

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

SECTION G36.110
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BURIED WIRE

OPERATION OF PLOW

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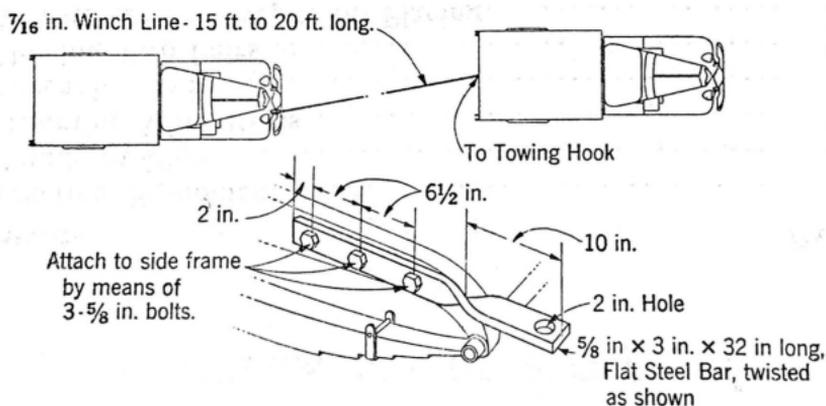
1. TRACTIVE EQUIPMENT

1.01 Considerable tractive effort is required to draw the wire laying plow through the ground and it is important to have an ample reserve of power in whatever equipment is assigned to the job. Under normal conditions in highway work two trucks of about 2 or 2-1/2 tons capacity each, operating in tandem, will handle the plow satisfactorily, or one four-wheel drive truck can be used alone. One caterpillar type tractor of 40 or 50 horsepower rating, equipped with a winch, is also satisfactory by itself.

1.02 When private property, such as cultivated fields, pasture land or other rough terrain, must be traversed for any great distance, a tractor is necessary because the usual construction truck cannot negotiate such territory. A truck can, however, be used for plowing short stretches over private property in cases where the truck can be so located that the plow can be drawn by the truck winch. Winching for considerable distances is not satisfactory because of the slow progress and because the continued heavy load imposed upon the winch is greater than it is designed to carry.

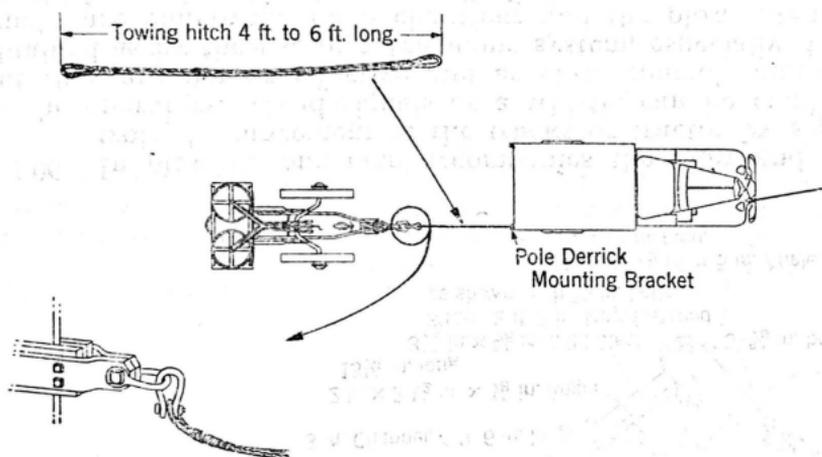
1.03 Where trucks are used it is convenient to mount the pole derrick on one of them and leave it in place throughout the course of a day's plowing. The derrick will be found useful in handling the plow as when shifting it to make right angle turns, lifting it over fences, etc.

1.04 The two trucks can be hitched together by means of a 15 to 20 foot length of chain or winch line with an eye on each end so that the trucks can be readily disconnected. The hitch should be attached to the towing hook of the leading truck and to the right front towing hook or the front of the right hand longitudinal frame channel of the chassis of the second truck.

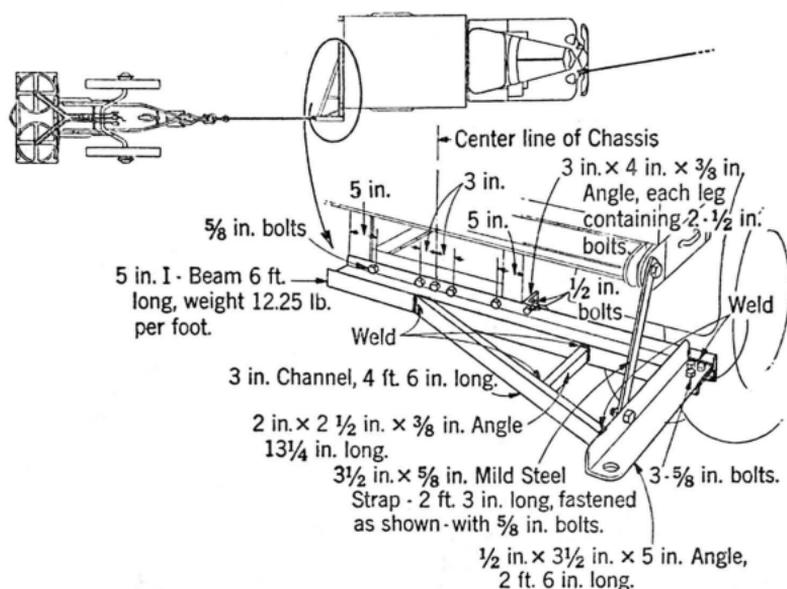


Method of attaching towing bar to side frame of chassis for trucks not equipped with towing hook

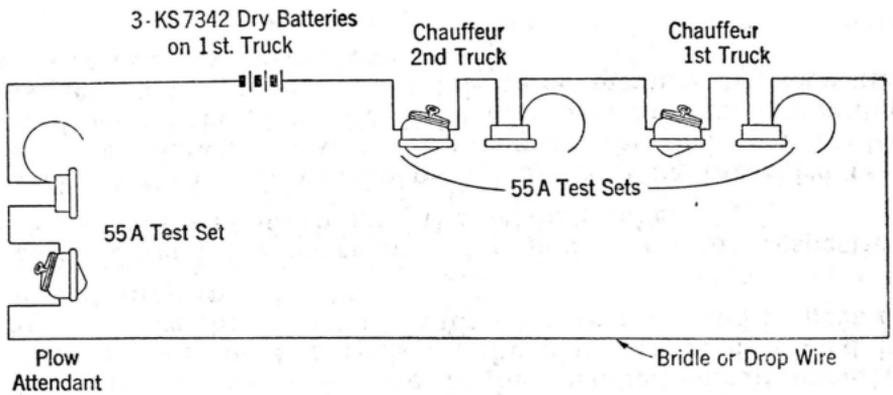
1.05 For plowing in the direction of traffic, the plow should be attached to the rear truck at the right hand pole derrick mounting bracket or to an outrigger similar to the one shown on the following page. Use of the outrigger enables the truck to remain on the hard surface while allowing the plow to run in the road shoulder. A satisfactory hitch can be made of a double loop of winch line preferably about 4 to 6 feet in length and served as shown below. The proper length will vary depending on the height of the point of attachment on the truck. The set-up should be such that the forward end of the plow frame rides about 4 to 6 inches above the extreme rear of the plow frame. In this position the angle of the plow point is just enough to keep the plow standard buried to the proper depth without requiring unnecessary force to pull it through the ground. Attachment of the pulling hitch to the plow is made at the clevis on the forward end of the plow.



ATTACHMENT OF TOWING BRACKET TO MODEL A-4 INTERNATIONAL TRUCK

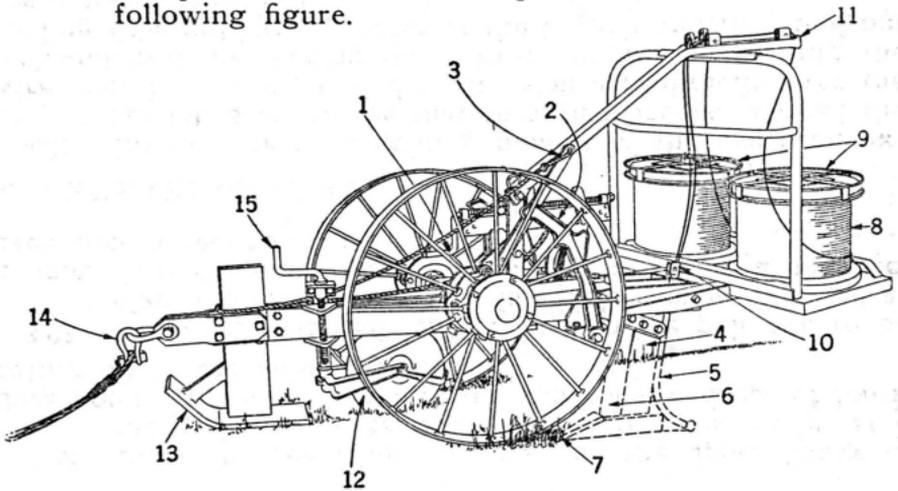


1.06 In plowing, one man accompanies the plow and controls the movement of the trucks or tractor by signals to the operators. Hand signals or a whistle can be employed but they are not as effective and as close control cannot be obtained as by the use of a telephone system, especially if two trucks are employed. Each chauffeur and the plow attendant should be equipped with an installer's 55-A test set connected as shown in the following diagram. The wire, consisting of twisted pair or any other durable insulated wire, can be attached to each truck at one or two points along the sides of the bodies. Attachment to the leading truck should be easily detachable, possibly by means of a plug and socket so that it can be removed readily when the trucks are operating independently.



2. DETAILS OF PLOW

2.01 The plow and its essential parts are illustrated in the following figure.



- 1 - Handle of depth adjusting screw
- 2 - Lifting arm
- 3 - Tripping lever and rope
- 4 - Plow standard
- 5 - Feeding Tube
- 6 - Cutting Edge
- 7 - Plow point
- 8 - Wire Reel
- 9 - Reel Head
- 10 - Wire guiding Sheave
- 11 - Wire guide
- 12 - Colter or sod cutting disk
- 13 - Shoe
- 14 - Pulling Clevis
- 15 - Colter Adjusting Crank

3. MOUNTING WIRE REELS

3.01 In mounting a single reel of wire first remove the lags and pile them to one side out of the way. Then free the outside end of the wire where it is lashed to the reel flange. Release the snap hook from the tongue of the rear hinged reel retainer. (The hook will be found attached by a chain to the underside of the reel platform.) Turn down the rear reel retainer to permit the reel to be placed in position on the platform. Set the reel on the platform with the flange containing the test end of the wire upward. Slide the reel into position in either of the spaces provided in the forward reel retainer. Turn the rear reel retainer to its upward position and replace the snap hook in the tongue on the underside of the platform.

3.02 Place the revolving reel head on the upper flange of the reel and rotate it to see that it turns freely. If it does not turn freely remove it and apply a few drops of lubricating oil to the spindle bearing.

3.03 When several reel lengths of a single pair are to be placed consecutively, two full reels can be mounted at a time. This will save time over stopping to mount a new reel each time a reel runs out.

4. THREADING WIRE

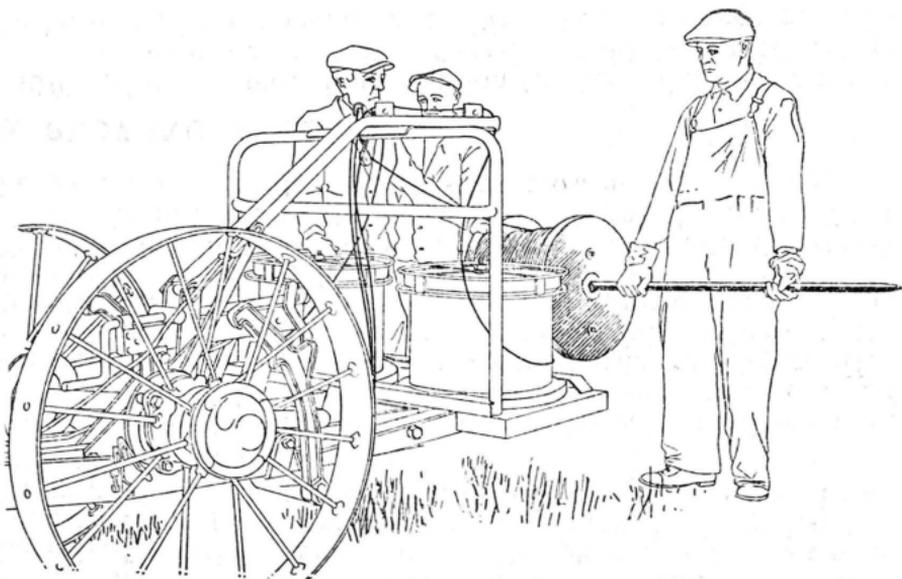
4.01 Inspect the wire guiding pulleys of the overhead extension arms to see that they turn freely. Thread the wire over both pulleys of the extension arm directly over the reel and into the feeding tube. Push the wire down into the feeding tube until it protrudes at the bottom and then pull out about five feet of slack.

5. PLOWING TWO PAIRS

5.01 When two pairs are to be installed simultaneously, mount the two reels on the platform as described in Part 3. Place the revolving heads on both reels and inspect to see that they turn freely.

5.02 Thread the wires over the pulleys on the respective sides and down into the feeding tube.

5.03 A third pair can be placed by carrying the third reel as shown below, or by mounting the reel on a trailer towed behind the plow. Feed the wire over an auxiliary pulley attached to the upper horizontal frame member between the two overhead extension arms.



6. ADJUSTMENT FOR DEPTH OF PLACING

6.01 Turn the handle of the depth adjusting screw in a clockwise direction to lower the plow standard to the required depth. When the cylindrical nut on the adjusting screw has reached a point about 6 inches from the front end of the screw, the plowing depth will be found to be about 18 inches.

6.02 When it is desired to decrease the plowing depth or adjust the plow to its fully raised position turn the crank of the adjusting screw in a counter-clockwise direction. When raising the plow with the standard buried in the ground it will be found that after one or two turns of the crank the front end of the plow frame will begin to rise. If the front end is then depressed by drawing it down with the towing line or otherwise, or if the rear of the plow is lifted by means of digging bars, further lifting of the share by means of the crank will be made easier.

6.03 The exact depth at which the wire lies may be determined by inserting a rule in the slot left in the ground after the passage of the plow.

7. SETTING OF SHOE

7.01 After the plow has been started and an opportunity is afforded to check the level of the plow frame, as explained in paragraph 1.05, adjustment of the shoe should be

made, if necessary. Excessive drag of the shoe along the ground increases the pulling load. It should therefore be adjusted so that when the plow is in operation the shoe just clears the ground or bears only lightly on it. Adjustment is made by means of the bolts extending through the frame at this point.

8. USE OF COLTER

8.01 The colter or sod cutting disc is useful in plowing across lawns or through matted vegetation. Its action is to sever the grass or weeds in advance of the standard and prevent accumulation on the cutting edge of the plow. When used in plowing across lawns the colter slices the turf cleanly and avoids tearing the sod as the plow passes.

8.02 The plow is equipped with a colter having a rack bar adjustment by means of which the height of the blade may be changed by turning a crank. The height should be adjusted so that the upper part of the disc clears the frame of the plow and yet allows sufficient clearance between the colter fork and the ground to prevent the fork from dragging along the ground. The disc should enter the ground to a depth of about 2 inches.

9. STARTING PLOW IN GROUND

9.01 After the adjusting screw has been set to the approximate plowing depth the rope attached to the tripping arm should be pulled to release the latch holding the plow in the raised position. The point of the plow is set at such an angle that the plow standard will automatically bury itself in the ground to the adjusted depth when the plow is drawn forward.

9.02 When the plow is started with the point resting on the surface of the ground, it must be moved forward 4 or 5 feet before the point will be buried to the desired depth. If it is of advantage to have the wire buried at full depth from the start, a hole about 24 inches long and of the proper depth should be dug to receive the standard before plowing starts. The plow should be maneuvered over the hole until the standard can be lowered to the bottom of the hole by hand. Then the plow should be tripped to start plowing.

10. PLOWING WIRE

10.01 After the plow is in position to start, about 4 or 5 feet of wire, or more if required, should be pulled out of the bottom of the feeding tube. Wind the wire once or twice

around the center of a marking stake ending with a half hitch around the stake. Start the plow and allow the slack wire to run into the plow slot until the stake bears against the wall of the hole or rests on the surface of the ground if no hole is dug. Do not attempt to hold the wire by hand as the tension in the wire may persist until the plow has traveled several hundred feet. Instead of using a stake the wire can of course be tied to a tree, fence post or any other firmly anchored object.

10.02 Final adjustment for depth should be made after the plow has been pulled forward far enough to let the standard reach its full depth for the preliminary adjustment.

10.03 In the course of plowing the speed should not exceed 4 miles an hour and this maximum should be reduced considerably where there is likelihood of obstructions being encountered. The plow operator should watch the rotation of the reel heads to see that they turn freely and should also inspect the reels from time to time to see that there is no overlap of the turns.

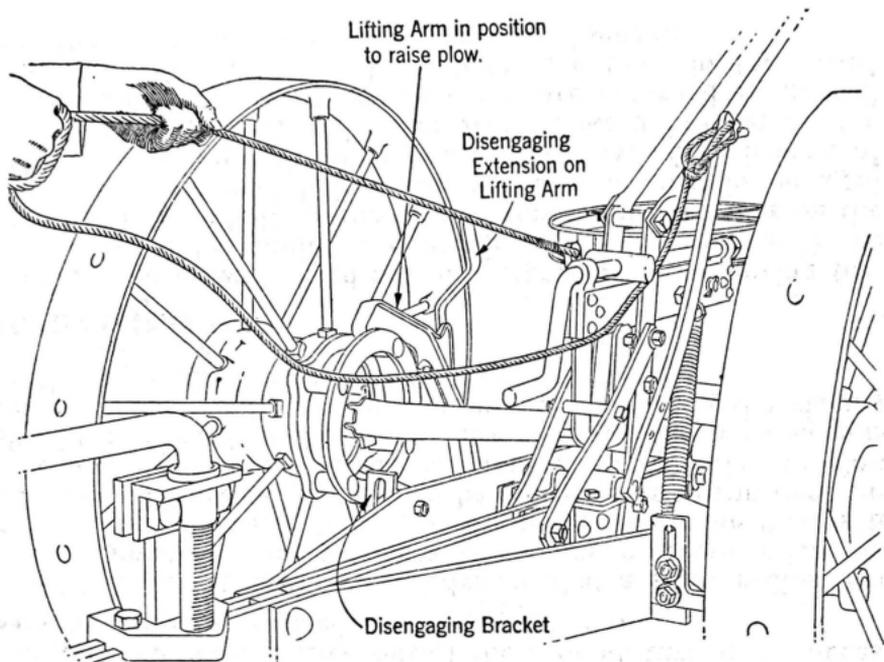
11. TURNING RADIUS

11.01 Do not attempt to make short radius turns with the plow standard in the ground. About a 20 foot radius turn is the minimum that can be made without twisting the standard of the plow. If a sharper turn than this must be made the plow should be raised out of the ground, turned the necessary amount and started in the ground again.

11.02 When it is known in advance that a short radius turn must be made a hole large enough to accommodate the plow standard should be dug at the point where the turn is to be made. The plow should then be pulled so as to run over the hole and when the standard is exposed in the hole the plow should be turned in the proper direction and the plowing continued. This avoids tripping the plow or digging in the vicinity of the wire to excavate a new starting hole.

12. RAISING PLOW

12.01 The plow is lifted out of the ground while moving forward by pulling the lifting arm lever rope until the hooks of one or both of the lifting arms engage the pins on the inside of the wheel hubs. The lifting arms remain engaged with the pins until the plow has moved forward a distance of 5 or 6 feet at which point the arms strike a bracket on the plow frame, become disengaged and are returned to normal position by a spring. A latch holds the plow in the raised position after the lifting arms become disengaged.



12.02 When raising the standard out of the ground, make certain that the latch has operated and that the lifting arms have returned to normal position before doing any further work around the plow.

12.03 As 5 or 6 feet of forward movement must take place before the plow is fully raised, allowance must be made for this travel when raising the plow to clear obstructions. If it is desired to have the hooks of the lifting arms engage immediately so as to have the lifting begin without waiting for the pins to rotate to a point where they engage the hooks, the pins can be brought into contact with the hooks by turning the wheels by hand while the plow is stopped.

12.04 If the plow is to be left in the raised position for some time, as when storing it overnight or when transporting over considerable distance, the depth adjusting screw should be turned to the fully raised position as a precaution against accidental tripping.

13. CLEARING OBSTRUCTIONS

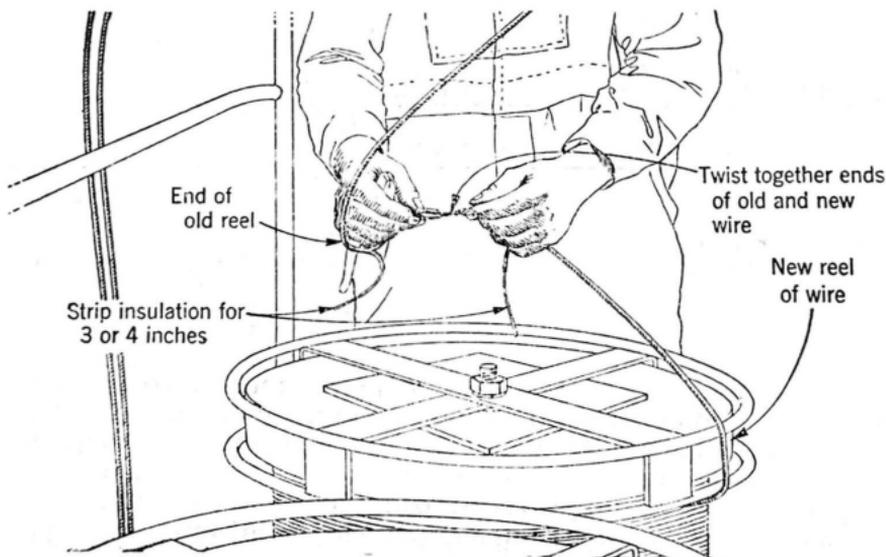
13.01 When it is necessary to raise the point of the plow to pass over an obstruction such as a bridge or paved highway the plow standard should be raised as explained in paragraph 12.01. If the obstruction is a pipe culvert or other

object buried at some depth below the surface, the plow need not be raised in this manner but should be pulled slowly into an excavation prepared in advance of the plow and stopped just short of the culvert. When the plow point is visible in the excavation, it should be raised by lifting with digging bars or by turning the adjusting screw crank until the point will clear the obstruction. Then pull the plow forward slowly until the plow standard clears the obstruction after which the depth may be readjusted and pulling resumed.

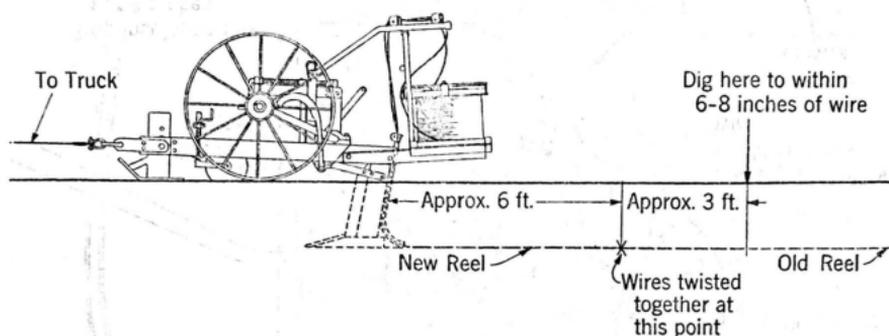
13.02 The lifting mechanism can also be employed to lift the plow partially out of the ground to clear an obstruction. After the plow point has been elevated to a height sufficient to clear, the depth crank should be turned to hold the plow at that level. The plow wheels should then be turned backward by hand until the lifting hook releases, after which the plow can be pulled over the obstruction and readjusted to proper depth.

14. CHANGING REELS

14.01 It is not necessary to raise the plow out of the ground to change to a new reel of wire. The plow should be stopped when 5 or 6 feet of wire remain on the old reel. Pull the remaining wire off the reel by hand, leaving the end of the wire in the feeding pulley and replace the empty reel. Strip the insulation from the conductors of both the old and new sections of wire for a distance of 3 or 4 inches and twist the ends of the two lengths together securely.



14.02 Pull the plow forward feeding wire from the new reel until the plow has progressed about 6 feet beyond the point where the splice is estimated to have entered the ground. Stop the plow and at a point about 3 feet back of the splice locate the wire and pull the splice above ground as described in Part 4 of Section G36.120.



15. BREAKING HARD PACKED SOIL

15.01 In locations where, because of soil conditions, the plow cannot be pulled at its normal depth, as in crossing hard packed roads or driveways, it may sometimes be advisable to remove the wire from the plow and make successive cuts along the same trench starting at a shallow depth and increasing the depth with each cut. When the required depth is reached, replace the wire in the feeding tube, leaving sufficient slack for a splice and plow the wire across the broken ground.

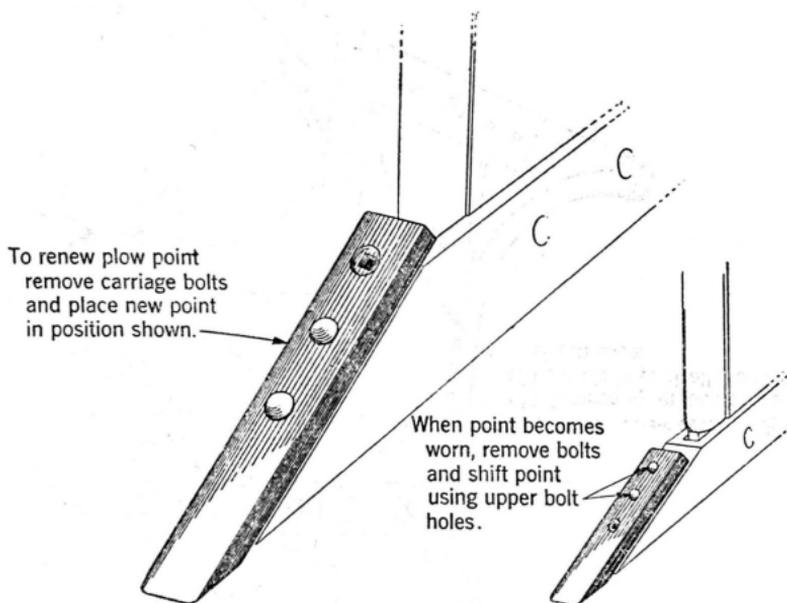
16. TRANSPORTATION OF PLOW

16.01 The wheel bearings of the plow are not designed for towing the plow behind a truck for considerable distances at the normal truck speeds and in transporting the plow to and from the job or between jobs it should always be carried in a truck or on a suitable trailer. Most of the standard telephone pole trailers are readily adaptable to this use and the pole derrick can be used in loading the plow on the trailer.

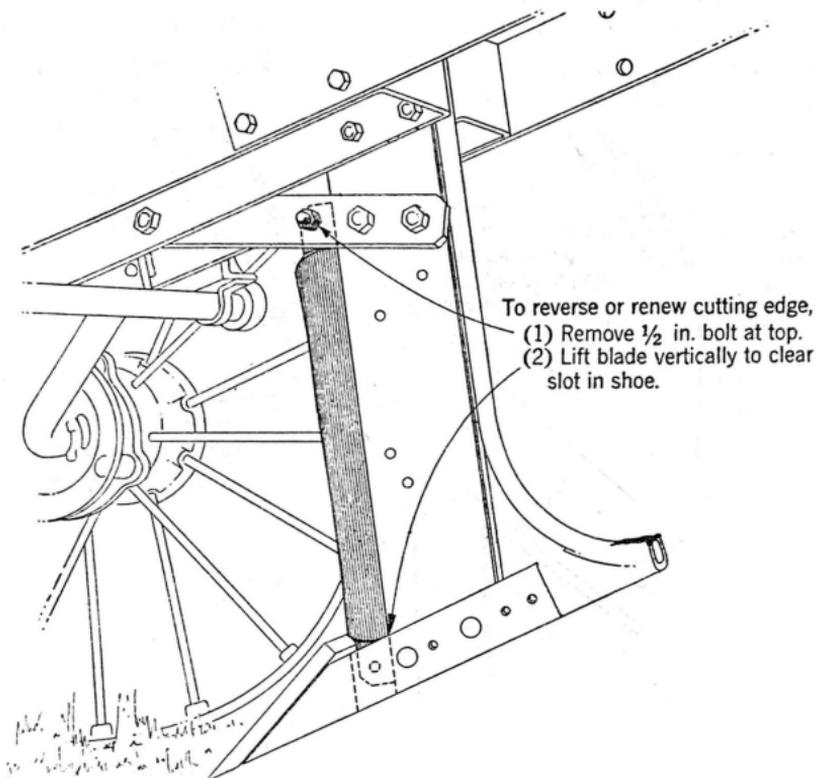
16.02 In moving the plow from one part of a job to another over comparatively short distances it can be carried by the pole derrick mounted on one of the trucks. The towing hitch can usually be attached at the truck towing hook to steady the plow when moving it in this manner. The plow can also be towed behind a truck at speeds not exceeding 10 miles per hour by lashing the rear end of the plow to the truck and towing it backward.

17. MAINTENANCE OF PLOW

17.01 Depending upon the character of the soil in which the plow is used, the plow point and cutting edge will require replacement due to wear caused by the abrasive action of the soil. The plow point wears more rapidly and should be inspected after 5 or 6 miles of plowing to determine the wear on the bolts holding the point to the plow standard. If the bolt heads are worn sufficiently to justify replacement, remove the old bolts and replace with new ones. If the point is worn appreciably, remove the bolts from the two lower holes, slide the point downward and replace the bolts in the upper holes, as shown below.



17.02 Wearing of the cutting edge is greatest at a point about $\frac{1}{3}$ of its length measured up from the bottom. It is designed to be reversible end for end, and when the leading edge of the cutter shows a deviation of about $\frac{3}{4}$ to 1 inch from a straight edge it should be reversed. Further wearing of the edge after having once been reversed will require replacement. These operations are described below.



17.03 Moving parts of the plow such as the pulleys, lifting arms and the depth adjusting mechanism should receive an application of engine oil after every 10 to 12 miles of plowing. The wheel bearings should be inspected at intervals of about 50 miles to see that they are packed with grease. If required, the wheel bearings should be repacked with cup grease or axle grease.