SPECIAL PAMPHLET *No. 78*

ONE-WAY DISK MAINTENANCE AND OPERATION

The condition of the one-way disk depends upon the wear of the disk blades, the gang and wheel bearings, and the power lift and its linkage. A certain amount of inspection should be maintained each day by the operator, when working the machine, and small repairs made to maintain a good state of repair.

CHECK UP BEFORE THE SEASON'S OPERATION

Condition of Disks.—The quality of work done the last time the machine was used may indicate the need for sharpening. If rose bushes, Canada thistle, or weeds of this type remain uncut in the furrow, the disks should be sharpened. Where the disks do not cut quack grass when operating at a shallow depth, the disks must also be sharpened. The addition of weight will not take the place of sharpening. Where the disks have been cracked, chipped or broken, they should be replaced or welded and sharpened.

Sharpening Disks.—There are two methods of sharpening the one-way disk blades: 1. Rolling between high-pressure rollers.

2. Grinding or turning.

The principle of sharpening disks by cold rolling has been used for 40 years. Machines for sharpening plough and harrow disks were of this type. The same type of machine is used in many blacksmith shops for sharpening the one-way disk blades. The disks are centred in the machine, and the thickness of the blade is reduced by gradually increasing the pressure on the rollers between which the disks are revolved. The rolling is done from 2 inches back of the edge to not closer than $\frac{1}{2}$ inch from the edge. Where the disk is rolled thin at the edge of the material, cracks and small pieces are apt to break and fall out. Where it is necessary to have a knife sharp edge, the disk can be edged on a grinding wheel. Usually it is not desirable to have the very edge too thin, because of contact with stone. The diameter of the disk increases about $\frac{5}{8}$ inch to $\frac{7}{8}$ inch during the rolling process. The original concavity of the disk can be maintained while rolling.

Grinding or turning the back of the disk blade to reduce the thickness of the disk is, in a sense, wasteful of material. It however, does sharpen the disk so that the quality of the work done is just as good as when the disk was sharpened by rolling, but the size of the disk will be reduced in the process of sharpening. Where the disks have been repaired by welding, they may be sharpened satisfactorily by either method.

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Condition of Bearings.—It is rather difficult to determine the condition of the disk hanger or thrust bearings when operating the machine. Whenever the disks are removed for sharpening, the bearing may easily be inspected for wear. However, before the disks are removed, the bearings should be inspected for slack, both horizontal and vertical. Horizontal slack will indicate wear in the thrust bearing, and vertical slack will indicate wear in the hanger bearings. The slack may be indicated by using a lever and block to pry up under the disk gang. Slack in the bearings should be noted. Where the slack is considerable, inspection when the bearings are opened as to the extent of wear will determine whether the shells or bearings should be replaced. The amount of horizontal slack may be determined by prying upon the bottom of the disk gang and moving it back and forth. The extent of gang movement will indicate the slack. When the slack is considered excessive, the disk thrust bearing or bearings should be inspected. These bearings may be ball bearings, taper roller bearings, or flat plate bearings. The ball and roller bearings may be washed out and readjusted if the wear is not beyond the range of adjustments provided. Where the wear is excessive, the bearings must be replaced.

The plate thrust bearings are fitted with steel or bronze plates which, when worn, may be replaced. The thrust plates do not need to be replaced unless worn to such an extent that wear of the brackets or housing results from the turning of the disks.

All bearings should be washed out to get rid of the dirt. Dirt seals and oil felts should be replaced to ensure as dust-free operation as possible. The bearings should be packed with the proper lubricant so that clean lubrication will be ensured.

Wheel Bearings.—Wheel bearings which have been well lubricated and have not been overloaded by an improperly adjusted high hitch will not show excessive wear. The wear may be determined by jacking the one-way disk up so that the load is off the wheels. The wear will be found in two forms—horizontal from thrust and vertical from load.

The horizontal wear may be taken up by thrust washer placed between the wheel hub and the axle collar. Steel washers are procurable from implement agencies and local hardware stores to meet practically every requirement. The wear of the pin retaining the thrust collar on the axle should be checked. The pin should be replaced with a new steel pin, not a bolt, whenever the slack between the pin and hole in the axle indicates wear. Where excessive wear has taken place, the hole should be reamed and an oversize steel pin put in its place.

The vertical wear occurs between the wheel boxing and the axle. The boxing is cast iron and should be replaced if the wear is sufficient to cause misalignment or poor grease control. Where the axle is badly cut or worn, it should either be built up in the shop or replaced. All bearings should be washed out and replaced with the proper lubricant, and all dust and oil seals replaced or renewed, so that clean lubrication will result.

Frame Bearings.—The large front frame casting with bearing which slides up and down on the front wheel standard is often partially exposed to dust and dirt. There is no remedy for wear in this part except replacement which may be expensive. Wear causes tilting of the front wheel, excessive pressures on the wheel and standard bearing, and poor control of the width of cut of the first disk. The excessive bearing pressures cause difficulty in lubrication and bearing wear. The casting should be replaced before cutting, or excessive wear takes place on the vertical shaft.

The shaft and casting should be protected from dust by canvas dust shields, both on top and bottom. These shields must be sufficiently loose to provide for the maximum lift of the front end of the one-way on the vertical shaft. Ample lubrication should be provided for this bearing at all times.

Power Lift.—The power lift may be an open type or an enclosed oil-bath type. Where it is an open type, the power lift should be inspected for wear when the land wheel of the one-way is raised for wheel bearing inspection. If the wheel bearing is not worn, the power lift will not be worn excessively. However, if any difficulty has been noted in the action of the power lift, the wheel should be removed and the power lift thoroughly cleaned and inspected for wear.

After the power lift is cleaned and oiled, the wear of the rollers and pins of the dogs and the tension of the springs should be examined, and replaced when necessary. There may be thrust washers between the release plate and dog clutch, which space the two properly. When the release drags from contact with the housing, the thrust washers should be replaced or added. Where excessive wear has occurred between the dog clutch housing and the axle, the housing must be replaced and the axle built up or replaced. Pins and supports for the power lift linkage should be inspected for wear and reamed out and fitted with oversized pins when necessary. Where wear occurs because of improper lubrication, the addition of small grease nipples will make lubrication possible and greatly lengthen the life of the parts.

Spring Tension.—Where difficulty with the power lift has been experienced and the power lift and linkage have been overhauled, the spring tension assisting the power lift should be examined and increased. The spring tension should not be increased so that the depth control is affected. Where extra springs are used with the seeder box attachment and where packers are trailed behind, the springs should be sufficiently tight to assist the lift with the extra load.

Tightening.—All bolts including the disk arbor or gang bolts must be inspected frequently and tightened. The arbor or gang bolts should be "sledged home" when being tightened, in order to draw them up sufficiently to hold. Whenever the arbor bolt nuts are not easily accessible, the gangs should be removed from the hangers and driven home and tightened. Loose gang bolts will cause serious centre disk wear and breakage of spacers.

One-way Disk Seeder Attachment.—When a seeder box is put on the one-way disk, drive sprockets should be carefully lined up and all bolts tightened, to prevent misalignment. The seed spouts and guides should be carefully tightened into place to ensure uniform placement of the seed in the furrows. The seed feeding mechanism should be turned, before being connected to the drive, to ensure its freedom. The seed shells and hopper should be clean and dry before filling with seed.

The calibration of the seeding mechanism should be checked at slow speed with the acreage covered, to ensure uniform and accurate seeding. It will be noted that, at high speed, the grain will work to the rear of the box. If the seed is being fed irregularly, the location of the feed shells on the drive rod should be checked and moved by the use of ¾-inch open shims, so that feeding will be uniform. The acreage covered can be calculated by the distance travelled in miles the width of the machine in inches, divided by 10.

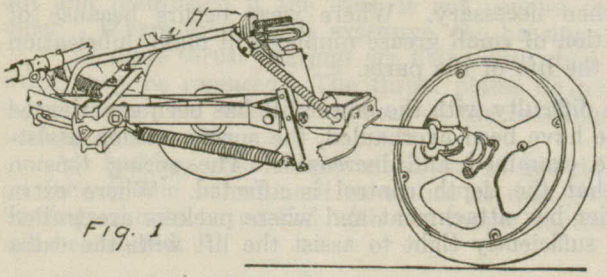
ONE-WAY DISK ADJUSTMENTS

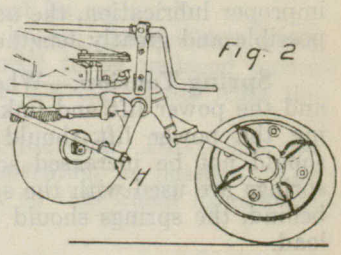
There are two major adjustments of the one-way disk which affect the draft and quality of work of the machine. First, the setting of the wheels; and, second, the setting of the hitch.

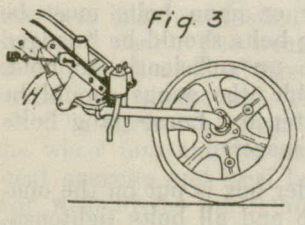
Wheel Adjustments.—There are three wheels supporting the one-day disk. The load of the machine should be carried about equally on each wheel.

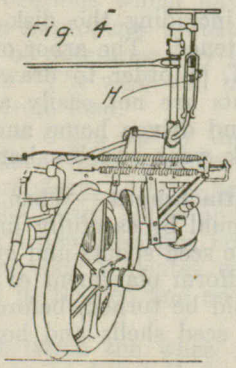
The front furrow wheel should be set with a slight lead toward the ploughed land. The broad faced rim of this wheel should run against the furrow wall for all services other than seeding. In seeding, the broad face of the rim may be required on the bottom of the furrow to support the machine in soft soil to obtain uniform depth of seeding.

The rear furrow wheel should be placed on the axle in the same way. The rear furrow wheel is the rudder for the machine. It should be carrying the weight of the rear of the one-way disk, so that the weight will hold it in the furrow. The rear end of the one-way disk should be raised upon the rear wheel as much as possible, when the lever on the land wheel is set for practically maximum depth. By this adjustment, as much weight as possible is placed on the rear furrow wheel without limiting the flexibility of depth adjustment. The rear furrow wheel adjustments for raising the rear end of the one-way disk are illustrated by the adjustment "H".









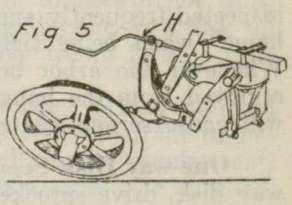


FIGURE 1. By lengthening an over head rod to hinge the rear wheel under the frame.
FIGURE 2. By shortening the side rod.
FIGURE 3. By shortening a turnbuckle.
FIGURES 4 and 5. By a screw or a lever.

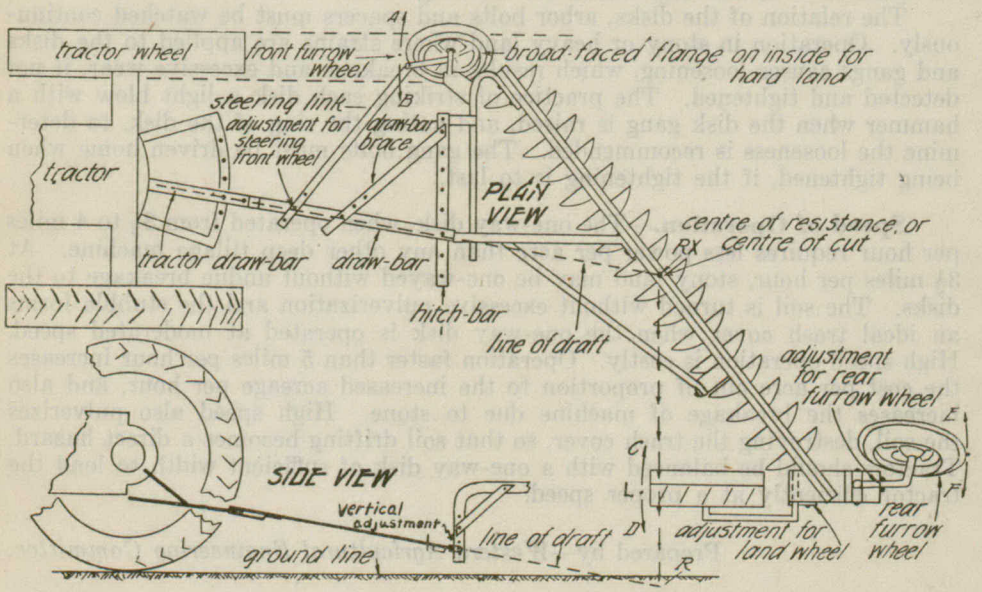
These adjustments make it possible to keep the frame level and load on the rear furrow wheel which is necessary to hold the machine in place and do good quality work. This adjustment and the vertical adjustment of the hitch are the two most important adjustments of the one-way disk. The rear furrow wheel should be set to push against the side thrust of the one-way caused by cutting and turning the soil. The amount of lead toward the ploughed land depends upon the width of cut of the machine and the hardness of the soil. Sufficient lead should be given to hold the machine so that the front disk cuts at least an inch less than the other disks.

The land wheel should operate with a slight lead toward the ploughed land to absorb some of the side thrust. The wheel adjustments are often set for hard, medium and soft soil, indicating the width of cut for various soil condi-

tions. The land and rear furrow wheels must be adjusted to work together for any width of cut and soil condition. The front furrow wheel may need readjustment when an appreciable change in width of cut is made. The narrower cut is more desirable for hard soil.

The machine should be set to cut the same depth at the front end and the back. The front lever is used for levelling.

The Hitch.—The one-way disk may be drawn by a variety of hitches. The machine actually is drawn from the centre of cut (between the two centre disks or from the centre disk), RX, plan view. The horizontal hitch adjustment should be so placed that the machine will be drawn from the centre of cut by the pivot of the swinging drawbar or end of the rigid drawbar of the tractor, with no side thrust. The line of draft is a straight line from the centre of cut to the tractor drawbar. The one-way drawbar should reasonably follow this line. The front wheel steering link should be adjusted to maintain a slight lead of the front wheel toward the ploughed land, A. The best way to make these adjustments is to pull the one-way disk into the furrow so that it is cutting 1 inch less with the front disk than the other disks. Then set the tractor either in the furrow or on the hand, as desired, and line up the drawbar from the centre of cut to the drawbar of the tractor (swinging or rigid, as desired). Plan view.



Hitch and Wheel Adjustments for the One-way Disk.

The vertical hitch on the tractor should be as high as is practical without loading the sliding drawbar too heavily or affecting the steering of the tractor.

The vertical hitch on the one-way disk must be as low as possible so that the drawbar of the one-way disk will be in line with the line of draft, which runs from the bottom of the centre disk to the drawbar of the tractor. Side view. In many one-way disks, the vertical adjustment is not sufficient to lower the hitch to the line of draft. This causes the one-way disk to be pulled down in front, loading the front furrow wheel and land wheel bearings and also lifting the load off the rear furrow wheel, so that it no longer can guide the machine. The only remedy is to extend the vertical adjustment of the one-way disk down by using extension bars braced to the frame or an offset heavy drawbar from the frame to lower the hitch into the line of draft. The drawbar must not pull down on the frame of the one-way disk.

SERVICING THE ONE-WAY DISK

Servicing of the one-way disk is confined to greasing during operation and general tightening. The hanger and thrust bearings do not have sufficient capacity to operate more than three hours continuous running. The wheel bearings, however, have capacity of at least ½-day operation.

The practice of frequent greasing with moderate quantity of grease will provide better lubrication than less frequent greasing where the maximum capacity of the bearing is used.

The bearings are practically all slow moving, heavy duty bearings, requiring a grease which will work under pressure and stick to the working surfaces. Many soft gun greases are not sufficiently sticky. There are specially compounded greases which are sticky and yet semi-fluid, available for lubricating the one-way disk. The common soft gun grease can often be greatly improved by the addition of 10 per cent to 15 per cent of transmission oil, well mixed with a paddle. The transmission oil provides the sticky quality of the grease. The same grease provides good lubrication for machines equipped with grease cups.

Machines in operation should be watched keenly for loosening of parts. The practice of lining up nuts square with the metal edges makes it possible for an operator to notice nuts which are working loose.

The relation of the disks, arbor bolts and spacers must be watched continuously. Operation in stony or heavy land where strains are applied to the disks and gangs causes loosening, which results in breakage and excessive wear, if not detected and tightened. The practice of striking each disk a light blow with a hammer when the disk gang is raised, and noting the ring of the disk, to determine the looseness is recommended. The gang bolts must be driven home when being tightened, if the tightening is to last.

Speed of Operation.—The one-way disk, when operated from 3½ to 4 miles per hour requires less power per acre than any other deep tillage machine. At 3½ miles per hour, stony land may be one-wayed without undue breakage to the disks. The soil is turned without excessive pulverization and the stubble forms an ideal trash cover when the one-way disk is operated at moderated speed. High speed operation is costly. Operation faster than 5 miles per hour increases the cost per acre out of proportion to the increased acreage per hour, and also increases the breakage of machine due to stone. High speed also pulverizes the soil, destroying the trash cover, so that soil drifting becomes a direct hazard. Tractors should be balanced with a one-way disk of sufficient width to load the tractor efficiently at a proper speed.

Prepared by—*Western Agricultural Engineering Committee.*

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