the "ditch side" or "furrow side". (And yes, these switch on a reversible plow when its directionality is reversed.)

And those terms are often used to identify the two horses of a two-horse plowing team (although we may often use the more global equine terminology in which the leftmost horse is said to be on the "near" side[3] (and is thus the "near" horse) and the right-hand horse is said to be on the "off" side (and is thus the "off" horse).

Shortly, we will take the next step in the language chain from "land".

The mystic significance of the ditch

The ditch left by one pass of the plow is ephemeral. As soon as possible, we exterminate it by turning earth into it. Yet it is in a way a metaphor for the plowing process, and it guides the process even as it is created—and then destroyed—by it.

With a two- or three-horse team, the "ditch side" horse (on the right, for a right-hand plow) walks in the ditch. With a walk-behind plow, the plowman will most of the time walk in the ditch. Figure 4 shows a lovely example.

Figure 4. A *Land Girl*—Women's Land Army recruitment poster (U.K., 1917)

[3] So-called because that is the side from which, in many countries, one mounts a horse, and in fact the side from which one traditionally photographs a horse (horse hairdressers take that into account in preparing the mane for a photo shoot).

With a riding plow, such as the Oliver 23-B, the ditch-side wheel runs in the ditch. (So, when we change the "hand" of a reversible plow, do the wheels have to go up and down? You bet! That is part of what all the wondrous machinery does!)

In permanent teams experienced with basic plows, one horse is normally always the landside horse and another one the ditch side horse. If the farmer then buys, for example, an Oliver 23-B, the horse that formerly always ran in the ditch wants to keep doing that consistently for a while.

Plowing patterns

The simplest pattern for plowing a rectangular land with a reversible plow such as the Oliver 23-B is to make the first pass at one edge of the land, and then make consecutive passes in alternate directions[4] (with alternating bottoms in effect) until the entire width of the land has been traversed.

As the mathematicians would say, this plan has a great steady state but the boundary conditions are problematical. When the first pass is made, the earth is turned to the side onto unplowed ground (not into a ditch from a prior pass), and thus leaves a mound (a "crown") higher than we will have elsewhere (sometimes called a "back furrow").

Then, the ditch cut in the last pass will not be filled in by a subsequent pass, and is said to be a "dead furrow".

There are many strategies to overcome these boundary anomalies. Some are rather complicated, often involving extra passes at varying depth to finesse an overall uniform-elevation land. The maneuvers at the beginning are spoken of collectively as "opening the land", and those at the end as "closing the land". This very complicated matter is beyond the scope of this article.

Horses, mules, and even oxen

I consistently speak here (as is common) of *horses* as the draft animals for our plows. Often mules are used instead. My simplification of the terminology is not meant in any way to slight mules or their supporters.

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[4] Called *boustrophedonic* plowing, from the Greek for "as the ox turns". The term is also used by linguists to describe writing systems in which alternate lines of text are written in alternating directions. When dot matrix printers were made to print that way (to save the time for the carriage to "deadhead" back to the left margin after every line), they were sometimes said to use a *boustrophedonic* mode (then usually translated "as the ox plows").

In some cases, oxen are used, and many believe that they are the best suited for the work.

Changing times

The development of the internal combustion engine led to the development of highly-mobile farm tractors. These gradually replaced the horse as motive power for plows (and in general, wholly different plow designs came into use in that context).

In recent times, the role of primary tillage, practiced by plowing, in agriculture has diminished through the development of more environmentally friendly schemes of planting and crop management.

But the Oliver 23-B was just the right tool for its time.

A surprising number of these machines (and of course many other kinds of plows) are still in operation. Some are used on special farms and ranches devoted to the recognition and preservation of traditional methods of agriculture, and at many of these one can take an apprenticeship program and learn to become a skilled plowman (much of the instruction actually given by the horses, it turns out).

Some are used in plowing competitions held all across the country. One of course sits in stately repose "where the desert meets the mountains".

THE BUSINESS END OF THE PLOW

The plow bottom

In a plow, what would be called on a multi-functional excavating machine the "tool"—the part that actually engages the earth—is usually called the *bottom* (although, especially in walk-behind horse drawn plows, it may be called the *base*).

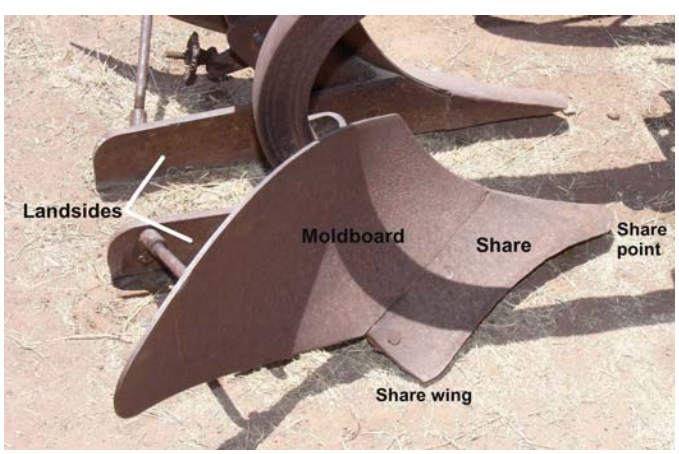

Figure 5. The plow bottoms

Figure 5 shows the two bottoms on Ollie.

The bottom comprises three major components (labeled on the figure).

The *share*. This is a mostly-horizontal blade whose function is to make the more-or-less horizontal cut that separates the slice of earth. Two features of it, the *point* and the *wing*, are also labeled.

The *moldboard*. This is the gracefully-curving blade whose function is to lift the slice free of *terra firma* in a curling fashion, and then flip it over (typically into the ditch of the previous pass).

The *landside*. This is a member aligned with the axis of travel of the bottom, usually with a cross section like a piece of angle iron. It is located where it will run along the bottom of the ditch and (in the example of a right-hand plow) against the left-hand wall of the ditch (the *landside* wall, get it?). Its purpose is to return to *terra firma* the lateral reaction force on the *moldboard* from its forcing the slice to the ditch side.

Often the bottom is augmented by another tool, the *coulter*. This is essentially a vertical knife, mounted just ahead of the bottom, whose job is to make a vertical cut (which will be the landside wall of the ditch), thus making penetration easier for the bottom. Sometime a rolling blade coulter is used.

The metallurgy

In the development of the modern plow, metallurgical considerations were among the most challenging.

A particular concern was the face of the moldboard. If the moldboard were cast of an alloy that would be "hard", it would fracture easily. Yet if the face were not hard, it would quickly be eroded by the passage of the earth over it, causing the moldboard to wear out soon and, even before that, making the face rough so the earth will not slide easily across its face but rather would cling to the face, frustrating the entire process.

James Oliver, who founded the firm that bears his name, perfected an ingenious method for producing moldboards with desirable properties. Metal pieces were embedded just below the surface of the sand mold on the "face" side. These "chill" the molten iron at the surface quickly, causing a mode of crystal formation that makes the surface of the face very hard, while the bulk of the moldboard cools more slowly and retains a "tough" character. The process is conceptually akin to *case hardening*.

It was in fact this technique that led to plows with such moldboards being called "chilled plows", and Oliver's firm in 1901 took on the name "Oliver Chilled Plow Works". It was for quite a while the largest plow factory in the world.

THE OLIVER 23-B

The frame

Unlike on a modern automobile, the frame of the Oliver 23-B does not extend from stem to stern. Rather, its major part is a cast iron arch, just an inch thick or so in most places, running from side to side just a little in front of the plowman's seat, like a bulkhead.

The frame is completed by a U-shaped steel member extending to the front of the plow from the frame arch.

Figure 6 shows this arrangement on Ollie.

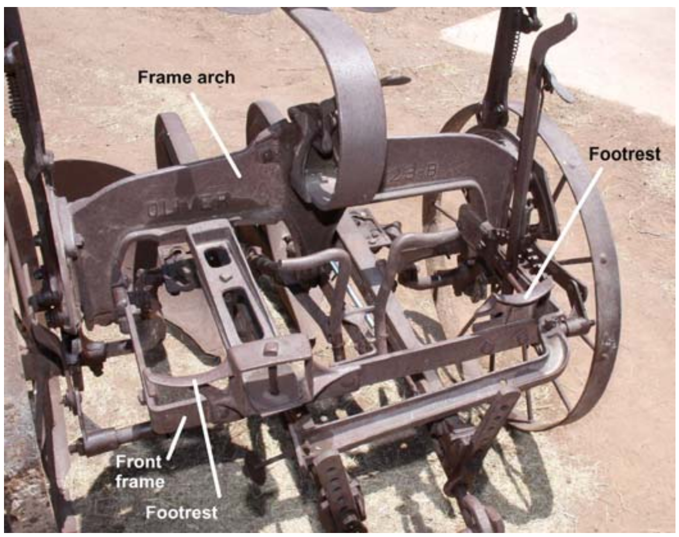

Figure 6. The frame

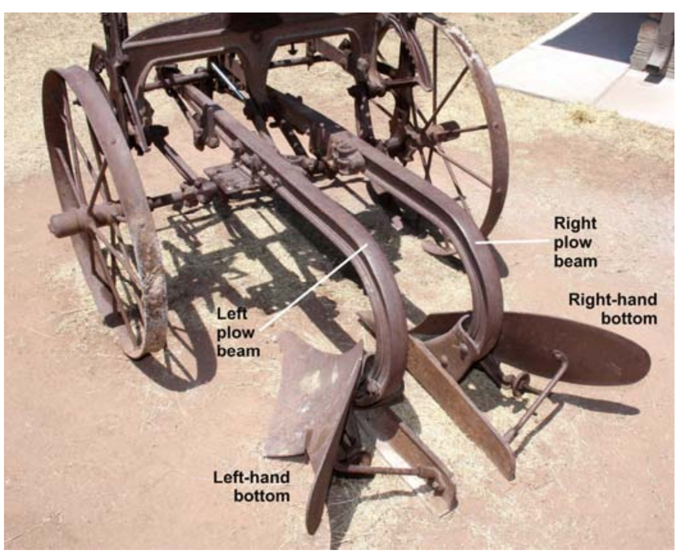

Figure 7. The plow beams and bottoms

The bottoms and plow beams

The machine has two bottoms, one right-hand and one left-hand—the essence of its "reversible" capability. Each is mounted at the lower rear of a curved cast iron *plow beam*[5].

Figure 7 shows the two beams and their associated bottoms.

The elevating process—prologue

The most complex job of the machinery involves adjusting the elevation of the two plow bottoms and of the adjacent wheels. The concept of the scheme is straightforward. But the details of execution, and in particular the geometry involved, make it difficult to recognize just what is going on. Accordingly, I will devote considerable effort to illuminate of the workings of this subsystem.

The elevating levers

The centerpiece of the elevation mechanism is a pair of levers, one on each side. Figure 8 shows the left side elevating lever on Ollie.

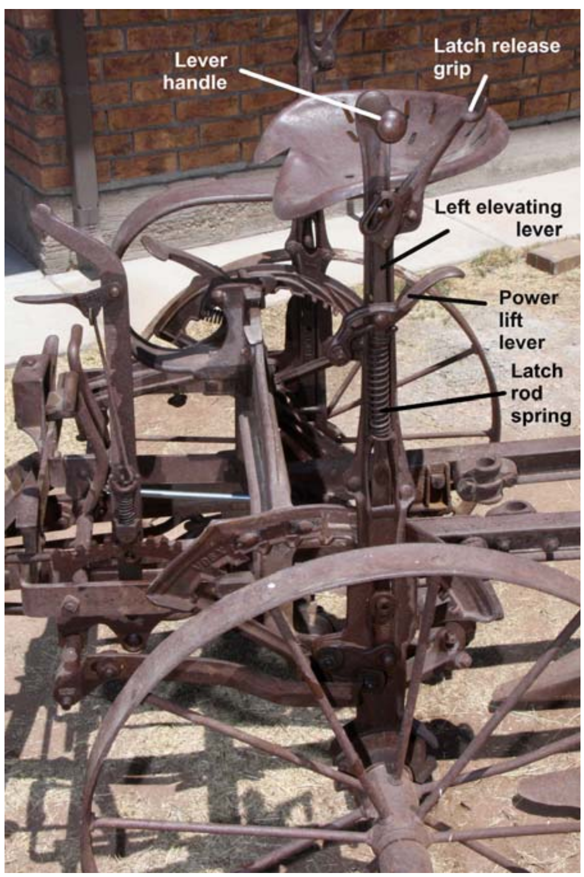

Figure 8. Left elevating lever

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[5] On a simple walk-behind plow, the plow beam is essentially the frame of the plow.

Functionally, each lever serves to:

- Raise and lower the plow beam (and thus the associated bottom) on that side.

- Raise and lower the wheel axle (and thus the wheel) on that side.

The latter is of course desirable because when the right bottom is lowered into the earth (the machine is acting like a right-hand plow), the right wheel will be running in the ditch made by the prior pass. Thus, to keep the machine level overall along the roll axis, the ditch side wheel must be lowered.

Each lever has, running longitudinally inside it, a locking bar. A spring holds this bar up, and a lug on it engages teeth on the underside of a sector to keep the lever in the desired position. We see this in figure 9 (left side mechanism, seen looking outward).

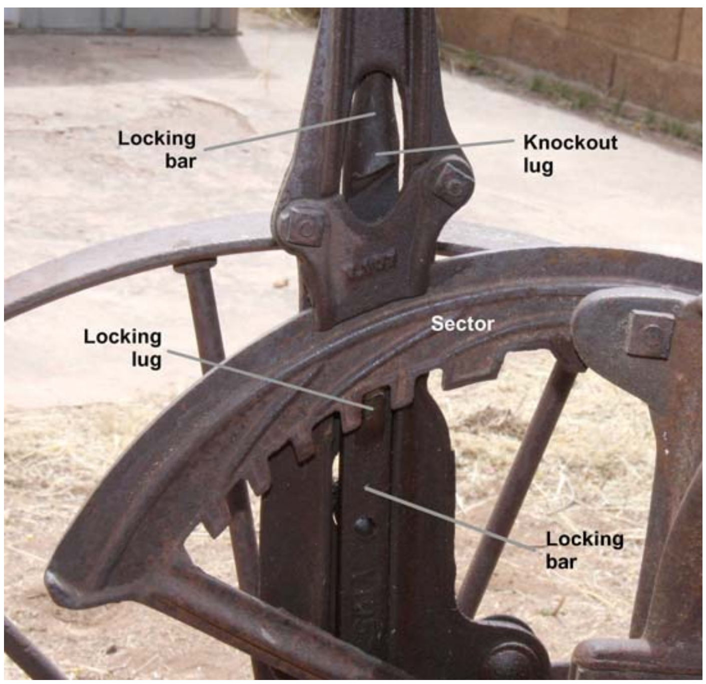

Figure 9. Locking bar and sector

(Do not be concerned yet with the *knockout lug*, also illustrated in this same figure. We will refer to it later.)

Forward movement of the lever (to the right in this figure) raises the plow beam and wheel axle, while rearward motion lowers them.

The amount the wheel is lowered is not as much as the amount the bottom is lowered, because the previously-idle bottom, on its way down, must descend quite a way from its “flying free” position before it even begins to enter the ground, but the wheel should only descend by the expected depth of the ditch that will be cut. The compensation for this, though, is not perfect.

The crank

On each side of the machine is a critical part I will call the *crank*[6]. It is rotated by the movement of the elevation lever. It is the key to the control of the vertical position of the plow beams and the wheels

In figure 10 we see it in place (with the rest of the machine dimmed out for clarity).

The main portion is a steel rod of substantial diameter bent into a crank shape. An extension is rigidly clamped to one of the sections of the crank, becoming in effect a part of the crank.

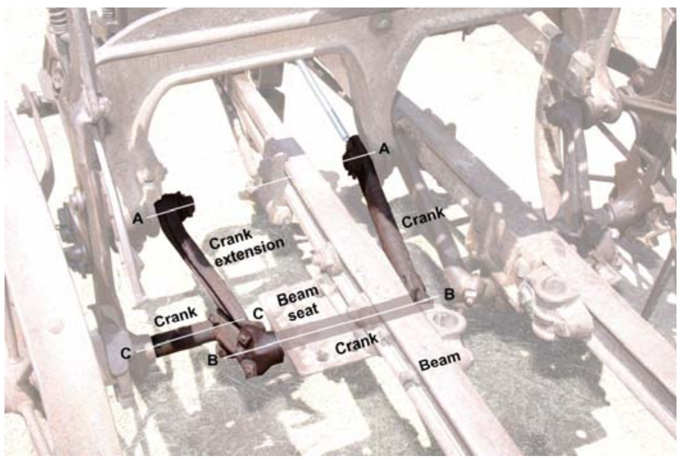

Figure 10. The left crank

The inside end of the crank proper and the forward end of the crank extension pivot on two brackets that are part of the frame arch. Line A-A shows the pivot axis of the crank itself.

Two other sections of the crank are eccentric to this axis. On one (line B-B is its axis) pivots the *plow beam seat*[7]. We see a phantom view of that section of the crank (it is actually hidden by the seat). The plow beam is firmly attached to the seat by way of an angle-iron chair.

The outermost eccentric section of the crank is the wheel axle. Its axis (and thus the axis of rotation of the wheel) is shown by line C-C.

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[6] In the Oliver literature, it is often called a *bail*.

[7] In the Oliver literature, it is often called the *saddle*.

Figure 11 shows the crank from the side in phantom view. The elevation lever is at an intermediate position. (A link that is part of the foot pedal-controlled power lift system has been removed to allow an important feature to be seen—we will see the link a little later.)

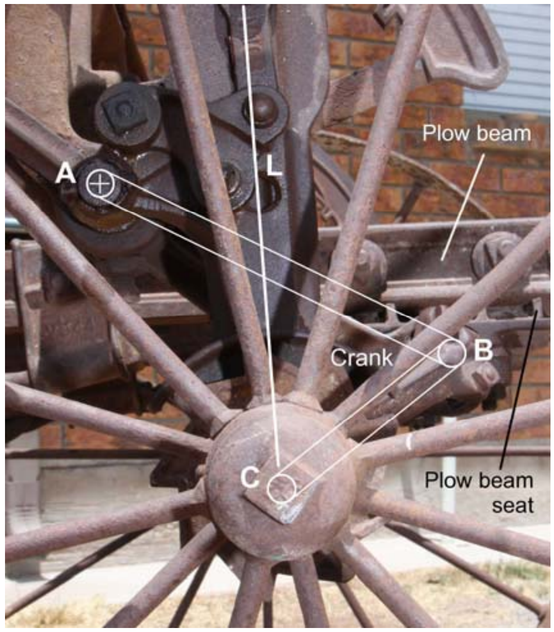

Figure 11. Crank pivot axes

Circle A represents the pivot axis of the entire crank (the cross reminds us of that). Circle B represents the eccentric crank section on which the plow beam seat pivots. Circle C represents the eccentric axle section of the crank. Remember that A, B, and C are on a single rigid member (the crank).

Thus, as the crank is rotated about its pivot axis (A), the eccentric portion B raises or lowers the plow beam seat (thus the beam and thus the bottom), and eccentric portion C (the wheel axle) raises or lowers the wheel itself.

The lever rotates on a pivot stud also located along the pivot axis of the crank (it is what we actually see at point A in the figure), but the lever is not attached to a place on the crank that is on that axis (as we might expect). Neither does the lever’s longitudinal axis pass through that axis—the lever has a “tab” to its side to reach its pivot stud. (The line “L” represents the longitudinal axis of the lever.)

In fact, the bottom end of the lever joins the crank (very) solidly at the wheel axle (on axis C) (for a reason we will see shortly). It can twist the crank from there just fine.

The arc of the locking sector must be centered on the actual pivot axis for the crank-plus-lever (A). So when we look at the machine, we wonder why the locking sector arc does not seem centered on what

seems as if it should be the pivot point for the lever (at the axle, where the lever ends), as we see on figure 12. But now we know.

Figure 12. Center of the sector arc

Since the locking rod runs along the length of the lever (inside it, for the most part), the movement of the locking lug is along the length of the lever (which is not radial to the pivot axis of the crank-plus-lever, point A in the figure). So the teeth on the locking sector have a seemingly-funny orientation (seen in figures 9 and 12).

Near the top end of each lever is a grip lever (see figure 8), and when it is squeezed against the lever proper, it moves the locking rod down, toward the axle, against the spring, far enough to disengage the locking lug from the teeth on the sector (but no more—we will see shortly why that is critical). We can see how this will work on figure 9.

The power lift

As the plow approaches the end of a pass, the bottom that is in the ground must be lifted out, so the plow can be readied for the return pass.

The plowman can of course just push the corresponding elevating lever forward, but that takes a fair amount of effort, and at this same time he must concentrate on the turning maneuver to come. So the 23-B incorporates a power lift system, which pushes the lever forward via energy from the turning of the wheel on that side.

The function is usually activated by pressing forward on one of a pair of foot pedals, which will engage the power lift on the corresponding side. We see them in figure 13.

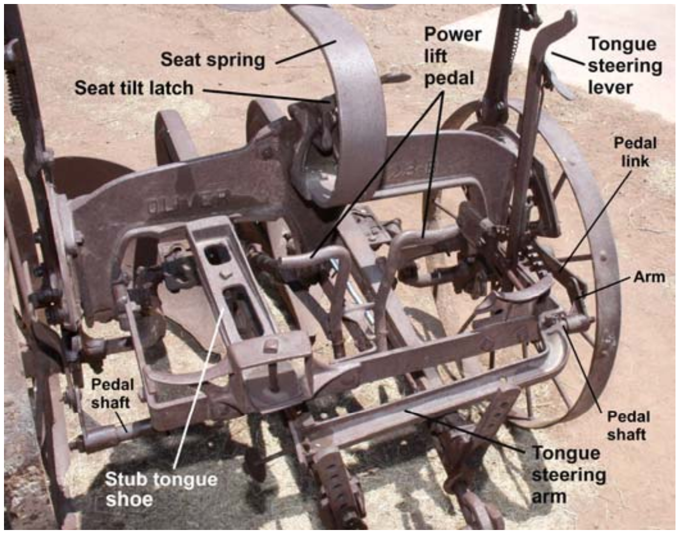

Figure 13. Power lift pedals and other stuff

When a pedal is pressed forward, the associated pedal shaft rotates, and an arm on the end pulls forward the pedal link. The next stage is seen on figure 14.

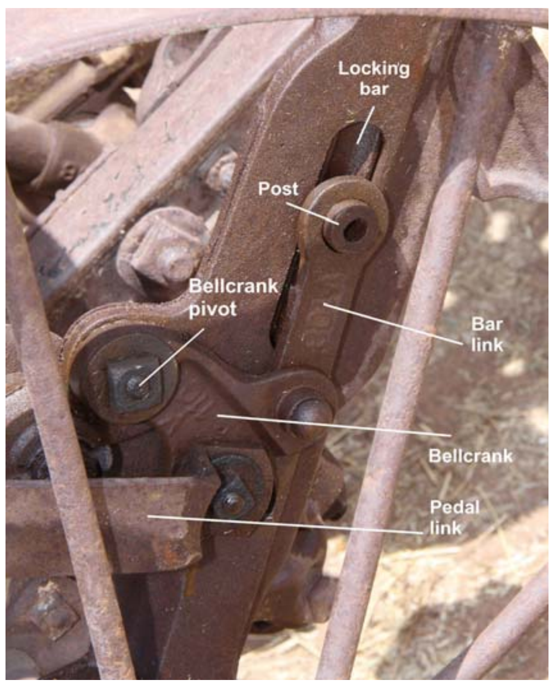

Figure 14. Foot engagement of power lift

The pedal link rotates the bellcrank (clockwise in this case). The bar link, leading to a post projecting from the locking bar, pulls the locking bar down (against its spring).

In the early part of the rod's downward travel, the locking lug comes clear of the teeth on the sector, so the lever can move. But as the rod travels further, its lower tip engages a small toothed wheel coupled to the hub of the main wheel on that side. (Recall that the lower tip of the lever is at the wheel axle—this is why it is there.)

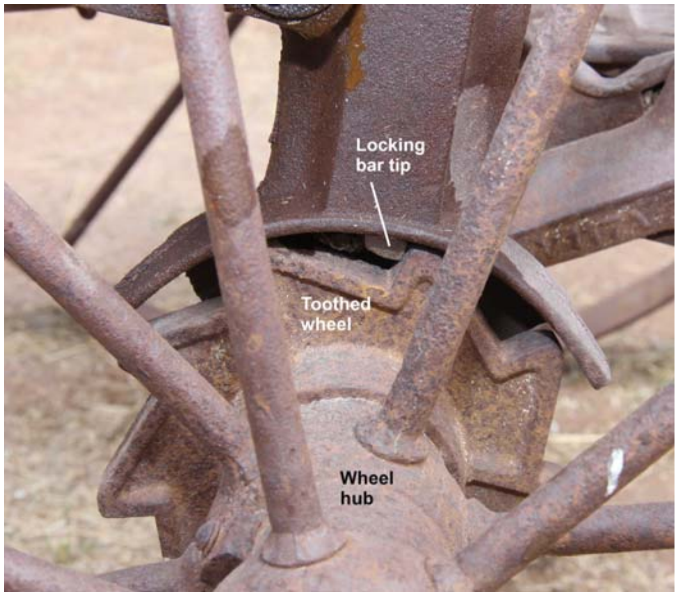

Figure 15. Power lift drive (left side)

We can see the toothed wheel and the engaged tip of the locking rod in Figure 15. The tip isn't fully engaged (a slip on my part when setting up the shot!). A curved shroud keeps trash out of the area.

The motion of the toothed wheel (counter-clockwise in this case) forces the lever to our left (forward), the "raise" direction. The friction between the face of the wheel tooth and the tip of the locking rod holds the rod engaged even if the plowman releases the little lever (which he **should** do promptly).

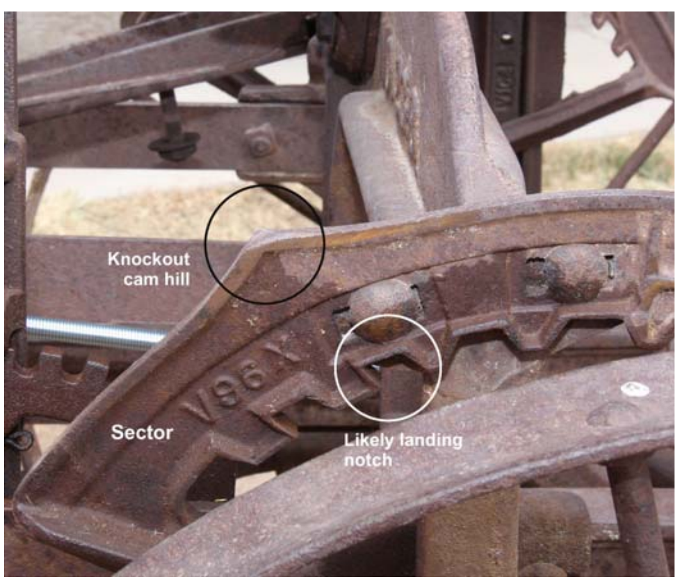

Figure 16. Knockout cam hill (left side)

As the lever nears the far forward limit of its travel (the plow beam and wheel axle now approaching their full-up positions), a knockout lug on the locking rod rides over a cam hill on the outside of the locking sector, raising the locking rod and disengaging its tip from the toothed wheel.

We see the cam hill in figure 16. We see the knockout lug in figure 9.

The spring on the locking rod causes the locking rod, once disengaged from the toothed wheel, to continue as soon as possible to its full-up position, where the locking lug on it will engage a notch on the sector (likely the one indicated), locking the lever in its new position.

As the lever moves forward (to our left), the change in geometry thwarts the pedal link's ability to rotate the bellcrank. Thus, even if the plowman keeps his foot on the pedal, the bell crank does not attempt to keep the locking rod down (and engaged with the toothed wheel) when the lever nears the forward end of its travel (where the cam hill tries to disengage the locking rod from the toothed wheel).

As we can see on figure 15, the teeth on the toothed wheels are asymmetrically-triangular, as on a ratchet wheel. This way, if the locking rod should improvidently be engaged with the wheel while the plow was backing up, it will be cammed out of engagement by the sloping flank of the oncoming tooth. Otherwise, the lever would be forcefully driven in the "downward" direction, and when it reached the end of its travel, the tip of the locking rod would be sheared off.

Hand control of the power lift

Sometimes the plowman would rather walk alongside the machine. To allow the power lift to be activated from that situation, there is on each lever a small power lift control level, easily reached from the ground (see figure 8). When depressed, they drive the latch bar downward, without the limit on its travel that is in effect when the bar is depressed by the grip lever. Thus the bar will be driven to engage the toothed wheel, and the power lift operation proceeds as before.

Plow beam upstops

When a lever is moved forward, to raise the bottom on that side, the plow beam seat of course rises as its crank portion rises, lifting the plow beam where it is fastened to its seat. It might seem that the plow beam, though, could just tip rearward, (the plow beam seat can easily tip, rotating on its crank section, and the bottom is quite heavy), rather than the bottom itself actually rising.

In fact that starts to happen, but the upward travel of the front end of the plow beam is arrested when it strikes a stop. Actually, it strikes a power lift foot trip pedal shaft, which does double duty as a plow beam upstop. (They are nice and fat.) Thus the rear of the plow beam rises, and with it the bottom.

The draft gear

The draft force of the horse team needs to ultimately go to whichever bottom is in the ground (which is where the load occurs). Rather than transmitting the force to the frame and then from it to the plow beam (and then to the bottom), the team is in effect hitched to the plow beams. The frame and the rest of the machine just go along for the ride.

The draft force from the team does not actually go directly to the front ends of the two plow beams. It actually goes to a pair of draft rods, the rear ends of which hook into large draft eyes on the plow beams a way back from their front ends. This allows for an alignment process we will discuss shortly.

The draft rods are supported at the front end of the plow beams by two support brackets (figure 17). Otherwise, they could drift from side to side, or even fall to the ground when there was no tension on the draft gear. And recall that the horses need to be able to back the rig up if needed for it to turn around at the end of a pass, so they must be able to push on the draft gear without it “buckling”.

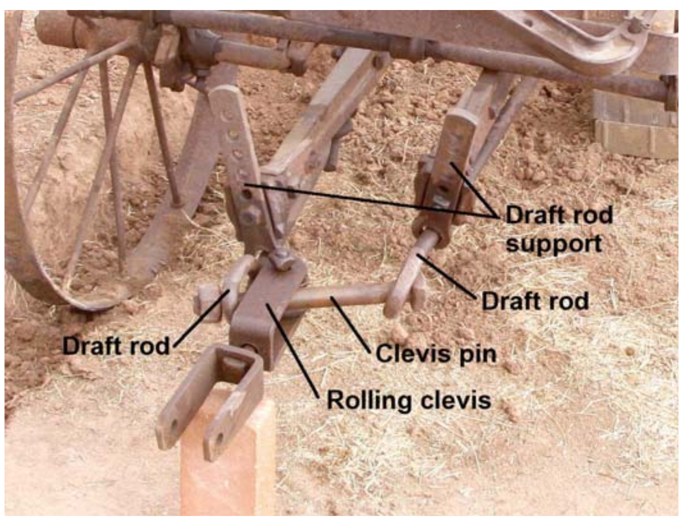

Figure 17. Draft rod supports and rolling clevis.

We do not want a vertical component of the draft force to force the front ends of the active plow beam up or down, which could cause the bottom to not maintain the proper depth of operation. (The bottom is actually a submarine sailing through earth!)

To avoid this, we can adjust the height of the draft rod support brackets so that the draft rods are held in a position along the line of force from the team hitch (the height of that line depending on the details of the horse harness, the size of the horses, and so forth).

The roller clevis

I noted before that the draft force from the team goes through a draft rod directly to the plow beams. Evenly divided? Well, we would like it to go mostly to the beam whose bottom is down, in the earth. This is arranged by a rolling clevis arrangement (see figure 17).

Because of the working of crank portion B, when one bottom is lowered, its beam is moved slightly forward. Thus the ditch end of the clevis pin is closer to the team than the landside end. (in this figure, this is the one to our left.)

As a result, the rolling clevis "rolls out" along the pin to the ditch side, thus applying the majority of the draft force directly to the draft rod on that side and thence to that plow beam and bottom.

The tongue and steering

The draft hitch doesn't participate in any real way in "steering" the plow.

Rather, a wood tongue[8] extends from the front of the plow between the two horses (or, in the case of a three horse team, between the center horse and the "off" (right) horse). It goes to the center of a bar ("neck yoke") that is connected to the chest harnesses of those two horses. It does not "pull" the plow. Its jobs are only steering the plow and controlling its "pitch attitude" (front-to-back tilt). For the latter task, the horses serve as the ballast.

<u>Tongue azimuth</u>

Normally, the ditch side horse will walk in the ditch. We want the ditch side wheel to run in the ditch, perhaps clear of its landside wall by a couple of inches. We need to able to adjust the azimuth of the tongue to bring the needed relationship precisely about, for whichever direction of operation is in effect, and to suit the specific distance between furrows being plowed.

The rear of the tongue is fastened to a *stub tongue* about three feet long (for a reason we will see shortly). The stub tongue is bolted to a shoe that is mounted in a bracket on the frame on a pivot bolt so it can potentially swing from left to right (see figures 13 and 18). The rear of the shoe is notched and rides on an arc on the frame arch, thus giving a solid basis for the vertical attitude of the stub tongue.

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[8] Sometimes called a *pole*; sometimes then the forward tip is called the *tongue*.

A lever to the left of the plowman moves, through a pushrod, the tip of a steering arm extending perpendicularly from the tongue, near its pivot point, thus shifting its azimuth. The lever has a locking rod with a lug working in a toothed sector so as to hold the tongue in the azimuth that has been set.

<u>Tongue lateral position</u>

When we have a two-horse team, the tongue extends between the two horses, in line with the hitch. But with a three-horse team, the tongue extends between the center and right-hand horses. Thus, the lateral position of the tongue at the machine must be different (by about 14 inches) between the two situations.

To accommodate this, the lateral position of the stub tongue is halfway between the lateral position required for two- and three-horse teams. We see the arrangement on figure 18 (this illustrating the 23-A, but the arrangement is almost identical on the 23-B).

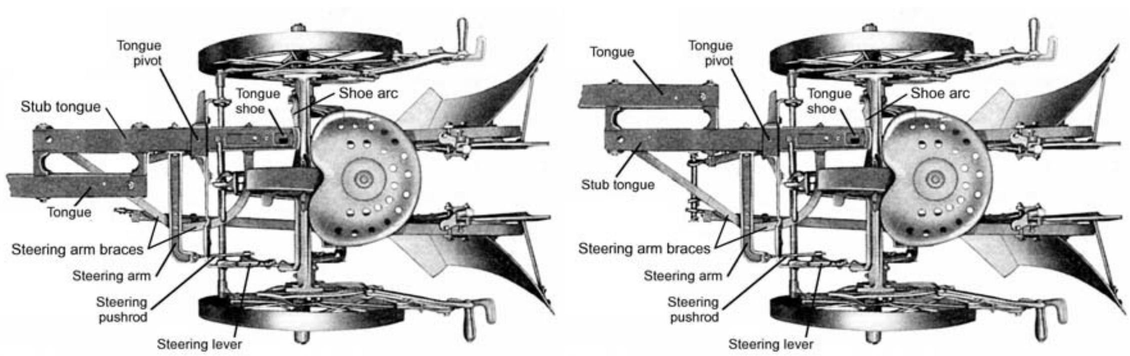

Figure 18. Tongue arrangement on an Oliver 23-A

Adapted from a figure in *Horsedrawn Plows and Plowing* by Lynn R. Miller, in turn from the manufacturer

The tongue proper is bolted alongside the stub tongue on one side or the other (with some metal spacers in between to give an offset of about 7 inches). This gives the two distinct lateral positions that are needed. We see it here first in the left-side position, as is suited for a two-horse team, and then in the right-side position, as is suited for a three-horse team,

This is not a quick change (notwithstanding what the brochure says). Generally, use on a particular farm will be consistently with a two-horse or three-horse team.

Lateral trim

As I mentioned, when we “set” one of the bottoms (lower it into the ground), the wheel on that side is also lowered, because we assume it will be running in the prior ditch. But the scheme of relative lowering of wheel and bottom is not perfect, and does not always automatically make the machine quite level side-to-side.

To make it level, the elevation lever on the land side can be moved, raising or lowering that wheel. Of course, this moves the "inactive" bottom up and down as well, but usually there is no difficulty from that—it has plenty of vertical space in which to loiter.

The plowman's seat

The plowman's seat is a traditional formed metal "tractor seat". It is mounted on a leaf spring (see figures 1 and 13), the stiffness of which is about that of a concrete block.

Often plowing is done on a hillside (the line of plowing being an elevation contour, so that the slope of the hillside is lateral). To allow the plowman some modicum of equilibrium (one could hardly say comfort) in this situation, the seat can be tipped to one side or the other (only one position each side of center, though). There is a locking lever, working in a notched sector (see figure 13).

Climbing aboard

When the plowman mounts the 23-B (the seat is about 40" off the ground), is there a boarding ladder or boarding steps or such?

No. But there are a lot of neat things you can step on. Oh, no, not **there**!! No, don't hold onto **that**!

Figure 19. Ollie in the ground

IN THE GROUND, WHERE A PLOW BELONGS

Since most of the photos in this article were taken, Ollie's display emplacement has been completed. She now sits with her right wheel in a nice "prior pass ditch" (hand dug by an old telephone engineer) and her right-hand bottom in the ground (buried by hand). We see the result in figure 19.

Behind the bottom we see a short length of the “new ditch”.

The left-hand (inactive) bottom is lifted to the point to which the power lift would automatically take it (where “knockout” occurs).

Ordinarily, the pitch attitude (“rocking forward or back”) of the machine is controlled by its tongue, which normally connects to about two tons of horse. We have no horses. So to keep the pitch attitude of the machine appropriate and stable, we have placed a column of small concrete blocks under the left-hand bottom.

Another advance (seen in the photo) is the construction of a replacement tongue assembly. It employs wooden offset spacers rather than the sections of metal channel used in the original design. It is configured for use with a two-horse team.

OLLIE’S PATRON

Here we see Carla, Ollie’s patron, aboard. Carla is always “on”, and we see here her in farmer’s overalls (purple of course), and a cowgirl-style field hat (red of course). [9]

Figure 20. Carla aboard

[9] The color scheme is appropriate to her role in the Red Hat Society.

ACKNOWLEDGEMENTS

Thanks to Lynn R. Miler, whose monumental (and recent—year 2000!) work, *Horsedrawn Plows and Plowing*, is a treasure of information about the topic.

Thanks to Ben Corson, the owner of two Oliver 23-B plows (one with the original paint finish intact!), for his encouragement as we came to grips with this complicated topic.

Thanks to Jim Brown ("Farmer Brown"), an expert in the restoration and usage of antique plows, for his support.

A great resource from the Internet is an extended video of Jim plowing a rectangular land with an Oliver 23-A (an earlier but very similar machine). Among other things, this gives a wonderful example of how a skilled two-horse team under a skilled plowman can maneuver the plow back and forth to turn it around in a narrow headland. Still, the best part is probably watching Jim mount the machine—a vision that inspired the section above on "Climbing Aboard".

Most of all, thanks to Carla, who said, "I think we should buy an old plow or something to put in the back yard." Of course, an Oliver 23-B was not what she had in mind. But she spotted Ollie outside a currently-inactive antique store out on the highway, fell in love with her, tracked down the owner, and negotiated the acquisition. She has also played a key role in the restoration work.

Beyond that, her skilled and careful copy editing is responsible for this article hopefully being fit for human consumption.

BENEDICTION

> God speed the plow, and the woman who drives it.
>
> –Woman's Land Army (see figure 4)

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