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EC702 Grinding the Farm Tools

L. M. Roehl

Extension Circular 702 April 1938

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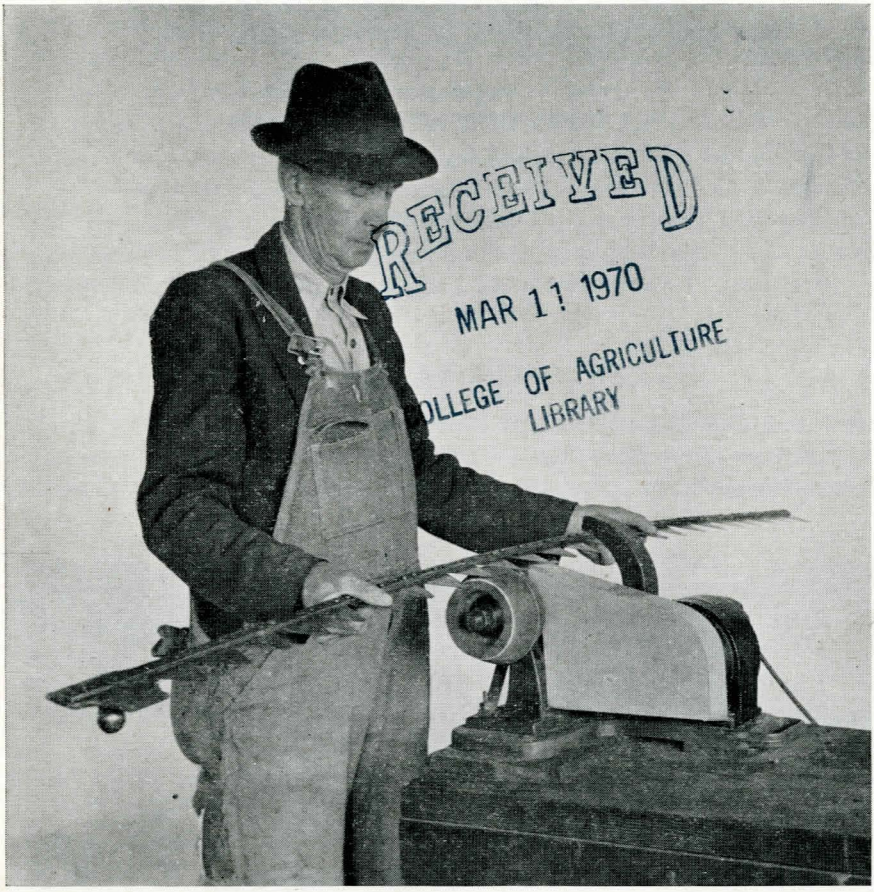

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GRINDING THE FARM TOOLS

L. M. ROEHL

SUCCESSFUL work and pleasure in the use of tools depend largely on their condition. This bulletin has been written to help those who grind their own tools.

Experience has proved that all edge tools used on farms may be ground with a motor-driven emery grinder. A grinder with the motor back of or below the grinding wheel is needed for this work. Certain tools, such as scythe, mowing-machine sickle, ensilage-cutter blades, and axe, require the removal of the grinding guard. As illustrated thruout the bulletin, the guard should be in place for whatever work permits.

HOW TO TRUE AN EMERY WHEEL

Because surfaces of grinding wheels become glazed or coated with metal and the wheels get out of round, an emery dresser is needed and should be obtained at the time the grinder is purchased. Surfaces partly

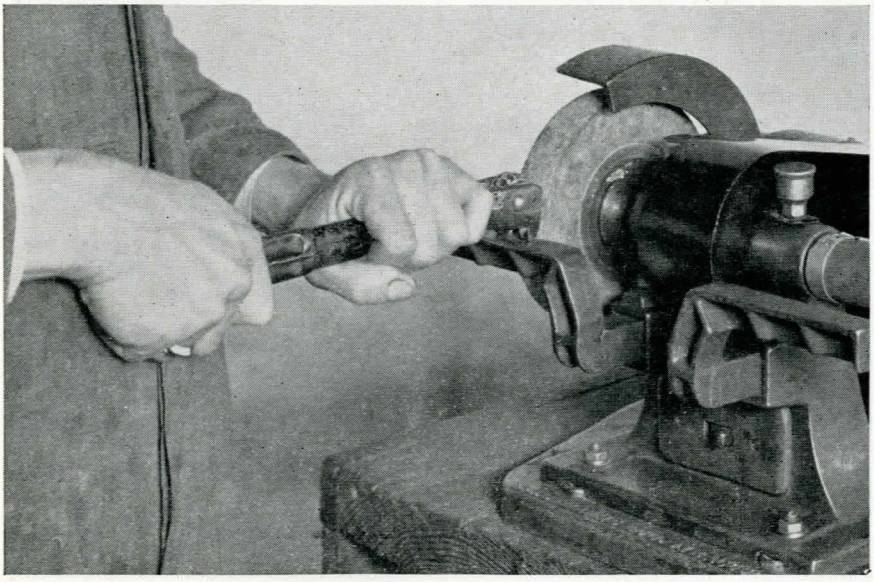

FIGURE 1. TRUING AN EMERY WHEEL

coated with metal do not cut well and cause excessive heating of the tools that are being ground. Emery dressers may be obtained at hardware stores or mail-order houses. Extra dresser wheels should be bought with the dresser, as the ones in the holder soon become worn.

The tool rest (figure 1) is placed in line with the center of and close to the wheel, which is run at full speed. The dresser is then held firmly to the tool rest and against the grinder, and moved right and left, until the glaze is removed from the grinder and the surface is true.

COLD CHISEL

The angle at which to grind a cold chisel depends on the hardness of the metal on which it is to be used; the softer the metal, the keener the edge.

The chisel is held against the stone as shown in figure 2, and one side is ground to the center of the stock; then the chisel is turned over and ground at the same angle, to a cutting edge.

A templet is very helpful in this work. The one shown in figure 3

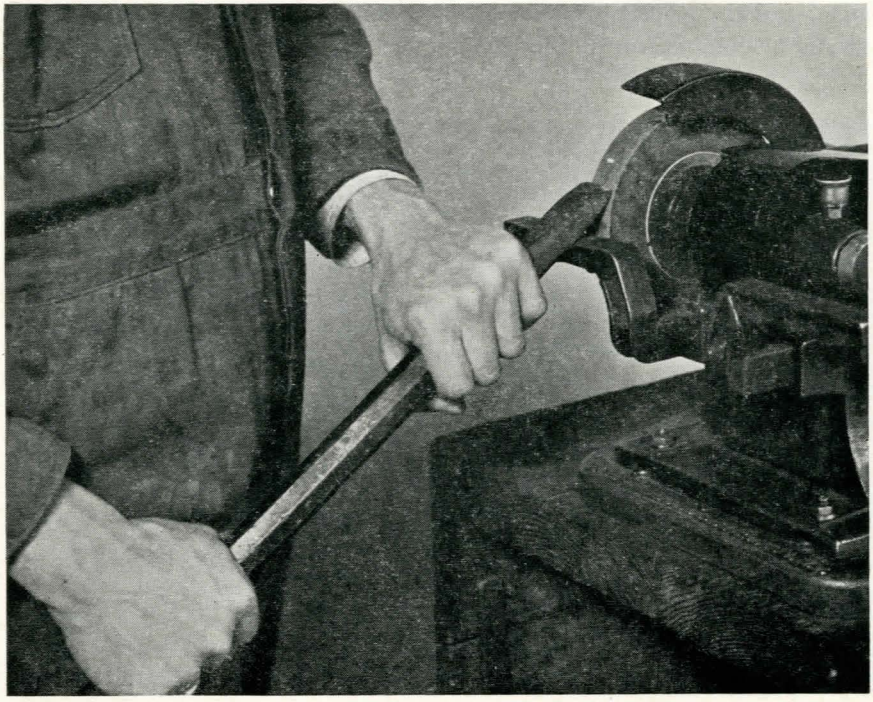

FIGURE 2. GRINDING A COLD CHISEL

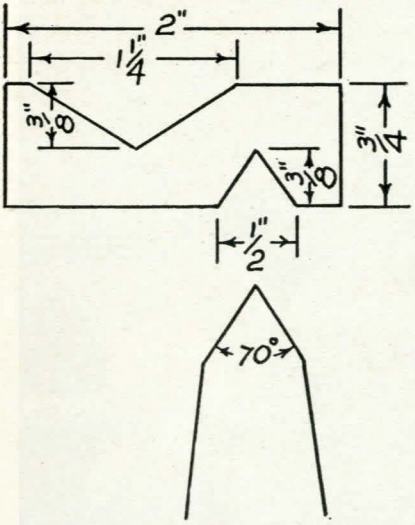

FIGURE 3. CONSTRUCTION DETAILS FOR TEMPLET

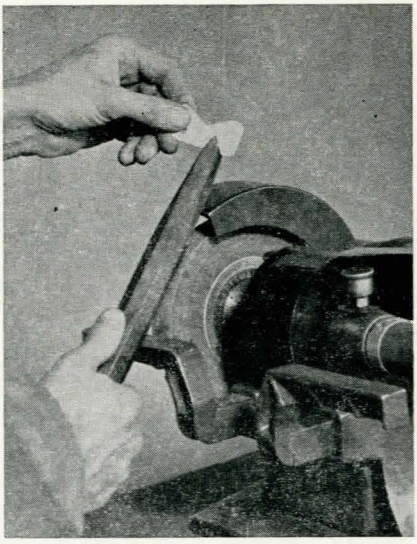

FIGURE 4. TESTING THE ANGLE OF A COLD CHISEL

is made of sheet metal and is ¾ by 2 inches in size. On one edge is a notch ½ inch wide and ⅜ inch deep. Chisels ground to fit this notch will be at about 70 degrees and are well suited for general work. On the other edge of the templet is a notch 1¼ inches wide and ⅜ inch deep, which is the angle for drills. The angle is tested by placing the templet on the chisel as shown in figure 4.

AXE

How to grind an axe depends upon the condition of the axe and what it is to be used for. An axe used for cutting needs to be thin; for splitting, a thicker blade is preferable. If the axe has nicks in the cutting edge, the edge needs to be ground back to the depth of the nicks. This is done by holding the axe flat on the tool rest against the grinder, as shown in figure 5. The blade is moved right and left horizontally, so that the full edge is ground and kept in the right shape.

For sharpening, the axe is held lightly on the grinder, as shown in figure 6, and is moved slowly back and forth and right and left. After grinding a little, the workman examines the ground surface to see that the grinding is being done where desired. If it is to be used for cutting, it is ground thin just back of the cutting edge. For a thin blade, the

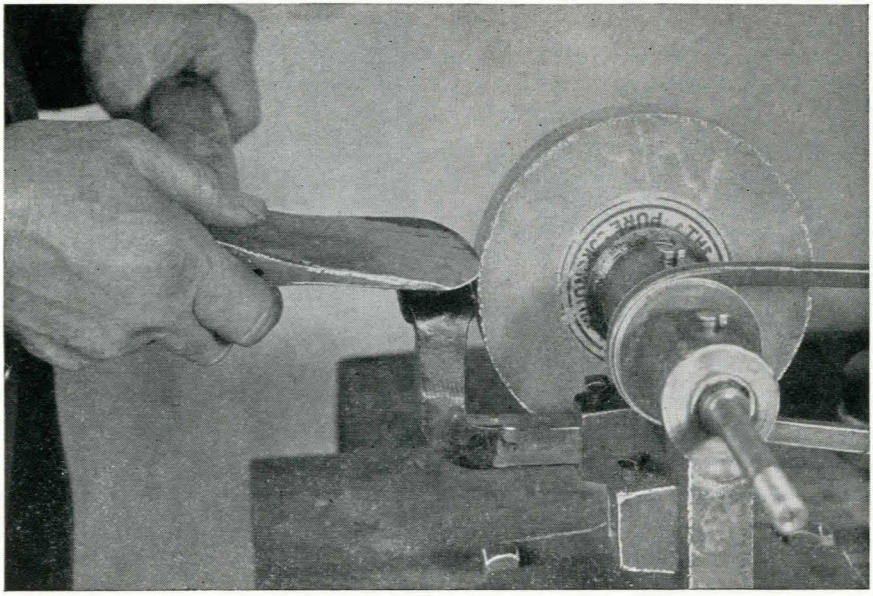

FIGURE 5. TRUING AN AXE

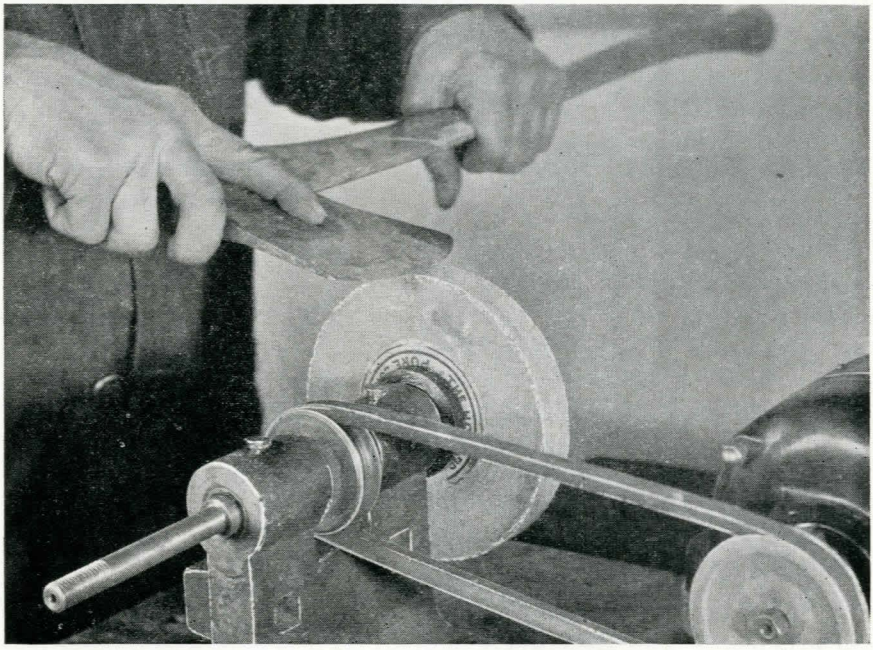

FIGURE 6. GRINDING AN AXE

axe is held rather far up on the stone; for a thick blade, the axe is held at a short bevel against the stone.

It is good practice to have a pail of water at hand and to cool the blade frequently as the grinding proceeds so that excessive heat will not draw the temper.

To remove the wire edge by honing, the axe is held in the left hand with the edge up and the oilstone or whetstone is manipulated with the right hand.

SCYTHE

A scythe cannot be ground well by holding it at right angles to the face of the grinding wheel or on the side of the wheel. The guard needs to be removed from the wheel and the scythe held parallel to the side of the stone, as shown in figure 7. The handle end is held down in the right hand and the blade held at a slight angle. This causes the grinder to make a serrated edge with the serrations pointing toward the tip of the blade.

The thickness of the blade just back of the cutting edge is regulated by the angle at which the blade is held on the grinder. Tipping the blade toward the cutting edge makes a blunt, or thick, blade just back of the edge. Tipping the back of the blade toward the stone thins the blade just back of the cutting edge. An effort needs to be made to find the right angle, or position, at which to hold the blade, and then to be consistent in holding that position for the entire length of the blade.

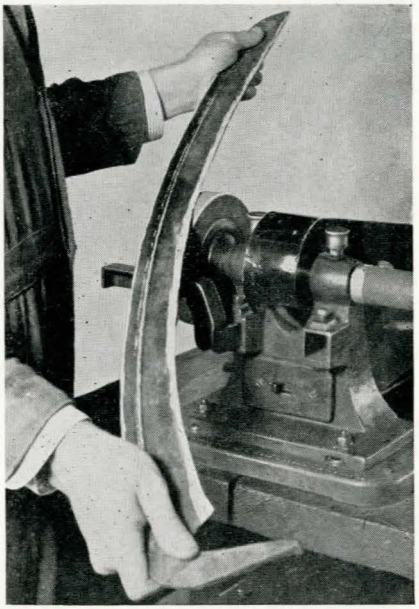

FIGURE 7. GRINDING A SCYTHE

To prevent excessive heating of the blade, it is gradually moved lengthwise over the stone so that the needed grinding in any one place is not all done at one time.

A good position of the tool and hands for whetting is shown in figure 8. The lower end of the snath is placed directly in front of the workman and about two feet away; the left hand holds the blade by grasping it over the top. This posi-

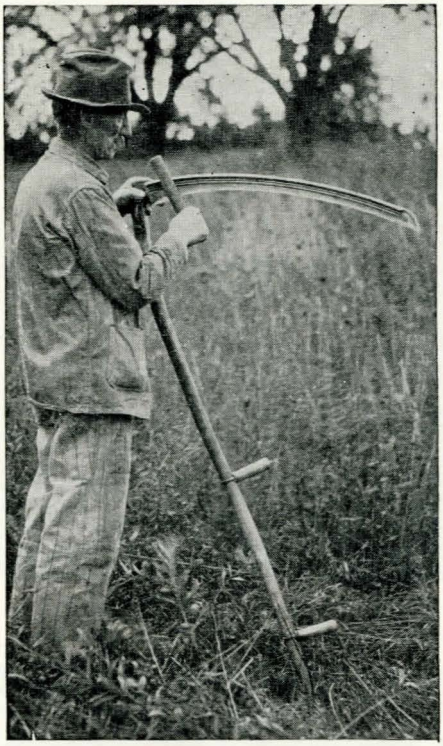

FIGURE 8. WHETTING A SCYTHE
Note the position of tool and hands

FIGURE 9. WHETTING THE TIP OF A SCYTHE

tion prevents the point of the blade from being held so low as to endanger the workman's hand while wetting. The end of the scythe stone is held in the right hand. The right elbow is held against the body and the stone is drawn down as well as forward at each stroke. The strokes of the stone are made on the right and left sides of the blade alternately. Since the lower end of the snath is placed about two feet in front of the workman, the blade drops back under the left arm as the whetting proceeds toward the tip of the blade (figure 9) and thus remains at about the same distance from the ground and from the right hand which holds the stone.

MOWING-MACHINE SICKLE

A mowing-machine sickle may be ground with a beveled sickle grinder mounted on the shaft of a power grinder. Success depends largely on the skill of the man holding the sickle. It needs to be held level, as shown in figure 10, so that the right side of the one section and the left side of

the one next to it are ground at the same time and at the same angle. The sickle is held on lightly and is moved back and forth, thus preventing burning the sections. The operator needs to estimate carefully just how far to draw the sickle down or back in order not to grind off the ends of the sections, and how far to push it forward to grind down into the angle where they join. If a section to right or left needs to be ground more than the other, a slight pressure to right or left will accomplish it. The sparks will indicate where the grinding occurs. A good way to support a long sickle is to make a sling of a piece of light rope and suspend it from above. A stand may also be used, but the sling is preferable as it allows the whole sickle to be moved back and forth parallel to the grinder shaft.

The beveled sickle grinder should not be used for any other grinding, as it may get out of shape. A grinder that is out of shape may be brought back by use of an emery dresser. To use the dresser, a tool rest or other support needs to be placed close to the grinding wheel and in line with the grinder shaft.

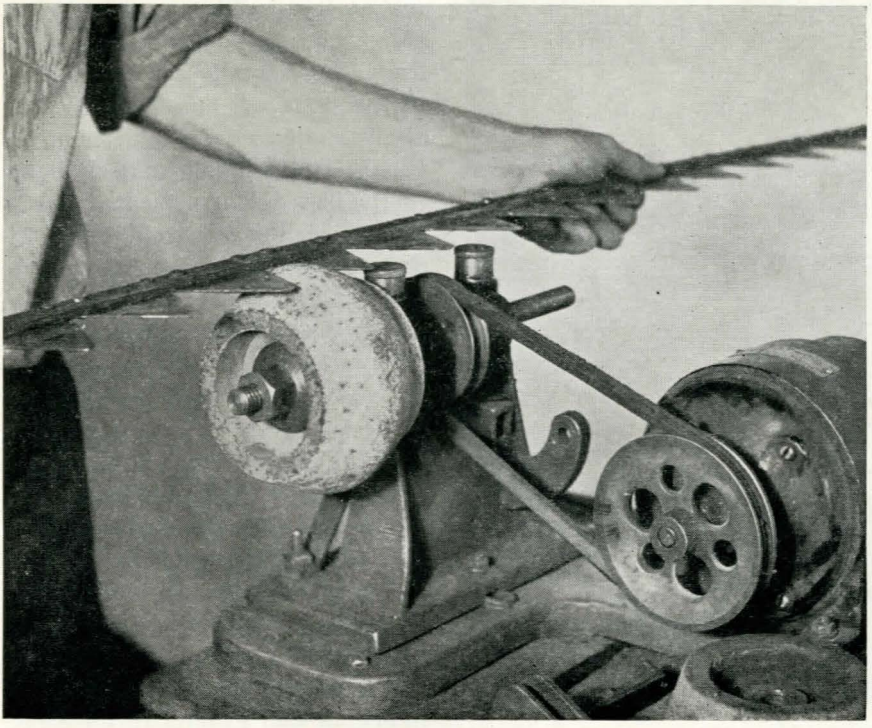

FIGURE 10. GRINDING A MOWING-MACHINE SICKLE

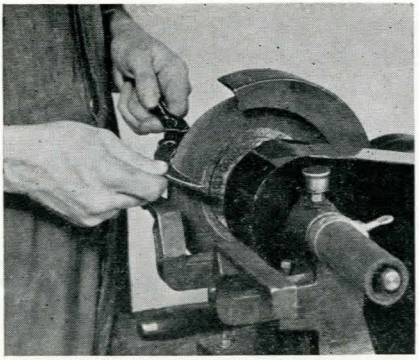

FIGURE 11. GRINDING A CUTTING BAR OF PRUNING SHEARS

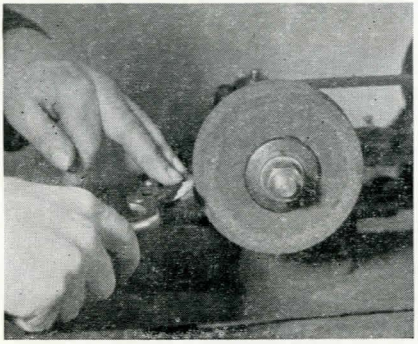

FIGURE 12. GRINDING NICKS FROM THE EDGE OF THE BLADE

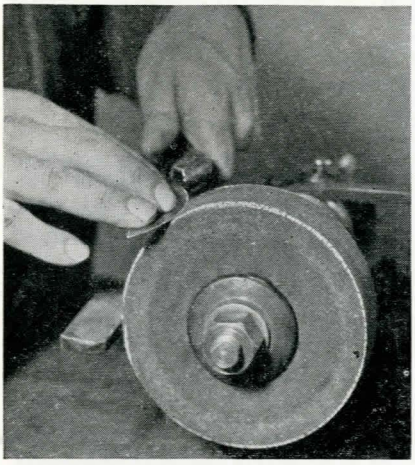

FIGURE 13. GRINDING A CUTTING BLADE OF PRUNING SHEARS

It is good practice to leave the beveled sickle cone on the shaft during the haying season and not to place it on and off more times than is necessary, as it is frequently slightly out of round when placed on the shaft.

At the close of the season's use, it should be removed and stored until the next year.

PRUNING SHEARS

To fit pruning shears, the bars need to be taken apart.

The cutting bar is then held against a round-faced grinding wheel such as a saw gummer, as shown in figure 11. The round face makes it possible to contact the entire cutting edge as the bar is drawn horizontally across the face of the stone. It must be held at a slight angle so as to under cut the edge. The grinding may be done on the flat edge of a standard grinding wheel, but the round edge of the saw gummer is far better suited. The flat surface of the bar is then honed so as to remove the wire edge. The hone is placed flat on this surface that contacts the cutting blade.

If the cutting blade is nicked, it is held flat on the tool rest with the beveled side up, as shown in figure 12, and by drawing it lightly across the stone the edge is ground down to the depth of the nicks.

The cutting blade is then held on the grinding wheel as shown in figure 13 and ground to an edge. It is moved back and forth on the

wheel so as to produce a ground surface like an axe. To hold it in one position and make a straight or hollow ground bevel would make the cutting edge too thin to stand up well. It is gradually moved right and left across the stone as the grinding proceeds to prevent the blade from heating.

To cut well, the cutting blade and the cutter bar need to make contact as they are closed. If they do not, the bar may be held in a metal vise, as shown in figure 14, and bent with a monkey wrench, or the tip of the bar may be placed in the vise and bent by bending the handle end to right or left as may be needed.

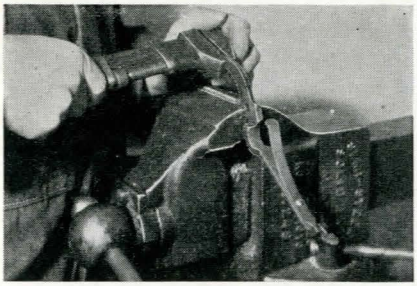

FIGURE 14. BENDING THE CUTTER BAR OF PRUNING SHEARS

HEDGE SHEARS

The blade of the hedge shears is held as shown in figure 15. The two blades are separated as far as possible, and then one is supported on the tool rest as it is drawn across the face of the grinder. The angle at which to hold the blade rests with the operator and depends on the work to be done with the shears. A long, thin edge is better suited for grass, twigs and other light work, than is a short bevel. The blade is drawn rather rapidly across the face of the grinder so that no one place is heated excessively.

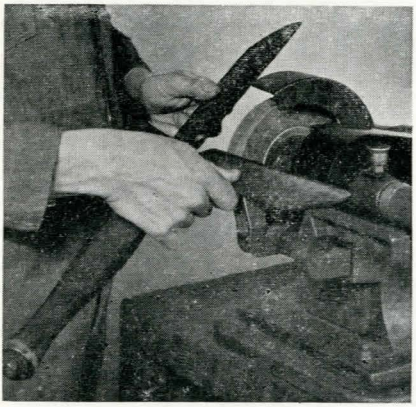

FIGURE 15. GRINDING HEDGE SHEARS

Success in the use of the shears also depends upon how the cutting edges of the blades come together as they are closed. If they do not make contact, the rivet or bolt that holds them together may need to be tightened or the blades may need to be bent toward each other. This may be done by placing a blade in the vise and bending it slightly.

To hone the blades, an oilstone is placed flat on the side of a blade opposite the bevel, and the wire edge is removed. The cutting edge is then brought to a finer edge than that made by the grinder by honing on the beveled face, as is done with a wood chisel or any other edge tool.

DRILL

A drill has two cutting lips that are ground to the same length and at an angle of 59 degrees to the axis of the drill, as shown in figure 16. The drill must have lip clearance; that is, the metal must be ground off just back of the cutting lips to allow them to contact the metal (figure 16). A tin template as at *C* is a very helpful device for testing the angle.

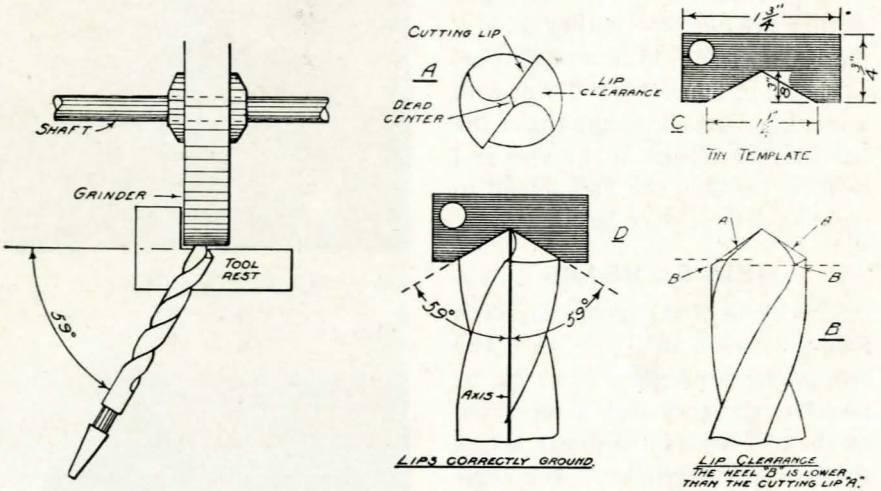

FIGURE 16. DETAILS FOR HOLDING, GRINDING, AND TESTING A DRILL

A notch is cut in the metal 3/8 inch deep and 1¼ inches wide, and the drill is ground to fit the template as at *D*.

The drill is ground by holding it in both hands, as shown in figure 17, at 59 degrees to the face of the grinder. A cutting lip is held against the face of the grinding wheel and the drill is turned slightly to the right and slightly raised to obtain the lip clearance. The operator needs to be careful not to turn it much as that will grind the edge of the other cutting lip. By turning the drill, the surface just back of the cutting lip is made slightly rounding. This is preferable to a flat surface because it makes a stronger backing for the lip and thus will stand more severe usage.

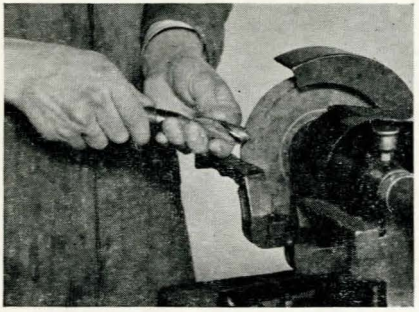

FIGURE 17. GRINDING A DRILL

The operator may need to test the angle frequently with the

template to find whether it needs to be held more to the right or left to get the correct angle.

If the drill is ground correctly, each lip will cut a spiral coil of metal as it is forced in (figure 18). In drilling large holes, it is good practice to first drill a small or lead hole, ⅛ or 3/16 inch. It is easier to thus center the hole, and the large drill will enter much easier.

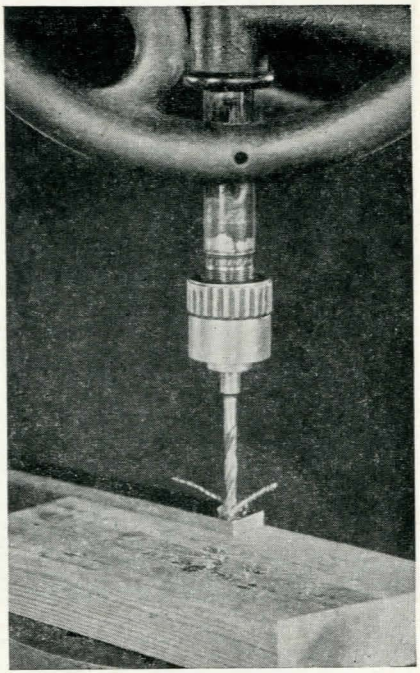

FIGURE 18. HOW A DRILL SHOULD CUT

ENSILAGE CUTTER BLADE AND SHEAR PLATE

When the edge of a shear plate of an ensilage cutter becomes worn, rounding, and smooth, and does not serve as a cutting edge, it tends to draw the material through between the cutting blade and plate and to tear instead of cut. The shear plate needs to be removed and the edge ground straight to the side with a slight undercut. It is placed flat on the tool rest of the grinder, as shown in figure 19, and moved right and left as the grinding is done, to allow the heat to be distributed along the plate and not to overheat it at any one point.

The ensilage cutter blade is held flat on the tool rest with the beveled edge up. The blade is drawn right and left across the face of the grinder, thus grinding the edge back to the depth of the nicks and irregularities. This may be done with the guard on the grinder wheel.

The guard is then removed from the wheel and the blade is held parallel to the side of the wheel, as

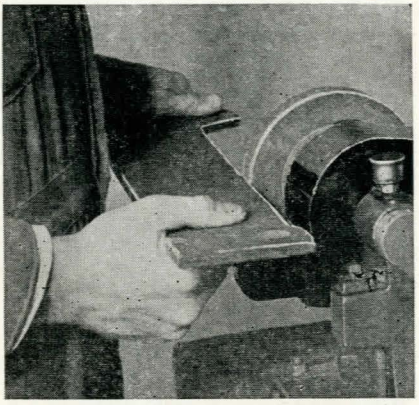

FIGURE 19. GRINDING THE SHEAR PLATE OF AN ENSILAGE CUTTER

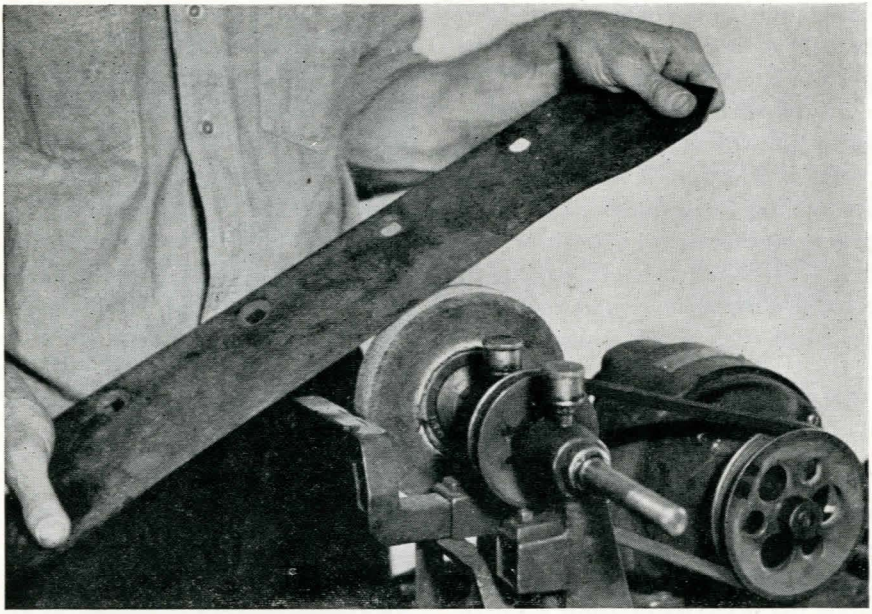

FIGURE 20. GRINDING AN ENSILAGE-CUTTER BLADE

shown in figure 20. While in this position the blade is drawn up and down, to allow the heat of the grinding to be distributed and not to become too intense on the blade at any one point. The workman needs to use his own judgment as to the length of the bevel on the blade. The sparks indicate where the grinding is being done. The bevel must be one straight surface, for a blade with a rounding surface will not cut well. The grinding is continued until the blade is brought to an edge. It is then honed as is done with an axe or other edge tool.

DISK HARROWS

A disk harrow may be ground without being taken apart. Each gang must be raised free of the floor so that it may be rotated.

It is good practice to remove the gangs from the boxes at least once a year, to renew the boxes if necessary, clean the oil holes, and do such repairing as may be needed.

The disks are ground with the gangs removed from the boxes, as shown in figures 21 and 22. The gang is raised and supported on a pair of sawhorses. Blocks of wood are nailed on the top edges of the horses at both sides of the shaft, thus making a box in which the shaft will rotate. The low sawhorses shown in figure 21 are of a height well suited for farm-machinery repair work and are made of pieces of 2 by 4's on edge.

The grinding outfit is hung, with the motor end up, by an old inner tube. The tube allows the grinder to be moved up and down and to be turned at any desired angle to the disk.

Two men do the work; one man turns the gang of disks, and the other holds the grinder to the disks as shown. The one holding the grinder presses the grinder against the disk as the other rotates it. The gang may be rotated by grasping the blades, or a wooden handle may be made to fit over the end of the shaft and then used as illustrated in figures 21 and 22.

A side of the grinding wheel is first held against the inside edge of a disk and the irregularities are removed, as shown in figure 21. The face

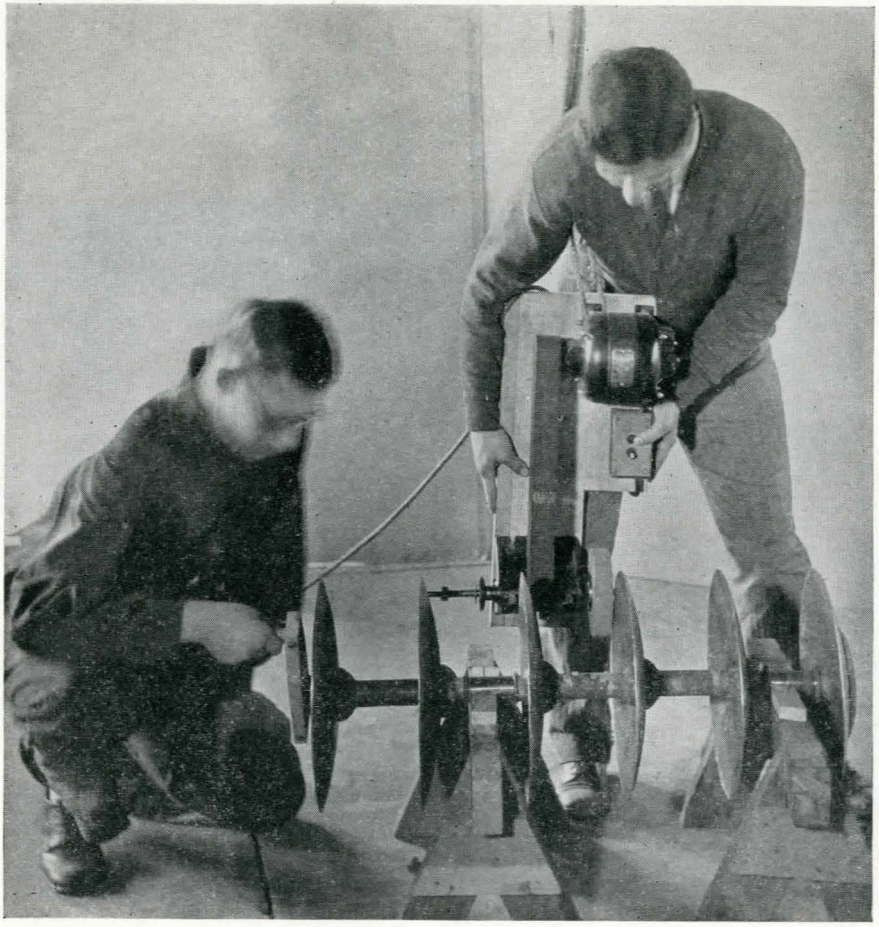

FIGURE 21. GRINDING THE INSIDE EDGE OF A DISK

FIGURE 22. GRINDING A DISK, WITH THE GANG REMOVED FROM THE BOXES

is then held on the convex side, as in figure 22, and ground as may be needed. The man needs to hold the machine at different angles as the grinding proceeds, to make the cutting edge like that of an axe. If the grinder is held in one fixed position, the edge will be keen like that of a wood chisel. A keen edge cuts sod well but does not stand up well in such work as is usually done with a disk.

CULTIVATOR SHOVEL

When cultivator shovels become thick, that is, when the edges have been worn away, they may be forged out to the required shape and again tempered or they may be ground. If ground, they are held on the

grinding wheel as shown in figure 23, and as much metal is ground from the back edges of the shovels as is necessary to restore them to a good working shape.

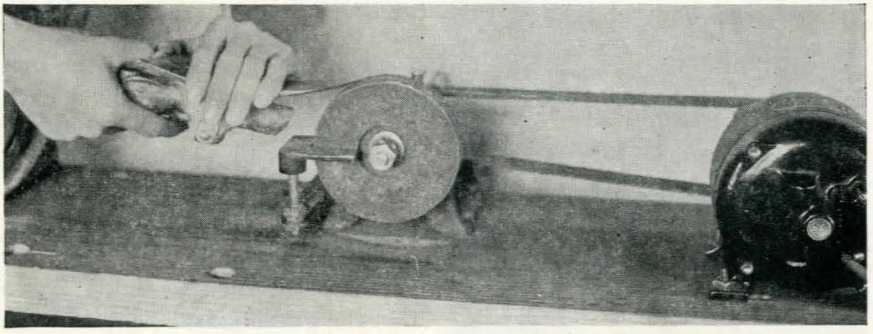

FIGURE 23. GRINDING A CULTIVATOR SHOVEL

DISC COULTER

A disc coulter is ground the same as an axe. The disc is held on the grinding wheel as shown in figure 24. By moving the disc back and forth on the grinder, the blade is ground to an edge and to the required thickness. The operator needs to be careful as he moves the disc back and forth not to draw the coulter down so far as to grind off the edge or to move it up so far on the stone as to make it too thin. By grad-

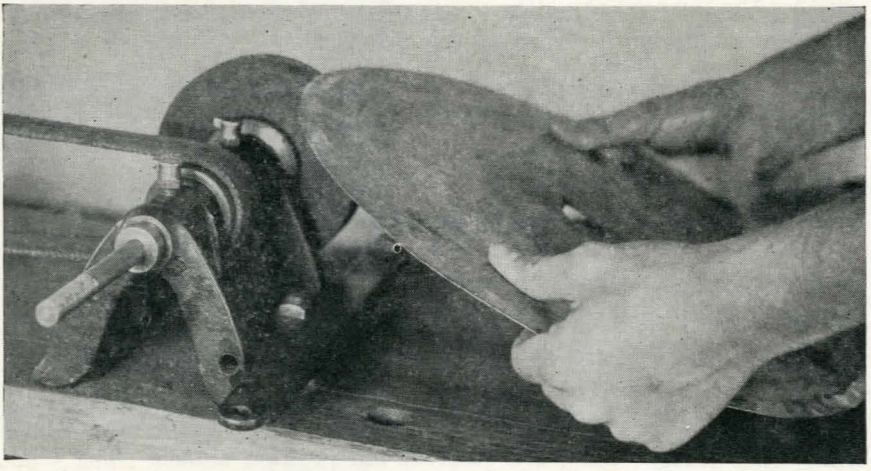

FIGURE 24. GRINDING A DISC COULTER

ually moving the disc right and left as the grinding proceeds, the heat of the grinding is distributed and does not destroy the temper of the coulter.

BUTCHER KNIFE

If the knife has nicks in the cutting edge, it is placed flat on the tool rest with the edge held square against the grinder and is ground back to the depth of the nicks. If the point has been broken off, it is held in like manner and a new point is ground.

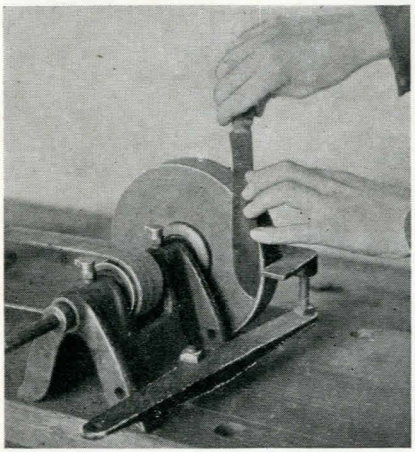

FIGURE 25. GRINDING A BUTCHER KNIFE

The knife is then held on the grinder as shown in figure 25 so that the grinding is done toward the cutting edge and diagonally away from the handle. The knife is held lightly against the grinder and is moved along from end to end rather rapidly; in this way the thin edge is not overheated. The angle at which to hold the knife must be determined by the workman. It is good practice to hold it lightly on the grinder in a certain position; note the position carefully, and then to look at the ground side to see whether the position produces the desired grinding. Both sides of the knife are ground until a wire edge is produced.

The wire edge is removed by honing with an oilstone, a whetstone, or steel. The honing is done toward the cutting edge and diagonally away from the handle.

GRASS OR SHEEP SHEARS

To grind sheep shears, the guard needs to be removed from the grinding wheel so that the blades of the shears may be held on the stone as shown in figure 26. The two blades are forced apart and then brought together with the right above the left, to allow the beveled edge of a blade to be held against the grinder. Shears are gripped firmly in the right hand and held in the position shown. The blade

on the wheel may then be held at whatever angle desired and moved back and forth to grind the full edge. By holding the blade on the grinder lightly and moving it back and forth, the heat made by the grinding is evenly distributed so as not to destroy the temper of the tool.

In honing, the oilstone is placed flat on the side of a blade opposite the bevel and the wire edge is removed. The beveled edge is then honed as is done with a wood chisel, plane iron, or any other edge tool.

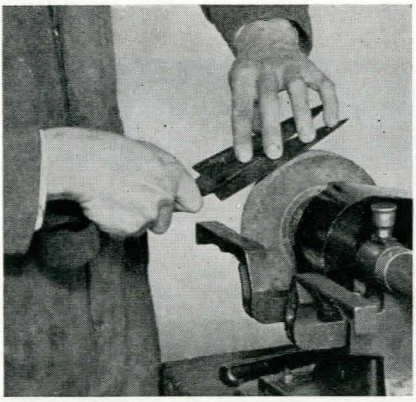

FIGURE 26. GRINDING GRASS OR SHEEP SHEARS

GRASS HOOK

If the cutting edge of a grass hook is irregular or nicked, the tool needs to be held lightly against the face of the grinding wheel and the edge ground down to the depth of the nicks. The blade is then held as shown in figure 27 and ground to a cutting edge. The guard is removed from the grinder wheel and the tool is held nearly parallel to the side of the stone. To prevent the blade from being overheated at one point, it is moved back and forth over the wheel. The workman needs to find by experience at what angle to hold the tool to obtain the proper cutting bevel. The sparks will indicate where the grinding is being done.

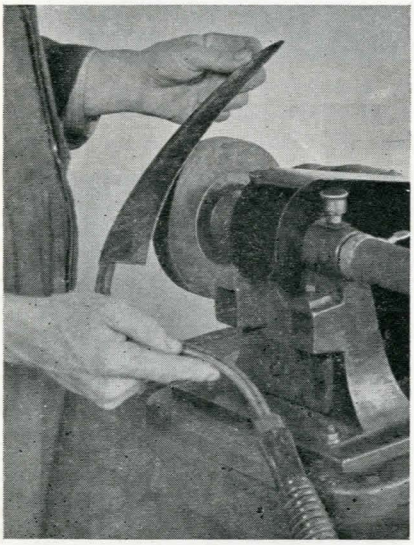

FIGURE 27. GRINDING A GRASS HOOK

In honing, the grass hook is held with the point projecting away from the operator and the scythe stone is drawn forward and down. Therefore, the serrations on the cutting edge will point toward the tip of the tool.

When through with a grinding job of this kind, the guard of the grinding wheel should always be replaced.

CLEANING AND SHARPENING AUGER BITS

An easy and effective way to clean auger bits is shown in figure 28. A strand of rope is saturated with cylinder oil and then coated or covered with fine emery dust. The bit is held rigidly in a metal vise, and the rope is wound once or twice around the bit and drawn back and forth. The oil holds the emery dust on the rope, and the dust acts as an abrasive which cleans the rust from the metal. A good way to coat the rope with the emery dust and oil is to place a quantity of the emery dust in a dish and cover it with oil, then stir it with a stick until thoroughly mixed. The rope is then put in the dish and coated.

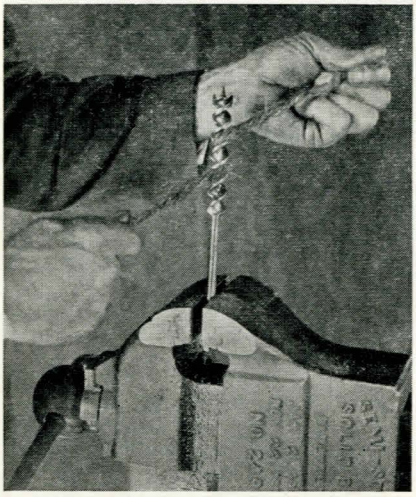

FIGURE 28. CLEANING AN AUGER BIT

The names of the parts of an auger bit are shown in figure 29.

Auger bits are sharpened by the use of a file made especially for that purpose and are called *auger-bit files.* The auger-bit file is flat and thin, and is better suited for the smaller bits than is the triangular file.

The bit is placed flat on a bench or table, and the parts of the spur which have been bent outward are filed off. This is done by holding the file as shown in figure 30. A mill file is well suited for this operation. The worker must be careful to make the file rest flat on the bit as

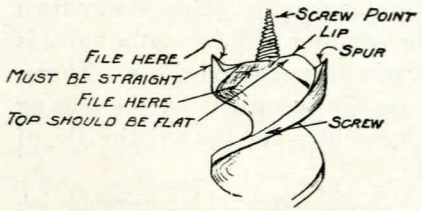

FIGURE 29. PARTS OF AN AUGER BIT

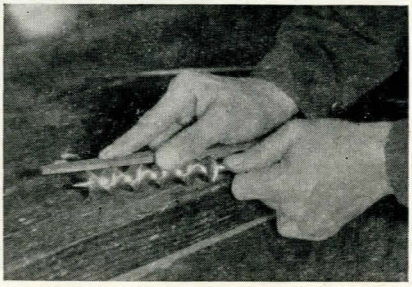

FIGURE 30. FILING THE OUTSIDE OF THE SPUR OF AN AUGER BIT

illustrated. To raise it would result in a bevel which would cut a hole smaller than the bit. The spur is then filed to an edge. This is done by holding it as shown in figure 31, filing the inside of the spur at the front or cutting edge. By examining the cutting lip of a new auger bit,

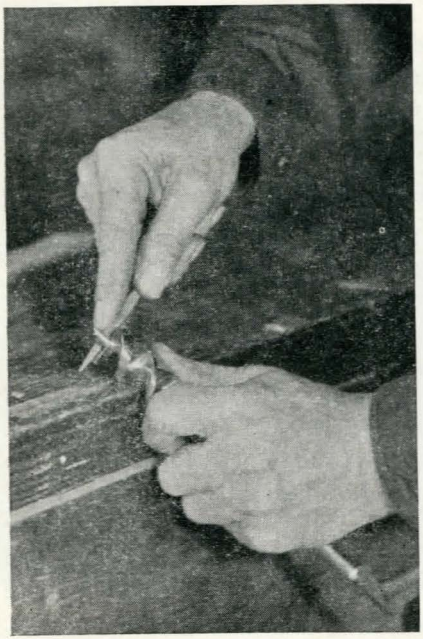

FIGURE 31. FILING THE INSIDE OF THE SPUR OF AN AUGER BIT

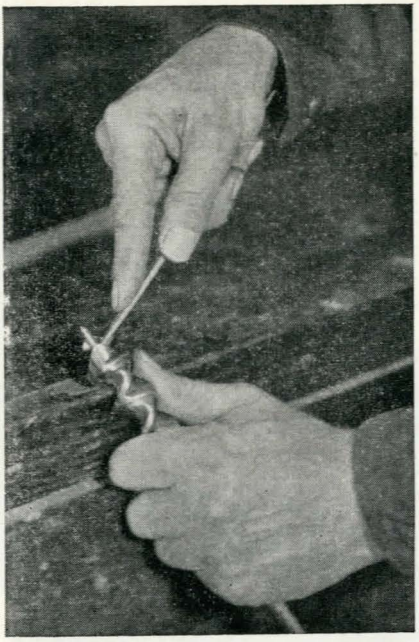

FIGURE 32. FILING THE FLAT, OR FRONT, SIDE OF THE TIP OF AN AUGER BIT

FIGURE 33. FILING THE CUTTING LIP TO AN EDGE

it will be observed that the cutting lips are shaped like wood chisels; one side is straight and the other beveled. The top or front of the cutting lip is filed flat (figure 32) at such a slope that, in cutting, the edge of the lip is the only part of this surface that touches the wood. The auger bit is then held as shown in figure 33 and the bevel filed until the lip is brought to a cutting edge. To get the proper angle at which to file the front of the cutting lip, one should compare it with the angle on the lips of a new bit. If the screw point of an auger bit becomes marred, it may be improved by running the edge of a triangular file around the thread of the screw.

CARPENTERS' PINCERS

If the cutting edges of carpenters' pincers are nicked or uneven, they may be held against the side of the grinding wheel, as shown in figure 34, and the edge ground back to the depth of the nicks.

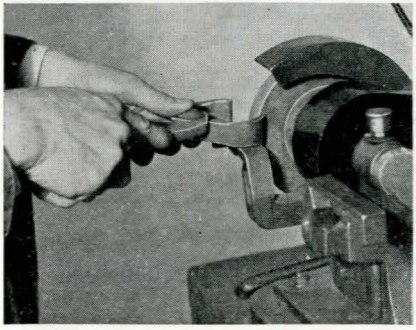

FIGURE 34. GRINDING THE CUTTING EDGES OF CARPENTERS' PINCERS

The bevels are then ground by holding the face of each jaw against the side of the stone, as shown in figure 34. To get an even bevel, the tool may need to be moved up and down slightly. The length of the bevel is regulated by the angle at which the blade is held. The grinding is continued until the face of the jaw is brought to an edge.

If the two jaws do not come together edge to edge, or if the handles are too close or bent to the right or left, the tool is placed in a

FIGURE 35. CLOSING THE JAWS OF THE PINCERS AFTER HEATING

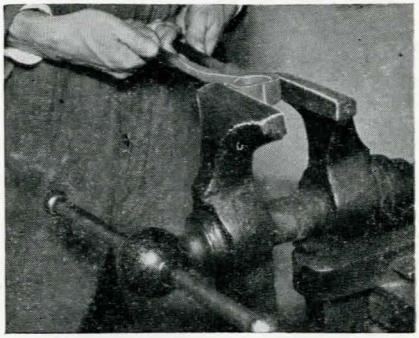

FIGURE 36. BENDING THE HANDLES AFTER HEATING

fire and, with a slow heat, brought to a cherry-red color. The jaws are then placed in a vise, as in figure 35, and drawn together by closing the vise jaws. When in this position the handles may be spread or closed or otherwise moved as necessary (figure 36).

The tool must now be hardened by heating it to a cherry-red color in a slow fire and then plunging it in water.

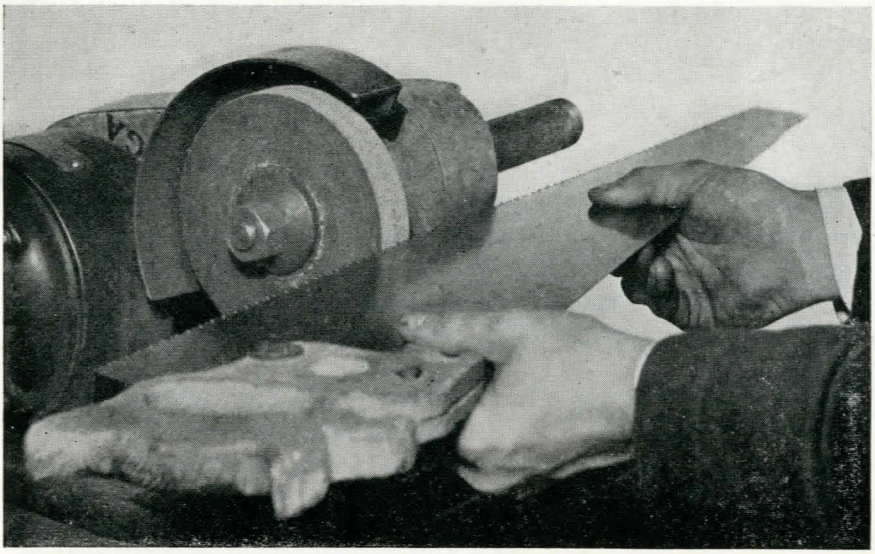

FIGURE 37. GRINDING TEETH OFF A SAW

BROKEN SAW TEETH

Frequently saw teeth are broken off so that the blade needs to be filed or ground back to the bottoms of the teeth and new teeth filed in. This may be done with a flat file, but it is a slow and laborious process. An easy method is illustrated in figure 37. The blade is placed flat on the tool rest of the grinder in line with the center of the wheel; while held lightly against the grinder wheel, the saw is moved right and left until the points of the teeth are ground to whatever depth may be desired. The teeth should not be ground off completely to a smooth edge unless they are to be made a different size. By leaving enough of the old teeth to show their spacing, the new teeth may be filed in like the old and in much less time than is needed to lay out new teeth on a blank blade.

In grinding, the operator needs to be careful to hold the blade straight against the face of the grinding wheel and not up at an angle, as that would cause the teeth to dig into the face of the stone.

WOOD CHISEL

The chisel is placed horizontally on the tool rest, with the bevel side up, and the cutting edge is ground square to the sides of the chisel and back to the bottom of the nicks. The tool should be moved right and left so that the wear on the stone will be uniform.

The chisel is then held on the stone as shown in figure 38, or on a tool rest, and a bevel is ground on one side. The chisel is held on the grinder lightly and is moved right and left. It is not moved back and forth. A ¼-inch bevel is suitable for general work. After grinding a little, the operator should examine the bevel; if it is too short, he lowers the handle end or holds it up farther on the stone. If it is too long, he raises the handle end or places it lower on the stone. The point is dipped in water frequently to cool the metal. Grinding is continued until the edge is turned and a wire edge is produced. This can be told by looking at the end or by drawing the flat side across the palm of the hand. If it is smooth, it is an indication that the edge has not been turned. The turned edge will slightly scratch the hand.

The chisel is then held on the oilstone, as shown in figure 39, and honed to a cutting edge. It is held so that a new, shorter bevel is made. Three or four forward strokes are made with the chisel held firmly against the stone.

The chisel is then placed in a horizontal position, with the flat side on the stone, and by three or four forward strokes the wire edge is removed.

The chisel is tested in a piece of soft wood. If the cut leaves a smooth surface, the chisel is sharp. If marks show on the wood, a few more strokes on the oilstone are needed.

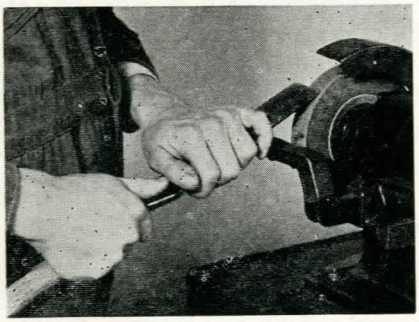

FIGURE 38. GRINDING A WOOD CHISEL

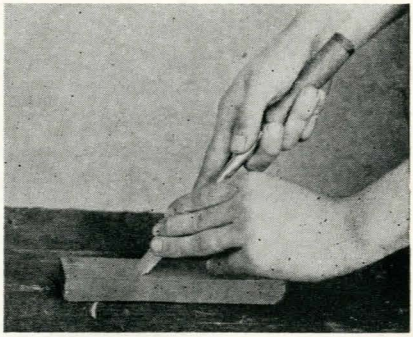

FIGURE 39. WHETTING A WOOD CHISEL

PLANE BIT

The plane bit is placed horizontally on the tool rest, with the bevel side up, and the cutting edge is ground back to the bottom of the nicks. The cutting edge of a plane bit is not square across, that is, at right angle to the edges, as is a wood chisel, but needs to be convex so that there are no corners to project through the throat of the plane. If the edge were ground square and projected through the throat, it would plow grooves in the board.

The plane bit is held as shown in figure 40 to make a bevel of 25 or 30 degrees. This is about twice the thickness of the blade. The bit is moved right and left, but not forward and back in the grinding operation. The tool is held on lightly and cooled in water frequently during the grinding process.

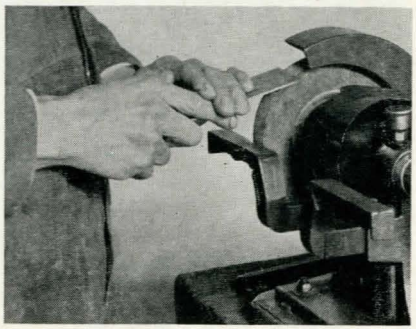

FIGURE 40. GRINDING A PLANE IRON

The plane bit is then held firmly in both hands on the oilstone at an angle of 30 or 35 degrees. This makes another bevel shorter than the first. It is given three or four firm forward strokes and then placed flat on the stone with the straight side down and given three or four forward strokes to remove the wire edge.

Some workmen prefer a tool rest for holding the plane bit while grinding, but it is worth while to learn how to hold it free-hand, as a tool rest is not always at hand.

USING A WIRE BRUSH

A wire brush may be used to remove the carbon from valve heads and stems, and rust and paint from tools and machinery parts. Its application is shown in figures 41 and 42. Whenever the whole grinding outfit is used, as in figure 42, it is suspended from above with a rope and an old inner tube. As the tube is stretched and hung from above, it is possible to move the brush about as needed without the operator bearing the weight of the motor.

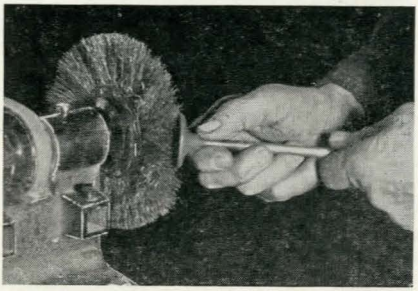

FIGURE 41. CLEANING A VALVE HEAD WITH A WIRE BRUSH

FIGURE 42. CLEANING A MOLDBOARD OF A PLOW, WITH A WIRE BRUSH

DRAWSHAVE

The first thing to do in fitting a drawshave is to see whether there are nicks in the cutting edge. If so, the tool is placed flat on the tool rest, with the cutting edge square against the face of the grinder, and by drawing the tool lengthwise across the face of the wheel, the edge is ground back to the depth of the nicks. If, on examination, no nicks appear, this step is not necessary.

A good position for holding the tool for grinding is shown in figure 43. The blade is held on the face of the grinder parallel to the side and moved back and forth. It is good practice to hold the tool on the face of the grinder at what

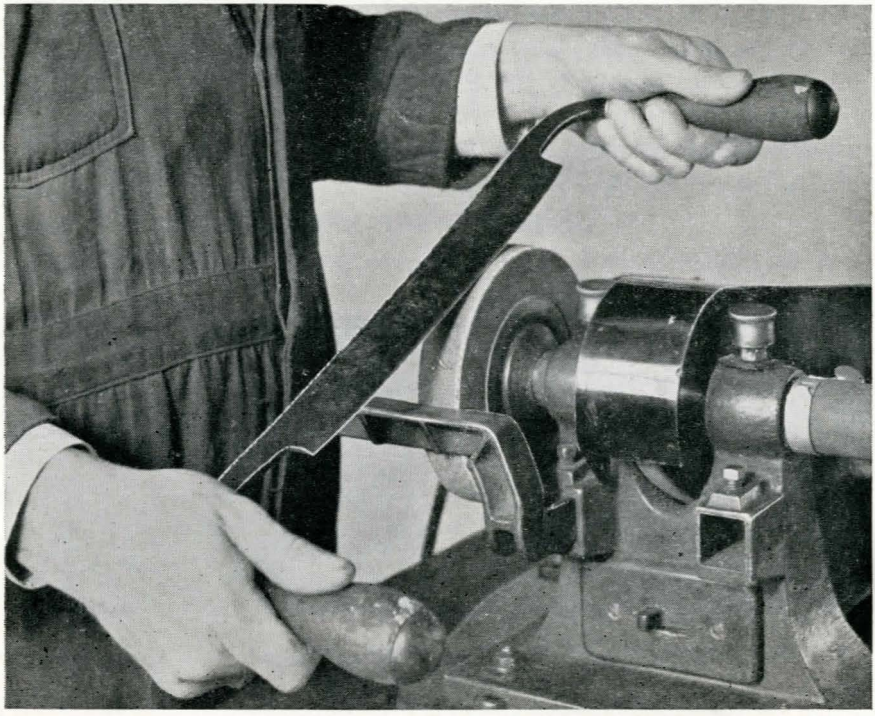

FIGURE 43. GRINDING A DRAWSHAVE

appears to make the correct bevel, to note the position carefully, then to look at the result to make sure that the position is right before any more grinding is done. Holding the tool on lightly and moving it back and forth prevents heating the blade and drawing the temper. The grinding is continued until the tool has been brought to an edge.

After the tool has been ground to an edge it is honed as shown in figure 44. A flat oilstone is better suited for this work than is a whet-

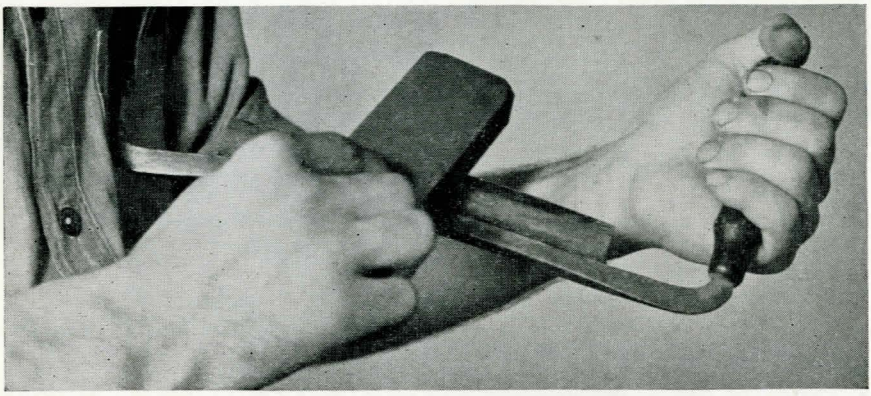

FIGURE 44. HONING A DRAWSHAVE

stone. The oilstone is held flat on the flat side of the drawshave and the wire edge removed. The tool is then held with one end under the left shoulder as illustrated and, with the stone held so as to produce another bevel shorter than the one made with the grinder, the tool is honed to an edge.

The guard needs to be removed from the grinder wheel for grinding a drawshave so that the tool may be held parallel to the side of the wheel.

SKATES

To grind skates a narrow tool rest needs to be provided so that the blade of a skate may be drawn across the face of the grinder in line with the center of the shaft. The wire edge may be removed with an oilstone. The dimensions for a tool rest for skate sharpening suited for this particular grinder are shown in figure 45. The skate is held firmly in both hands with the side of the blade parallel to the floor and drawn lightly across the face of the grind-

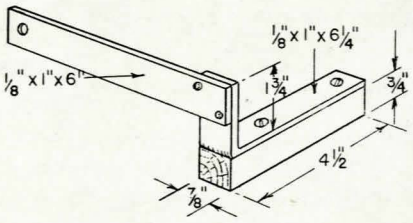

FIGURE 45. TOOL REST FOR SHARPENING SKATES

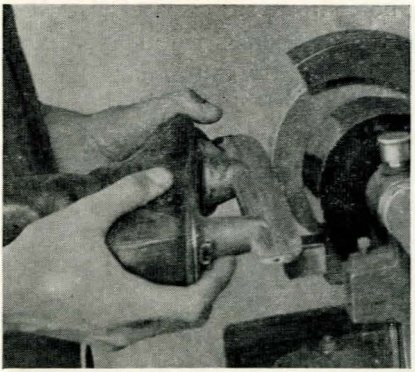

FIGURE 46. SHARPENING SKATES

ing wheel, as shown in figure 46. The operator needs to hold his forearms firmly against the body and swing the body pivoted at the ankles. He needs to note the position carefully so that the skate may be replaced on the tool rest in the same position for each stroke that the blade needs to be drawn across the wheel.

A wheel of fine grit is better suited for this work than the medium or coarse stones that are used for general grinding work.

SHEARS

Shears may be ground on a high-speed grinder.

The tool is held firmly in both hands, as shown in figure 47, so as to grind an angle of about 30 degrees if the shears are to be used for cloth.

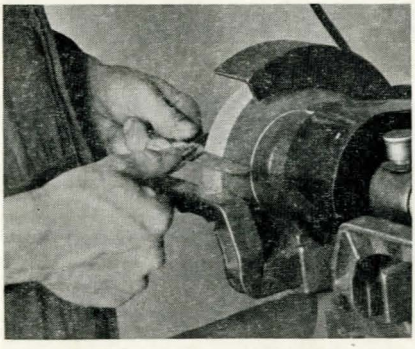

FIGURE 47. GRINDING SHEARS

Each blade is held on lightly and drawn rapidly across the face of the stone.

In removing the wire edge, the oilstone is placed flat on the flat side of each blade and manipulated until the surface is smooth.

On the beveled side, it is held at the same angle as the original ground bevel.

In holding the shears, the forearms are held firmly against the body and the tool is drawn across the face of the wheel by moving the body. This makes it possible to hold the shears in a fixed position.

HAYKNIFE

The cutting part of a hayknife consists of a number of short cutting edges such as wood chisels. To grind the cutting edges, the guard needs to be removed from the grinder wheel so that the edges may be held as illustrated in figure 48. Both sides of each knife are ground to an edge: one side as shown in figure 48, and the other by turning the knife over, as in figure 49.

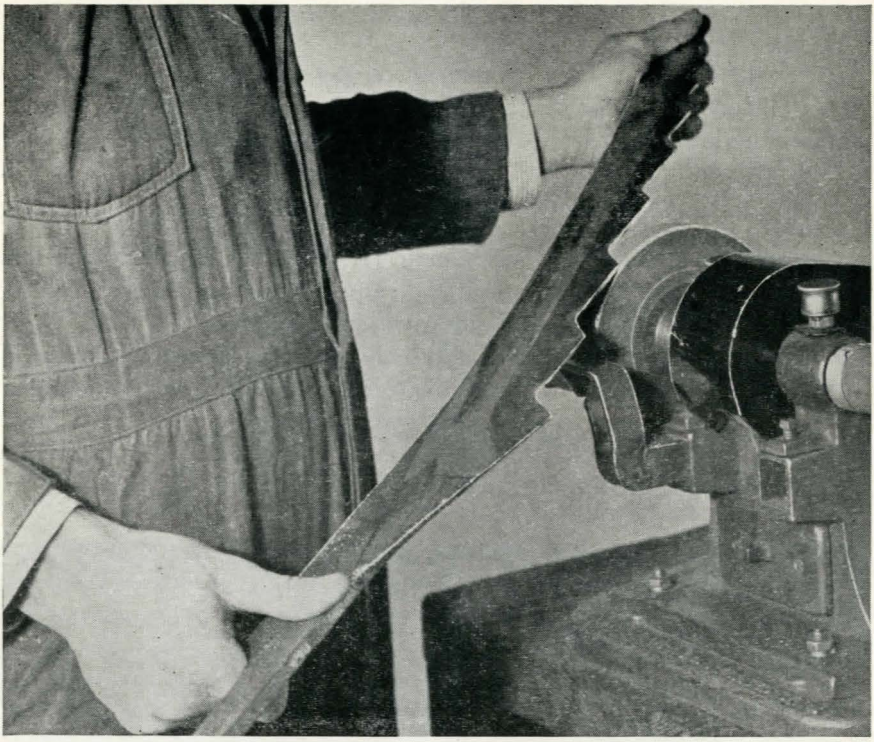

FIGURE 48. GRINDING A HAYKNIFE

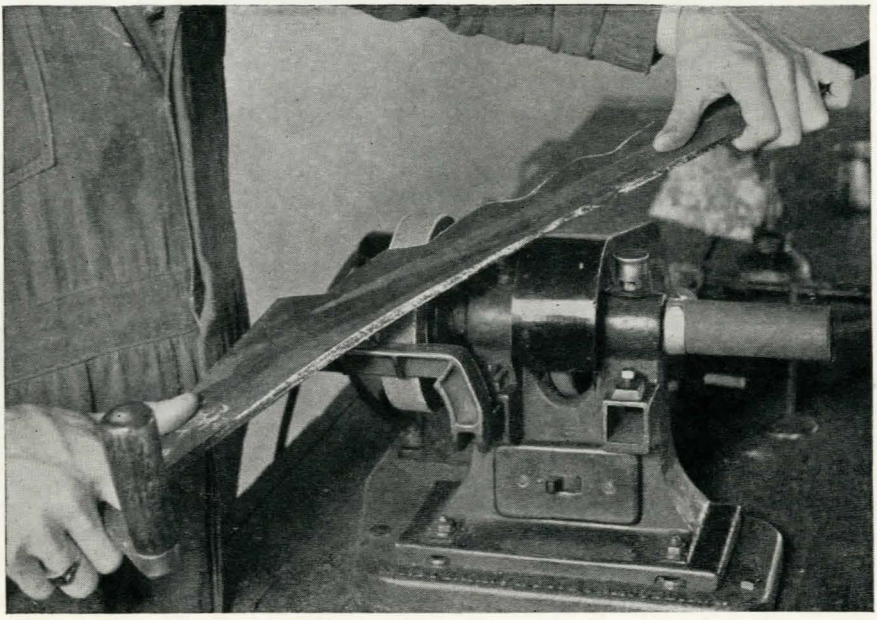

FIGURE 49. GRINDING A HAYKNIFE

After the knife has been ground, the edges may be honed by the use of an oilstone, as is done with any other edge tool, moving the oilstone against the knife instead of the knife against the stone.

TABLE OF SPEED FOR WHEELS

The number of revolutions per minute (R.P.M.) for specified diameters of wheels, to cause them to run at the respective surface speeds of 4000, 5000, and 6000 feet per minute, are given in table 1.

The medium of 5000 feet is usually employed in ordinary work, but in specific cases it is sometimes desirable to run wheels at a lower or higher rate, according to requirements. As there is danger that too high a speed may cause the wheel to fly to pieces, it is recommended that no wheel be run at a surface speed greater than 6000 feet per minute.

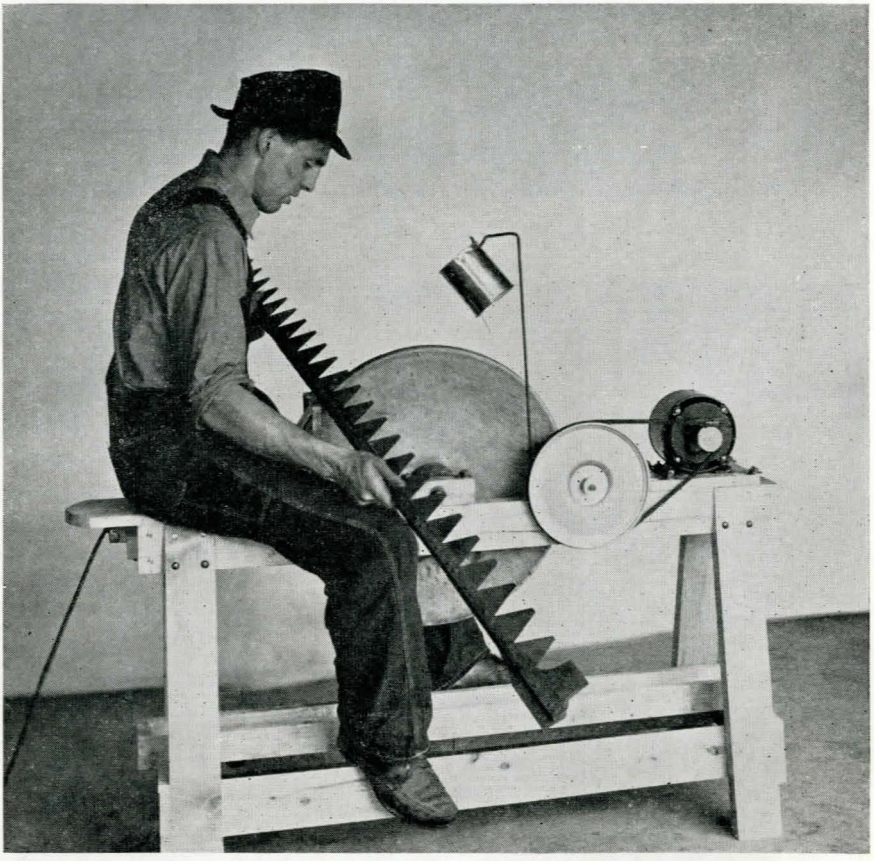

FIGURE 50. GRINDING A MOWING-MACHINE SICKLE, WITH A MOTOR-DRIVEN GRINDSTONE

TABLE 1. SPEED FOR WHEELS

Diameter of wheel	Surface speed of 4000 feet	Surface speed of 5000 feet	Surface speed of 6000 feet
Inches	*R.P.M.*	*R.P.M*	*R.P.M.*
1	15,279	19,099	22,918
2	7,639	9,549	11,459
3	5,093	6,366	7,639
4	3,820	4,775	5,730
5	3,056	3,820	4,584
6	2,546		3,820
7	2,183	2,728	3,274
8	1,910	2,387	2,865
10	1,528	1,910	2,292
12	1,273	1,592	1,910
14	1,091	1,364	1,637
16	955	1,194	1,432

MOTOR-DRIVEN GRINDSTONE

Many workers would rather grind their tools on a grindstone than on an emery grinder. There is not the danger of damaging the tools by

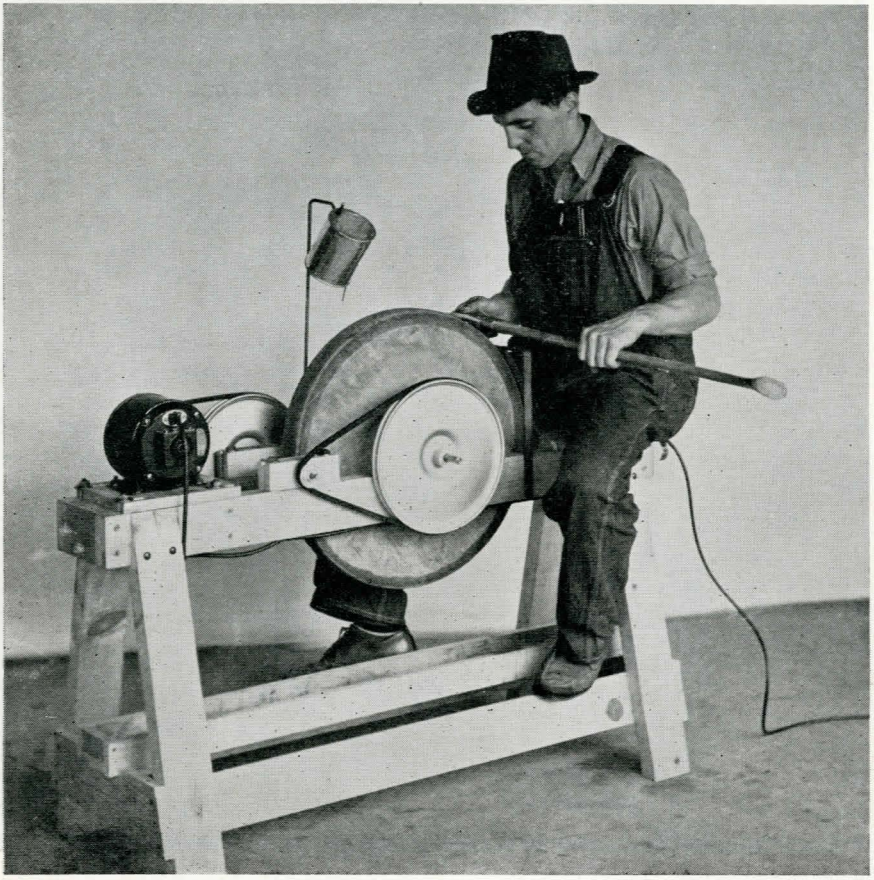

FIGURE 51. GRINDING AN AXE, WITH A MOTOR-DRIVEN GRINDSTONE

drawing the temper. The objection to the hand power required may be overcome by the use of a motor, as illustrated. By its use much of the grinding that attends farming can be done and the operator experiences pleasure in doing the work.

The grindstone frame may be built of material and with tools usually at hand or available locally. If the belts and pulleys cannot be obtained at local stores, they may be had from the mail-order houses.

Grindstone frame

Bill of materials

4 pieces, 2″ x 4″ x 2′–3″, for legs.
2 pieces, 2″ x 4″ x 4′–3″, for sills.

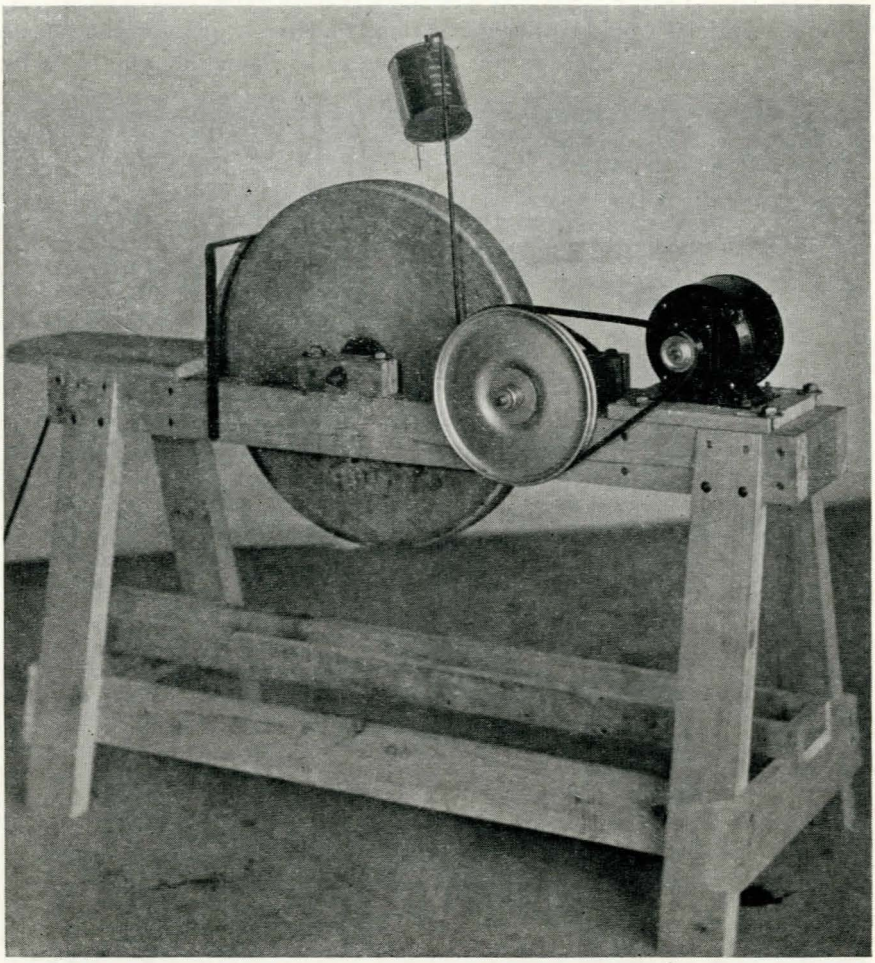

FIGURE 52. SIDE VIEW OF A GRINDSTONE—MOTOR ASSEMBLY

4 pieces, 2″ x 4″ x 4½″, for cross pieces of frame.
2 pieces, 1″ x 4″ x 3′–11″, for braces.
2 pieces, 1″ x 4″ x 21″, for end braces.
1 piece, 1″ x 4″ x 4′–0″, for bottom of box.
2 pieces, 1″ x 1¾″ x 4′–2″, for sides of box.
2 pieces, 1″ x 1¾″ x 4″, for ends of box.
4 pieces, 1″ x 1″ x 6¼″, for furring to hold box in place.
1 piece, 1″ x 8″ x 16″, for seat.
4 pieces, maple 1¾″ x 2″ x 7″, for boxes.
1 piece, 1″ x 8″ x 9½″, for motor base.
1 piece, ¼″ x 1″ iron 32″ long, for tool rest.

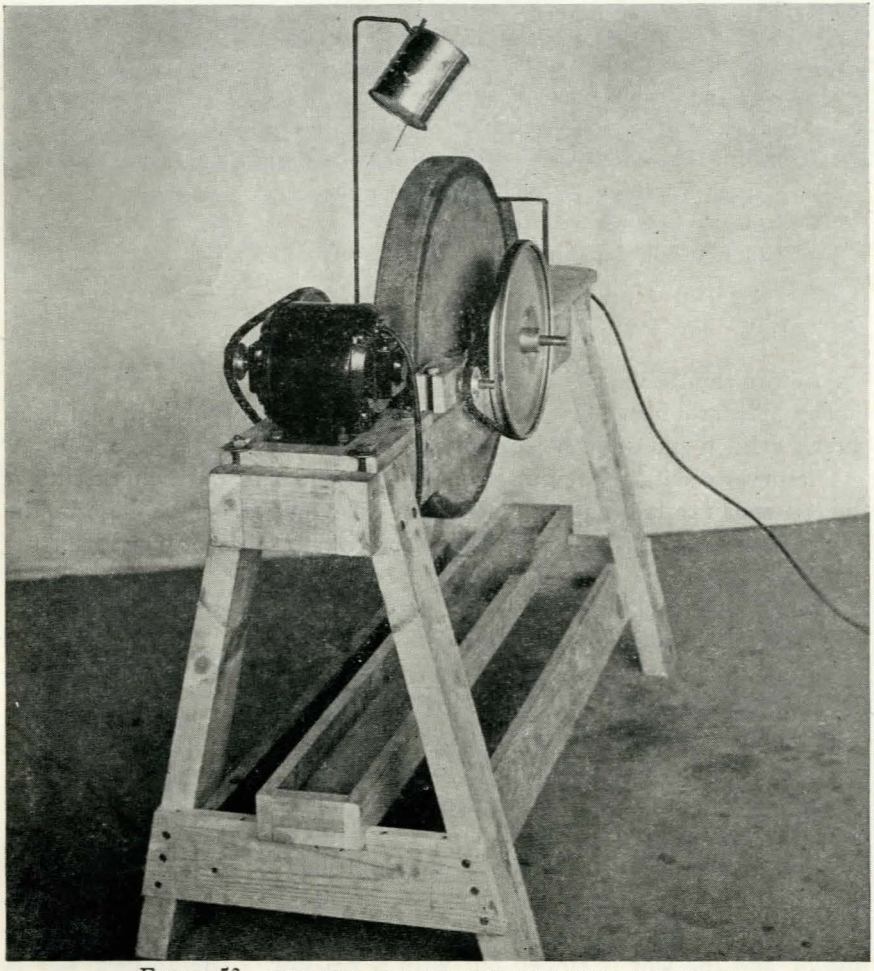

FIGURE 53. END VIEW OF A GRINDSTONE—MOTOR ASSEMBLY

4—1-inch No. 8 or 9 round-head wood screws, to attach tool rest.
8—⅜" x 6" machine bolts, to attach boxes to frame.
8—⅜" x 3" carriage bolts, to attach legs.
4—⅜" x 5" carriage bolts, to attach motor base to frame.
3 dozen, 1½-inch No. 10 flat-head screws, to attach legs, seat, and braces.
16—3-inch No. 14 flat-head screws, to assemble frame.
1 piece, ¼-inch iron 26 inches long, to hold water can.
1 water can.
2 dozen, 6-penny box nails, to assemble box.
1 piece, sheet metal 3" x 9", for splash board.
1 piece, ⅝-inch cold rolled shafting 12 inches long, for grindstone shaft.
1 piece, ½-inch cold rolled shafting 12 inches long, for countershaft.
1—12-inch V pulley, ⅝-inch bore, for grindstone (D).
1—10-inch V pulley, ½-inch bore, for countershaft (C).
1—2½-inch V pulley, ½-inch bore, for countershaft (B).
1—1¾-inch V pulley, ½-inch bore, for motor (A).
1—48-inch V belt for grinder.
1—42-inch V belt for motor.
1—¼-horsepower motor.
1—switch and cord.

Directions

Any firm lumber may be used for the frame.

The sills are fastened to the cross pieces with two 3-inch flat-head screws at each end of each cross piece.

The beveled cuts at the bottom ends of the legs and the cheek cuts at the top ends are laid out by placing the steel square on the edge of the 2-by-4-inch wood as shown in figure 55 with the dimensions 13 on the blade and 3¼ inches on the tongue.

Two ⅜-by-3-inch carriage bolts and two 1½-inch No. 10 flat-head screws are used to fasten each leg to a sill.

All of the bottom braces are fastened to the legs with 1½-inch No. 10 flat-head screws, three at each end of each piece.

The box is made of a 4-inch board, ripping it to two pieces of equal width for the sides and ends. Box nails are used to assemble it.

The grindstone is fastened to the shaft by means of set screws in the collars of the flanges at each side of the stone.

Maple boxes are well suited for the shafting. It should be noted in the detail drawing (figure 55) that a ½- by 2-inch slot is made in each end of each block. To do this ½-inch holes are bored through the blocks, and the slot is ripped out with a rip saw. The ½-inch slot is preferable to one ⅜-inch wide because it aids in lining up the shaft.

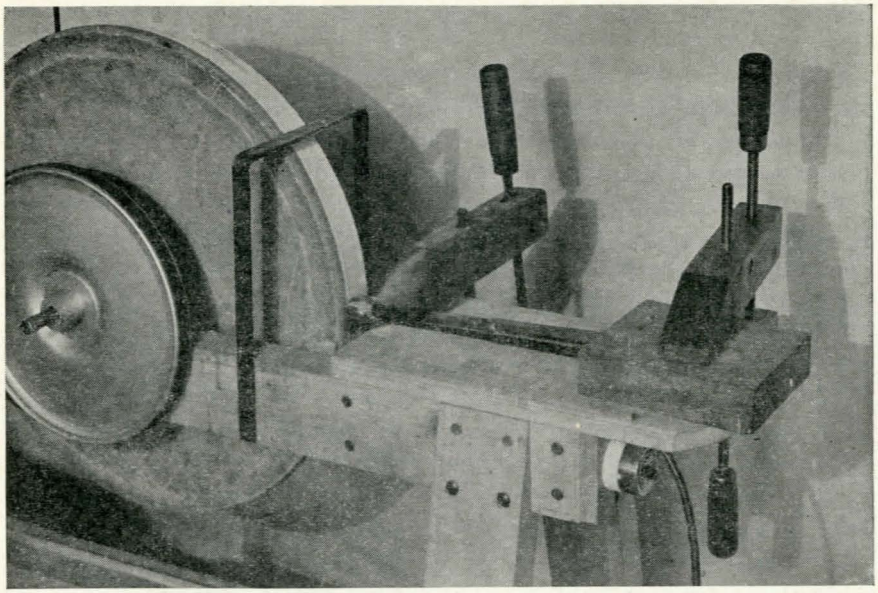

FIGURE 54. USING AN EMERY DRESSER TO TRUE UP A GRINDSTONE

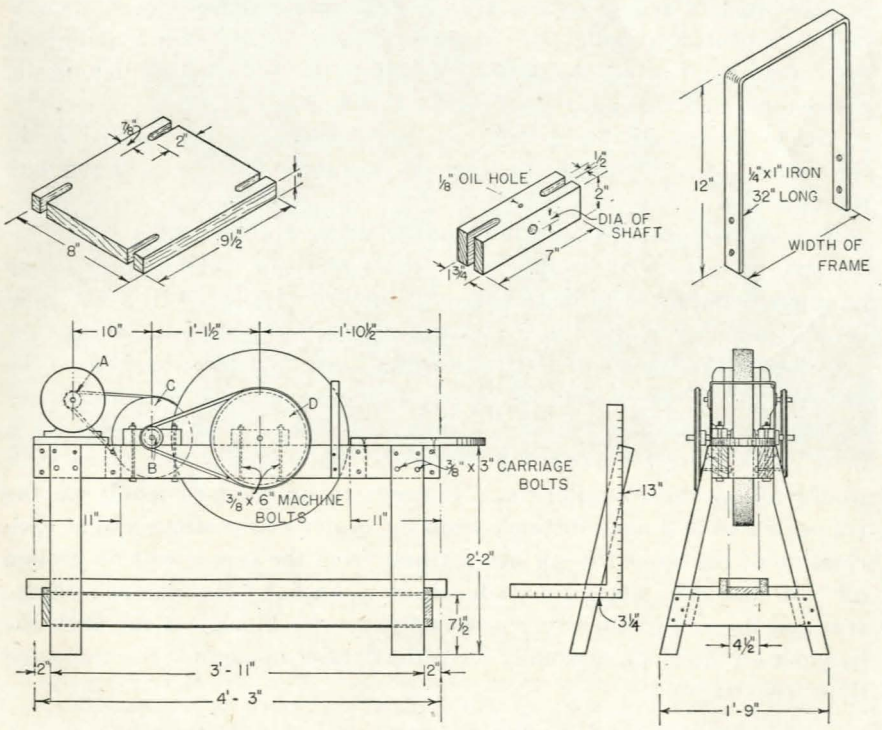

FIGURE 55. CONSTRUCTION DETAILS OF THE GRINDSTONE FRAME

It is essential that the holes for the shafts be straight to prevent the shaft from binding. A ⅛-inch oil hole is bored in each box.

Dimensions for placing the boxes on the sills are shown in the drawing of the side view (figure 55). The slots in the boxes are to allow tightenening the belts, and the boxes should be so placed on the sills to make this possible.

Slots ½-inch by 2-inches are made in the motor base to provide a means of tightening the motor belt.

One end of the seat piece is rounded and the board is fastened to the sills, close to the stone, with screws.

One-fourth-inch iron may be bent cold to the shape shown in the detail drawing for the tool rest. It is fastened to the sides of the sills with round-head screws, placing it close to the stone.

The sheet-metal splash board is fastened to the end of the seat with two round-head screws. It is bent so that the upper end fits under the top of the tool rest.

As shown (figures 51 to 54) the switch is placed under the seat and is attached to the end of the frame.

A 1¾-inch V pulley on the 1725 R.P.M. motor drives the 42-inch V belt on a 10-inch V pulley on the countershaft. A 2½-inch V pulley on the countershaft drives the 48-inch V belt on the 12-inch V pulley on the grindstone, thus making the stone run about 65 R.P.M.

The lower end of the ¼-inch iron rod is placed in a ¼-inch hole in the frame. A nail is placed in a hole in the bottom of the can to regulate the flow of water.

At least two coats of outside paint should be applied to the frame.

Some users of grindstones prefer to have them run in water. The box may be attached to make this possible if so desired. It is not good for a grindstone to stand partly in water as it may soften the stone.

If the surface of a grindstone becomes hard or coated, it needs to be dressed. If it becomes out of round, it needs to be trued up. Both may be done with an emery dresser, as shown in figure 54. The work cannot be done by merely holding the dresser by hand against the stone as it would follow the irregularities. It needs to be clamped firmly on the frame or seat at a fixed distance from the center of the stone, and at each rotation of the stone the surface farthest from the center will be ground off. It should be noted that a block of wood has been clamped on the seat and the end of the dresser rests against the block. A tap with the hammer on the block gradually feeds the dresser up against the stone and thus trues it up.

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