

# THE FARM SHOP



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# The Farm Shop

The construction, maintenance, and repair of farm equipment should receive more attention than it does on many farms. It is probably a conservative estimate that an efficiently used farm shop will save at least one hundred dollars yearly on the average farm. This estimate includes savings from having machinery in good repair so that there will be fewer breakdowns and therefore less loss of time and crops. A certain amount of repair work can be done without a shop, but there are many advantages in having the tools and equipment arranged in an orderly manner under one roof. The farm shop provides a comfortable place in which to work on rainy days, and, if heated, it makes an ideal place in which to do overhauling and repairing during the winter months.

The well-equipped farm shop will serve as the center of activity for a great variety of repair and construction jobs in wood, metal, leather, rope, and concrete. Auto and tractor repairing, glazing, soldering, simple plumbing, and electrical jobs can also be performed more readily because of a well-equipped shop.

Farm machinery can be made to last many additional years if it is systematically overhauled, repaired, and repainted. A complete overhauling includes the cleaning of all parts; the application of heavy oil or grease to the bright parts so that they will not rust; the changing of oil and grease in all bearings; the tightening of nuts; straightening of bent rods; the replacing of broken or worn parts; the sharpening of sickles, discs, cultivator shovels, colters, and plow shares, and the repainting of both wooden and metal parts.

Many construction jobs can be done with the aid of woodworking tools and lumber. Farm equipment such as hog feeders, poultry mash feeders, water stands, nests, hay racks, lawn furniture, tool kits, supply cabinets, sawhorses, feed racks, loading chutes, eveners, singletrees, gates, and ladders can be made by the man or boy who is handy with tools. The repair of farm buildings as well as the construction of new buildings will be more easily handled because of a well-equipped shop.

A little time and money spent in repainting farm buildings will pay big dividends by increasing the useful life of the buildings, and, at the same time, improve the appearance of the farmstead.

There will always be a need on the farm for concrete work such as footings, foundations, feeding floors, water troughs, steps, sidewalks, fence posts, and other projects in concrete.

Equipment for leather work will enable the farmer to splice a broken strap, repair a broken tug, sew a ripped horse collar, or replace a broken buckle, snap, or ring.

Some farms will have very little need for plumbing tools. However, where a water system is installed in the house or the barn, there will be an occasional repair or installation job. Faucets will have to be

rewashed and repacked, and pipes will have to be cut, threaded, and assembled.

If a forge is available, it will be handy for various repair jobs on farm machinery. It will aid in straightening and bending rods, in welding, in tempering, and in shaping iron for tools, horseshoes, and miscellaneous repair parts.

Farm repair, construction, and maintenance jobs will also include the overhauling of the tractor, auto, and the gas engine; the soldering of holes and joints in milk cans, kitchen utensils, and galvanized iron roofing, eave troughs, and conductors; the building and repairing of farm fences, and the replacing of broken window glass.

### CARE OF THE SHOP AND EQUIPMENT

The usefulness of a farm shop depends largely upon the condition in which the shop and equipment are kept. There is little incentive to work in a shop where the bench and floor are covered with an accumulation of dust, shavings, bent and rusty nails, and worn-out machine parts. Tools and other equipment should always be put back in their proper places after they have been in use. Much time will be wasted if it is necessary to hunt through a lot of shavings for a small tool that is carelessly left lying around.

Not only must the shop be kept clean and orderly, but the tools and equipment must be used for the purposes for which they were intended. To use a chisel for a screwdriver, a hammer to drive a chisel, or a pair of dividers to open a can of paint is a sign of a poor workman, and such abuse of tools will make them unfit for service.

Edge tools must be kept sharp, for a dull tool not only does poor work, but discourages the worker. With a tool grinder and an oilstone as a part of the equipment, it takes only a few minutes to put a good edge on the tools. The saws must be sharpened when they become dull. Auger bits have to be filed occasionally, and drills should be ground.

To prevent tools from rusting, keep them in a dry place and apply a light coating of lubricating oil. If rust has already formed, it can be removed by scouring with pumice stone and water or with a piece of emery cloth.

If the head of a cold chisel, wedge, punch, or similar tool becomes mushroomed, there is danger in using it as small iron chips may break loose and penetrate an eye or cause a severe flesh wound. The tools can be made safe for use by grinding off the cracked portions of the heads.

### LOCATION

It is important that the farm shop be properly located with respect to the other farm buildings. The type of building which houses the farm shop will also influence the location. A combination shop and garage should be located a short distance from the back door of the

house, because a large percentage of farm activities center around the family car or truck.

If the farm shop is a part of a building used for sheltering farm machinery, it should preferably be on the end nearest the house, as many of the repair and construction jobs will originate with activities related to the home. This type of structure should be located between the horse barn and the road leading to the fields, to save time in handling the farm machinery.

Other factors, such as the general appearance of the farmstead, adequate drainage, drifting snow, the location of windbreaks, and the possibilities for future additions should all be kept in mind when planning the location of the farm shop.

**TYPE**

There is no one standard type of farm shop, altho they can, with few exceptions, be classified into four groups or types. One type is the

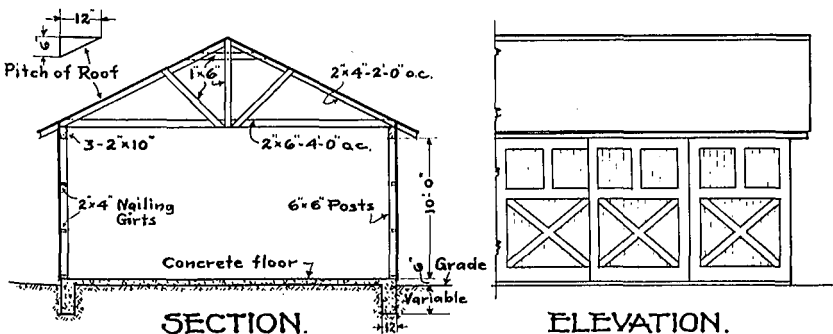
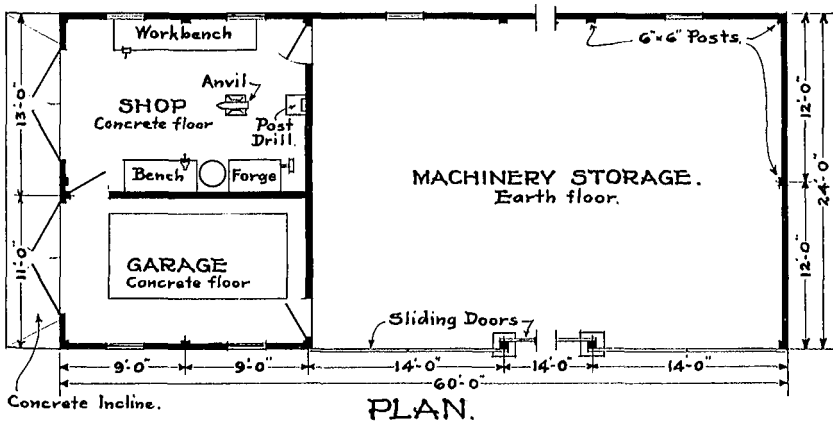


FIG. 1. PLAN 208, MACHINE SHED, SHOP, AND GARAGE

combination machine shed, garage, and shop. Figure 1, Plan 208, shows this type of building. Much can be said in favor of this arrangement. It brings together, under one roof, the tools and equipment to work with and the machinery to work on. It also decreases the number of buildings needed, which usually means a saving in building costs as well as an improved appearance of the farmstead. With this type of building it is advisable to have a wall between the shop and the garage.

A second type of building combines the machine shed and the shop. Where a garage has already been provided, or where it may be desirable to have the garage built close to and in harmony with the house, this second arrangement is desirable.

A third type consists of a separate building for housing the tools and other shop equipment. If this building is large enough to permit bringing in farm machines, it will make a satisfactory shop. Any fire hazards common to farm shops would be confined to a single unit.

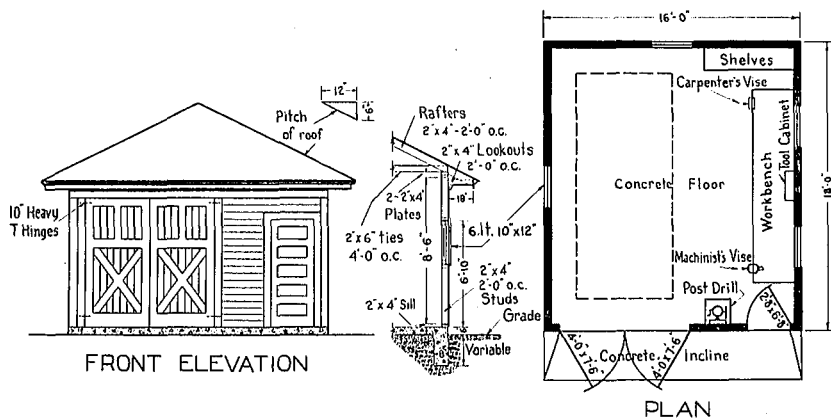


FIG. 2. PLAN 311, GARAGE AND SHOP

A fourth type combines the garage and the shop. Figure 2, Plan 311, illustrates this type. This arrangement is satisfactory, provided the garage is built large enough to accommodate the shop equipment and provide sufficient working space.

In addition to the four types of buildings mentioned, there are other arrangements, a few of which are good, but many more are very inefficient.

## SIZE

The size of a farm shop is influenced by a number of factors. The type of building in which the shop is housed often determines one or more dimensions. The best width for a machine shed or the length of a car will influence the size of the shop. The shop must not be too small, for its usefulness depends upon the amount of space provided. There should be sufficient space for the tools and equipment and enough additional floor area to accommodate one or more farm implements.

For a combination garage and shop, the floor should be at least 12x18 feet, altho 18x20 feet is better. If the shop is a part of the machine shed, one dimension will usually be 18 feet and the other will vary between 14 and 20 feet. The shop should be made slightly larger than the minimum requirements demand, as any extra space can be utilized for the storage of miscellaneous farm equipment such as crow-bars, hoes, rakes, scythes, chains, shovels, and axes.

## CONSTRUCTION

**Building materials.**—The farm shop may be of frame construction, or it may be of fireproof materials such as brick, tile, or concrete blocks. There is always some danger of fire from the presence of oil, grease, and shavings in a building where a stove, forge, or blow torch is being used. This hazard can be greatly reduced by a little forethought in planning the building and by always keeping the shop clean and orderly.

**Foundation.**—The foundation should be of concrete, extending about 18 inches into the ground. A footing will not be needed if the soil is uniformly hard. The foundation should be 6 inches thick at the top and 10 to 12 inches thick at the base. If a 4x12-inch footing is used, the foundation may be 6 inches thick. In either case the foundation should extend at least 6 inches above the ground level. If a frame structure is planned, anchor bolts should be imbedded in the concrete for attaching the sills. Reinforcing rods should be used at the corners as these are the weak spots in most foundations.

**Floor and approach.**—Concrete makes the ideal floor for the shop. The floor should slope about 1 inch in 10 feet toward the doorway. Floor drains are sometimes used, but they will give trouble in cold weather if water freezes in the drain pipes. A concrete approach will facilitate bringing in farm machinery. If the cost of the concrete floor makes it prohibitive, a rammed earth floor may be substituted, provided it is kept several inches above the outside ground level.

**Walls.**—Vertical boards with battens are frequently used in frame construction. This makes an inexpensive covering which will last for years because the boards dry off quickly after a rain. Either vertical or horizontal drop siding may be used. If the shop is to be heated, the walls should also be boarded on the inside. Dressed and matched lumber is satisfactory for the inside walls. The addition of building paper between the studding and the boards will keep out much of the wind. The application of insulation between the walls would be ideal, but might be too costly unless insulating materials such as dry shavings, shredded flax straw, or other fibrous materials can be obtained locally at a moderate cost.

**Doors and windows.**—The shop should have windows large enough to admit plenty of light for doing all kinds of repair work and arranged to provide good cross ventilation. Two windows should be provided

over the workbench, one at each vise. Four windows, each consisting of six 10x12-inch lights would be sufficient for the average shop.

Double doors having a total width of 8 feet and a height of 8 feet will make it possible to bring into the shop most of the farm machines. A doorway 12 feet wide would be better for bringing in the large machines for overhauling. The doors may be hinged or hung on a track. A service door is a convenient addition to the shop, as there are many occasions when it would not be necessary to open the large doors on entering the shop. The service door is usually on the side nearest the house. It is also convenient to place a door between the machine shed and the shop.

**Roof.**—The type of building will largely determine the shape of the roof. If the building is a combination machine shed and shop, a gable or broken gable roof will be the most appropriate. The framing of the roof should consist of 2x4-inch rafters, 2 feet on centers, and with 2x6-inch ties, 4 feet on centers. On an extra wide building 2x6-inch rafters would be used. The ties and rafters should be braced with 1x6-inch boards.

For a combination shop and garage or a separate shop building, the hip roof or a gable roof will be satisfactory. It should be framed with 2x4-inch rafters, 2 feet on centers, and with 2x6-inch ties, 4 feet on centers. A one-fourth pitch roof is recommended. With less pitch the roof would not drain properly, and with more pitch the cost would be greater.

The roof may be covered with wooden shingles, galvanized iron roofing, composition shingles, or roll roofing. The best grade of wooden shingles, if laid 4 or 4½ inches to the weather, will give splendid service for a long time. The galvanized iron roofing, if properly coated with zinc, will also be satisfactory. Composition shingles will not usually last as long as the wooden shingles, and they do not always stay in place when the wind is very strong.

**Chimney.**—If a forge is to be used or if the shop is to be heated, a brick or tile chimney should be built. A double flue is desirable where one chimney must serve for the forge and the stove, altho a single flue may do quite well. The chimney should extend at least three feet above the highest part of the roof. A screen over the chimney will reduce fire hazards from sparks.

## EQUIPMENT

**Workbench and vises.**—Every farm shop should have a substantial workbench equipped with a metalworking and a woodworking vise. Figure 3, Plan 170, shows a 12-foot bench which is an appropriate size. This bench can be constructed at a small cost by anyone who is handy with tools. The plan shows a woodworking vise. The jaw and the strut can be made, but the vise screw will have to be purchased at a



hardware store. Near the opposite end of the bench should be placed a metalworking vise. A machinist's vise with 4½-inch jaws and a swivel base is the most satisfactory, but a blacksmith's vise may be substituted.

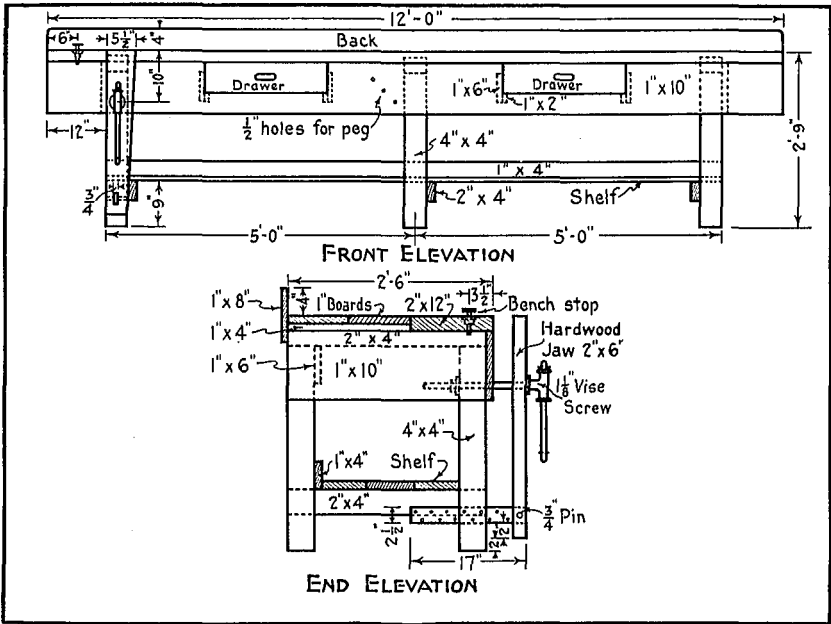


FIG. 3. PLAN 170, FARM WORKBENCH

**Post drill.**—A post drill is almost indispensable for the farm shop. Metal can be drilled with hand tools, but it can be done much more quickly, more accurately, and with less energy if a post drill is provided. A heavy duty post drill, which takes blacksmith's drills, is recommended. The drill should have a pulley so that it can be operated with power as well as by hand.

**Tool cabinets.**—Tool cabinets have been found to be more convenient than tool chests because they can be placed on the wall directly over the workbench. When the doors are opened there is no juggling of tools or manipulation of drawers in getting one's hands on the desired tool. Figures 4 and 5 show two sizes of tool cabinets. The larger cabinet is usually necessary, because there is always a need for additional tool space. Some workers prefer to keep their woodworking tools separated from the other tools, and this can easily be done with two tool cabinets, one near the machinist's vise for metalworking tools, and the other near the woodworking vise.

**Supply cabinets.**—In order that all types of repair and construction jobs can be made with the least waste of time, it is necessary to keep on hand a variety of supplies and repair parts. These can best be cared

for by putting them in a cabinet having drawers, shelves, or trays. A cabinet in which small boxes such as cigar and cheese boxes are used for drawers is easy to build and makes a good place in which to store screws, bolts, staples, washers, and other supplies. If a supply cabinet is not used and the shop has exposed studding, shelves can be placed between the studding and on these shelves the various supplies can be kept, using jars, tin cans, or boxes as containers. These containers should be labeled.



FIG. 4. TOOL CABINET (TWO DOORS)

**Forge.**—All farmers do not find it necessary to have a forge, but where one is provided it will increase the scope of work that can be done. Two general types of forges are used, the portable steel type and the stationary type which is usually made of brick and concrete. The portable type has one advantage in that it can be moved to the job. It is important that the hearth of a forge is not too small to accommodate a variety of farm repair jobs. Twenty-two inches should be the minimum size for the hearth. A good blower is essential.

**Anvil.**—An all-steel anvil is recommended in preference to cast-iron or wrought-iron anvils having chilled or steel faces. A 100-pound anvil is about the correct size. The anvil should rest on a solid block of wood. A good anvil is expensive, therefore some farmers substitute a short piece of railroad rail, which does quite well for many jobs.

**Tool grinder.**—A farm shop is not complete without a satisfactory tool grinder. While the grindstone will sharpen tools, it is at its best a slow process, and it is difficult to keep the stone true enough for sharpening such tools as plane blades and chisels. A hand or power bench grinder is much more satisfactory. A floor type of grinder operated by the feet can be used where power is not available. A good tool rest is essential on any grinder. A special grinding wheel for sharpening sickles can be used on a bench grinder, or a sickle grinder having a suitable tool rest for the sickle can be purchased. Aluminum oxide or

carbide of silicon make good grinding wheels for general grinding. If a grindstone is used, always select a No. 1 stone, 2½ to 3 inches thick and 24 to 28 inches in diameter.

**Motors.**—If the farmstead is electrified, an electric motor and line shaft can be installed to operate the tool grinder, post drill, and other pieces of shop equipment. However, where there are but two or three pieces of equipment to operate, individual motors are preferable. For the post drill, tool grinder, or the grindstone, a ⅓-horsepower, single-phase motor of the split-phase type is the most satisfactory. If only direct current is available, a shunt-wound motor is recommended.

Where electricity is not available, a gasoline engine and line shaft may be used. The size of the engine will depend upon the work to be done. If one engine must serve the shop equipment, a feed grinder, or circular saw, a 5-horsepower engine will be necessary. A 1½-horsepower gasoline engine would handle a line shaft, tool grinder, and post drill.

## TOOLS

A few good tools will be more useful than many tools made of inferior materials. Where all the tools and equipment cannot be purchased at one time, the most essential ones should be obtained first, and the others added as funds permit or as the needs arise.

It would be impossible to make a list of tools that would be practical for every farm. The size of the farm and type of farming, the mechanical ability of the farmer, and other factors will necessarily influence the kind and amount of equipment needed. The lists that follow, therefore, are only suggestive. Some farmers will require more tools while many farmers will be able to do their repair, maintenance, and construction jobs with much less equipment. The tools are listed under a number of headings based upon the various types of activities found on farms.

### Woodworking Tools

1 bench hook (homemade)	2 files, slim taper, 5", 6"
6 bits, auger, Nos. 4, 6, 8, 10, 12, 16	1 hammer, nail, 16 oz.
1 bit, countersink	1 level, carpenter's, 26"
1 bit, expansive, ⅞" to 3"	1 mallet, wooden
4 bits, gimlet, Nos. 4, 5, 6, 7	1 marking gauge, 6"
1 bit, screwdriver	1 miter box (homemade)
1 brace, ratchet, 10"	2 nail sets, 3/32", 1/8"
2 chisels, firmer, ½", 1½"	1 oiler
1 crosscut saw tool	1 oilstone, 2" x 8"
1 pr. dividers, 8"	1 plane, jack, 15"
1 drawknife, 8"	1 rule, fourfold, 2 ft.
1 emery wheel dresser	1 saw, compass, 12"
1 file, auger bit	1 saw, crosscut, 5½ ft.
1 file card	1 saw, hand, 8 point, 26"
1 file, half-round, wood, 10"	1 saw jointer (homemade)



- 2 sawhorses (homemade)
- 1 saw, rip, 6 point, 28"
- 1 saw set, pistol grip
- 3 screwdrivers, 3", 6", 8"
- 1 spokeshave, 2 $\frac{1}{8}$ "x10"

- 1 square, steel, 16"x24"
- 1 square, try, 8"
- 1 vise, saw
- 1 wrecking bar, 30"

### Metalworking Tools

- 1 blow torch, 1 qt.
- 2 chisels, cold,  $\frac{1}{2}$ ",  $\frac{3}{4}$ "
- 7 drills, bit stock, carbon steel,  
 $\frac{1}{8}$ " to  $\frac{3}{8}$ "
- 6 drills, blacksmith's, 1/4", 3/16",  
5/16", 3/8", 7/16", 1/2"
- 11 drills, straight shank, 1/16" to 1/4"
- 1 file, flat bastard, 12"
- 1 file, mill bastard, 10"
- 2 files, round bastard, 6", 10"
- 1 hacksaw, 8"-12"
- 1 hammer, machinist's ball pein, 1 lb.
- 1 hand drill,  $\frac{1}{4}$ " capacity
- 1 pr. pincers, 12"

- 1 pr. pliers, combination side cutting,  
7"
- 1 punch, center,  $\frac{3}{8}$ "x4"
- 3 punches, solid, 1/4", 5/16", 7/16"
- 1 soldering copper, 1 $\frac{1}{2}$  lb.
- 1 tap and die set, N.C. (U.S.S.)  $\frac{1}{4}$ "  
to  $\frac{1}{2}$ "; N.F. (S.A.E.)  $\frac{1}{4}$ " to  $\frac{1}{2}$ "  
and  $\frac{1}{8}$ " pipe
- 1 pr. tinner's snips, 3"
- 3 wrenches, crescent, 6", 10", 12"
- 4 wrenches, engineer's double end, cap  
screw, 1/4"-5/16"; nut, 5/16"-3/8";  
7/16"-1/2"; 9/16"-5/8"

### Forging Tools

- 1 hammer, blacksmith's cross pein, 2 lb.
- 1 hardie (to fit the anvil)

- 1 pr. tongs, bolt  $\frac{3}{8}$ "x20"
- 1 pr. tongs, straight lipped, 20"

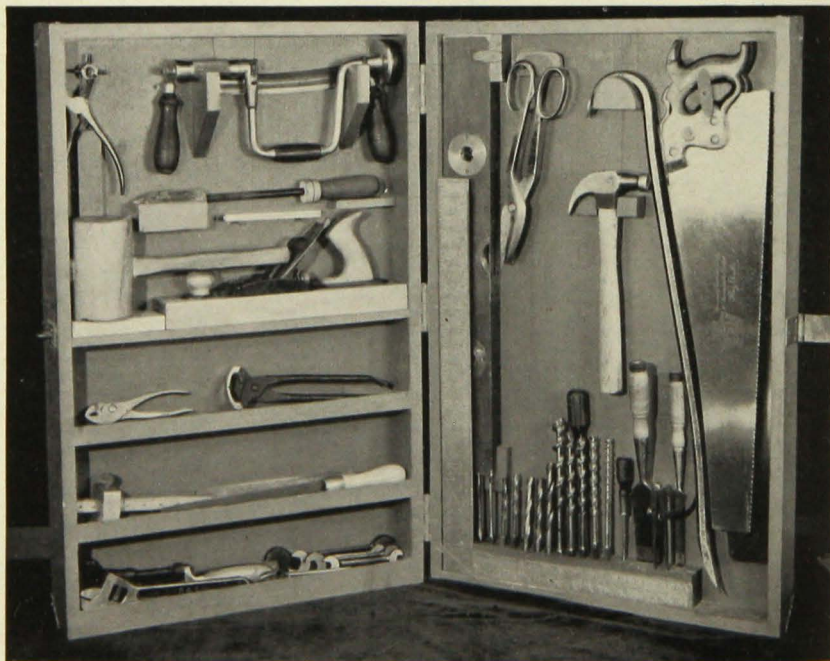


FIG. 5. TOOL CABINET (ONE DOOR)



FIG. 6. UTILIZING POWER IN THE FARM SHOP

### Gas Engine, Auto, and Tractor Tools

- |                                |                                      |
|--------------------------------|--------------------------------------|
| 1 auto creeper (homemade)      | 1 valve lifter                       |
| 1 auto jack, 1½ ton heavy duty | 6 wrenches, double open end (set)    |
| 1 carbon scraper               | 17 wrenches, socket, 12 point to fit |
| 1 thickness gauge              | ¼" to ¾"                             |
| 1 valve grinder                | 4 wrenches, tappet (set)             |

### Concrete Tools

- |                            |                            |
|----------------------------|----------------------------|
| 1 edger                    | 1 mixing box (homemade)    |
| 1 float, wooden (homemade) | 1 sand screen (homemade)   |
| 1 hoe                      | 1 straight edge (homemade) |
| 1 jointer                  | 1 tamper (homemade)        |
| 1 mason's line             | 1 trowel, cement           |
| 1 measuring box (homemade) |                            |

### Fencing Tools

- 1 pr. fencing pliers
- 1 post hole digger
- 1 post maul, 13 lb.
- 1 wire stretcher

### Glazing Tools

- 1 glass cutter
- 1 putty knife

**Plumbing Tools**

- 1 pipe cutter,  $\frac{1}{2}$ " to 2"
- 1 pipe reamer,  $\frac{1}{4}$ " to 2"
- 1 pipe stock and die,  $\frac{1}{2}$ " to  $1\frac{1}{4}$ "
- 1 pipe vise,  $\frac{1}{8}$ " to  $2\frac{1}{2}$ "
- 2 pipe wrenches, 14" and 18"

**Leatherworking Tools**

- 1 awl haft (assorted blades)
- 12 needles, harness (assorted)
- 1 punch, 6 tube revolving belt
- 1 rivet set
- 1 riveting machine
- 1 stitching clamp (homemade)

**SUPPLIES**

It will be impossible to foresee the nature of all the varied repair jobs that will be taken care of in the farm shop, but this should not prevent one from keeping on hand a few supplies. Experience has shown that it will be convenient to have on hand the following supplies for farm repair jobs.

**Woodworking Supplies**

- Glue, liquid
- Lumber, oak, pine, fir
- Nails, 3, 8, 10, 16 and 20 penny common and 4 and 6 penny box
- Sandpaper (assorted)
- Screws, wood, flathead bright, (assorted sizes)

**Leatherworking Supplies**

- Harness oil
- Rivets, copper (assorted)
- Rivets, tubular (assorted)
- Thread, white linen No. 10

**Forging Supplies**

- Coal, blacksmith's or best grade of Pocahontas screenings
- Welding compound

**Glazing Supplies**

- Glazier points
- Putty

**Fencing Supplies**

- Staples
- Wire

**Metalworking Supplies**

- Bar iron,  $\frac{3}{8}$ " and  $\frac{1}{2}$ " round;  $\frac{1}{8}$ ",  $\frac{1}{4}$ " and  $\frac{3}{8}$ " flat, 1" to 2" wide
- Bolts, carriage,  $\frac{1}{4}$ ",  $\frac{3}{8}$ ",  $\frac{1}{2}$ " (assorted lengths)
- Bolts, machine,  $\frac{3}{8}$ ",  $\frac{1}{2}$ ",  $\frac{5}{8}$ " (assorted lengths)
- Emery cloth (assorted)
- Hacksaw blades, 14 and 18 point
- Nuts, N.C. (U.S.S.)  $\frac{1}{4}$ " to  $\frac{1}{2}$ " (assorted)
- Rivets,  $\frac{3}{16}$ " and  $1/4$ ",  $1/2$ " to 2" long
- Sal-ammoniac, 1 cake
- Solder, 50-50, bar or wire
- Soldering flux
- Soldering paste
- Washers, flat,  $\frac{1}{4}$ " to  $\frac{1}{2}$ " (assorted)

**Plumbing Supplies**

- Lard oil
- Pipe, galvanized, sizes used on the farm
- Pipe fittings, galvanized; assortment of caps, plugs, elbows, nipples, unions, and tees
- White lead

**Gas Engine, Auto, and Tractor Supplies**

- Cap screws and nuts, N.F. (S.A.E.) ¼" to ½" (assorted lengths)
- Cotter keys (assorted sizes)
- Fittings, compression; nuts, sleeves, elbows, connectors, for ¼" tubing
- Gasket material
- Lock washers (assorted sizes 3/16" to ½")
- Machine screws, round head, 10-24, and ¼"-20, 1" and 2" long
- Nuts, machine screw, hexagon, 10-24 and ¼"-20
- Tubing, copper, ¼"
- Valve grinding compound

**Painting Supplies**

- Linseed oil
- Paint brushes, 1", 2½", and 4"
- Turpentine
- Wall scraper
- Wire brush

**Electrical Supplies**

- Fuses
- Tape, friction
- Tape, rubber

**PUBLICATIONS**

The following publications can be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.C., at the prices indicated. Many of the Farmers Bulletins can be obtained free of charge, as long as the supply lasts, from the U. S. Department of Agriculture, Washington, D.C.

<i>Care and Repair of Mowers and Binders</i> , Farmers Bulletin 1754 .....	.05
<i>Care and Repair of the House</i> , Building and Housing Publication BH 15 .....	.15
<i>Construction of Chimneys and Fireplaces</i> , Farmers Bulletin 1649 .....	.05
<i>Farm Horseshoeing</i> , Farmers Bulletin 1535 .....	.05
<i>Farm Plumbing</i> , Farmers Bulletin 1426 .....	.05
<i>Farmstead Water Supply</i> , Farmers Bulletin 1448 .....	.05
<i>Fire Safeguards for the Farm</i> , Farmers Bulletin 1643 .....	.05
<i>Heating the Farm Home</i> , Farmers Bulletin 1698 .....	.05
<i>Insulation on the Farm</i> , Report of National Committee on Wood Utilization ...	.10
<i>Painting on the Farm</i> , Farmers Bulletin 1452 .....	.05
<i>Plain Concrete for Farm Use</i> , Farmers Bulletin 1279 .....	.05
<i>Plowing with Moldboard Plows</i> , Farmers Bulletin 1690 .....	.05
<i>Protection of Farm Buildings and Property from Lightning</i> , Farmers Bulletin 1512 .....	.05
<i>Ratproofing Buildings and Premises</i> , Farmers Bulletin 1638 .....	.05
<i>Roof Coverings for Farm Buildings and Their Repair</i> , Farmers Bulletin 1751	.05
<i>Selection of Lumber for Farm and Home Building</i> , Farmers Bulletin 1756.....	.05
<i>Sewage and Sewerage for Farm Homes</i> , Farmers Bulletin 1227 .....	.05
<i>Simple Plumbing Repairs in the Home</i> , Farmers Bulletin 1460 .....	.05
<i>Small Concrete Construction on the Farm</i> , Farmers Bulletin 1480 .....	.05
<i>Wind-resistant Construction for Farm Buildings</i> , Leaflet No. 87.....	.05

The various state agricultural colleges publish bulletins which are helpful in farm shop work. Such bulletins are distributed free to residents of the state, and non-residents are usually given the same privileges if their requests are reasonable.

The following bulletins can be obtained by writing to the Bulletin Department, University Farm, St. Paul, Minnesota:

*Farm Building Plans*, Special Bulletin 111 (This bulletin contains a list of available plans for farm buildings and equipment).

*Farmstead Wiring*, Special Bulletin 179

*Hitching Horses for Better Implement Operation*, Special Bulletin 162

*Test Concrete Sand for Impurities*, Circular 34

For information on how to do the various jobs mentioned in this bulletin, write to the Agricultural Engineering Division, University Farm, St. Paul, for a list of textbooks and free literature available from manufacturers.