UNIVERSITY of IDAHO
A College of Agriculture Publication

your Electric Farm Shop

plan it
build it
use it

by
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IDAHO Agricultural
Extension Service

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SOME SHOP SUGGESTIONS

It has been said that a farm without a shop is not a complete farm. Your shop need not be an elaborate layout of expensive power tools housed in a new building. But, it should fit your needs. The size, plan, amount of tools and equipment, and their arrangement will depend on the type of farming you do and your interest in keeping things in repair.

If you already have a farm shop, check it against the following items and see how it rates:

1. Is your shop an asset or a liability?
2. Is your shop efficiently arranged?
3. Is your shop efficiently managed?
4. Is your shop clean and orderly?
5. Is your shop properly lighted?
6. Does your shop have sufficient electrical circuits?
7. Does your shop have sufficient electrical outlets?
8. Do you have a supply of materials for fabrication?
9. Do you have spare parts on hand?
10. Is your shop a safe place to work?

Cooperative Extension Work in Agriculture and Home Economics, D. R. Theophilus, Director, University of Idaho College of Agriculture and United States Department of Agriculture Cooperating.

Issued in furtherance of the acts of May 8 and June 30, 1914.

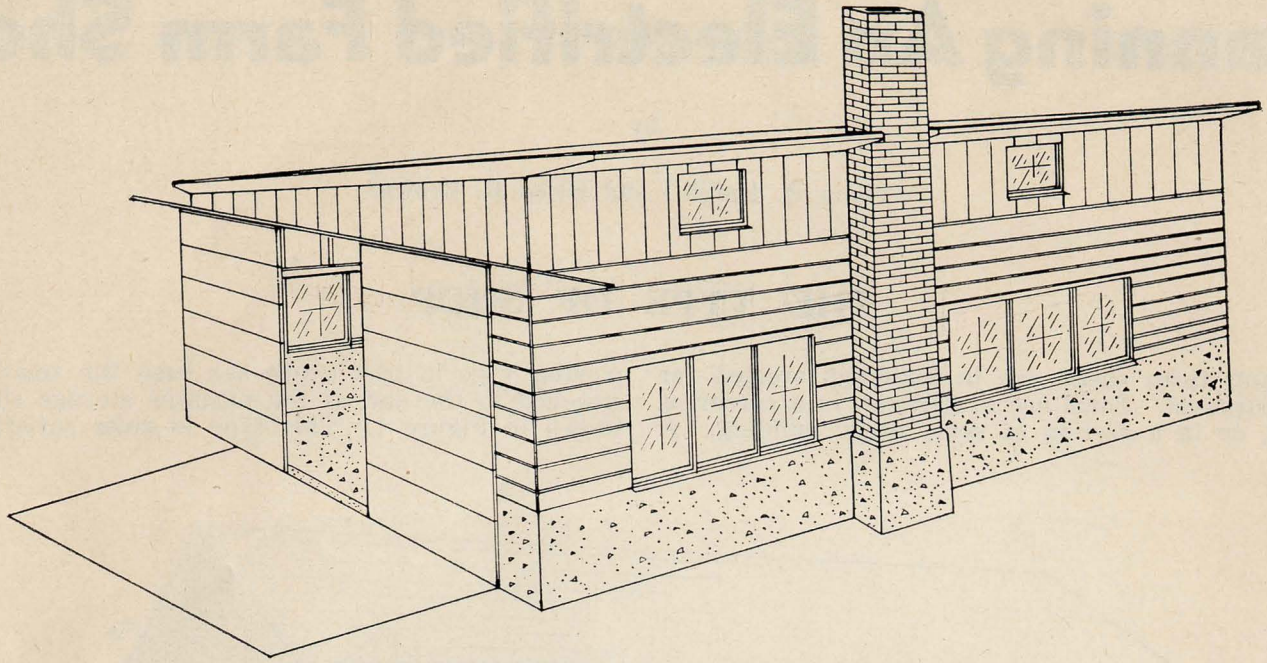


Fig. 2 A Modern Design For The Medium Type Farm Shop

for the small or diversified farm as it offers a space for parking the truck, pickup or tractor. But it does not offer sufficient room for bringing in large machinery for repair.

The medium type farm shop, shown in Figures 2 and 3, may be of special construction and arrangement to house and repair specialized equipment. For example, very often a large proportion of the shop tools will be for plumbing and wood working. This is particularly true in many irrigated farming sections. The amount of tools and shop equipment needed will largely depend upon the size of the enterprise.

The large, completely electrified farm shop, shown in Figures 4 & 5, is becoming very popular on large grain farms. Such a shop is usually an individual building and contains a complete assortment of tools and shop equipment for doing almost any type of farm repair job.

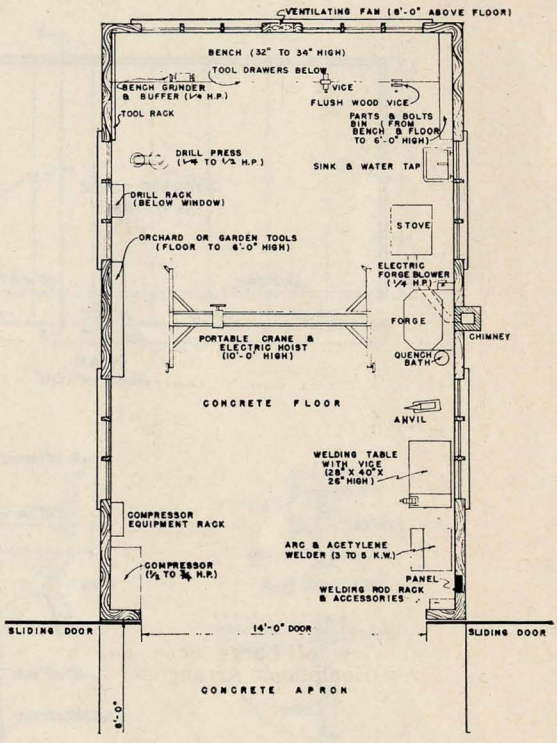


Fig. 3 Plan View of Medium Size Shop Showing Suggested Equipment Arrangement

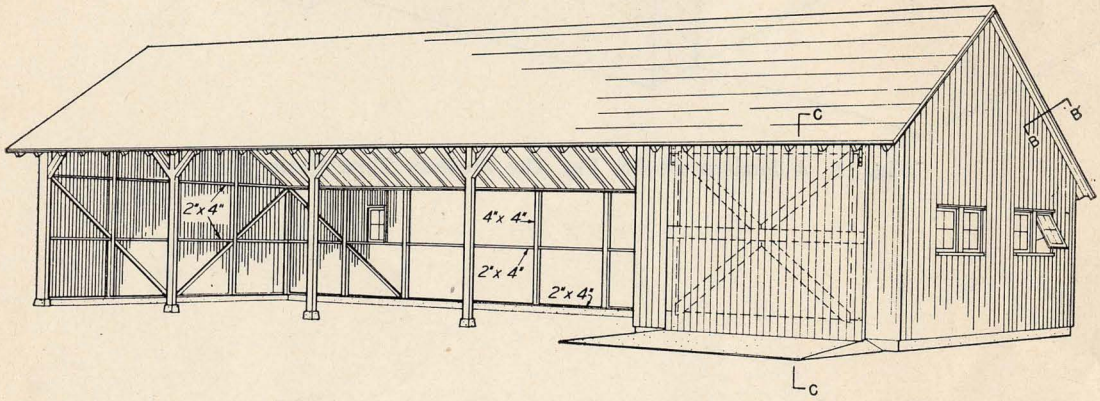
Planning An Electrified Farm Shop

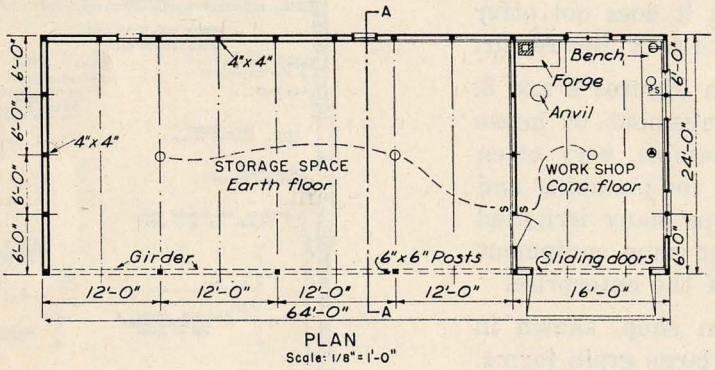
by

William H. Knight[1] and Owen K. Brown[2]

THE TYPE OF SHOP

Many farm shops are in buildings erected for other purposes. Some are in garages, in a corner of a shed, or in a section of some other building. A popular type in past years has been the small shop attached to the end of the machine storage shed as shown in Figure 1. This type is quite satisfactory





PLAN
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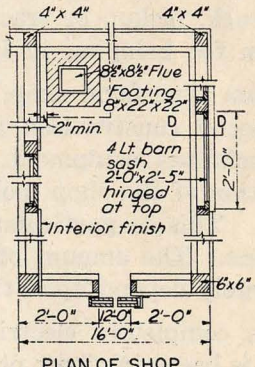
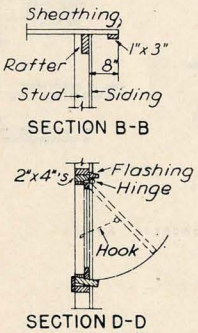


PLAN OF SHOP
Scale: 1/2"=1'-0"



SECTION B-B

SECTION D-D
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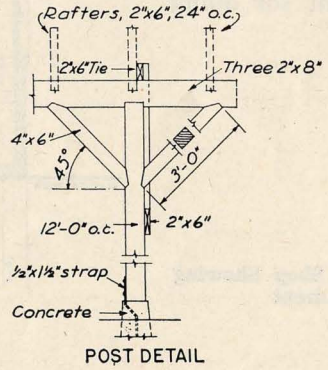
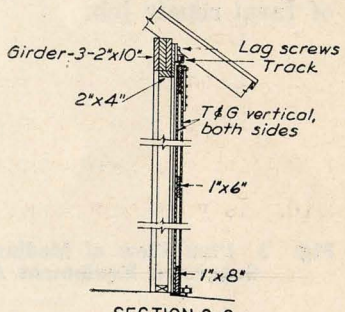


POST DETAIL



SECTION C-C
Scale: 1/2"=1'-0"

Fig. 1 The Small Shop With Adjoining Machine Storage Shed

[1] **Farm Electrification Project Director** [2] **Extension Agricultural Engineer**

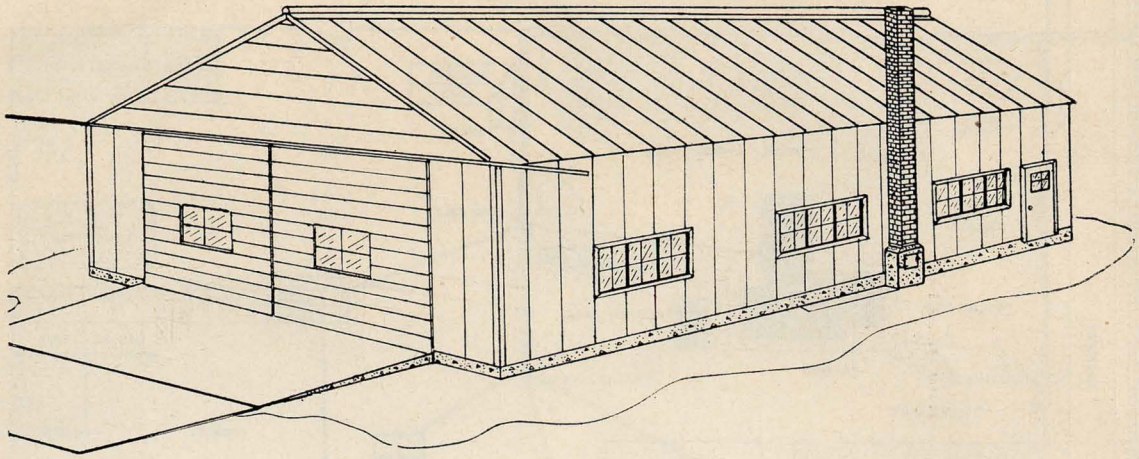


Fig. 4 The Large Completely Electrified Farm Shop

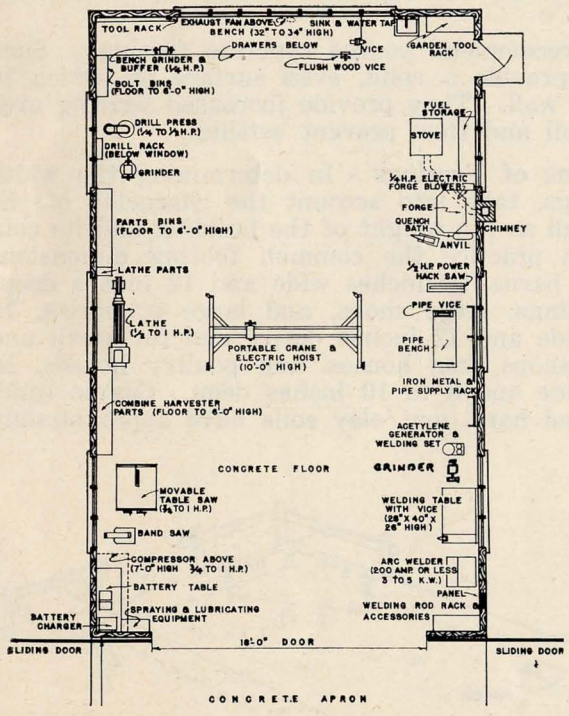


Fig. 5 Plan View of Large Shop Showing Suggested Equipment Arrangement

SIZE AND LOCATION OF THE SHOP

Look to the future when you plan the size of your new farm shop. Be sure that it will be large enough to handle the machinery you will want to bring into it 10 or 20 years from now as well as your present-day equipment. Plan the shop to house the largest farm machine that you are likely to use. Add enough space to allow free working room between large machinery and the benches or walls of the shop. Don't forget that you will need to move welders or other pieces of shop equipment around the machine you are working on. Most of us are apt to build too small.

The size of doors to any shop is extremely important. Build them with room to spare. No matter how large your shop is, the doors will limit the size of the machines you can get inside to work on. Open doors to the outside or use an overhead track and slide them to the side. The sliding overhead garage type doors are also becoming popular. Don't forget that height as well as width of the door is important. Combines and some orchard equipment may need 14 feet of top clearance.

Locate the shop so that you will have the least possible trouble in getting your machinery in and out of it. Trees, fences, irrigation ditches, or other buildings too close to the shop's entrance may offer hazards to entrance. (See Fig. 6)

If possible to do so, locate the shop close to the machine shed. This makes it more convenient to work on large implements in the winter time when moving equipment through snow or over wet ground can be a problem. Fairly level ground for the location of both the shed and shop adds to their convenience and usefulness and contributes to greater safety.

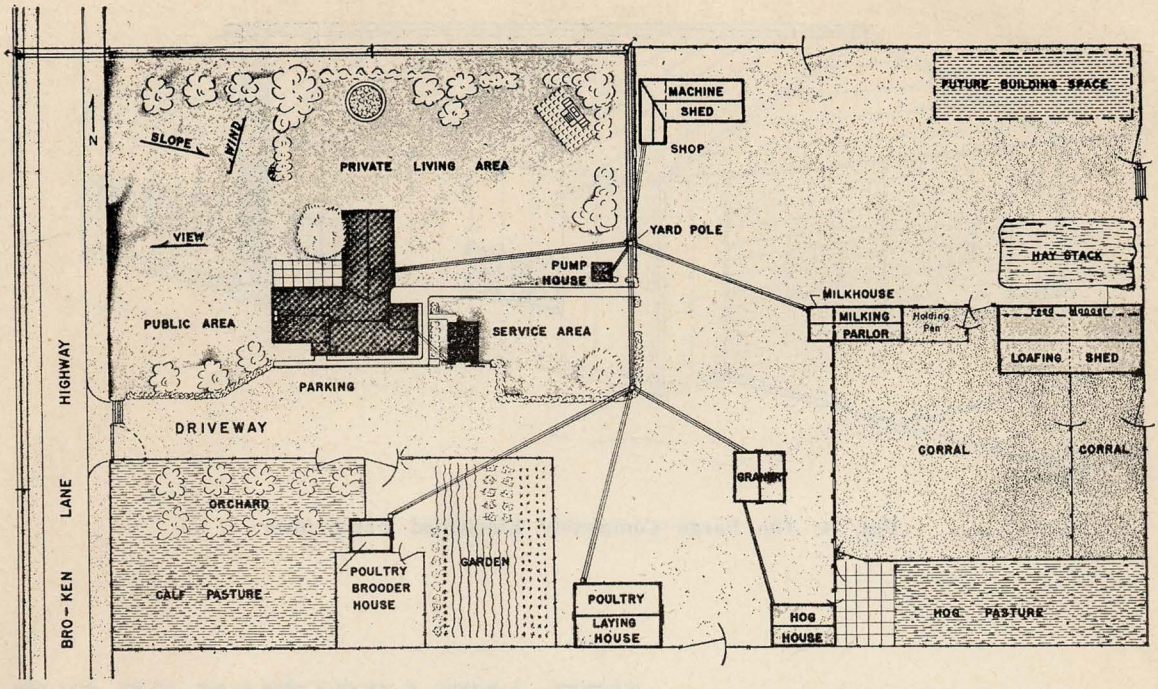


Fig. 6 Locate The Farm Shop and Machine Shed So It Is Easily Accessible From The House and Farm Court. The More Accessible Your Shop Is, The More Use You Will Make Of It.

CONSTRUCTING THE SHOP BUILDING

A firm foundation is vital to the usefulness and durability of any building. Whether the structure is a one-story building or higher, plan a concrete foundation if at all possible.

Footings - A foundation must rest on a good footing which, in turn must rest on firm earth or some other solid foundation bed. This means that the site of the building must be selected with care. Provide for surface drainage as well as drainage around the bottom of the footing.

The footing, as shown in Figure 7 is the widened base of the foundation. Its purpose is to spread the weight of the building over a relatively wide area of earth.

The footing should go down below the depth of winter frost and to solid, well-drained earth. This will protect the building from damage by frost heaving.

We recommend poured concrete footings. Such footings provide a solid, even surface on which to start the wall. They provide increased bearing area on the soil and thus prevent settling.

Dimensions of Footings - In determining the width of footings, take into account the character of the soil as well as the weight of the building and its contents. In practice the common footing dimensions are: for barns, 24 inches wide and 12 inches deep; for dwellings, large shops, and large granaries, 18 inches wide and 12 inches deep; and for small and medium shops, hog houses, and poultry houses, 16 inches wide and 8 to 10 inches deep. Coarse sand, gravel, and hard, dry, clay soils have approximately

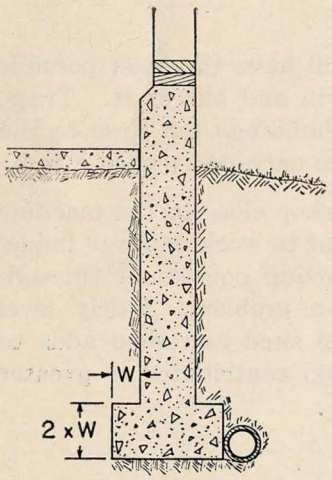


Fig. 7 A Concrete Footing

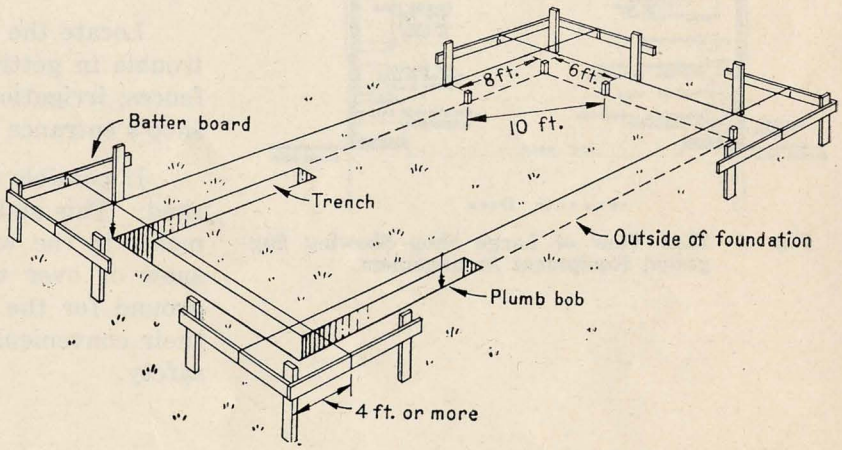


Fig. 8 Method of Laying Out A Building

twice the carrying capacity per square foot as does fine sand and firm clay soils. They usually will not require such wide footings. Soft clay soils have the least carrying capacity per square foot and will require footings of maximum width.

Floor and Approach - Although we often use earth floors in farm shops, a concrete floor has many advantages. Heavy machines roll into a shop with greater ease on a smooth, hard surface. A concrete floor helps you keep an orderly shop.

A concrete apron or approach is convenient, and we recommend it. You will probably do a great deal of cleaning, minor repairs, and adjustments on such an approach. For further details on the uses of concrete get a copy of U.S.D.A. Farmers' Bulletin No. 1772, "Use of Concrete on the Farm," or any of the excellent handbooks available.

Practice good "shopkeeping":

A. Keep the floor free from grease, oil and debris.

B. Keep your benches and tools clean and in good order.

C. Remove obstructions from work spaces.

Windows and Ventilation - Properly planned and arranged windows will insure better use of natural daylight and provide better ventilation. Provide 1 square foot of window surface for each 4 to 6 square feet of floor area. Space the windows to allow enough wall area for tool cabinets and part bins. Hinge the windows so they can be opened to provide greater ventilation in milder weather. For summer conditionig and for exhausting smokes and odors, install a ventilating fan with at least a 12-inch blade. Place this fan above the windows at the end of the shop.

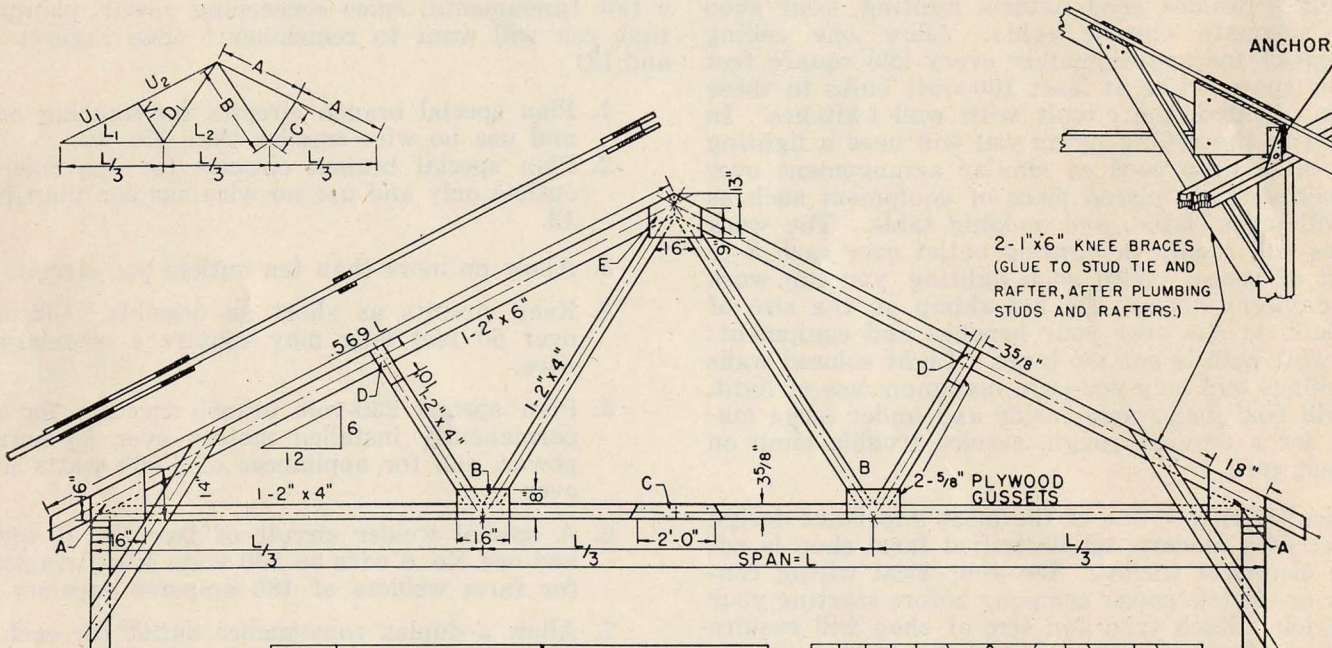
Guard against fumes:

A. Open a door or window before running an engine in the shop.

B. Avoid breathing fumes from welding or forging operations.

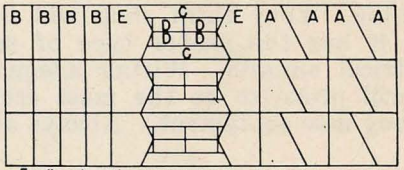
Bracing - Well-braced buildings seldom suffer wind damage. The additional cost for good bracing is small. Good bracing also prevents sagging roofs, doors, and window frames.

Figures 9 and 10 show some typical examples of good roof trusses and good bracing.



SPAN	DIMENSIONS			LUMBER				
				2" x 6"		2" x 4"		TOT
L	A	B	C	NO	LENGTH	NO	LENGTH	FBM
26'-0"	7'-3 3/16"	7'-9 5/16"	3'-10 7/16"	2	16'-0"	2	14'-0"	68
						2	12'-0"	
28'-0"	7'-9 15/16"	8'-4 9/16"	4'-2 1/16"	2	18'-0"	2	14'-0"	75
						2	14'-0"	
30'-0"	8'-4 5/8"	8'-11 3/4"	4'-5 11/16"	2	18'-0"	2	16'-0"	76
						2	14'-0"	
32'-0"	8'-11 5/16"	9'-6 15/16"	4'-9 1/4"	2	20'-0"	2	16'-0"	80
						2	14'-0"	
				1/3 5/8"-4'x10' D.F. EXT PLYWOOD				

DESIGNED FOR DEAD LOAD & LIVE LOAD = 45#/□' WHICH WILL CARRY ORDINARY METAL ROOF ON 2 x 4 NAILING STRIPS SPACED 16" O.C. WITH NO ADDITIONAL RAFTERS BETWEEN THE 6' SPACING OF TRUSSES.
FOR TIGHT ROOF DECK, SPACE 1 PLAIN RAFTER BETWEEN EACH TRUSS TO STIFFEN 1" SHEATHING.



5/8"x 4'x 10' PLYWOOD UTILIZATION (FOR 3 TRUSSES)

USE CASEIN GLUE ON ALL JOINTS.
NAIL GUSSETS WITH 7D BOX NAILS TO HOLD GUSSETS WHILE GLUE SETS.
USE 1 METAL ANCHOR AT EACH TRUSS TO PLATE CONNECTION.

Fig. 9 A Roof Truss of This Type Eliminates The Need For Posts To Bear The Weight Of The Roof

BENCHES AND WORK TABLES

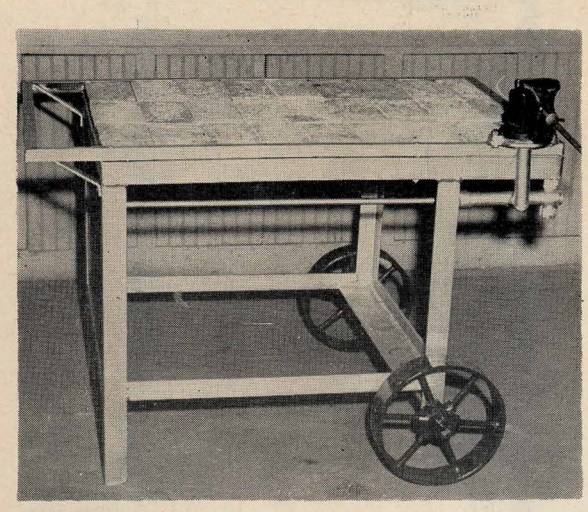


Fig. 14 A Good Sturdy Welding Table

A good, sturdy work bench is one of the first pieces of equipment needed in the shop. It can be simple in construction and made from 2-inch yellow pine planking with 2 by 6's for legs. Nail the back legs to the wall and it will be more sturdy. Locate your work bench in front of windows for daytime light. Certain work tables such as the pipe-vise bench, battery table, and welding table will need to be near their related equipment for convenience. Bench heights are important and should depend somewhat on the height of the shop worker. The general rule is: "Build them high enough so you don't have to stoop or bend your back, and low enough so you don't have to lift your arms to do your work."

Here are some recommendations for benches and working surfaces:

1. Electrical and general repair bench—32″ to 34″ high, 28″ to 30″ wide, with a wooden top.
2. Welding table—26″ to 30″ high, approximately 28″ wide and 40″ long, built of metal with a fire-brick top. Figure 14 shows a good, sturdy metal-welding table that you can build in your own shop using 1¼″ angle iron and parts from the scrap pile.
3. Pipe vise bench—30″ to 32″ high, 26″ to 28″ wide, built of wood or metal.
4. Battery table—24″ high, 26″ to 28″ wide, covered with an acid-resistant material such as hard rubber or heavy glass. Figure 15 shows a good arrangement.
5. Anvil—top should be 28″ to 30″ high.

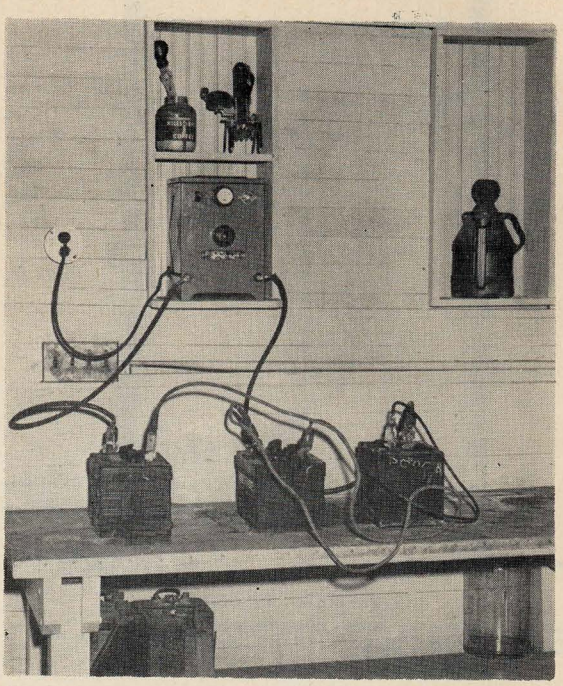


Fig. 15 A Battery Table, Charger and Accessories

PARTS BINS AND TOOL RACKS

Many farmers keep a supply of new spare parts on hand for repair work and emergency jobs. Parts bins between the windows are convenient storage spaces. Build these approximately 6″ to 8″ wide, 8″ to 10″ high and 10″ deep for bolts, sickle guards, and other smaller parts. For larger parts you will need bins 12″ x 12″ and even larger in some cases.

For segregation and ease of identification, classify the bin sections for your various machines, such as plow, tractor, and harvester parts.

Build tool racks next to the wall, and provide a hook, nail, or slot for each tool, as shown in Figure 16. Group similar tools together. A black silhouette painted on the wall behind each tool will aid you in returning the tool to its proper location. Locate special machine tools in smaller racks near their related machine for convenience. If you use enclosed racks, you can place tools on the inside of the enclosure door.

Protect yourself:

A. Keep your tools in good working condition.

B. Wear goggles when grinding or welding.

C. Block all hoisted machinery before you work near it.

D. Put guards on belts, gears, and pulleys.

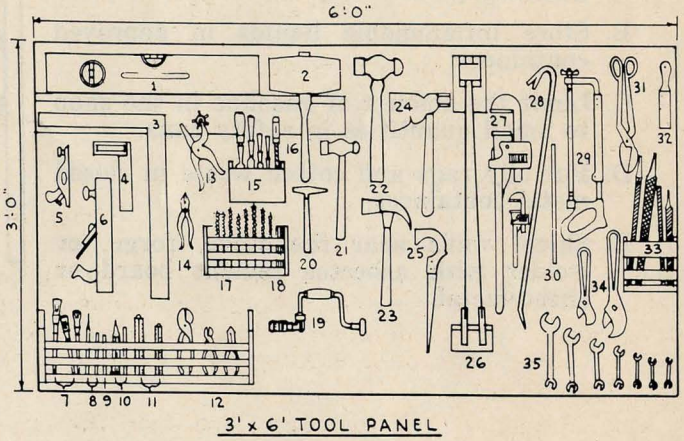


Fig. 16 A Useful Tool Panel

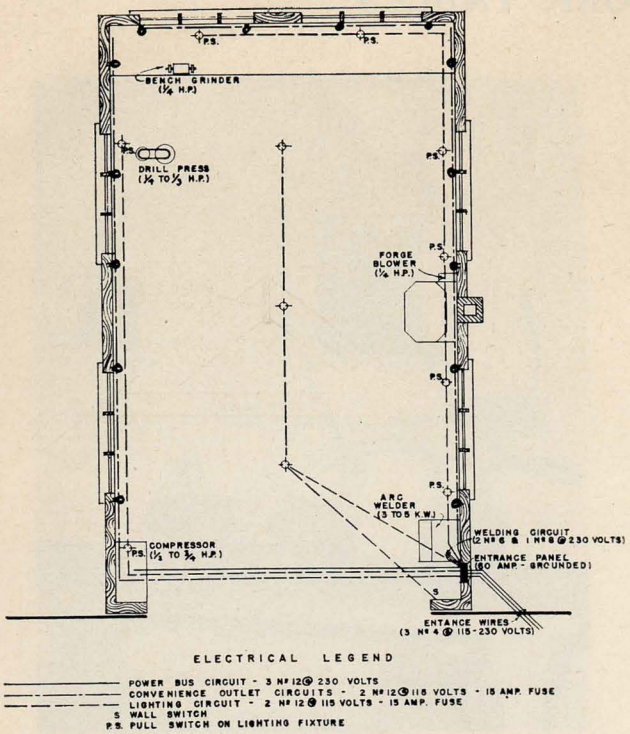


Fig. 11 Suggested Wiring Plan for the Medium Size Shop

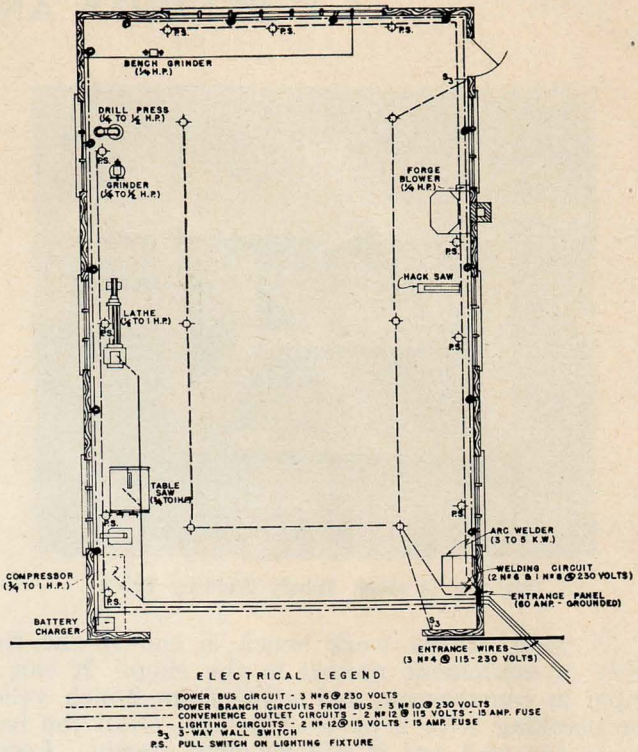


Fig. 12 Suggested Wiring Plan for the Large Shop

The Heating System - The double (50 gallon) drum-type heater shown in Figure 13 is a satisfactory shop heater and can be built on the spot. This type of heater will use either coal, wood, or oil. Store fuel on the inside of the large shops and just outside the door of the smaller ones. In extremely cold areas and where the interior of the shop is to be finished with shiplap or wallboard, insulate your walls. Locate the chimney so it is accessible to both heating stove and the forge.

Prevent fire hazards:

A. Install at least one or two fire extinguishers in the shop.

B. Store inflammable liquids in approved containers.

C. Limit the amount of gasoline in the shop to small quantities in safety cans.

D. Put oily rags and cotton waste in closed metal containers.

E. Shield walls near the stove, forge, or welder with asbestos cement board or sheet metal.

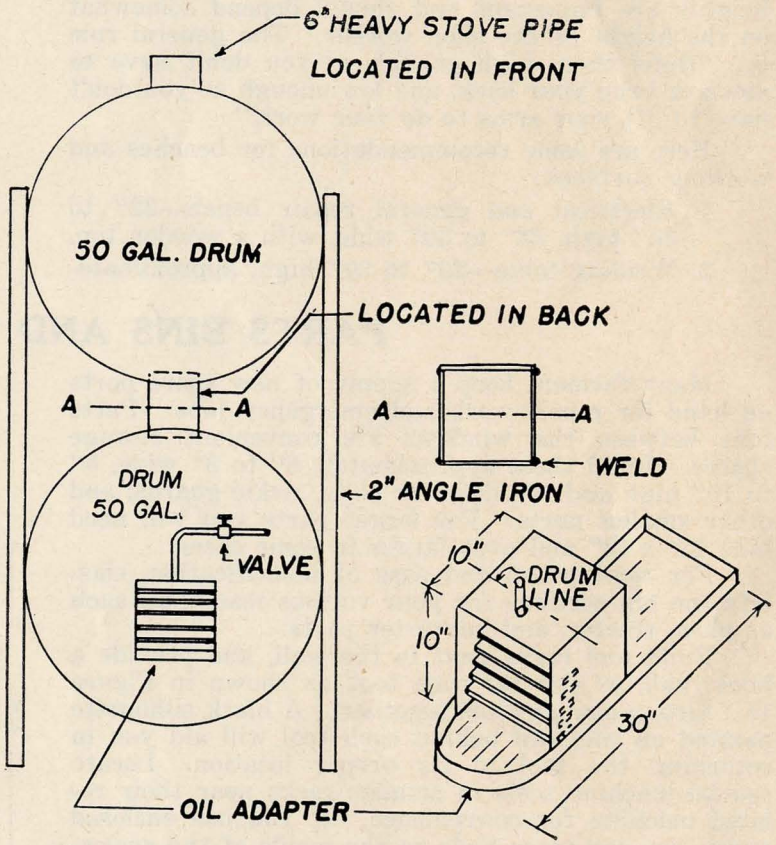


Fig. 13 The Double Drum-Type Heater (Courtesy of The State College of Washington)

PLANNING YOUR EQUIPMENT ARRANGEMENT

In order to have an efficient and convenient arrangement to do one job in one place without carrying your equipment all over the shop, group similar equipment. Suggested floor plans and equipment arrangements are shown in Figures 1, 3, 5, for the three different sizes of shops. Here are some of the different groups:

1. All welding equipment—arc welder, acetylene welder, welding table, grinder, welding rods, hoods, and other accessories.
2. Metal supply equipment—pipe and metal rack, pipe bench and vise, power hack saw.
3. Forging equipment—forge and blower, anvil with hammer and tongs' rack, quenching bath, forge fuel supply.
4. Garden tools—hoes, spades, and garden hoses.
5. General repair equipment—work bench, tool racks, swivel vise and wood vise, bench grinder and buffer, drill press and drill bit rack.
6. Wood working equipment — table saw, band saw, and sander.
7. Battery equipment—battery charger, battery tester, acid and distilled water.
8. Air compressor and auxiliary equipment—lubricating equipment, tire inflating hose and gauge.

You will notice in Figures 3 and 5 that we have located the welding equipment and the compressor near the traffic door. This arrangement is for greater accessibility to machinery for welding to trucks, tractors, and cars for inflating tires, for outdoor paint spraying of machinery, and for similar operations.

Locate lathes, table saws, and all work benches near windows for better daytime light.

Many farmers like a portable crane and hoist like the one shown in Figures 3, 5, and 17. You can build it right in your shop. Never attach a hoist or a block and tackle to ordinary roof trusses. Without special reinforcing beams, they will not support heavy engines and machinery. Be careful. Don't break your roof supports down. And don't hoist heavy machinery until you are sure of your crane supports.

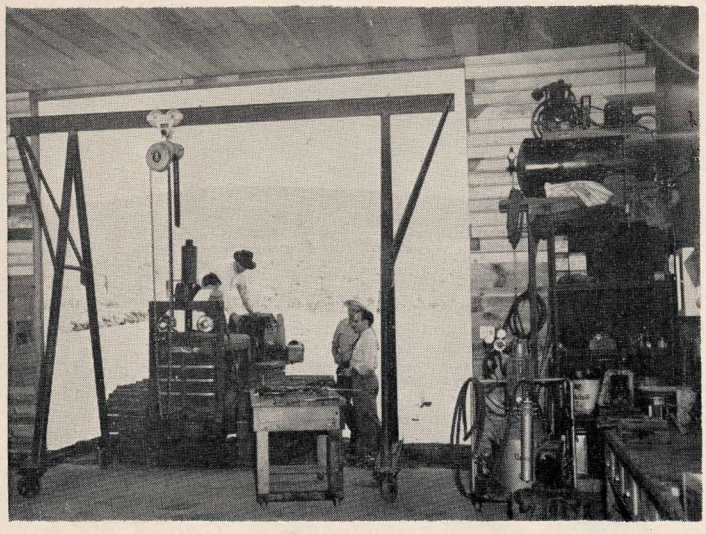


Fig. 17 The large portable crane of this workshop adds greatly to its efficiency.

Fig. 18 This shop has excellent storage bins under work bench. Tool racks are above bench.

SPECIAL IDEAS AND SUGGESTIONS

You can use many suggestions and new ideas over a period of time. They will add to your shop's convenience and make it a finer, more pleasant place to work. Here are a few—

1. Keep grinder speed charts and other conversion tables in a convenient place. Keep your parts catalogs with them.
2. A portable ½ to ¾-horsepower electric motor with a four-step pulley and V-belt has many uses. It will do such inside and outside jobs as grinding, buzz sawing, and grain or hay elevating.
3. An anchor hook installed flush with the floor near the rear-center of the shop will help when you need to drag in heavy machinery.
4. A pressure line running from the compressor to the work bench area will help with spraying and cleaning jobs.
5. Foam fire extinguishers are best for electrical fires.
6. A radio will improve the dull atmosphere on cold winter days or long evenings.
7. If you have a center crane track and a small door, you can project the crane track outside for 5 or 6 feet for picking up heavy machinery.
8. If you live in a damp area, keep your welding rods in moisture-free containers. They will stay in good condition.
9. Old rat-tail files make fine center punches with only a little reworking on a grinder.

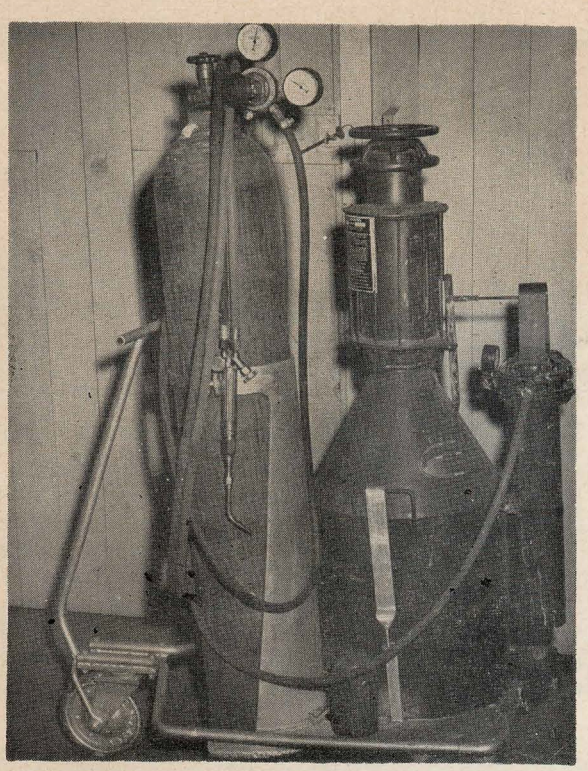


Fig. 19 An Acetylene Generator and Welding Outfit on Wheels

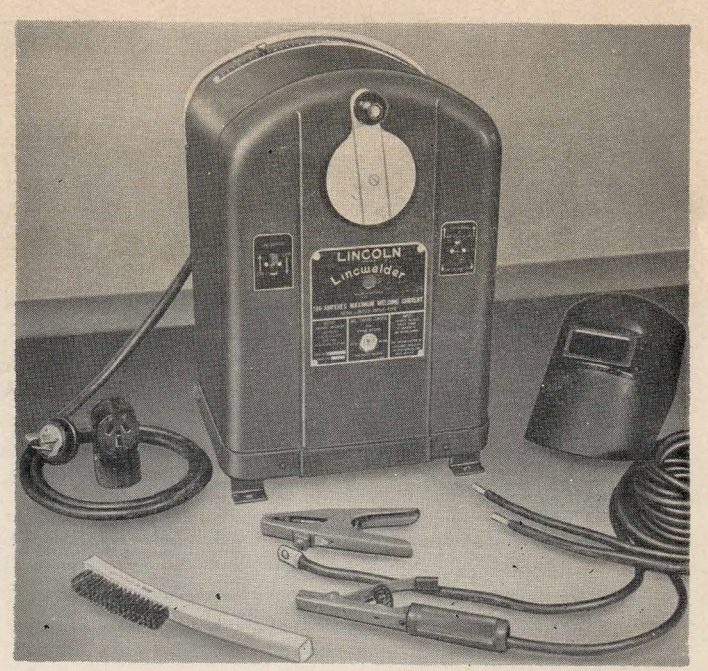


Fig. 20 A Typical Farm Arc Welder and Accessories

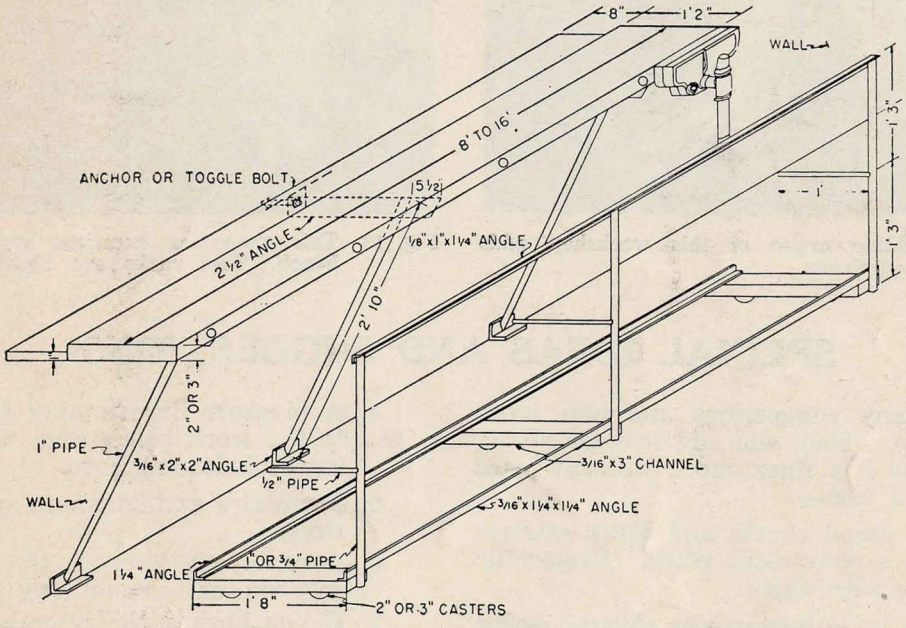


Fig. 21 A Sturdy Wall Bench and Portable Lumber or Metal Rack