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ELECTRICITY

for the 4-H scientist

Safety
Uses
Economy

DIVISION IV
4-H ELECTRIC

TEACHING RESEARCH SERVICE

UNIVERSITY OF IDAHO
College of Agriculture

4-H Electric, Division IV

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UNIVERSITY OF IDAHO
COLLEGE OF AGRICULTURE
AGRICULTURAL EXTENSION SERVICE

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LET'S GO SHOPPING

Would you like to go shopping for an electric appliance for someone else or for your own home?

This may seem a long way off, but sooner than you think you will be doing just that. For example, you may want to buy an electrical gift for your parents' anniversary or for someone's birthday. Someday, too, there may be those shower and wedding gifts to be bought for friends.

Shopping for a small appliance can be fun. And it's something that you can do intelligently, if you start now to learn what to look for when you buy.

What to Do

1. Make a list of as many small electric appliances as you can.

2. Collect as many advertisements and as much literature as you can on small appliances, but only on those that you think you might be most likely to buy someday.

3. Visit several appliance stores to see the various models on display. Ask questions about them from the dealer.

4. Make a chart to help you compare the information you have assembled. Use the chart to help you reach a buying decision.

Materials You'll Need

Recent issues of magazines with small appliance ads in them

Retail, mail order, and other catalogs

A 9" x 12" or larger file folder or envelope

Scissors

A pad or notebook and pencil

What Are "Small Appliances"?

"Small appliances" are those which are portable, and which usually are used on a table or counter. Toasters, coffeemakers, portable fans, and griddles are good examples.

("Major appliances" are those which are not so readily portable, and are either free-standing or built-in. Ranges, refrigerators, washers, and dryers are examples.)

Make your own list of small appliances, using what you have seen and read to help you make it as complete as possible. Check the ones that you have in your home.

Choose One That Will Be Used

Everything that we buy, whether it is for ourselves or for someone else, should be selected to give maximum return for what we spend. In other words, we always try to "get our money's worth."

This money's worth may come in the form of convenience, savings in labor, better quality of work done, or just in the pleasure we get from what we buy.

The general rule for selecting a small appliance is: Get the one that best meets an actual need, and which will be used often enough to justify its cost. No appliance that sits unused for months at a time gives its owner her money's worth.

Choose The Model That Suits Best

Once you have decided which appliance you are shopping for, you must decide on one of the many different models made available to you by the manufacturers whose products are sold where you live.

To choose wisely, you should consider many factors. Among them are:

Safety to the user - Your best assurance of this is the presence of the Underwriters (UL) label on the appliance.

Reputation of the maker - The maker with a good reputation is anxious to protect it, and does so by building quality appliances.

Availability of service - Replacement parts and competent repair service should be easy to get.

Worthwhile features - Look for those things that will pay off in more use, longer life, and more convenience.

Appearance - Appliances should be pleasing to the eye, as well as functional.

Cost - The lowest-priced appliance is not always the best buy, when all other factors are considered.

Get All The Information You Can

The basis for good judgment in buying is good information, and there are lots of ways you can get it.

1. Talk to users. If you evaluate it carefully, you will find this kind of information to be of real help to you. Ask people who own this type of appliance how much they use it, how they like it, whether (and how long) it has performed satisfactorily for them, and whether they've been able to get service and parts promptly.

The danger is in relying too much on just a few users, whose experiences are limited to only a few models. Another danger lies in the fact that their experience may be with models that are no longer on the market, or that have been changed a great deal.

2. Read the ads. Advertising is the means that manufacturers use to tell us about their products. These messages tell us much about a product's appearance, its cost, its features, and its capabilities.

Advertising is especially helpful as a source of news about new products, product improvements, new uses, price changes, where to buy, and techniques for care and maintenance.

3. Study manufacturers' literature. Much more complete than most magazine and newspaper advertising are the folders and brochures prepared by manufacturers. Usually included are specifications, sizes, colors,

and ratings, as well as a complete description of the product's features. Special models and optional accessories--things that may meet your needs exactly--are also described in literature.

4. Study the catalogs. Many retail stores, mail order houses, and premium companies publish catalogs which give some information about small appliances. While not as complete as manufacturers' literature, catalogs often do have a great deal of information in them.

5. Visit the stores. You can see the actual appliance, feel it, and ask questions about it and the service, in only one place--the dealer's store. If there is a special price on the appliance, this is the place to find out about it.

The danger lies in buying the first one you look at. Instead, visit several stores, and you'll find that you add to your information with each stop.

Ask for literature while you're at the store. Read the labels and information tags. Make notes on prices, guarantees, and service.

Organize Your Information

You will soon realize that there is a lot of information to be obtained on each appliance. Collect it in your large envelope or file folder. To help you compare the different appliances point-by-point, you should organize your information. One way to do this is to make a chart like the one shown.

After you've written down the information you have, you may want to try to get any facts that are missing.

Then you are in a position to make your comparison, and from that your buying decision.

Appliance	Maker	Model	U.L. Label	Features	Guarantee	Dealer	Parts and Service	Price	Remarks
Mixer	XYZ Co.	Standard	Yes	Multi-speed motor, 2 beaters, 2 stainless steel bowls. Optional attachments: meat grinder, shredder, knife sharpener, can be used as a portable	1 year parts only	Jones Appliance Store	Available	$19.95	Aunt Ginny likes hers

After You Buy

If you buy the appliance for yourself, then this suggestion is for you. Read and reread the instruction booklet or card that comes with the appliance. Avoid that temptation to use it before you have learned how. Then, be sure to save this information, preferably in a file set up just for this purpose. Write the purchase date on this material, and be sure that the model number's on it, too. If the appliance has a serial number, make a note of this, also.

If there's a guarantee card that's to be filled out and mailed, do so at once. Be sure to give all the information asked for.

Remember, too, that your new appliance will perform no better than the wiring that supplies it. If it's a heating appliance, and is slow to heat, or a motor-driven one and it lacks power, or if lights dim when you are using it, then you may need to add a new wiring circuit.

If you see any of these symptoms of poor wiring, then your power supplier should be asked to check it and make recommendations for correcting the situation.

What Did You Learn? (True or False)

1. A 30-inch electric range is an example of a small appliance.

2. An electric can opener would be a good gift for a person who uses mostly frozen food.

3. The UL label on an appliance is an assurance of safety.

4. Price is always the most important consideration in buying.

5. Advertising is a good source of information for prospective buyers.

6. The availability of service and parts is not important.

7. It's easier to compare information if you organize it in some way.

8. If a new appliance does not work properly, the trouble may be in your own wiring.

Demonstrations You Can Give

Obtain as many makes of a particular appliance as you can. (Maybe you can borrow one from a neighbor. Ask one or more of your local electric dealers to let you take an appliance for this demonstration. You must be very careful to return the appliance in as good condition as when taken out.) Show the advantages of each, using a poster or blackboard. Make clear that each buyer should select the model of appliance that will best meet his or her need.

Show an early model of some appliance, such as a toaster. For comparison, show a new model and point out the advantages it offers.

For More Information

Ask your County Extension workers and your power supplier representatives for bulletins or suggestions on buying.

MAKE A CONTINUITY TESTER

When something electrical won't work, the chances are that the current is not getting to where it should go, or else going somewhere that it shouldn't!

With a tester that you can make yourself, it's possible for you to find and correct many such failures. You'll also be able to know whether appliances are safe or not.

You'll find circuit testing and trouble shooting to be fascinating. It is also important to you and to your mother and father and other members of your family to find out if the equipment and appliances that they use are perfectly safe at all times.

What to Do

1. Make a battery-operated bell or buzzer continuity (circuit) tester.

2. Learn how to use it safely.

3. Use it to test some cords and appliances for short circuits, grounds, and open circuits.

4. Record what you found.

Tools and Materials You'll Need:

2 #905 dry cell batteries

10 ft. of flexible insulated one-conductor wire (or split a 5-ft. piece of brown rubber-covered lamp cord.

Bell or buzzer

Tape (plastic or friction)

2 small clips (either battery or "alligator" type)

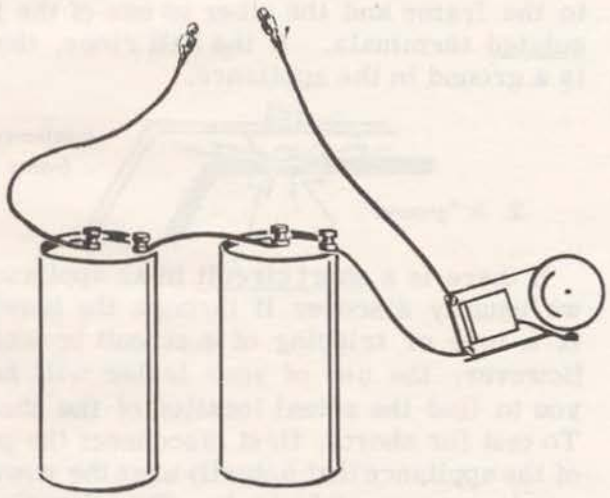
Knife

Electrician's pliers

Assemble Your Tester

Cut the wire into two 5-ft. pieces. Cut a six-inch piece from one end of each 5-ft. piece. Remove 3/4-inch of insulation from each end of all four pieces.

Attach the clips, one to each of the two longer pieces of wire. Then, connect the batteries and bell or buzzer as shown in the drawing.



Finally, tape the batteries together and the bell or buzzer to them, as shown in the upper picture.

Test Your Tester

When you touch the two clips together, the bell or buzzer should sound. Try it and see if it does this.

If it does, you are now almost ready to begin to use your tester.

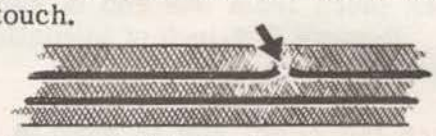
Always Disconnect First

Whatever you are testing must always be disconnected from its 115 or 230-volt alternating current supply before you attempt to check it with a battery-operated tester.

Always keep this in mind. You will not endanger yourself or anyone else if you observe this simple rule.

Make Three Kinds of Tests

By touching the two clips to two places along the path that electricity flows, you can quickly tell whether or not that path is complete. This is a check for an open circuit, and the bell will ring only if the circuit is continuous between the two points your clips touch.

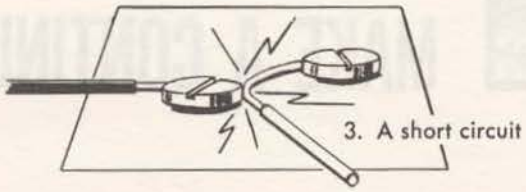


1. An open circuit in a cord

To check for a "ground" (flow of current to the frame of an appliance) touch one clip to the frame and the other to one of the insulated terminals. If the bell rings, there is a ground in the appliance.

2. A "ground"

If there is a short circuit in an appliance, we usually discover it through the blowing of a fuse or tripping of a circuit breaker. However, the use of your tester will help you to find the actual location of the short. To test for shorts, first disconnect the part of the appliance that actually uses the power, as close as possible to it. (On a lamp, for example, simply unscrew the bulb.) Then attach your clips to corresponding places along the two wires that supply power to the appliance, starting at the plug on the end of the cord.



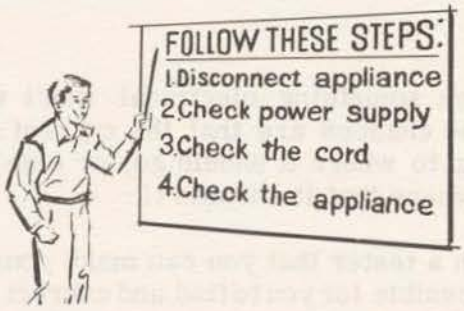
3. A short circuit

If the bell rings, you have discovered a short. Try to locate it by moving up to the next point where you can attach your clips, first disconnecting the cord where it enters the appliance.

Check from the Source to the Use

If an appliance fails to operate, we are apt to think that the trouble lies within the appliance itself. In many cases, however, this is not true. Instead, the reason it doesn't work is that it is not receiving electricity from the outlet or through the cord.

Because of this, and because of the wisdom of scientific practice, we should "move from the known to the unknown."

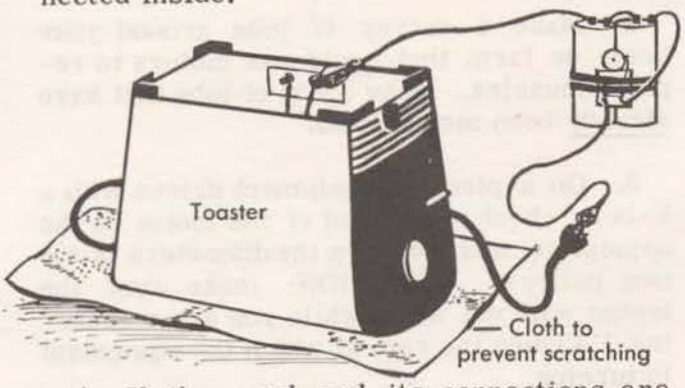


Follow these steps, then, in checking for trouble:

1. Plug another appliance or light into the same outlet. If it works, then you have eliminated possible trouble up to that point. If it doesn't work, go to the fuse or circuit breaker.

2. Check the plug and cord of the offending appliance. If it is a detachable cord (one with plugs on both ends), remove it from the appliance. Attach one clip to one of the wall plug prongs, and touch the other clip to the metal contact in one or the other of the slots in the appliance plug. One or the other should cause the bell to ring. Then move the first clip over to the other prong, and a touch of the second clip in the other slot should cause the bell to ring again. (If the cord has a temperature control or switch built into it, make sure that this is in the "on" position.)

3. If the cord and plug are attached, you follow a similar procedure, but it will be necessary to "open up" the appliance to get at the terminals to which the cord is connected inside.



4. If the cord and its connections are good, then you should start checking the appliance itself for a broken wire or a bad element or an open circuit. Touch the clips to various points along the wiring within the appliance to determine whether there's a path for the current.

If you cannot pinpoint the trouble, or if you cannot repair it when you do locate it, then you should take the appliance to an authorized service agency.

Check Appliances for Safety

It is good to check your appliances occasionally for shock hazard. To do this, touch one clip to the metal frame of the appliance. Touch the other to the cord plug prongs, one at a time. If the bell doesn't ring, there is no apparent shock hazard.

Be sure that the appliance is disconnected from the outlet while you are testing.

What Did You Learn?

1. When you touch the leads (clips) of your continuity tester together, they act like (a switch, an electromagnet).

2. The bell should ring (every time, half of the number of times) we randomly connect to a prong and a slot at opposite ends of a detachable appliance cord.

3. If current is leaking from within an appliance to its frame, we call it (an open circuit, a short, a ground).

4. If there's a break in one wire in an appliance cord, we call it (an open circuit, a short, a ground).

5. If the two wires in an appliance cord are touching, we call it (an open circuit, a short, a ground).

6. If an appliance fails to operate, the first place to look is (inside it, the outlet supplying it).

7. In checking for trouble, as in science, we always move (from the unknown to the known, from the known to the unknown).

8. When you are checking appliances with your tester, you should disconnect the 115 or 230-volt alternating current (always, only when you think there's danger).

Demonstrations You Can Give

Show and tell others how to assemble a tester, and how to use it to find shorts, grounds, and open circuits. Be sure to point out the safety precautions that must be followed.

For More Information

Ask an appliance repairman or an electrician how they use their test equipment. Ask your power supplier representative about the importance of test lamps to the safety of linemen.

Chart Your Results

Make a chart like this one and write down the appliances and cords that you have tested, what was found, and what you did to correct the trouble.

Appliance Tested	Condition	Action Taken
Clothes Dryer	Ground in motor circuit	Wrapped wire with tape

LESSON NO. 63
Credit Points 5

MOTORS instead of MUSCLES

WHETHER you live on a farm or not, did you ever stop to think how much time and effort has been used just to move things from one place to another?

People who run factories and warehouses call this "materials handling." They long ago learned that if they were to be successful in this competitive world, they would have to handle materials as economically as possible. They found that, in most cases, they could not afford to move things using manpower.

Long before this, they had discovered that the processing of materials was something that human power could not do nearly as economically as mechanical power (and in many cases humans couldn't do it as well!).

Now, homemakers and farmers are finding that these same things are true--that they cannot afford to move and process with human power, if a practical way can be devised to do these things mechanically.

What to Do

1. Prove to yourself and others that it's good business to substitute motors for muscles where you can.

2. Make a survey of jobs around your home or farm that could use motors to replace muscles. Make a list of jobs that have already been mechanized.

3. On a piece of equipment driven with a V-belt, check the speed of the motor on the nameplate, and measure the diameters of the two pulleys. (CAUTION: make sure the motor will not start while you are measuring.) Figure the rpm at which the equipment is turning.

1. Why Use Motors?

If you do a job that an electric motor can do, do you know what kind of wages you are earning? Use these materials to help you figure your wages:

Three 8-inch concrete blocks
Truck bed or heavy table
Watch
Rule

One member of the group moves blocks from the floor to the truck bed or table as fast as he can for a 30-second period. His partner replaces the blocks on the floor. Another member keeps time with the watch.

At the end of the run, count the number of blocks lifted and record in the formula. Weigh one of the blocks or estimate its weight (average 40 lbs.) and record in the formula. Measure the height from the floor to the table or truck bed and record in feet.

Multiplying the number of blocks by the weight times the height in feet gives the number of foot-pounds of work done. Multiplying this by 2 gives the work done in one minute. Dividing by 33,000 results in the number of horsepower (hp) developed.

$$\frac{\text{(hp = foot-pounds per minute)}}{33,000}$$

$$\frac{\text{\_\_\_ blocks x \_\_\_ lbs. (wt./block) x \_\_\_ ft. (table height) x 2}}{33,000} = \text{\_\_\_ hp}$$

Your answer should be less than one hp, since a grown man cannot develop much over 1/10 hp for a very long period.

What would it cost to run a 1/10 hp motor for 10 hours with electricity selling at 2 cents per kilowatt-hour? (1 hp equals about 1,000 watts or 1 kilowatt)

There are other reasons for using motors instead of muscles:

Motors never get tired, as you probably did when you were lifting those concrete blocks from the floor to the table for just half a minute.

Motors are on duty 24 hours a day, with no extra pay for overtime or the night shift, or concern about holidays and vacations.

Motors will go into operation automatically whenever a sensing or timing device tells them to.

Motors can be remotely controlled, so that they can work where we would find it uncomfortable or dangerous.

2. What Motors Can Do

Electric motors can do thousands of jobs. Properly connected to the right kind of machines, they can move liquids, solids, and gases up, down, across, or just about any way we want to have them moved.

Motors can process, whether this be laundering clothes, stirring up a cake, lowering the temperature of milk, or washing fruit.

On our farms, materials handling with electric power is one of the greatest advances since the first tractor. Like tractors, however, electric motors must be carefully matched with the other equipment in the whole system. This is necessary so that one machine will not be underloaded, and perhaps the next one overloaded. As with anything, it pays to plan ahead.

What Kind of Motor?

There are several types of motors, and you should know which type to use for various jobs where single-phase electric service is available.

Split-phase motors are generally the least expensive, but their use is limited to jobs requiring from 1/4 to 1/3 horsepower, and which start easily.

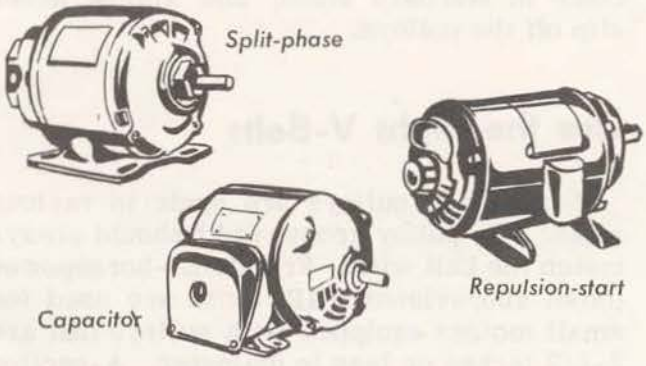
Capacitor motors are designed for medium to hard starting loads, and they are available in sizes from 1/3 horsepower on up.

Repulsion-start motors are for very hard-starting jobs, from 1/2 hp on up.

The position in which your motor will work is important. Any motor will work in a horizontal position. If your job calls for tilted or vertical operation, your motor must have ball bearings to take care of the end thrust.

You should also know of the power requirements. You can get this by looking at similar equipment that was fitted with a motor by the maker.

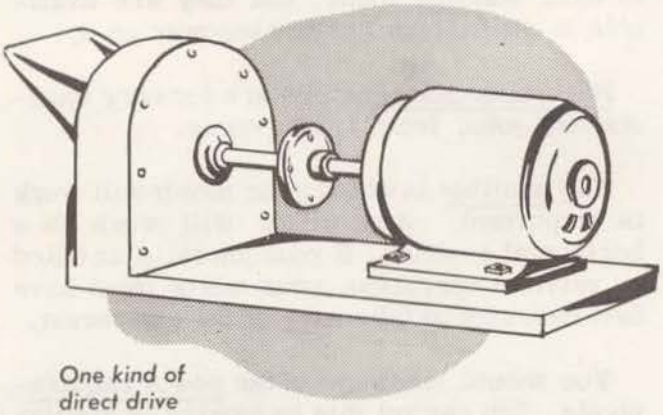
The kind of housing your motor should have is determined by the environment where it is to work. Drip-proof (the most common) housings will keep out water that drips from above. Splash-proof housings will keep out water that might splash up from below. Totally enclosed motors will keep out all water and dirt. Explosion-proof motors will prevent a spark in the motor from igniting dust or fumes.



The voltage at which you will operate your motor depends usually on its size. Those a half horsepower or smaller are usually operated on 115 volts, and bigger motors on 230 volts. If you try to operate motors bigger than 1/2 hp on 115 volts, you may have trouble.

3. How to Put Motors to Work

You will need some kind of a drive mechanism to connect the motor to the machine you wish to operate. One kind is called the direct drive and another is the belt drive. Both are practical.



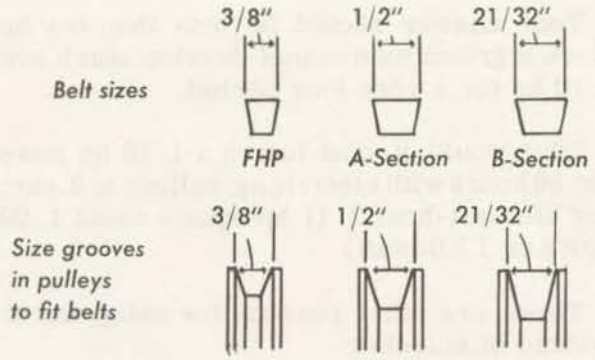
One kind of direct drive

The direct drive is not common, because it requires that the motor speed and the equipment speed be the same. Equipment such as vacuum cleaners, fans, and centrifugal pumps are often mounted directly on the motor shafts. Equipment that has separate bearings must have a flexible shaft or coupling between the motor and equipment shaft.

The most practical and popular drive is the V-belt and pulley. V-belts are easily installed and it's easy to get the speed you need. They also absorb shock and vibration, come in standard sizes, and almost never slip off the pulleys.

Use the Right V-Belts

V-belts and pulleys are made in various sizes. The pulley groove width should always match the belt width. Fractional-horsepower (often abbreviated FHP) belts are used for small motors equipped with pulleys that are 2-1/2 inches or less in diameter. A-section belts and pulleys are used for most farm jobs requiring 3/4 to 5 horsepower. Motor pulley size should be at least 3 inches in diameter. B-section belts and pulleys are used on 3 horsepower or larger motors. Here the motor pulley size should be 5-1/2 inches in diameter or larger.

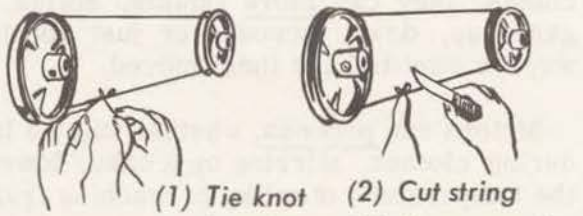


V-BELTS RECOMMENDED ACCORDING TO SIZE OF DRIVE PULLEY AND HORSEPOWER OF MOTOR.

Diam. Motor Pulley Inches	Number and Type of Belts Required Horsepower of 1750 RPM Motors							
	½	¾	1	1½	2	3	5	7½
2	1-A	2-A	X	X	X	X	X	X
2½	1-A	1-A	X	X	X	X	X	X
3	1-A	1-A	1-A	2-A	2-A	3-A	5-A	8-A
3½	1-A	1-A	1-A	2-A	2-A	3-A	4-A	7-A
4	1-A	1-A	1-A	1-A	2-A	2-A	3-A	5-A
4½	1-A	1-A	1-A	1-A	1-A	2-A	3-A	5-A
5	1-A	1-A	1-A	1-A	1-A	2-A	3-A	4-A
5½	1-A	1-A	1-A	1-A	1-A	1-B	2-B	3-B
6	1-A	1-A	1-A	1-A	1-A	1-B	2-B	2-B
7	1-A	1-A	1-A	1-A	1-A	1-B	2-B*	2-B
8	1-A	1-A	1-A	1-A	1-A	1-B*	1-B	2-B
9	1-A	1-A	1-A	1-A	1-A	1-B*	1-B	2-B

*Type A could be used instead of Type B.
X Pulleys less than 3 inches in diameter should not be used for motors 1 hp and larger.

To figure the proper length of a V-belt for a motor already mounted, measure the distance around the pulleys with a piece of string. See diagram.



(1) Tie knot in string *(2) Cut string* *(3) Measure string*

If the motor does not have to be mounted in a certain place, the following formula will give you the length of belt that will be most efficient:

Add:

5. 6 x diameter of larger pulley, and 1. 6 x diameter of smaller pulley, to get the total length.

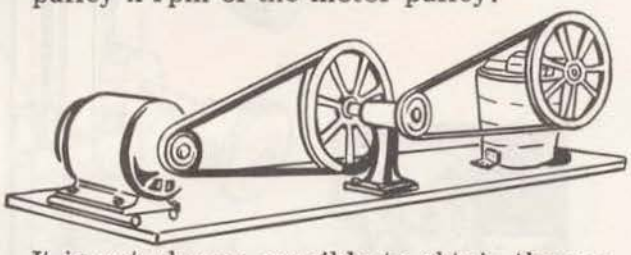
When you find the total length, buy the standard length belt that comes closest.

Pick the Right Pulleys

Most farm equipment does not operate at the same speed as its motor. For example, a hammer mill may require a speed of 3000 rpm; a tool grinder, 2000 rpm; a hay drying fan, 1150 rpm; and a feed auger a much lower rpm. To change the motor speed to the required equipment speed, you will need to use different size pulleys on the two shafts.

A simple way to figure proper pulley diameter is to use the formula:

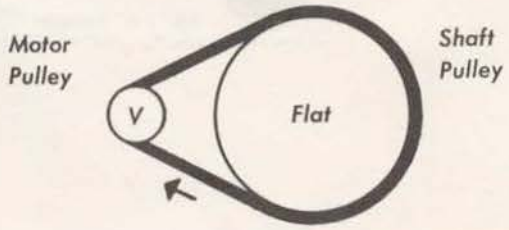
Diameter of the driven pulley x rpm of the driven pulley = Diameter of the motor pulley x rpm of the motor pulley.



It is not always possible to obtain the correct speed with one set of pulleys. A speed reducer or jack shaft can then be used. You will then need to apply the pulley formula twice--between motor and jack shaft, then between jack shaft and machine. Sometimes a roller chain is used between the jack shaft and machine.

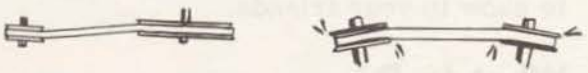
V-Flat Drive

In some instances, you will find it desirable to have a small V-pulley driving a large flat pulley. This is called a V-flat drive. Large V-pulleys are expensive and hard to obtain. This arrangement is particularly good if you are (1) running a machine that needs a pulley larger than 12 inches in diameter, and (2) are operating at 600 rpm or less. A standard V-belt is used that fits the V-pulley on the motor. If the distance center to center on the two pulleys is not greater than the diameter of the large pulley, very little slippage will occur.



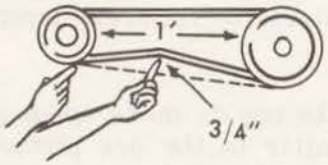
Tips for Good V-Belt Operation

1. Clean the pulleys—wipe out all oil, dirt, and grease.
2. Check pulley grooves—worn or bent pulleys wear out belts fast.
3. Release the take-up adjustment—do not "roll" a belt on a pulley.
4. Check pulley alignment. Use a straight edge against the two pulleys.



Pulleys out of line *Shafts out of line*

5. Get the right belt tension—neither too tight nor too loose. A good rule is to allow a 3/4 inch depression for each foot of distance between pulley shafts.



6. Always use "matched" belts in multiple drives.
7. Recheck the pulley alignment and belt tension periodically.
8. Never use a belt so worn that it rides the bottom of the groove.
9. Be sure the belt matches the pulley.
10. Try to have the bottom section of the belt do the pulling.

Demonstrations You Can Give

Show and tell about the three sizes of V-belts, and how to properly install a V-belt.

LIVE WITH LIGHT—OUTDOORS

With light, you can make the outdoors around your home a place that is safe and convenient, a place in which you can have more fun, a place in which you can get more work done, and a place that you'll be proud to show to your friends.

What to Do

1. Pick an outside area around your home that you would like to see well lighted. Decide the purposes for which you would like to light it - for safety, play, work, or beauty.

2. Make a plan for lighting it. List the wiring materials, fixtures, lamp bulbs, and the cost.

3. Make one or more spike-pole outdoor lights similar to the one pictured here, or one or more garden lighting shields.

Light for Safety, First

Does your home have porch or entrance lights? It probably does, and it may well have a post lantern or some other kind of yard light.

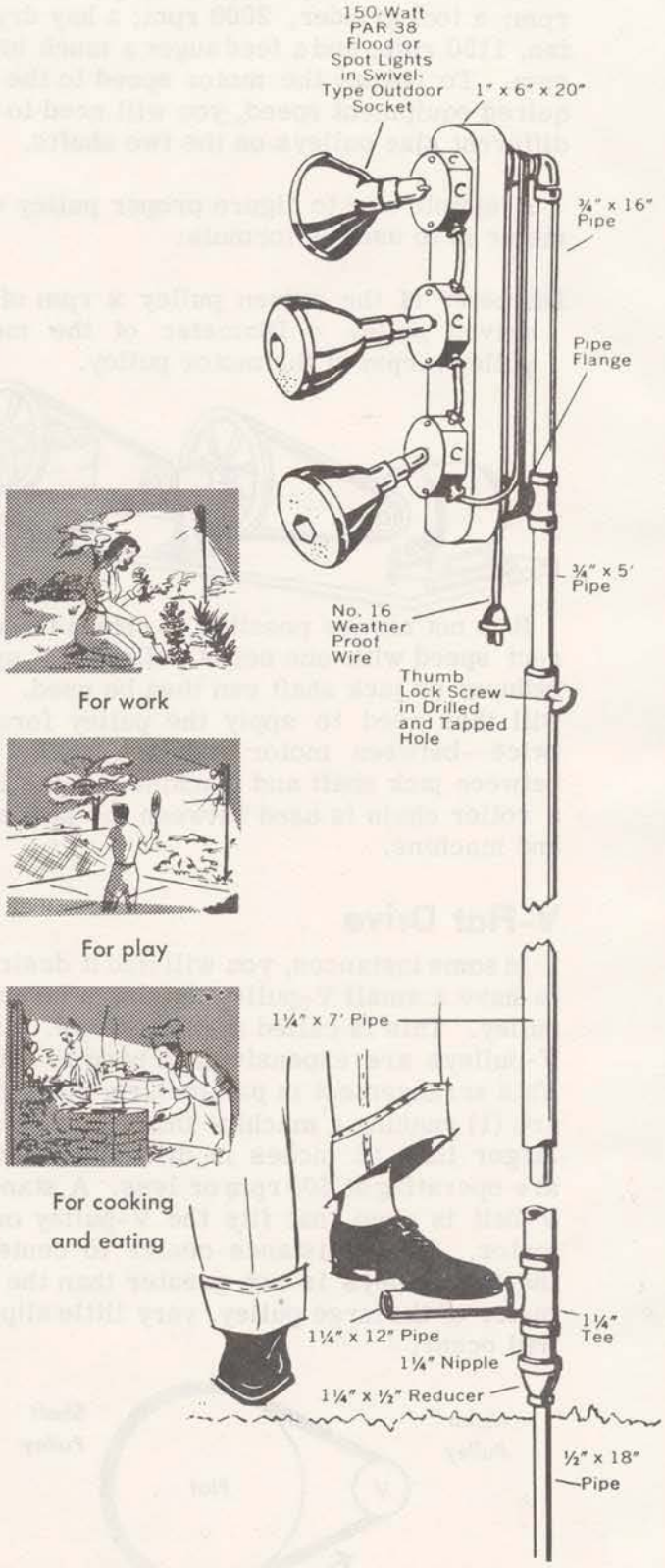
The main reason for such lights is safety. When they are turned on, they help people to see stairways and other obstacles over which they might fall.

Porch, entrance, and yard lights also discourage vandalism, intruders, and thieves. They are regarded as essential.

Light for Convenience

Outdoor lights also make it convenient for us to walk around outdoors without having to bother with a flashlight. This is especially true on the farm, where people must travel between the house and other buildings, often with their hands full.

Just how convenient such lights are depends on how many there are, how well they are placed, and the way in which they are controlled.



Generally speaking, lights for safety and convenience should be placed as high as possible without shadowing heavily traveled areas. (A light high above the back porch might make the roof cast a shadow on the steps.)

Such lights can be located on poles and will cover more area than if mounted on a building. Use 150-watt PAR 38 floodlamps, located 10 to 20 feet above the area to be lighted, or regular pole lighting fixtures.

For walks near the house, you can use dome type units about 16 feet apart with 25 to 50-watt bulbs.

They can be controlled with three-way or four-way switches, with low-voltage controls, with photoelectric controls, with time switches, or with a combination of the last two methods.

Are the outdoor areas around your home lighted for safety and convenience?

Light for Play

Have you ever had some friends at your place in the evening, and wished that you had enough daylight to let you play croquet, horseshoes, badminton, or some other outdoor game?

You should light the areas for such games in a generally uniform manner. Be sure to keep direct light out of the players' eyes. A light source well above eye level on a building or pole is usually best.

Light for Cooking and Eating

Most everyone agrees that food tastes better outdoors. Lighting of the cooking and eating area will help the cook and make backyard picnics easier and more fun.

To light the outdoor fireplace or barbecue, use 150-watt PAR 38 floodlamps, located 10 to 20 feet above the ground, and aimed in several directions to soften shadows.

The table can be lighted in the same way, or you can use two 10-inch weatherproof plastic "bubble" fixtures with 60 to 75-watt bulbs, suspended three to five feet above and slightly to one side of the table. When you put lights near the table or fireplace, use the yellow bulbs that do not attract insects.

Light for Work

Do you ever run out of daylight when you have some important work to do on your outdoor 4-H project?

You can do many jobs after sundown if light is available. In fact, the cool of the evening is often the best time to mow the lawn or work in the garden. Portable flood lights will do for this kind of work.

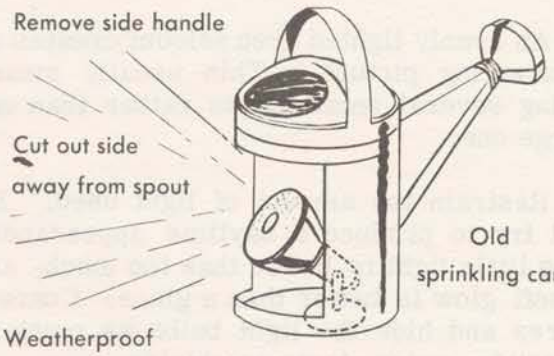
Jobs such as painting and other do-it-yourself projects require uniform light of fairly high intensity, and freedom from shadows.

Light for Beauty

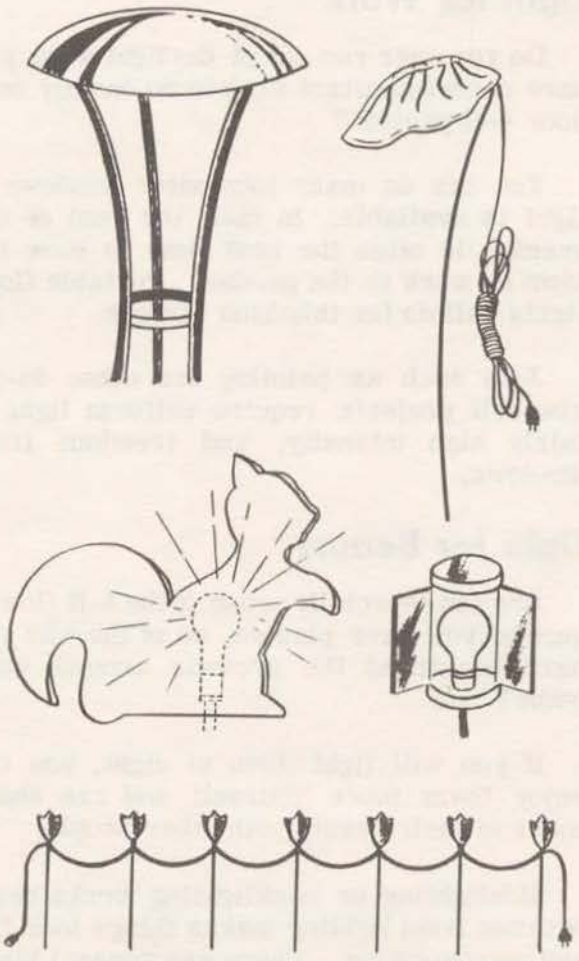
Are you especially proud of the 4-H flower garden you have planted, or of the way you have beautified the grounds around your home?

If you will light them at night, you can enjoy them more yourself and can share more of their beauty with other people.

Sidelighting or backlighting works best, because front lighting makes things look flat and uninteresting. There are several kinds of commercial garden lighting fixtures available. The dome or mushroom type is most common. Use 25 to 40 watt bulbs in them, 12 to 14 inches above the flowers. Or, conceal a weatherproof lampholder in a sprinkling can or other kind of shield.



Be careful about shadows. When they are carefully controlled, they add to the beauty. Out of control, they can produce some weird effects.



Various types of holders. Some you can make; others you can buy.

You can light trees or shrubs to accent unusual foliage, bark, or shapes. Select open, artistic forms instead of solid masses of foliage.

An evenly lighted area seldom creates an interesting picture. This usually means using several small lights rather than one large one.

Restrain the amount of light used. Do not try to produce a daytime appearance. Too little light is better than too much, and a soft glow is better than a glare. Conceal wires and hide the light bulbs as much as possible, using plants or shields.

Consider your neighbors. Carelessly located lights can be very annoying. Place or shield your lights so they will not disturb other people by shining on their property.

Use These Kinds of Bulbs

Equipment for outdoor lighting should be durable, moisture proof, rustproof, and preferably grounded to prevent electrical shock. Indoor fixtures and extension cords are unsatisfactory and can be dangerous. Use weatherproof porcelain sockets, sealed with a gasket.

First, let's take a look at the light bulbs available for outdoor lighting.

1. Projector (PAR) Lamps - are available for spot or flood lighting. Try both since they throw quite different beams. They are made of hard glass and will not break when water strikes them. You may need a snap-on shield or reflector to eliminate glare. Colored covers are also available as shielding devices and fit directly on the rim of the lamps.

2. Reflector (R) Lamps - also come as spot and flood lights in various colors. However, they must be protected from the weather. A spatter of rain or snow can break them when they are hot.

3. Inside Frosted Lamps - may be used outdoors unprotected in wattages of 15 and 25 watts. Higher wattages should have shielding from moisture.

4. Yellow lamps are sometimes called "bug lights". Since insects see only the blue part of the light spectrum, yellow bulbs eliminate most of the light that attracts them. Remember, however, that yellow light deadens the color of foliage.

5. Mercury Lamps - produce a blue-white light that flatters most foliage. They are available in PAR bulbs and in tubes. They need special sockets and auxiliary ballast to operate properly.

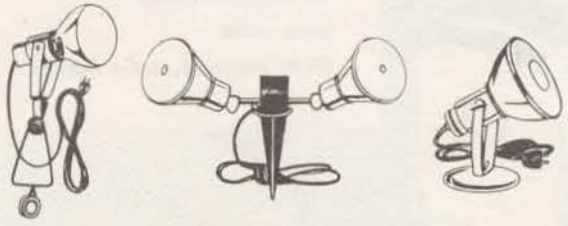
6. Sign Lamps - are weatherproof and useful for garden, and decorative lighting. They come in white and eight other colors.

7. Christmas Lamps - come in varied colors and are very effective for a party atmosphere or holiday decorations.

8. Fluorescent Lamps - Use them where you want light on vertical surfaces such as fences or hedges.

These Fixtures Work Best

1. Adjustable Holders - are used for PAR projector lamps and others. In singles or clusters, they are available with spikes for ground placement, plates that attach to walls, and clamps for use on trees and poles.



2. Dome or Mushroom Units - are used for general lighting on a terrace or where you want the light directed down. The stem will vary from two to five feet. The bulb wattage is optional.

3. Flush and Surface Mounted Units - direct the light horizontally and down. These are located along paths or walks near buildings. The lamp size usually varies from 6 to 25 watts depending on the unit.

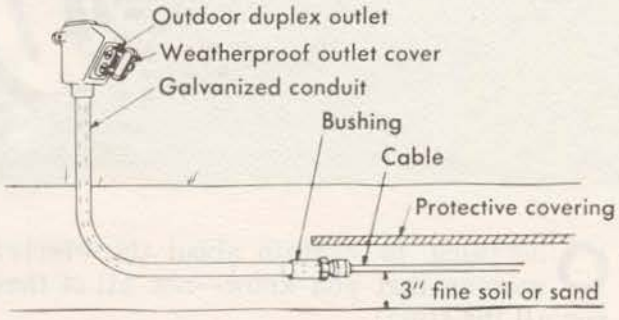
4. Diffusing Plastic Shade - or "bubble" unit is attached to a suspended socket. It is used for general terrace lighting with a roof or overhang. They are available in 10" diameters on up. Wattages vary from 40 to 150 watts in the larger sizes. With smaller bulbs inside, they are very decorative.

5. Telescopic Poles - use holders for PAR lamps or enclosed floodlamp holders. They fit into pipe sleeves driven into the ground or have a floor base.

Wiring Should Be Right

For full enjoyment of outdoor lighting, adequate wiring is essential. It may be temporary or permanent, but permanent wiring has a number of advantages. It makes installation of lighting equipment easy, avoids the hazard of cords stretched across lawns and walks, permits the use of appliances and small power tools outdoors, and because it must be grounded, is much safer.

Portable Cords - Most outdoor lighting equipment has up to 12 feet of weatherproof cord. Weatherproof portable cord sets, which handle several lighting units, are available. Some lighting fixtures have built-in outlets to connect additional units. (WARNING--these outlets may not be intended to carry appliances or power tools.) Plugs, sockets, and splices on cords should be molded in rubber to keep the cords weatherproof.



Permanent Wiring - offers maximum safety and convenience. Plastic wire types USE or UF can be buried without enclosing them in conduit. If the soil is rocky, place a layer of sand or fine soil in the trench as a bed for the cable. A slight "S" should be made in the cable where it enters the house to allow for expansion or contraction. Separate circuits for outdoor lighting equipment should be provided for in the main house panel. Be sure that one or more convenient controls are installed.

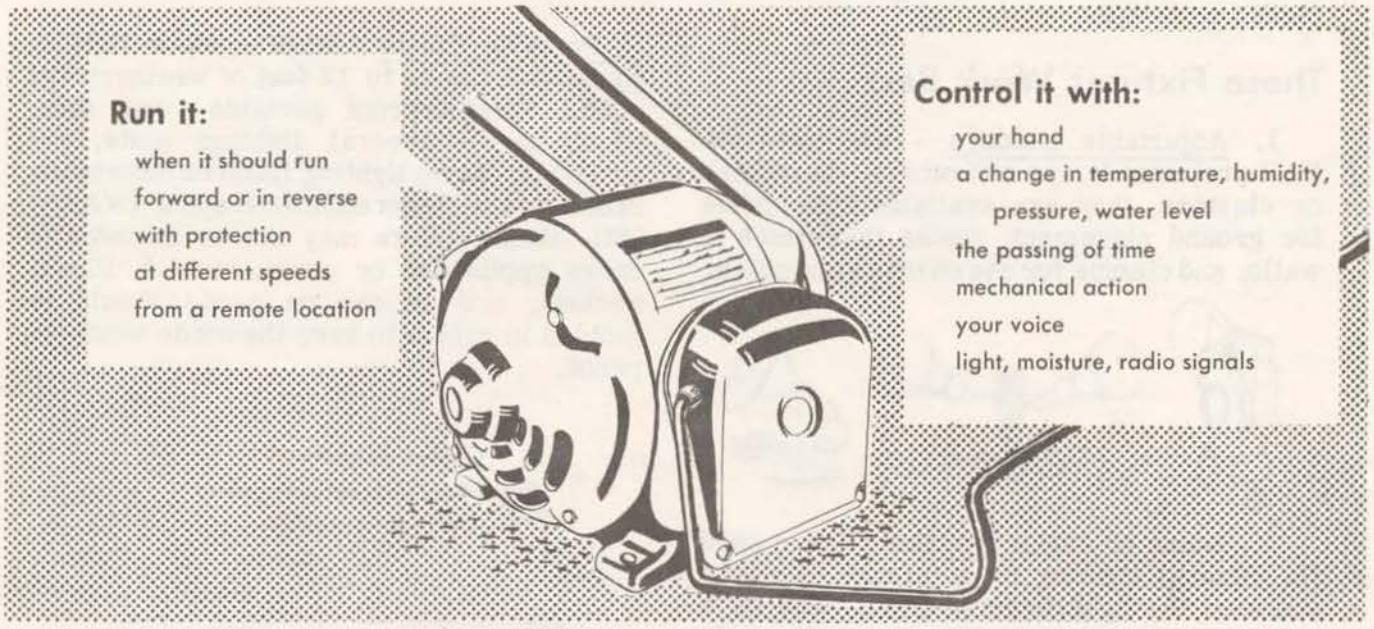
Demonstrations You Can Give

Show various bulbs and fixtures suitable for lighting outdoor areas, and tell what each is best adapted for. Show some "before" and "after" pictures of an area that has been properly lighted.

For More Information

Ask the home or farm representative of your power supplier, or your county Extension or home demonstration agent.

KEEP YOUR MOTORS UNDER CONTROL



One thing is certain about the electric motors that you know--not all of them run all the time!

Instead, they run only when they should--to refrigerate, ventilate, elevate, clean, mix, sew, move materials, and so on.

In addition, some of them run some of the time at one speed, then later at a different speed. Others run sometimes in one direction, at other times in another.

Did you ever wonder how all this starting and stopping and changing of speeds and direction is done?

The answer, of course, is that it is all done by means of the right kind of control device for each motor. Some controls also provide protection for the motor. (NOTE: Many of the control devices described may be used for lights and heating equipment, too.)

What to Do

1. Learn what the most common kinds of motor controls are, how they work, and where they are used.

2. List all the motors used in your home or on your farm. In a separate column, tell how each one is controlled, and whether overload protection is provided.

3. Inspect as many different types of motor controls as you can. If possible, help your club leader bring some of these to a club meeting so that you might better understand how they work.

4. Show others how some of these controls work, and tell how they are used.

How to Pick the Right Control

Selecting the right control for a motor depends on many things: Can the control be automatic, or will it be operated by some person? What safety measures should be taken? If manual, will it be near the motor, or at one or more remote locations? If automatic, what will be the changing condition that will make the control work? Will the control include overload protection for the motor? How large is the motor?

These are some of the questions that must be answered before the right control is picked.

Manual or Automatic?

What determines when the motor should be turned on or off? Is it a change in temperature or humidity? A change in water level? A change in air pressure? The passing of time? The movement of equipment that could cause damage?

Generally speaking, changes in temperature, humidity, fluid level, pressure, time, and location all can be used to control electric motors automatically. Other types of automatic controls are in use, but these are the most common.

How Many Locations?

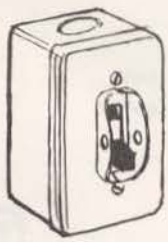
If a motor is to be controlled manually, it may be that control from more than one point is desired. If so, this will affect the type of manual control used.

Manual On-Off Switches

The only control that many small motors have is a cord and plug, but an on-off switch is much safer and more convenient.

Snap switches such as are used for lights are suitable for controlling motors, up to the limit of their current-carrying capacity. (Almost all motor controls have quick snap-action to cut down on the "arcing" or flow of current through the air when the circuit is broken.)

Three-way and four-way switches can be used to control small motors from two or more locations. (Compare rated capacity of the switches with the current requirements of the motor.)



Snap-action switch for small motors—with overload protection

Special small-motor snap switches that include overload protection are better, however, if the motor does not have such built-in protection. When you go to buy such a control, know the full-load current rating of the motor so that the store can supply you with the right size "heater" for it. This is the part that causes the switch to open if a dangerous overload does occur.

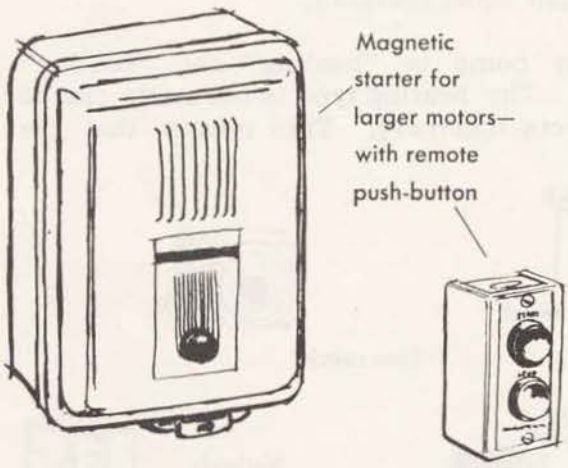
Other kinds of manual switches are those that spring back into the off position when you let go of them. These trigger switches are common on power shop tools. Treadles, that work when people, animals, or vehicles pass over them, use the same principle.

Magnetic Starters

Magnetic starters are made for motors ranging in size from one horsepower on up. The push of a button, either on the starter or at any one of several remote locations, closes a circuit that causes an electromagnet to snap the contacts together. It includes overload protection.

Because the control circuit does not carry the full motor current, this kind makes it possible to control a larger motor automatically. It can be actuated by the small amount of current that will safely flow through a thermostat or other sensing device.

It also permits the use of any number of control locations, and the wiring that connects these push-button stations is relatively light.



Magnetic starter for larger motors—with remote push-button

Reversing Switches

This kind of manual switch changes the motor connections to get reverse rotation when that is desired. It is used on two-way conveyors, certain fans, and shop equipment.

Variable Speed Controls

This kind of control uses varying amounts of resistance in the motor circuit, or changes from one motor winding to another.

It is used on some fans, food mixers, and sewing machines.

Time Switches

These use electric or spring-driven clocks to open and close contacts. Some kinds automatically start and stop motors at certain times each day. Others can be set for motors to be on for a certain number of minutes and off for a length of time.

Still others will stop operation the desired length of time after the motors have been started manually.

Kitchen appliances, off-peak water heaters, poultry and cattle feeders, fans, irrigation pumps, and incubators use time switch controls.

Thermostats

Thermostats depend on the expansion and contraction of gases, liquids, or solids to open and close contacts.

They come in "heating" and "cooling" types. The heating type is normally closed (contacts together). This means that the motor will run until the temperature comes up to a set level. This kind is used on brooders, and of course on many devices which have no motors but which merely have heating elements.

The cooling type is normally open (contacts apart). It does not complete the circuit until the temperature gets up to a set level. It is used on ventilating fans, refrigerators, and air conditioners.

There is a limit to the size of motor that can be controlled directly by a thermostat or other sensing device, and on a large motor it may be necessary to use a magnetic starter to carry the motor current.

Humidistats

A humidistat is a mechanical snap-action switch operated by an element, generally made of human hair (sensitive to changes in the amount of moisture in the air).

This device is used to control humidifiers, dehumidifiers, and ventilating fans.

Pressure Switches

This kind of switch has a bellows or diaphragm that is linked to a snap-action switch. When certain pressures are reached, the switch is tripped on or off, according to the way it is adjusted.

Pressure switches can be actuated by changes in pressure of gases, liquids, and by the presence or absence of bulk materials such as grain in a bin.

They are commonly used on water pumps and air compressors.


Reversing switch


Time switch


Thermostat


Variable speed switch


Pressure switch


Limit switch


Humidistat


Float switch

Float Switches

This is a mechanical snap-action switch operated by a float. When the water or other liquid rises to a pre-determined level, the float rod actuates a trip-lever and opens the circuit. When the liquid level falls, the circuit is closed again. These are used on stock-watering tanks and also on sump pumps.

Limit Switches

There are certain types of equipment, such as motor-operated doors, windows, gates, elevators, and hoists that are safer and more convenient if they have a switch to open the circuit when they reach the end of their travel. A limit switch depends on mechanical action, something pushing on an external bar or roller to open a snap-action switch.

Miniature Snap-Action Switches

Trigger-type snap switches that operate with a very small amount of mechanical pressure are used to control many types of electrical equipment. They are available in normally-open and normally-closed types.

Electronic Controls

Through the miracle of electronics, motors can be controlled by many other means.

Electronic controls can be built or purchased that will operate when actuated by: the human voice, the presence of the human body, light, the presence of moisture, the passing of time, and radio signals.

What Did You Learn? (True or False)

1. A switch should open and close quickly to prevent arcing of the electric current.

2. Switches with overload protection are used only for large motors.

3. A pressure switch operated by a diaphragm does not have a snap action.

4. A pressure switch cannot be used to control air pressure.

5. The float rod of a float type switch operates a trip-lever that always opens the circuit.

6. Without a limit switch, an elevator could cause extensive damage.

7. You can use the same thermostat for a stable ventilating fan and for an electric room heater.

8. You can control a large motor directly with a humidistat.

9. Time switches can control only lighting circuits.

10. Radio signals are the only things that will actuate electronic controls.

Demonstrations You Can Give

Borrow or otherwise get as many different kinds of motor controls as you can. After studying how they work, connect each of them to a separate light. Show others how each device will turn its light on and off, manually or automatically, as the case may be. (Use the warmth of your hand to actuate a thermostat, or the moisture in your breath to actuate a humidistat, and so on.)

For More Information

See the literature of manufacturers of control devices, or ask your power supplier representative.

Motor	H.P.	Control	Overload Protection?
Water Pump	1/4	Pressure Switch	No
Dehumidifier	1/6	Humidistat	No
Crop Dryer	5	Magnetic Starter	Yes

HOW TO BUILD AN ELECTRIC HOTBED

Do you have a 4-H vegetable garden or flower project? Are you interested in the science of plant development? Or, would you like to earn some extra money by growing and selling plants?

One of the best ways to grow better plants is to get a jump on the weather. With a good electric hotbed you can gain several weeks on the growing season.

What to Do

Construct an electric hotbed. Talk over with your parents the plans given. Follow the steps as outlined. Have your parents help you make some of your decisions. Keep an account of your costs and itemize them and the materials.

Pick a Good Location

You should pick a good location--it's essential for satisfactory operation of a hotbed. Select a place where the soil has good natural drainage so there is no chance of water standing in the bed. It should be close to a source of electricity and a water outlet.

Buildings or other objects such as trees should not block sunlight from the bed. The bed should have a southern exposure so that it receives maximum amount of sunlight. If the ground slopes, a southern slope is preferred. Some form of a windbreak on the north or windward side will help reduce operating costs.

Size According to Need

Almost any size hotbed can be electrically heated. Beds 12 feet wide have been operated successfully but a narrower bed is easier to work. The size of the bed will depend on the kind and number of plants, and spacing between plants and plant rows.

A standard hotbed sash is 6 by 3 feet. If you plan to use this type of covering, a practical width for a bed is 5 feet 8 inches. The length should be a multiple of three such as 6, 9, or 12 feet. Cable is usually designed to fit 2, 4, or 6-sash beds, although special units are available for small beds.

Cables and Controls

Various types of electric heating cable are available. Both lead-covered and plastic-covered give satisfactory results when used properly. In selecting cable, you must know how many watts per square foot of bed area are needed to provide enough heat. In southern areas, 10 watts per square foot have proved adequate. In northern areas, during extremely cold weather, as much as 16 watts per square foot may be needed.

The cables vary in length and heating capacity. Some are 60 feet long and are rated at 400 watts on 115 volts. Others are 120 feet long and rated at 800 watts on 230 volts. Still others are 60 feet long and rated at 300 watts. Various other cable lengths and wattages are available. Use your judgment in selecting the proper size cable for the bed you plan to build. Your power supplier or equipment dealer can assist you in selecting your heating cable.

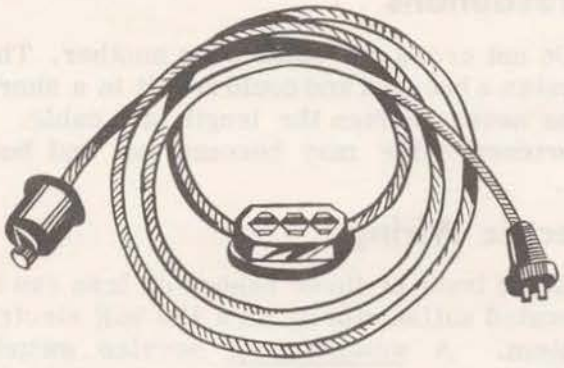


Figure 1

Select a thermostat with an operating range of from around 30° to 120°F. One whose sensing device can be buried will work satisfactorily in a small bed. It must have sufficient current-carrying capacity to handle all the cables that are connected to it.

Place the thermostat 1/3 of the way across the width of the bed and about the same distance from the end wall. Some growers bury it about one inch in the soil near the northwest corner. Others set it in a vertical position with the bottom half buried. Here it is affected by both soil and air temperatures. Do not place the thermostat or bulb directly above a heating cable or allow it to come in contact with a cable.

Covering

Glass sash is the best type of covering for hotbeds, but is also the most expensive. Other materials such as plastic film, plastic coated fabric, and treated muslin work in warmer climates and help cut costs.

Materials

Most beds are constructed with wood sidewalls. They should be two inches thick and made of tongue-and-grooved lumber. If this is not available, use 2-inch lumber dressed on all sides, and weatherstrip the joints. Treat the wood with copper napthenate or some other product that retards decay but will not injure the plants. Do not use creosote. It is harmful to plants.

Instead, you may wish to use 4-or 6-inch masonry blocks. They should have a good footing to prevent frost damage. Use mortar in laying the masonry blocks. Poor joints permit air leakage and increase operating costs.

Ground Work

The bed area must be level. If sloping land is leveled, be sure that runoff water will not enter or stand around the bed. It may be necessary to place cinders or gravel under the bed to insure proper drainage. If so, dig the bed area to a depth of about 8 inches. After the walls are built, tamp cinders or gravel to a depth of 6 inches in the excavated space. Cover the cinders or coarse gravel with burlap to prevent sand from sifting down.

Add a two-inch layer of sand. This is important. It protects the heating cable from mechanical or chemical damage.

Construction

Build the back or north wall 18 inches above the level at which the heating cable is placed. Side walls usually slope toward the front about one inch per foot of width. If the bed is 6 feet wide, the front wall will be 12 inches high when the back is 18 inches high. With six inches of soil this will provide six inches of space along the front edge. This is ample room for plants.

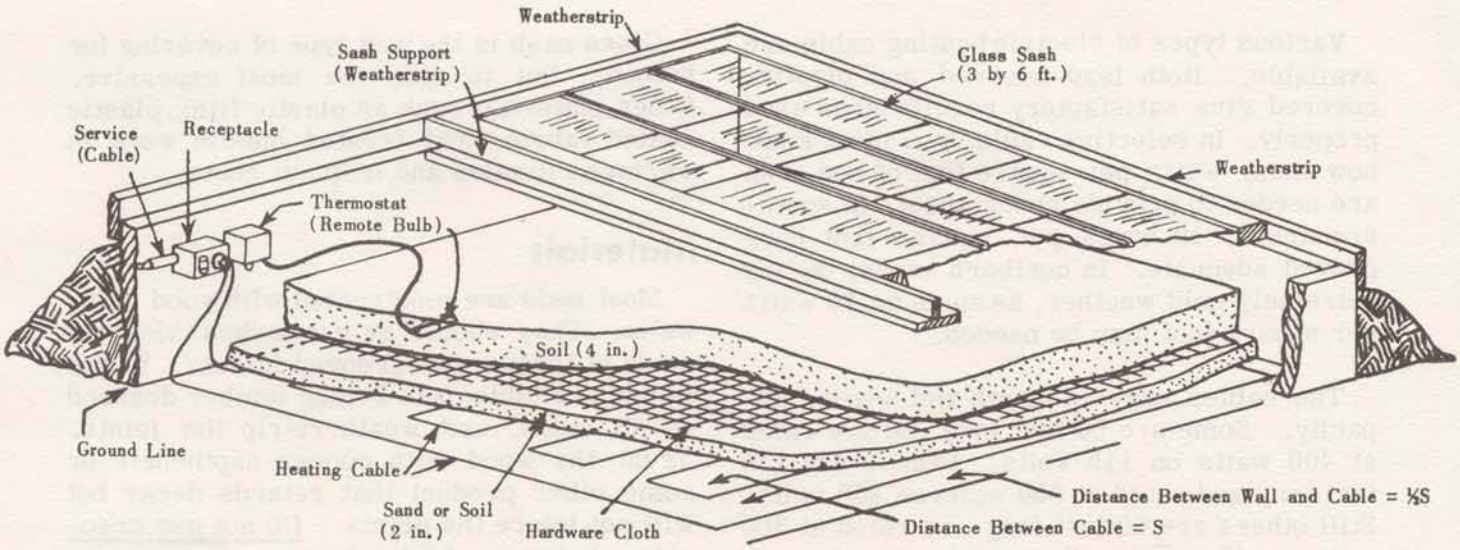


Figure 2

If the bed area was excavated, extend the walls down to the bottom of the excavation. If the area was not excavated, extend the walls down to about four inches below the level at which the heating cable is placed.

Nail one-by-four inch boards to the outside top edge of the back and side walls, as shown in figure 2. The boards serve as weather stripping and reduce heat loss between walls and sashes. Bank soil against the outside of the walls to prevent air leakage.

Laying the Cable

Lay the cable on level soil at the bottom of the bed. If the bed was excavated, lay it on the sand covering the cinders or gravel.

Uniform spacing between loops or sections of cable is important. The distance between the outside loops and the wall should be one-half the distance between the inside loops.

After the cable is in position, cover it with 2 inches of loose soil or sand. Then place a 1/2-inch mesh hardware cloth on top of the soil or sand. This will prevent damage to the cable when digging in the bed.

Precautions

Do not cross one cable over another. This creates a hot spot and could result in a short. Also never shorten the length of a cable. A shortened cable may become hot and burn out.

Electric Wiring

Small beds of three sashes or less can be operated satisfactorily on a 120 volt electric system. A weatherproof service switch, properly fused and grounded, should be installed on a pole adjacent to the bed. The wiring to the switch must be large enough for the distance and heating load. Make all connections to the heating cable water-tight to exclude moisture.

Larger beds, of 4 or more sashes, should have a 3-wire, 230-volt service line.

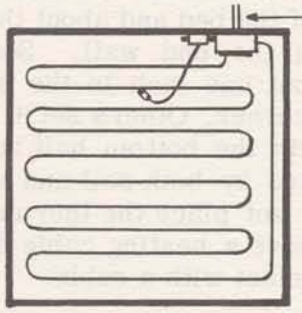


Figure 3

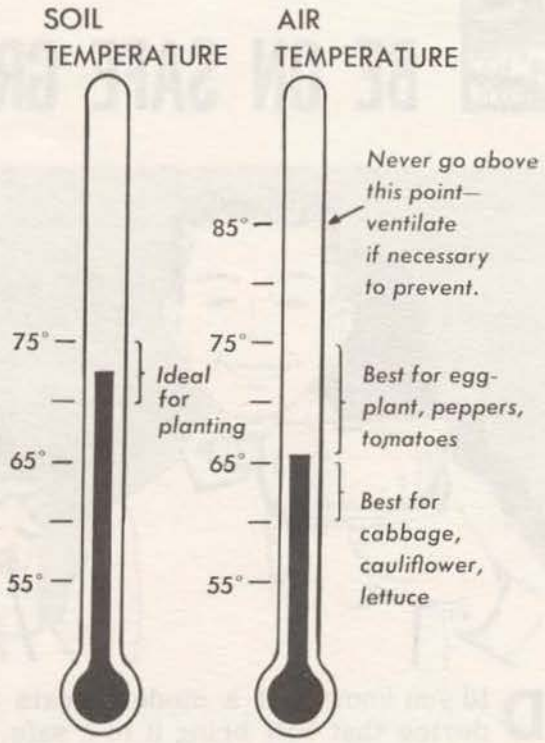
Operating the Bed

Place four to six inches of soil in the bed. Use rich soil that is free of weeds and diseases. It is desirable to sterilize the soil with heat or chemicals to kill the weed seeds and reduce the possibility of disease.

Your Extension Agent can give you information about sterilization of the soil. He can also help you with testing the soil to determine what fertilizer is needed.

A soil temperature of 70° to 75°F. is ideal for planting most seeds. After the seeds germinate, adjust the temperature to suit the particular plant. Cool season crops such as cabbage, cauliflower, and lettuce, require an air temperature during the day of 60° to 65°F. Warm season crops such as egg plant, peppers, melons, and tomatoes require 65° to 75°F. air temperature. Night temperatures can be 5° to 10° lower than day temperatures.

Check both soil and air temperatures with thermometers. Air temperature over the bed should never go above 85° F. Some ventilation will probably be needed on all mild sunny days. Avoid cold drafts or rain on the young plants.



Keep the bed moist at all times, but do not apply too much water. Apply water in the morning so that plant foliage will dry off before evening. Be sure all joints are wind-tight. Cover the sashes during extremely cold weather. You can expect a 3 x 6 foot bed to use one to two kilowatt hours of electricity per day.

What Did You Learn? See if You Can Match These

Maximum amount of sunlight	18 inches
Standard glass sash	10 watts per square foot
Minimum heat requirement	6 inches of gravel or cinders
Height of North side above the cable	Southern slope
Operating range of thermostat	Shorten cable
For poor drainage	3 by 6 feet
Weather-stripping	70° to 75° F.
Cover for cable	1 to 4 inch boards to top edge of the back and side walls
An unsafe practice	30° to 120°F.
Ideal soil temperature for planting	2 inches of sand and hardware cloth

BE ON SAFE GROUND!

Did you know that a modern train has a device that will bring it to a safe, sure stop if anything happens to the engineer?

This "dead man control," as railroad people call it, would keep the train from speeding uncontrolled down the track, from going astray at the next curve or stop signal, from injuring persons or property.

Just as there can be human failure which must be guarded against, there can be electrical failure which likewise requires precautions.

The most important such precaution is called "grounding". Like the dead man control on the train, it will bring electricity to a safe, sure "stop" and prevent electrical injury to people and animals.

What to Do

1. Learn why grounding is important and how it works to prevent injury.

2. Check the outlets in the so-called "hazardous" locations in your home or other buildings, to see whether they are properly grounded.

3. Ground an ungrounded appliance, either by connecting its frame to an approved ground, or by fitting it with a three-wire grounding-type cord and plug. If the appliance is sometimes used with an extension cord, make a three-wire grounding-type cord of the proper wire size and length.

Tools and Materials You'll Need

Screwdriver
Test light
Knife Pliers

Selected materials from among these, depending on what is required to ground your ungrounded appliance. Determine which you'll need and the quantities of each:

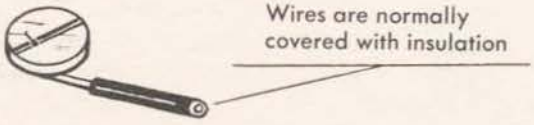
- Single-conductor stranded wire (No. 16 is adequate for grounding most 115-volt appliances)
- Ground clamp--several types available
- Three-wire S or SJ type cord (No. 16 preferred)
- Three-wire cord connector
- Three-wire plug cap (cord grip type)
- Adapter to adapt 2-wire outlet to 3-wire grounding type

Electricity Can Go Astray

Electricity likes the ground! A current, flowing in a wire, will always seek the shortest path to the ground, even though that path might be through the body of a person or animal.

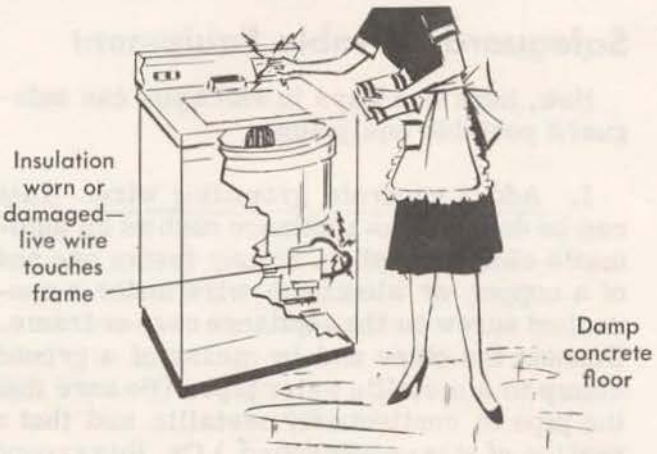
When this happens, the person or animal receives what we call a "shock". This may not only be unpleasant, but it can also cause serious injury or death.

Electrical wiring and appliances are designed so that this will not normally happen. The wires, terminals, coils, and heating elements--all of the current-carrying parts--are usually very well insulated or otherwise protected according to the voltage or electrical pressure that they carry.



Terminal screws usually are insulated with air

Sometimes, however, through damage or use, this insulation or protection fails in some manner. When this happens, other metal parts, such as the frame of an appliance or the outside of a switch box, become electrically charged or "hot".



If these parts are not grounded (connected to permanently moist earth with a conductor of sufficient size), the current will seek whatever other path to ground is available. If you should touch such a metal part, the current will try to go through you. And it will do just that if your skin is not insulated where you touch the appliance, and if another part of your body is not well enough insulated from the ground.

Safeguards Will Prevent Injury

If the frame of an appliance (or switch or outlet box) is grounded, then any stray current will flow to the ground. If this current flow is great enough, it will cause the fuse or breaker on that circuit to blow or trip. If the flow is not great enough to cause this, it will trickle away to the ground, harmless except to your electric bill!

Here's an example of what can happen. Suppose you had been washing a car, and had dried it off preparatory to polishing it. The concrete under the car, and your feet, had both become wet in the process.

Then you reached for a portable electric drill with a buffing attachment to help you do the next job. But through time or damage, a piece of the insulation inside the drill had dropped off, and a current-carrying part had come in contact with the aluminum frame of the drill.

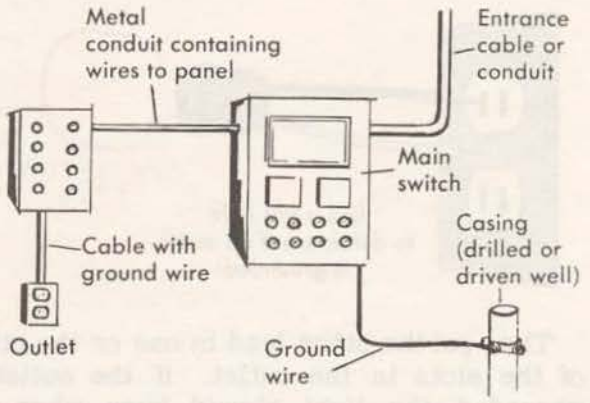
In such an instance, current would choose to go through your body to get to the ground unless you had made sure that the drill was properly grounded. If you had done this, the current would have been drained off harmlessly through the wire to the ground.

Permanent Wiring and Equipment Often Have Safeguards

Because of the importance of grounding, the rules which govern permanent wiring require that much of this equipment be grounded when it is installed.

This is required of the service entrance, panels containing fuses or breakers, and outlets and switches in the so-called "hazardous" locations. These locations include those within reach of the kitchen sink, in the bathroom, and where the floor is concrete directly on the earth, or where there is an earth floor.

The rules require that such wiring devices be permanently grounded by connecting to an underground metallic water-piping system, to the casing in a drilled or driven well, or to one or more driven ground rods.



Electricians sometimes ground all wiring devices--not just those described here. This is done by using metallic sheathed cable (BX), or metal conduit, or non-metallic sheathed cable with a ground wire in it. The metallic sheathing or conduit or ground wire are then connected to the box housing each wiring device and to the ground.

When this is done, it means that if a live wire or connection should come in contact with any of the non-current carrying parts of

a wiring system, neither persons nor animals would be endangered. The current would drain off harmlessly to the ground, and if the flow were sufficient, would cause a fuse to blow or breaker to trip.

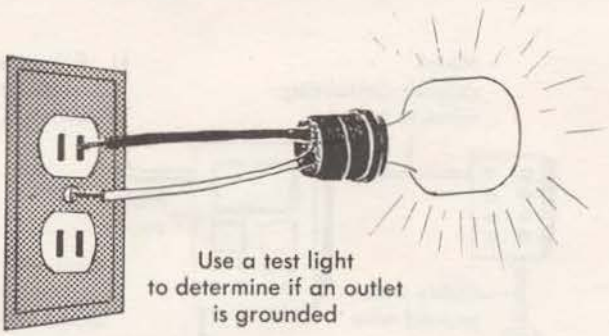
This is the reason why the fuse or breaker must always be in the "hot" side of the line--to make sure that the circuit does go "dead" in the event of an accidental ground or short circuit.

Check Certain Outlets

Is the wiring in your home or other buildings properly grounded?

You can make a simple check, using a 115-volt test light which you can make yourself, if you do not already have one.

As shown in the drawing, hold one of your test light leads on the metal screw which holds the cover plate at the outlet that you want to check. If the screw has paint on it, you may have to scrape off a tiny bit to make a good contact. Make sure that you hold the lead only by the insulation!



Use a test light to determine if an outlet is grounded

Then put the other lead in one or the other of the slots in the outlet. If the outlet is grounded, the light should burn when you have this lead in the slot connected to the fuse or breaker back at the panel. If the outlet is not grounded, then the light will not burn regardless of which slot your lead is in.

Make Plans To Have Grounding Done Where Needed

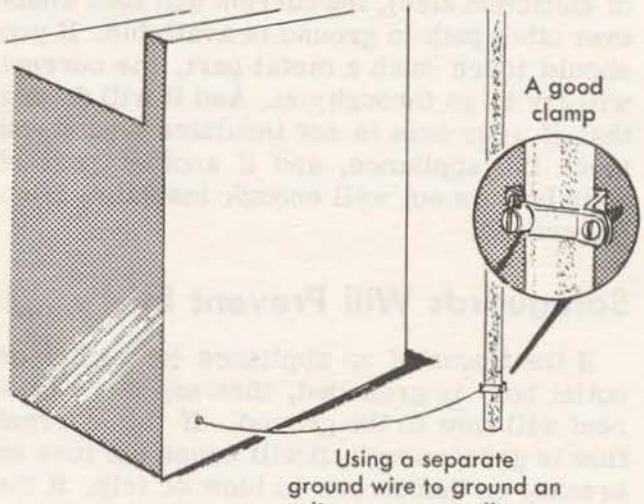
If your check shows that some of the outlets are not grounded in locations where a person can come in contact with a ground, then you should show this condition to your parents. Use the knowledge you have gained to help you tell them about the danger that exists.

Urge your parents to call in a qualified electrician to properly ground the outlet or outlets involved.

Safeguard Portable Equipment

Now, here are ways in which you can safeguard portable equipment:

1. Add a separate grounding wire. This can be done with an appliance such as an automatic clothes washer. Simply fasten one end of a copper or aluminum wire under a convenient screw on the appliance case or frame. Connect the other end by means of a ground clamp to a metallic water pipe. (Be sure that the pipe is continuously metallic and that a portion of it is underground.) Or, this ground wire may be connected to a driven ground that meets the requirements in your area.

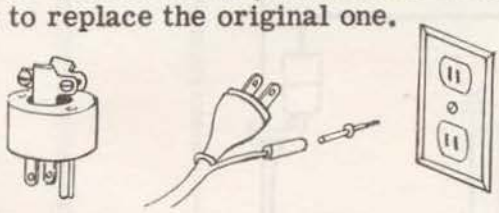


Using a separate ground wire to ground an appliance to a metallic water pipe

The wire you use should be no smaller than that in the present cord which supplies the appliance. Preferably you should use stranded wire, for flexibility, and you can tape it to the regular cord for that distance that the two run together. Protect the wire from physical damage.

2. Use a grounding-type plug cap. This involves adding an extra wire, similarly to the above, but using a special plug cap to make the connection to an approved ground. To be effective, it requires that the outlet be grounded.

The ground wire, connected to a screw on the frame of the appliance, can be a separate stranded wire, no smaller than the wires in the cord and taped to the cord every few inches along its length, or it can be incorporated in a three-wire cord that you attach to the appliance to replace the original one.



Three-prong and screw-stud plug caps

The best grounding-type plug cap is the three-prong kind. The third prong is for the grounding wire only. You will find this on some portable power tools, and shop and laundry equipment. It must be used with a grounding-type outlet, or with an adapter properly connected to a conventional receptacle that is grounded.

Another kind of grounding-type plug cap is one that is fitted with a threaded stud which screws in instead of the cover plate screw of a duplex outlet. Or, it may have a spring clip or magnet to make a connection with the cover plate screw.

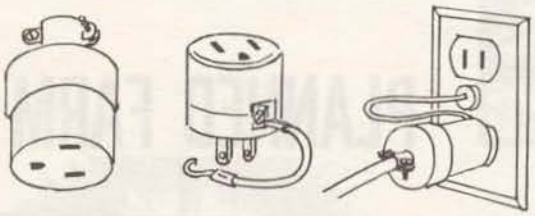
Make A Grounding-Type Extension Cord

If the appliance that you have grounded is a portable tool, such as a drill, then there is the strong possibility that you sometimes use it with an extension cord.

If that is the case, then your grounding efforts will be to no avail unless your extension cord is also of the grounding type (and is always supplied by a grounded outlet).

You can make a grounding type extension cord very easily. Secure No. 16 three-wire cord (type S or SJ) of the length you will need. Attach the grounding-type plug cap to one end, and the connector to the other, using the green wire as the ground wire.

But so that you can use this extension cord at outlets not equipped to accommodate your three-prong plug, you should equip it with a grounding type adapter. One with a magnet or spring clip is preferred to one with a screw stud.



Left to right: cord connector (to accept 3-prong plug), adapter (with lead to attach to cover plate screw), plug and adapter with magnetically attaching lead.

Keep in mind that you will have protection only when the ground is continuous. You will not have this at an ungrounded outlet, or when you fail to make the grounding connection at some point.

What Did You Learn?

(Underline the right answer.)

1. The only permanent wiring that needs to be grounded in a home includes (fuse or breaker panels) (fuse or breaker panels plus outlets and switches within reach of a ground).

2. The purpose of grounding is to (prevent injury to persons or animals) (prevent electrical overloads).

3. All portable alternating current power tools (are) (should be) equipped with grounding type cords and plugs.

4. The use of plastic pipe underground has (little) (great) effect on the grounding value of copper pipe connected to it in a building.

5. The fuse in a circuit should always control the ("live" or black) ("neutral" or white) wire.

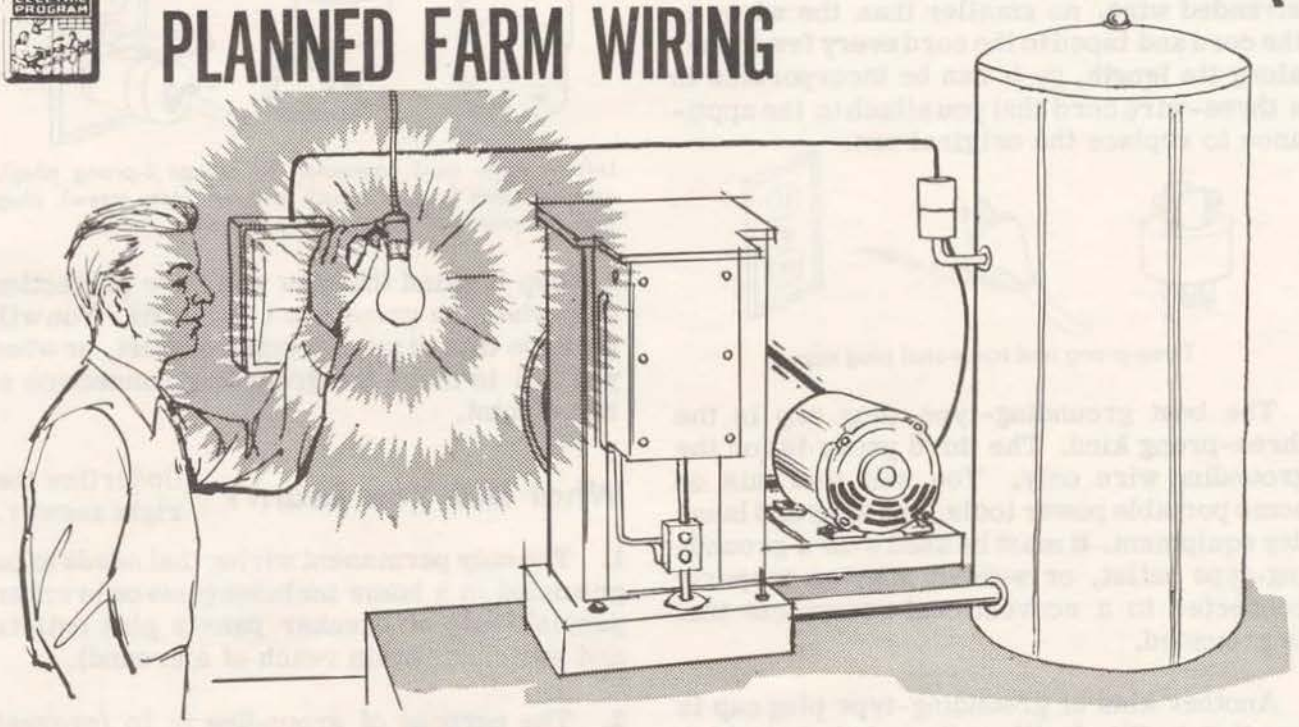
Demonstrations You Can Give

Show how an electric drill or other portable AC tool can be made safe by fitting it with a three-wire cord and three-prong grounding-type plug cap. Show how an adapter will let you use this appliance safely from any grounded outlet.

For More Information

See the National Electrical Code or the wiring regulations of your local power supplier, or talk to one or more qualified electricians. Ask others about experiences they may have had with inadequately grounded wiring or appliances.

PLANNED FARM WIRING



Do you know what it feels like to be starved?

Your electric servants (lights, motors, appliances) can be starved, too. The chances are good you have seen symptoms of this kind of starvation whether you recognized them or not. Someone has estimated that 90 percent of the electrical wiring in use today is not heavy enough to supply the equipment it serves. This means circuit breakers trip and fuses blow for no apparent reason. Lights blink when motors start, or flicker when equipment is running. Heating appliances and equipment such as ranges, water heaters, and brooders are slow to reach proper temperature.

When these things happen on your farm, don't blame the electrical equipment. It's probably doing all it can on a starvation diet of electricity. Chances are that it is suffering from a very common "ailment"--low voltage caused by a lack of capacity in your wiring. This condition has been building up over the months or years while you've been adding electrical equipment. If your wiring is overloaded, it's being asked to shoulder a much heavier electrical load than was originally intended. Just as your tractor or any other piece of farm equipment, your wiring system should be checked and overhauled occasionally.

Do your appliances and lights show some "starvation" symptoms?

What to Do

1. Check your wiring system first.
2. Plan what changes you would recommend, and discuss them with your parents.

For Safety, Convenience, Economy

A well-planned farm wiring system is safe, convenient, adequate, easily expanded, and efficient.

Safety will be satisfied if your electrician follows the National Electrical Code. The other requirements depend on careful planning. Farmstead wiring should be planned with outlets conveniently located for the use of modern electrical farm and home equipment.

Service entrances, feeders, and branch circuits should be large enough to deliver current at proper voltage. You should be able to make changes and additions easily and at minimum expense.

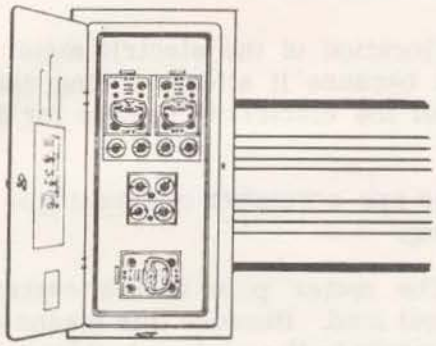
It is better to do a good job at the start, because it is difficult and costly to make changes later. The experience on countless numbers of farms shows that heavier wiring is needed and should have been installed in the first place.

Plan All Four Parts

Your farm wiring system can be divided into four parts. These are the circuits and outlets, building service entrances, feeder wires to the buildings, and the main service entrance.

Circuits

A circuit consists of a pair of wires providing a path for the flow of electricity. It is the last link in the permanent electrical wiring before the power reaches the various outlets where it is converted into light, heat, or power. Circuits start from the distribution panel or fuse box. The number needed will depend on the uses made of electricity in the particular building. Provide for enough circuits to take care of your present and future needs.



There are three types of outlets--lighting, convenience, and special purpose. Various lighting fixtures are attached to a lighting outlet. A convenience outlet is the familiar plug-in receptacle for small appliances, motors, heaters, etc. Both lighting and convenience outlets are usually 115 volts.

A special purpose outlet is one that is designed for particular equipment at a certain location. Examples of this type are outlets serving ranges, clothes dryers, farm welders, hay dryers, or cattle feeders. Special purpose outlets are usually 230 volts.

Branch circuit wires are usually rated to carry 15 or 20 amperes. At 115 volts, the total load on a 15 ampere circuit should not be more than 1725 watts. On a 20 ampere circuit, the load should not be more than 2300 watts. There should be enough circuits so that these limits will not be exceeded.

Number 14 wire was used extensively in old wiring and should not be fused at more than 15 amperes. In modern wiring, Number 12 wire, properly fused at 20 amperes, should be considered. Branch circuits serving convenience outlets for small motors and heavy duty lights must be Number 12 or larger.

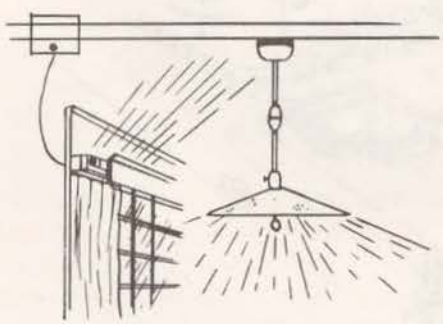
The total amperage on all the circuits in one building makes up the total connected load that must be supplied through the service entrance switch.

Building Service Entrance

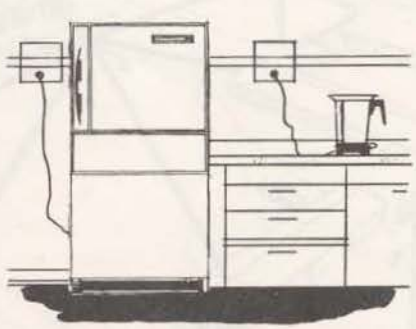
The "service" to an individual building consists of the service drop or feeder wires, entrance cable, the disconnecting switch, fuses, or circuit breakers, and a grounding connection. It is through the service entrance switch that electricity is supplied to a building in such a way that it may be distributed further to various outlets. It also provides a way to disconnect all the circuits of that building from the source.

Feeder Wires

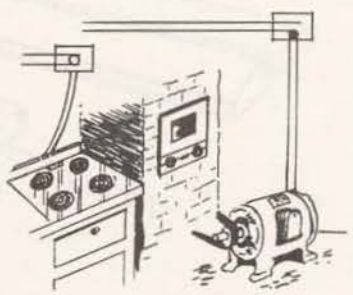
Feeder wires are the conductors that carry electricity between buildings or from the meter pole to the buildings served. It is very important that feeder wires be large enough to serve for a long time. Wires that are too small cause extensive line loss and poor equipment performance. These wires may be overhead or underground.



Lighting outlets



Convenience outlets



Special purpose outlets

When the maximum probable demands for the various buildings are known, with allowance for future needs, the sizes of the feeder wires may be calculated. The size depends on two things--the size of the load and the distance from the meter location. Following is a guide to adequate overhead feeder wire sizes:

Weatherproof Copper Wire		
Load in Building	Distance in Feet from Meter to Building	Recommended Size of Feeder Wire for job
Up to 25 amperes, 115 volts	Up to 50 feet	No. 10
	50 to 80 feet	No. 8
	80 to 125 feet	No. 6
20 to 30 amperes, 230 volts	Up to 80 feet	No. 10
	80 to 125 feet	No. 8
	125 to 200 feet	No. 6
	200 to 350 feet	No. 4
30 to 50 amperes, 230 volts	Up to 80 feet	No. 8
	80 to 125 feet	No. 6
	125 to 200 feet	No. 4
	200 to 300 feet	No. 2
	300 to 400 feet	No. 0

Main Service Entrance

The main service entrance is the point where the power supplier delivers electricity to you. It must be large enough to supply all the buildings on the farm. The main entrance should be on a centrally located building or pole. Your local power supplier will be glad to furnish you the information you should have before you plan this part of your wiring.

Here's the electrical load for a typical farm:

Buildings	Connected Load (Amperes)	Switch Required
Dwelling House	70	100
Dairy Barn or Poultry House	70	100
Farm Shop	45	60
Total Connected Load	185 amperes	

At least a 200 ampere main service entrance would be recommended. When calculating the size of service entrance equipment, always allow for extra capacity to take care of future expansion.

Meter Location

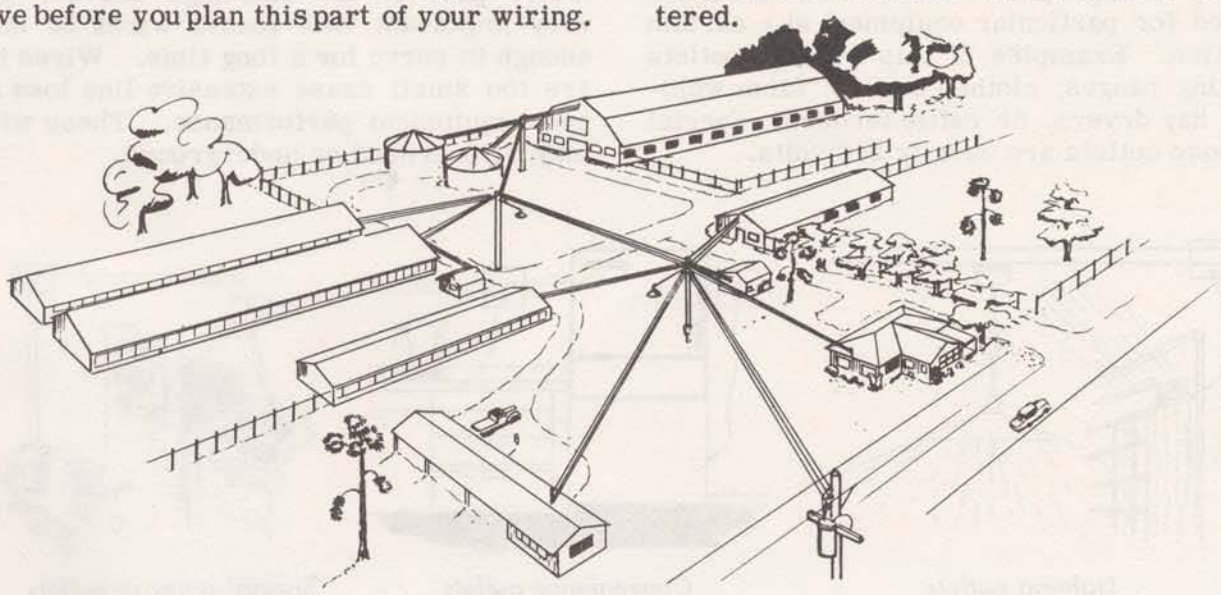
The location of the electric meter is important because it affects wiring costs and how well the electricity you pay for does its job.

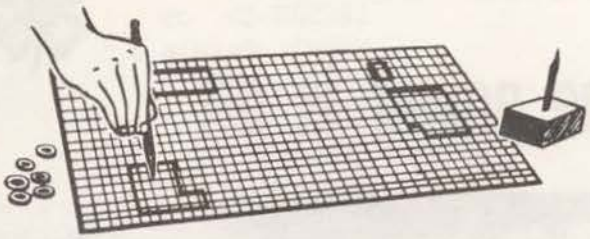
There are a number of advantages of pole metering:

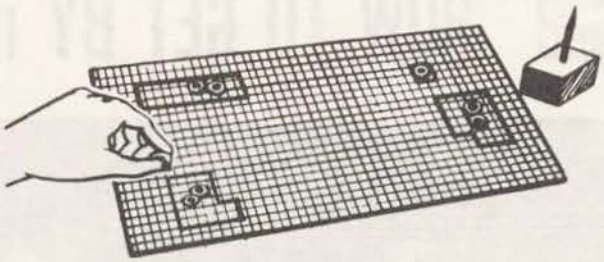
1. The meter pole is the center of the electrical load. Because this means shorter feeder wires to the various buildings, it also means that these feeder wires can be smaller.

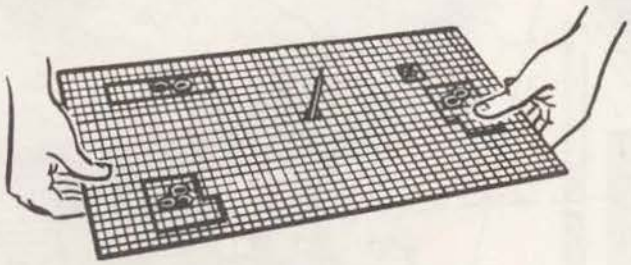
2. In an emergency, each major building can be cut off without disturbing service to any other building.

3. If the load in a particular building ever exceeds that planned for, only one set of feeders and entrance would need to be altered.









Locate Your Load Center

You can locate the actual center of the electrical load for your farmstead by the following procedure:

1. Make a map of the farmstead. Use a convenient scale and show the location and size of each building. Cross-ruled paper 8-1/2 x 11" is convenient to use.

2. Paste this map on a piece of lightweight cardboard of the same size.

3. Determine the load that will be on at any one time in each building. Allow for future electrical loads.

4. Place at the center of each building on the map one penny or washer for each 1000 watts (kilowatt) of load.

5. Balance the map on the point of a nail held in a vise or driven through a block. Press the nail up through the balance point. This hole indicates the position of the electrical load center. If this is in the center of a driveway or a garden, some adjusting of the center will be required. The corner of a building may be considered if it is near the calculated load center.

What Did You Learn?

(Cross Out One)

1. Slow heating of an electric brooder is probably due to a (slow thermostat, inadequate wiring).

2. The regulations of the National Electrical Code cover (only safety, all) requirements for adequate wiring.

3. Experiences in the past indicate (heavier, lighter) wiring should be installed on most farms.

4. A 1/2-horsepower motor on a ventilating fan should be on a (115, 230) volt circuit.

5. Maximum wattage on a No. 14 wire circuit should be (1725, 2500) watts.

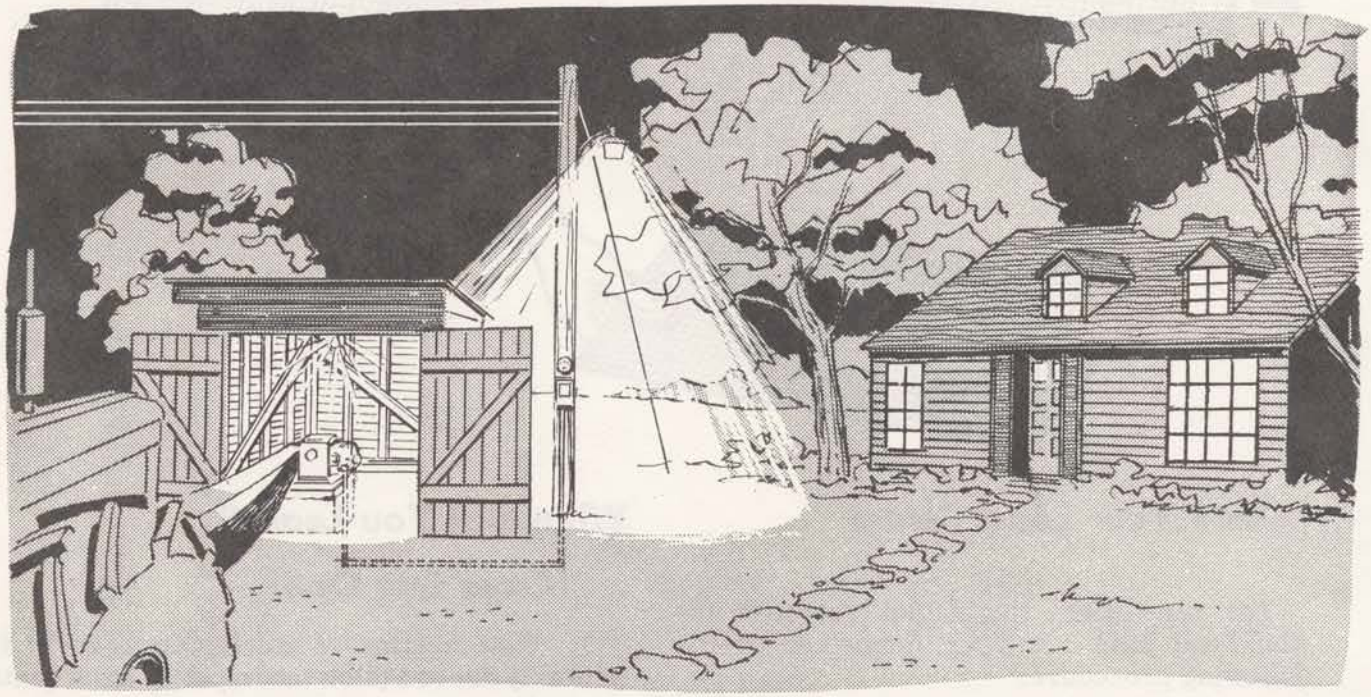
6. Feeder wire size is determined by size of load and (size of entrance cable, distance).

7. The main service entrance should be located on the (meter pole, corner of the house nearest the transformer pole).

8. If the barn were on fire and you could not disconnect the main switch, the feeder wires should be cut one at a time (at the barn, at the meter pole).

9. If the electrical load center falls in the middle of the lane (the pole should be moved to one side, the road should be relocated).

HOW TO GET BY if the power is off



Did you ever think about pumping water by hand for 50 or even 25 head of thirsty cattle? Or hand milking a big herd in the dark?

Fortunately for you, your power supplier has spent a lot of time and money to insure against your having to do this. They build their lines so well that only in the most severe storms can there be a power interruption. Also, they have provided more and more "two-way feeds" into the various areas that they serve. Where these exist, often it is only necessary for them to throw a switch to get the power on again.

But in spite of all this, an occasional longer interruption does occur, and because you are now so dependent on electricity, you should have a plan for such emergencies. Such a plan should provide for equipment and procedures.

What to Do

1. Put on paper a plan for an extended period of "no-power", including the equipment that will be needed for emergency lighting, heating, ventilating, pumping, refrigeration, and power. Do it now while there is no emergency. You won't have time when the emergency is upon you.

2. Talk it over with your parents and carry out as much of your plan as they think is practical at the present time. Keep the plan for future reference.

Emergency Light and Heat

Emergency lighting can be taken care of by candles, lanterns, oil lamps, battery light, or flashlights. Be sure you have a supply of kerosene and extra batteries in good condition.

A fireplace can temporarily solve your cooking and home heating problems. Portable grills, stoves, charcoal briquettes, kerosene, gasoline, or canned heat may be used.

Emergency cooling could be a problem depending on the weather. If you have a food freezer and the power is interrupted, plan on keeping the freezer closed tightly. Don't

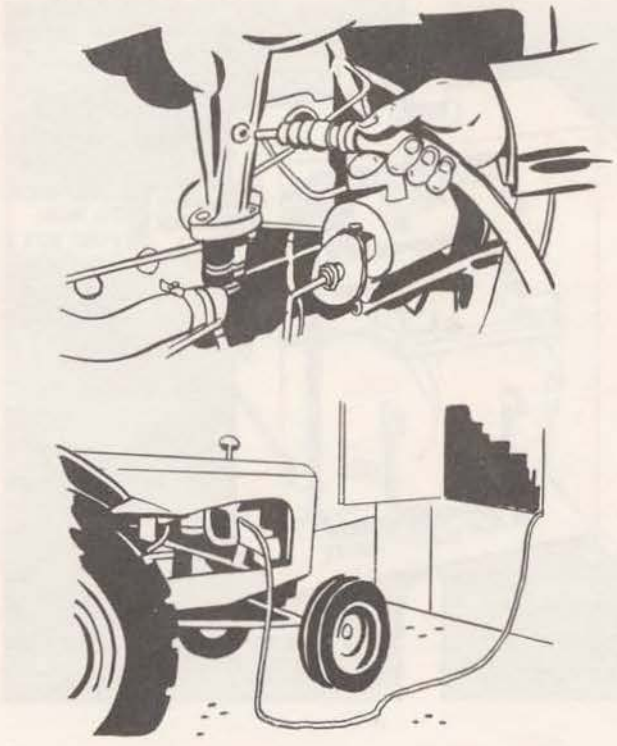
even look in it for 48 hours. If it appears that the interruption will be longer, try to get some dry ice and put it in the freezer. Use gloves so that your hands will not become frostbitten. Unfrozen perishables could possibly be kept in running water, ice, a cold spring, or outdoors in cold weather.

Emergency brooding on a large scale usually turns out to be a hopeless task. However, on a small scale, a metal box, can, or earthen crock can be filled with hot coals, hot sand, or hot water. Heated stones or bricks also help. Portable stoves or heaters might also be considered.

Regulating your doors and windows will help to take care of emergency ventilating. But for pumping, milking, cooling, and other tasks, power is needed to get the jobs done.

Use an Engine

The intake vacuum of a tractor or truck can be adapted to run a milking machine. Plan now to install an aircock, by means of a threaded reducer, on the intake manifold. Run a hose from the aircock on the tractor outside to the pipeline in the barn.



If you have magnetic-type milkers, ask the dealer for wiring information and instructions on operating this kind of equipment in an emergency.

Don't overlook the possibilities of a spare gasoline engine for some of the jobs requiring power, such as pumping water, hay drying, gutter cleaning, and milk cooling. Many times a reel type lawn mower can be adapted for the smaller tasks, or the farm tractor for the larger ones.

Standby Generators

Electric power for emergency operations can be provided through a standby generator.

Should you buy such a unit? Your decision on whether to buy a unit should depend on the size of your operation, the type of farm, and the amount of inconvenience and loss that could result from a power interruption.

How Big a Unit?

What is the largest horsepower motor on your farm? Let us say it is a 5 hp motor. A 10 kilowatt or 10,000 watt generator is needed to start this motor. (Table 1)

This does not mean that nothing else can operate after this motor has been started. In our example, Table 1 again tells us the running wattage of the 5 hp motor is only 4500 watts. This leaves 5500 watts for starting other motors or for lighting.

A good rule is to allow up to 2500 watts (2.5 kw) for each horsepower to get a motor started and 1000 watts (1 kw) per horsepower for running. Remember, the largest motor today may not be your largest motor in a few years. Plan your standby equipment to serve future electrical equipment. Use the chart to estimate total load and generator size.

Table 1

Approximate Wattage and Power Required to start and run most Electric Motor Powered Equipment

Horsepower	Approx. Running Watts*	Approx. Starting Watts Full Load**	Size Generator Normal Operation	Minimum Driving Engine (Tractor)
1/4	300	1200	0.75 KW	1.5 HP
1/3	400	1600	1.0 KW	2 HP
1/2	550	2300	1.5 KW	3 HP
3/4	800	3345	2.0 KW	4 HP
1	1000	4000	2.0 KW	4 HP
1 1/2	1500	6000	3.0 KW	6 HP
2	2000	8000	5.0 KW	10 HP
3	3000	12000	7.5 KW	15 HP
5	4500	18000	10.0 KW	20 HP
7 1/2	7000	28000	15.0 KW	30 HP

*For estimating total motor load, single phase motors—120 or 120/240 volts.
**For checking generator size needed for largest motor. Starting load watts given in this table are for capacitor motors. Most split phase motors will draw approximately 25% more power and most repulsion induction motors will draw approximately 25% less power during starting. Estimate accordingly.

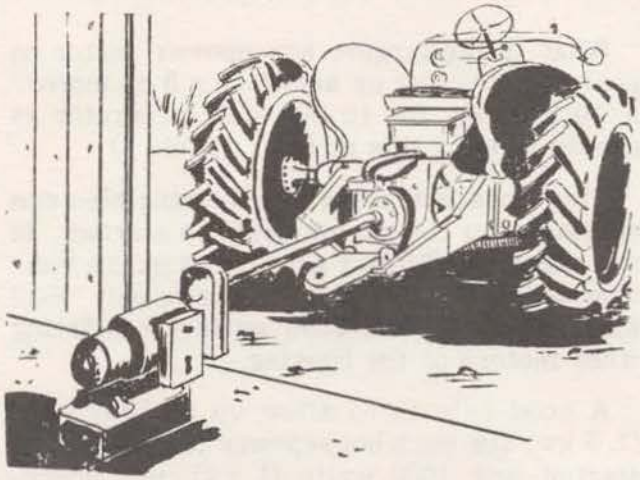
What Kind?

There are several types of standby generators that might be used for emergencies. These are:

(1) Self contained units with the engine attached. These may be fully automatic or manually controlled.

(2) Belt-driven tractor units

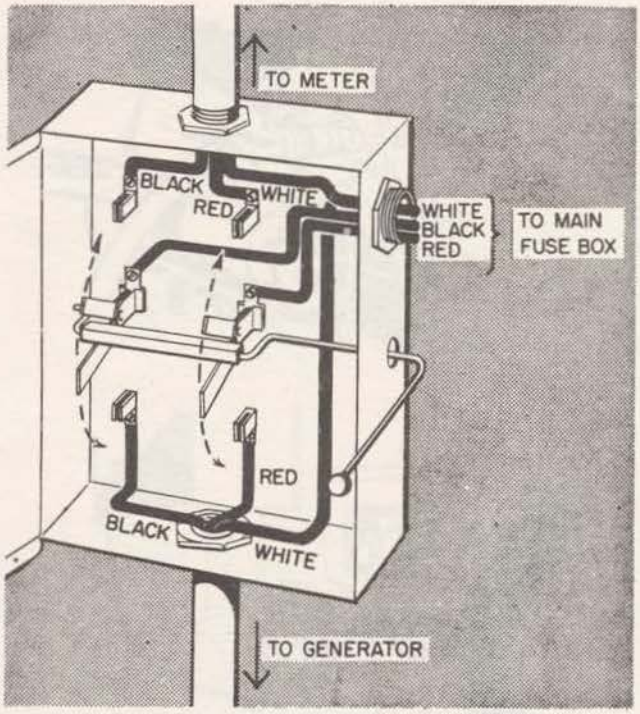
(3) Power takeoff driven units



The kind you select will depend on the importance of continuous power (hatcheries often have automatic units), the amount of money you wish to spend, and whether you have any use for a portable electric power source (to operate power tools or lights at remote locations).

How to Install

A manual double-throw switch is necessary to disconnect from the power supplier's wiring and connect to the generator. Otherwise, you could endanger a repair lineman's life or overload your generator. A transformer can step up voltage as well as step it down. This means your generator could apply the regular high tension voltage out on the line. This current would be deadly to any lineman working in the area.



You will want to locate your generator in a dry, well ventilated, and convenient place. It should not be covered with old sacks or boxes. Naturally, exhaust fumes should be carried to the outside.

A voltmeter should be mounted on the generator to let you know when the generator is operating at the correct speed. An ammeter, recommended for the larger units, tells you when you have reached the limits of the generator capacity.

Be sure you have the correct pulley and belts for proper speed of the generator. Then the throttle setting can be varied up or down according to the load.

If the generator is to be driven by an attached engine or a belt from the tractor, it should be mounted on a permanent base. This could be close to where the tractor is normally parked.

A neon type pilot lamp connected between the meter and transfer switch will tell you when normal power has been restored.

Costs

Prices of generators vary from $75 to $100 per kilowatt capacity. Direct connected engine driven models will often run $150 per kilowatt.

Safety

You must be absolutely certain that your standby generator will operate safely. Your power supplier representative will be glad to help you locate your generator, suggest necessary wiring, and inspect the finished job.

Do not use the unit if your own wiring has been damaged or is defective.

Maintenance and Operation

Like other equipment, your standby generating unit must be kept in good running order at all times. This means normal maintenance and periodic "dry runs". The combination generator-engine unit should be put into operation at least once a month. Spark plugs, battery, and other parts should not be removed to be used as replacement parts for other farm equipment.

Instructions for operating the units should be carefully preserved and kept nearby for inspection. Oiling and greasing should be closely followed. Align the drive shaft for the power take-off drive to prevent vibration. The speed of the tractor should be regularly checked and adjusted for correct voltage output. An extra flashlight should be placed in one convenient location.

Your Plan

Make a list of all electrical equipment on your farm. Include everything, and don't forget the appliances in the home. Now go over the list and check off those pieces of equipment that must be on at any one time. Remember, this is an emergency requiring some inconvenience. On the other hand, don't forget part of mother's range for hot food.

Rate all the checked items either in watts or horsepower. What is the largest horsepower motor on your checked list? Check Table 1 for necessary generator capacity. What size did you select? How many watts of capacity are left over for other equipment? Is this enough to handle your list of checked items and allow some extra capacity? What size generator did you finally select?

Demonstrations You Can Give

Show how to modify a tractor intake manifold so that it can be used to operate a non-magnetic milker.

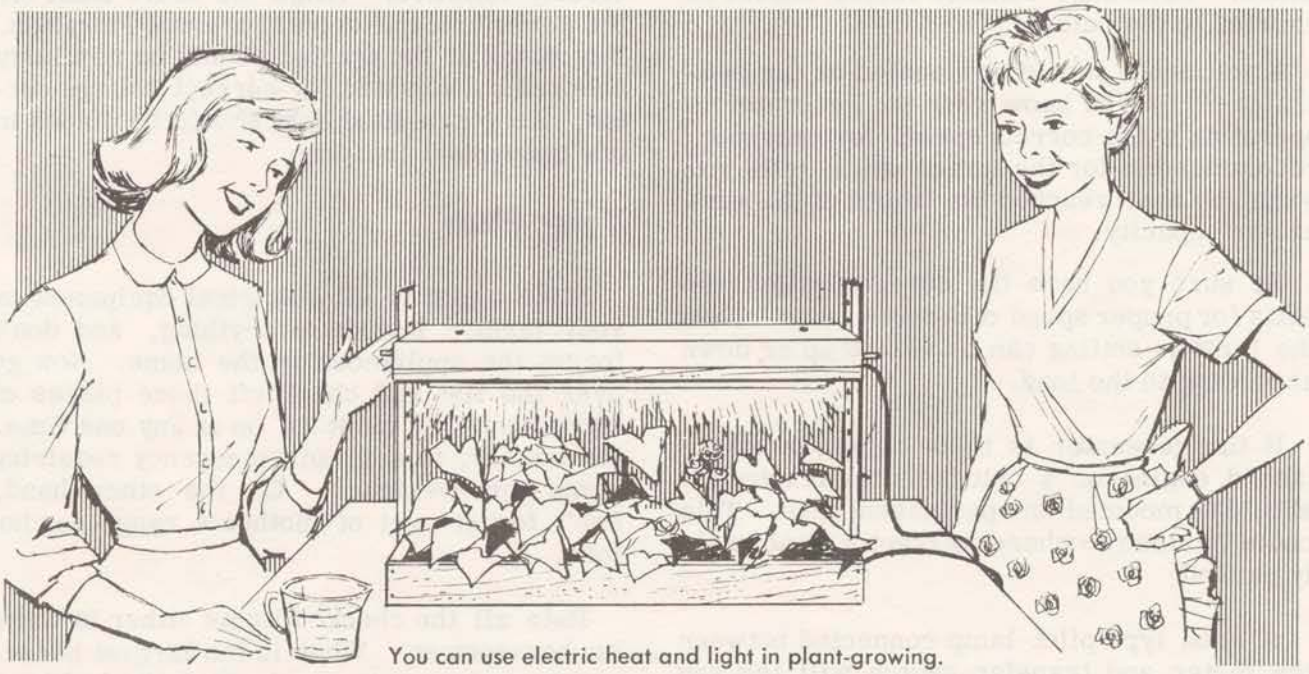
Show how a double-throw switch is used to insure safety in the operation of a standby generator.

For More Information

Ask your County Extension Agent for a bulletin on standby generators. Get the literature of one or more manufacturers of this equipment. Ask your power supplier representative to tell you of the things they do to prevent extended interruptions. He also will be glad to look over your standby plan.

Visit a farm or public building where this kind of equipment is installed. Visit a dealer who sells standby generators.

BETTER PLANTS INDOORS, WITH ELECTRICITY



You can use electric heat and light in plant-growing.

Plants are important. They provide us either with leaves, seeds, stems, fruits, or roots that we ourselves eat, or that we feed to animals whose products we eat. They supply us with wood, cotton, and other fibers, and in the process of growth give off oxygen for us to breathe.

Plants help to make our world more attractive by giving us flowers, shrubs, and trees. Plants that grew long ago are now the coal, oil, and gas that are used as fuel.

The growth of plants is one of the miracles of nature, but it is also something that we can assist through the use of electricity.

What to Do

1. Learn how temperature, moisture, and light affect plant growth.

2. Make an electrically heated flat or plant growing box.

3. If possible, equip your flat with a growth-stimulating light.

4. Grow some plants which you can use or sell.

Tools and Materials You'll Need

2 pcs. 3/4" x 3" x 11-1/2" soft wood
6 pcs. 5/16" x 3" x 19-1/2" soft wood
24 2d or 3d spiral shank zinc coated nails
2 wire coathangers
Hardware cloth (screen) 11" x 17"
Sheet of clear plastic film about 36" square (or extra large plastic bag)
15-watt heating cable kit
About 24" coarse thread or fishline
Coarse needle
Hammer, ruler, square, pencil, wire cutters
(If you are going to equip your flat with a light, you will also need the following.)
Channel or fixture for either one or two 18" 15-watt fluorescent tubes
Cord and plug
One or two (depending on your fixture) 18" 15-watt GRO fluorescent tubes
3 pcs. 3/4" x 1-1/2" x 18" soft wood
2 pcs. 3/4" x 2-1/2" x 12" soft wood
Sheet metal 20" x 17"
2 3/16" x 1" machine bolts with nuts
4 1-1/4" No. 8 flat head wood screws
2 wooden pegs about 1/4" x 3"
About 8 more spiral shank nails
Drill with 1/4" and smaller bits
Screw driver

What Plants Need For Growth

The fact that plants do not grow at all times and in all places should remind us that certain conditions must be met before plants will grow.

Here are the conditions for the growth of green plants:

1. A seed, seedling, or cutting that is viable (has the ability to live).
2. A growing medium, usually soil.
3. Moisture.
4. A temperature high enough to permit growth.
5. Radiant energy (light).
6. Plant nutrients (found in soil and fertilizer).

Nature Is Seldom Ideal

In nature, these conditions are often not in perfect balance.

For example, in the spring of the year we may have everything except a high-enough temperature, with the result that plants will either not grow at all, or will grow slowly, or may even freeze at night. This is the common problem that is faced by people who want early vegetables.

A florist, however, may find a problem in the hours of light (photoperiod) provided by nature. It may prevent a particular flower from blooming at a time when it would be most in demand.

But through the years, people have found that they can modify or change some of the conditions affecting plant growth, to help get the results that they want. Electricity, because it can be used to make both heat and light, helps to make two of the conditions more nearly ideal.

You can make a heated (and possibly lighted) flat to help you grow better plants indoors.

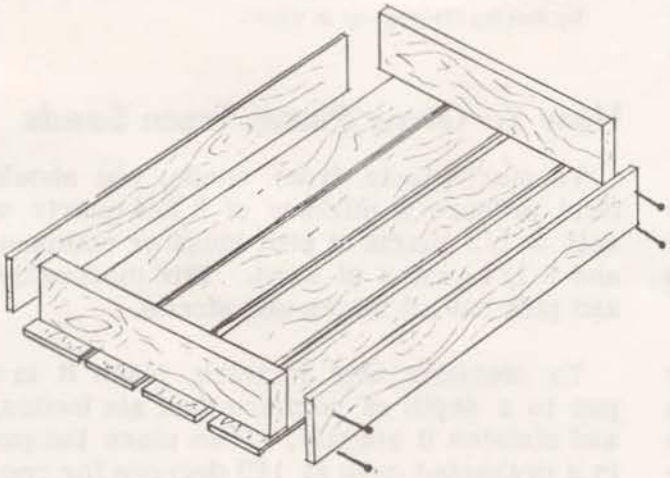
How To Make A Flat

First, make sure that the ends of your wood pieces are square. Then, following the sketch, nail the wood parts of your flat together. Nail the sides to the ends first. Make sure that this frame is square, and then nail on the bottom pieces. Leave small cracks between them.

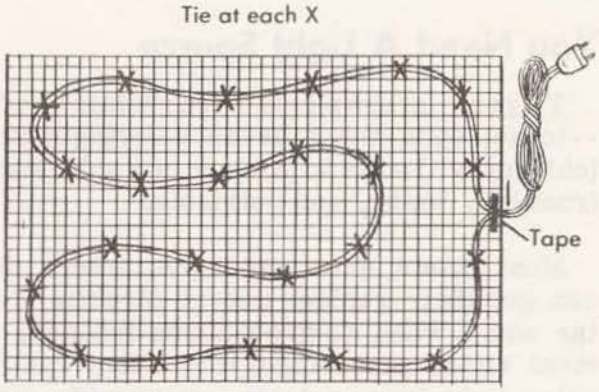
Install Heating Cable

Lay the heating cable on the screen according to the layout below. Tie it to the screen as shown, using the coarse needle to take the thread or fishline through. Don't tie so tightly as to cut the insulation. If you use metal screen, put electrician's tape over the edge where the cord touches.

Put one-half inch of sand in the bottom of the flat. With the screen on top for protection, lay the cable on the sand.



Use two nails in each end of each board

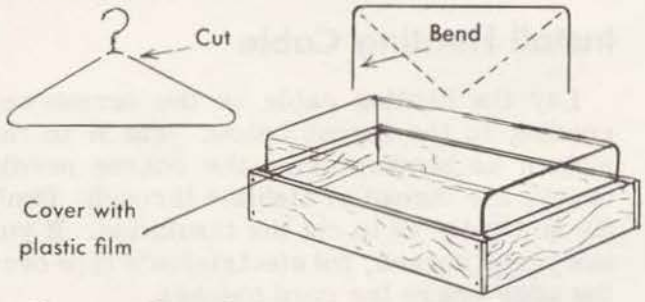


Humidity Control Is Important

To germinate, seeds need moisture. To produce roots, cuttings need moisture. Of course we supply this by watering the soil. But the soil would soon become too dry for germination or rooting if the flat is in a room where there is very little moisture in the air (low relative humidity).

So we should keep the relative humidity very high until the seedling has adjusted to the dry air of the room, or the cutting has developed a vigorous root system. This is done by making a "case" that is, by enclosing it with either glass or plastic.

If you are going to use your flat only for starting seeds, you can simply lay a piece of glass over the top. After the seedlings have emerged and grown for a week, the glass can be lifted a quarter-inch each day to allow the plants to adjust.



If you also plan to use your flat for cuttings, you can make a simple tent out of coathangers and a sheet of plastic film or a large plastic bag. You can then increase the amount of ventilation a little each day so as to let the plants adjust. (If you choose to add a light, you can use the reflector to support the plastic, and you won't need the wire coathangers.)

You Need A Light Source

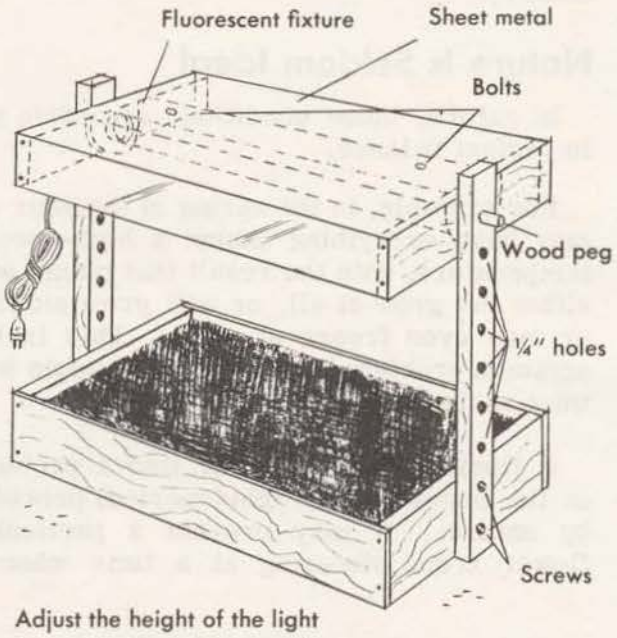
To grow, green plants need radiant energy --to act upon their green coloring matter (chlorophyll) so as to produce new substances from air, water, and nutrients.

Most plants grow outdoors, where they can get their radiant energy directly from the sun. When we grow plants indoors, we must either place them where they can receive light from outside, or provide some other source of radiant energy.

It is possible to do a very satisfactory job of growing plants indoors without using any artificial light. But it is a problem, when depending entirely on natural light, to control the amount that the plants get.

In addition to the amount, the kind of light is important to plants. The "GRO" fluorescent tubes give the color of light that has been found to be best for plant growth. These tubes give a reddish-blue light. It is considered harmless to the eyes. This light has also been found to be beneficial to African violets and other plants grown indoors.

You may want to add a source of electric light to your flat. To do this, follow the steps outlined in this sketch.



Adjust the height of the light by moving the pegs up or down.

How To Grow Plants From Seeds

To start plants from seeds, you should first prepare a mixture of 3 3/4 quarts of soil, 2 1/2 quarts of peat moss or compost, and 1 1/4 quarts of sand. Mix thoroughly, and pick out all sticks and stones.

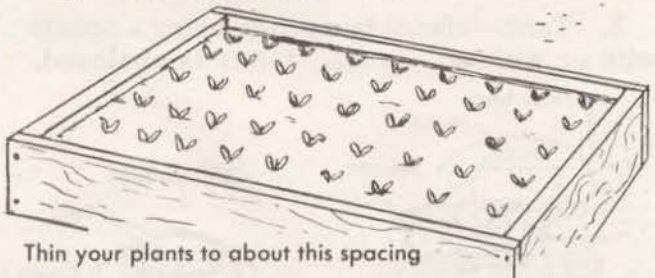
To sterilize this mixture, place it in a pan to a depth of no more than six inches, and moisten it slightly. Then place the pan in a preheated oven at 180 degrees for one-half hour. This will destroy most of the diseases, insects, and weeds.

Then, using clean hands or a trowel that has been washed in boiling water, transfer the mixture to your flat. (If you plan to grow more plants than your flat will hold at one time, you can transfer the mixture into smaller plastic or metal flats which you can then set in your electric flat. If you do this, put another half-inch of sand on top of the cable first.)

A good way to water and plant your seeds is this: Hold out a small amount of your soil mixture for covering the seeds. Sprinkle what is in the flat with about 3 1/2 cups of water. Then plant your seeds, in rows one-half to one inch apart, depending on their size. Cover them, using the mixture you held out, to a depth of four times their diameter. Press the soil very gently, and then add the other 3 1/2 cups of water.

Cover your flat with a piece of glass or plastic. Place the flat in a sunny location. (Or, if your flat has its own light, use that for 14 to 16 hours each day.) After the plants come up, you will have to be very careful not to put the flat in direct sunlight if you have a plastic cover over it because burning of the plants can result. Increase the ventilation gradually after the plants come up. Add enough water to keep the soil "moist," but not "wet," at all times.

Regulate the heat this way: If the flat is in a sunny location, use your heating cable only at night and on cloudy days. If not in a sunny location, your flat should have bottom heat at all times. You may use a thermometer, with its bulb in the soil, as a guide. A soil temperature of 70° to 75° is ideal for most germinating seeds. Never let the air temperature go above 85°.



Thin your plants to about this spacing

Plants should be fertilized when they are about 1/2 to 3/4" high. You can use a water soluble fertilizer, or mix a tablespoonful of complete garden fertilizer in 3 quarts of water and use this to water your plants every two to three weeks.

When seedlings are 3 to 4 inches high, they are ready to be set out in the garden. They should be hardened first, however. Ask your leader or county agent for suggestions on hardening plants in your part of the country.

Start Plants From Cuttings

Many kinds of plants can be or should be started from cuttings--a part cut from a mature plant.

Your heat flat, if properly equipped with a plastic cover, will help you to start many valuable plants in this way. Humidity and temperature are very important, and so is the method of cutting. Ask your leader or county agent for information on starting plants from cuttings.

What Did You Learn? (True or False)

1. To grow, green plants need only soil, moisture, and nutrients.

2. There is always the right balance among the conditions that plants need.

3. Germinating seeds require plenty of moisture.

4. The sun is the only source of radiant energy.

5. Soil mixtures are sterilized to keep down objectionable odors.

6. Seeds should be covered to a depth of four times their diameter.

7. "When you think of it" is the right time to add water to a flat of plants.

Demonstrations You Can Give

Show and tell how to install heating cable in a flat. Show how light of the proper type can be added. By means of a foil or cardboard divider, grow some plants under equal conditions except for the amount and type of light received.

The flat you have made, with explanations makes a good exhibit.

PUT POWER TO WORK IN YOUR HOME

A pitcher on a baseball team doesn't win a game by himself. The field is too big, and there is just too much to do. So it is that the nine men (plus the substitutes) make up the team.

Housekeeping is a big job, too. You are half of the team, and the rest of it is good equipment. There are many electrical appliances that substitute motor power for muscle power. The more of these you have on your team, the easier it will be for you to do an outstanding job when you're ready to take over the role of homemaker.

What to Do

1. Learn how to select, care for, and use a food mixer, vacuum cleaner, and floor scrubber-polisher.

2. Arrange to have one of each of these brought to a club meeting -- or meet at a dealer's store where all are available.

3. Make a recipe of cookies by hand, and another using an electric mixer.

4. Clean and oil, if needed, at least one motor-driven appliance, following manufacturer's instructions.

5. Make improvements, if needed, in the manner of storing at least one appliance.

Tools and Materials You'll Need

A vacuum cleaner or scrubber-polisher or food mixer, with instruction book
Cloths, lubricant as recommended
Recipe, ingredients, and equipment for making cookies by hand and with mixer
Appliance advertisements and literature

Use Motors Instead of Muscles

Today's electrical equipment is manufactured to work hard and last long, when used carefully and as directed. Good equipment plus good management will yield top performance. Before you use any appliance, read the manufacturer's instruction book thoroughly.

Know Your Cleaner

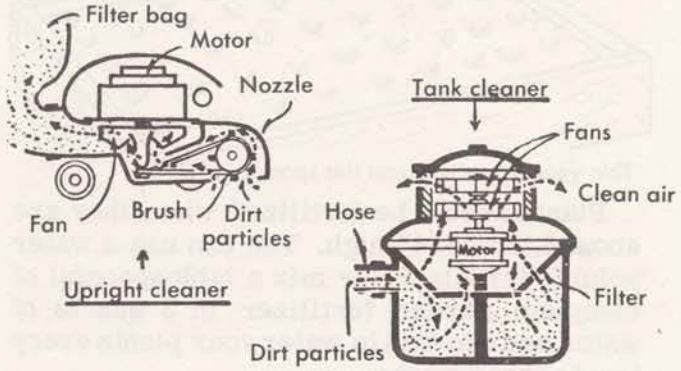
Every vacuum cleaner has four basic parts--fan, motor, filter bag, and nozzle.

The fan creates the air suction that draws dirt through the nozzle into the cleaner. The motor drives the fan. The filter bag traps the dirt and dust, returning clean air into the room.

There are many makes and models of vacuum cleaners on the market, but they all fall into two general types:

1. Upright--cleans by suction, plus motor driven brushing. Filter bag is exposed.

2. Tank--cleans by suction using a nozzle with or without a brush. Filter is enclosed.



When buying, select a cleaner that fits the tasks to be done. Is it to be used only for cleaning heavy rugs or carpeting? Or also for dusting hard floor surfaces? For cleaning above-the-floor surfaces, such as walls, draperies, lights, and furniture?

For carpet cleaning, many people prefer upright cleaners. Their motor driven brushes or beater bars combine a vibrating, sweeping, suction action that does an outstanding job in removing embedded dirt.

For dusting hard floors and above-the-floor surfaces where suction is important, the tank models excel. Attachments are usually easier to use.

For Best Performance . . .

The suction of any type cleaner depends a great deal on how clean the bag is. The air must be able to filter through the bag in order to produce the suction upon which the cleaning depends. Empty the cloth bag or discard the paper one often, ideally after each use. The cloth bag should be turned wrong side out occasionally and brushed clean. When very soiled, it should be replaced with a new one or be dry cleaned, but never washed.

How good a job of cleaning you do depends also on the rate of operation and number of times the nozzle passes over the surface to be cleaned. For rug cleaning, it is recommended that you push or pull an upright slowly at about one foot per second. If operated faster, this cleaner's effectiveness is lowered. With a tank type, more passes over a rug at a slightly faster rate are necessary. For best results, always work in the direction of the pile, not across the grain of a rug.

The revolving brush on an upright cleaner should come in contact with the rug surface. The bristles will wear down with use so should be checked regularly and adjusted or the brush replaced as needed. Follow directions in manufacturer's instruction book.

Hair, string, and thread will collect on the rotating brushes and reduce the sweeping ability of the machine. Clean out this material frequently by snipping it into short pieces close to the brush roll and then pulling it out.

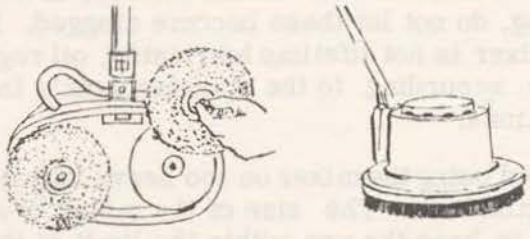
The belt of an upright cleaner also needs care. It must be tight enough to turn the brush roll. To avoid damage to the belt and to other parts of the cleaner, it is recommended that you pick up any objects that are on the floor before running the cleaner.

For best results with tank cleaners, the connections between the flexible and rigid tubings should be tight. Always use the right attachment for the job you are doing.

Some cleaners are lubricated for life. Others, usually older ones, need to be lubricated occasionally. If the cleaner you use requires lubrication, follow the maker's instructions carefully. If the instructions have been lost, write the manufacturer for a new copy.

Scrub and Polish Electrically

A floor polisher will save you much hard work, too. Some models can be used to shampoo rugs as well as to scrub, wax, polish, and buff hard surface floors.



Brushes and pads are easy to remove and change

If you are shopping to buy a polisher, look for one with a low base unit height so that it can be used under cabinets and furniture. Look for the manufacturer's guarantee.

Some polishers have motors which are lubricated for life, but others require lubrication. Be sure you know how often to do this, and keep a record on a simple chart or tag to be sure the job gets done. After use, the brushes should be removed and washed in warm soapy water, rinsed in warm water, and stood on the bristles to dry. For storing, either leave the brushes off the polisher, or hang the machine on the wall. An eight-quart basket with a handle is handy for storing the dry brushes, buffing pads, and any other polisher accessories.

Mixer Saves Time And Effort

When it comes to saving work and time, there's nothing quite like an electric mixer. To prove this to yourself, make some cookies by hand and some more by using a mixer. Compare the amount of time and energy it took.

Method	How much time?	How much effort?
Stirring by hand		
Using the mixer		

The buyer of a mixer has a choice of the hand model which may be mounted on the wall, or the pedestal type which frees both hands of the user. In buying, look for a motor that will maintain full power at all speeds. The controls should be easy to read and to set. Look for beaters that are easy to remove and clean.

After use, wipe the mixer off with a damp cloth. If there are ventilation slots for motor cooling, do not let these become clogged. If the mixer is not lifetime lubricated, oil regularly according to the manufacturer's instructions.

Avoid using the mixer on too heavy batters and mixtures. The size of the mixer bowl tends to keep the use within the limit of the motor. There are institution - size mixers which should be used where a heavy amount of mixing is to be done.

Use Appliances Safely

All electric appliances require that good care be taken of the cord. Replace or repair it if it shows signs of wear. If one of the wires is broken in two, however, replace the cord with a new one of the proper type. Avoid running the vacuum cleaner over its own cord. When not in use, the cord should be looped loosely around hook supports and not flexed in the same places each time. Turn off the motor switch before you pull the plug. Grasp the plug to remove it from the outlet.

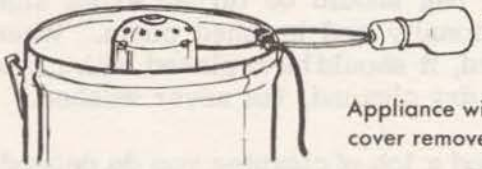
Motors and water do not mix. Avoid using small appliances in an area where they could accidentally fall into a sink while still connected. Avoid using electric appliances when standing on a wet concrete floor. Where this is necessary, as when using an electric polisher in a basement, the appliance should be properly grounded.

Mixer beaters should not be rinsed off with running water while this appliance is still plugged in. Disconnect it first.

If There's Trouble . . .

Sometimes minor trouble can be found and simple repairs made when an electric appliance fails to operate. First check for a blown fuse. Disconnect the appliance before replacing the fuse or resetting the circuit breaker because the trouble may be somewhere in the cord, plug, or the appliance itself; or the circuit may be overloaded.

Test the plug and cord using a test lamp or a continuity tester. Do not touch "live" connections. If the test lamp does not burn, the cord or plug needs to be repaired.



If the cord, plug, and fuse are found to be all right, there is likely something wrong with the motor or switch. Return the appliance to your dealer, serviceman, or manufacturer for repair.

Motors in constant use should be expected to become hot enough to be uncomfortable to the touch. But they should not smoke. This may be a sign that the motor bearings need to be oiled. If the motor on a vacuum cleaner runs hot, empty and clean the bag. Motors on mixers can become overheated when used in too stiff a batter.

Some motors will run, but not come up to full speed. Check for overloading--dust bag too full on the cleaner, or batter too stiff in the mixer. Another cause might be low voltage. Do not plug more than one appliance into a wall outlet; never plug into a light fixture. Avoid using extension cords because long runs of small wire may not be able to supply enough electricity to the appliance. If you must use an extension cord, make sure that it is a heavy duty one.

Store For Convenience

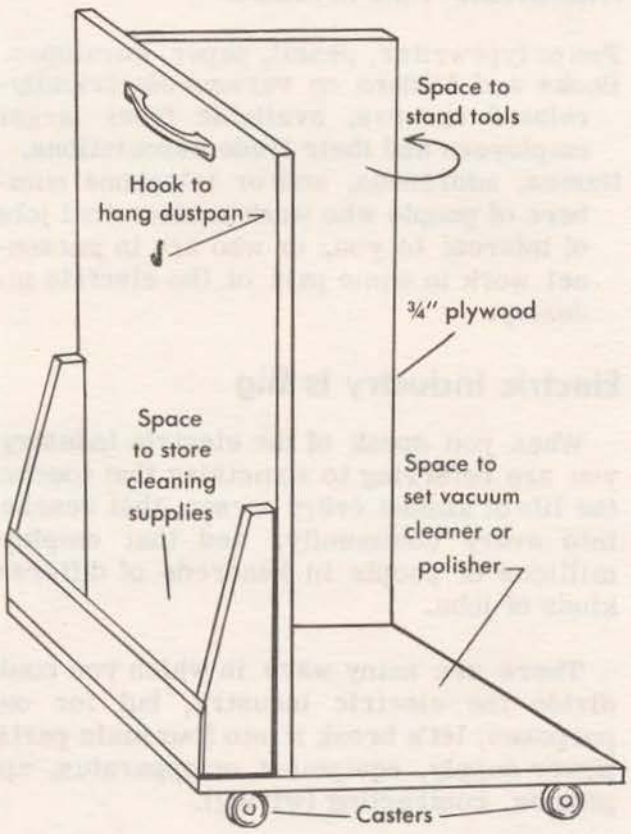
Have you ever put off cleaning your room because the cleaner or polisher was hard to get out--that is, was not stored in a handy place? First, you must recognize the problem; then it's important to do something about it.

Keep equipment and supplies as near to their point of use as possible. The electric mixer may be kept on a counter top or in a wall holder. Parts that touch food should be covered when not in use.

For your cleaning equipment, you may want to consider building a cart with casters and a handle that can be moved around the house as needed. Where it is necessary to move supplies up and down stairs, baskets are a real help.

Rather than trade in an old but still useable appliance, some people prefer to keep it so as to have two to use. This is particularly helpful when there are two floor levels in the home.

A cart for cleaning equipment that you can build



Get The Most From All Appliances

Is there an attachment made that could be used on an appliance you now have that would do something easier for you? (This might be a gift idea.) You may be surprised to learn something new that you can do with the appliance and attachments you now have. Check the book that came with the appliance for ideas.

What Did You Learn?

(Underline the right answer.)

1. Management is of (no) (little) (much) importance in using appliances.

2. Every vacuum cleaner has a fan (and belt) (and filter bag).

3. Floor polishers should be stored (standing on the brushes) (hanging up or with the brushes removed).

4. When buying a mixer, look for (a good paint job) (ease in using and cleaning).

5. If a motor doesn't come up to speed, you should (put in a bigger fuse) (lighten the load).

6. When one of the wires in a cord breaks in two, you should (replace the cord) (twist the broken ends together).

Demonstrations You Can Give

Show and describe points to consider when buying an appliance.

Demonstrate use of a motor driven portable electric appliance, using attachments in as many ways as practical.

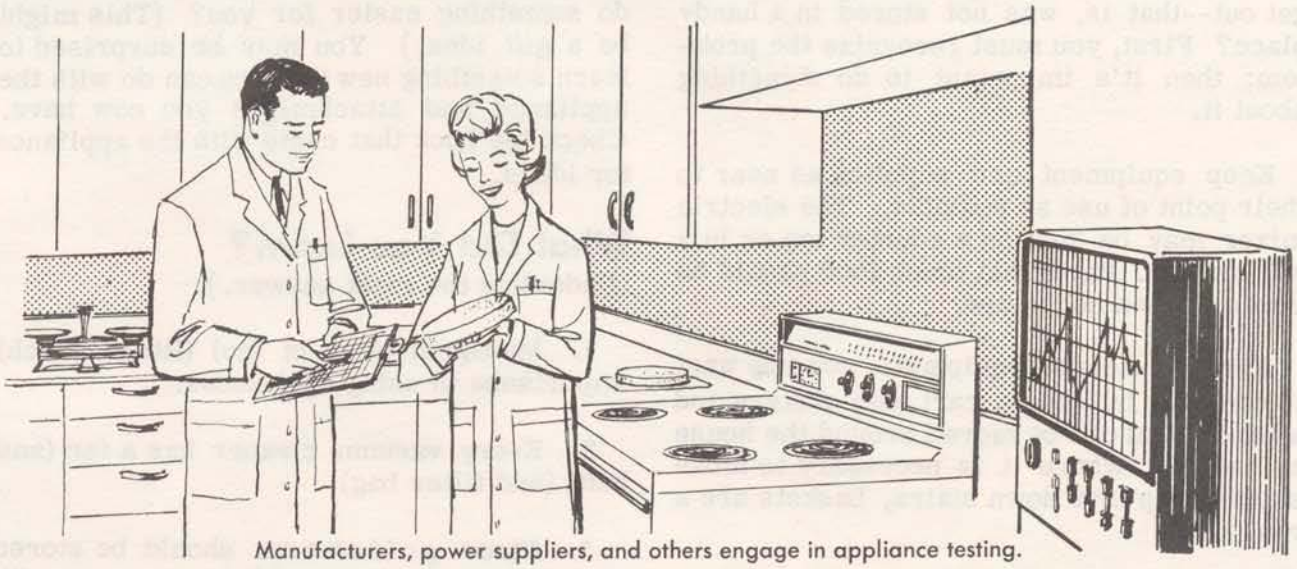
Demonstrate care of an appliance, including a way to store it for convenient use.

Using a test light, show how to check an appliance cord and plug.

For More Information

Ask your power supplier representative or your leader for information on grounding portable appliances.

AN ELECTRICAL CAREER FOR YOU?



Manufacturers, power suppliers, and others engage in appliance testing.

What will your career be? Will you work at something you like, at something which rewards you according to your abilities and interests?

These are important questions for people of your age, and ones about which you already may have thought seriously.

Experience has shown that people work better and are happier doing the things that they like to do. If you are interested in electricity, then it is possible that you might do well in a career that is electrically-related.

What to Do

1. Acquaint yourself with some of the many electrically-related careers.

2. Visit, with other members of your group, one or more of the following: power supplier office, generating station, appliance or electrical equipment manufacturer or distributor or dealer, an electrical contractor or electrician.

3. Learn as much as possible about those careers that most interest you by:

Reading as much as you can about them, talking to people in your community who work at these jobs or who know about them, and writing to others for more information.

4. Help build up a library of information on electrically-related careers for use by others in your community or county.

Materials You'll Need

Pen or typewriter, pencil, paper, envelopes.
Books and folders on various electrically-related careers, available from larger employers and their trade associations.
Names, addresses, and/or telephone numbers of people who work in electrical jobs of interest to you, or who are in personnel work in some part of the electric industry.

Electric Industry Is Big

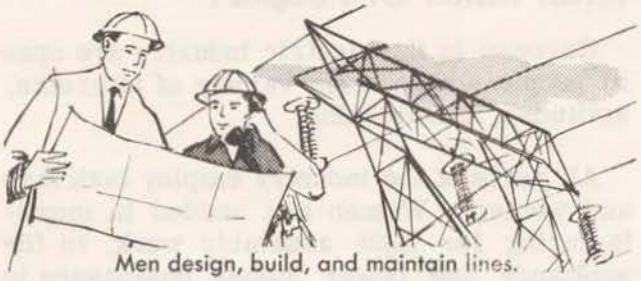
When you speak of the electric industry, you are referring to something that touches the life of almost every person, that reaches into every community, and that employs millions of people in hundreds of different kinds of jobs.

There are many ways in which you could divide the electric industry, but for our purposes, let's break it into four main parts: power supply, equipment or apparatus, appliance, contracting (wiring).

Power Supply

The power supply part of the industry is that which supplies the actual electricity to consumers. It does not always include all of the following functions, but it may: generation of power, transmission (long-distance high-voltage movement) of power, and distribution of power to the ultimate user.

This is a part of the industry that you may know something about--because you often see the employes of your own power supplier at work. You may see meter readers, linemen, and cashiers--and perhaps someone from the power supplier's sales or utilization department.



Men design, build, and maintain lines.

But there are many other career opportunities with power suppliers that you may hear about only rarely.

All of these different kinds of work must be performed by someone who is employed by a power supplier:

Managing the business (larger power suppliers have several levels of management); hiring, training, and looking after the safety and welfare of employes; billing and collecting consumer accounts; testing and installing meters; selling and demonstrating the benefits of electricity to consumers; designing and drafting plans for generating stations, substations, and lines; operating power stations; handling consumer problems; conducting information programs for employes, consumers, and the public; buying, storing, and keeping track of materials and supplies; buying real estate and rights-of-way; keeping countless kinds of records; typing, duplicating, and filing reports and correspondence; operating office equipment ranging from adding machines to the most complex computers; driving and servicing motor vehicles; building and maintaining lines and substations; planning; and researching new ways to do things.

Apparatus or Equipment

This is the part of the industry concerned with manufacturing, distributing, and selling electrical equipment used by power suppliers and by other industries including agriculture.

The things made and sold include everything from giant turbine-generators down to tiny fuses. The kind of work varies from that of the president of a giant corporation to that of a person whose only responsibility is keeping a warehouse clean.

This part of the industry employs thousands who work in its manufacturing plants, where they operate machines and handle raw materials and finished products. It has many other people whose job it is to explain and sell these products, either to the ultimate users or to distributors or jobbers, and to electrical contractors and electricians.

There are many records to be kept, and many letters and orders to be typed and filed. There are advertising materials to be prepared, and all kinds of purchases to be made. There is research to be done, and of course much management and supervision is necessary throughout.

Those who sell this equipment to the ultimate user often help plan the installation, and advise as to how it should be used. There are specialized farm electrical equipment manufacturers, distributors, and dealers who provide such service.

Appliance

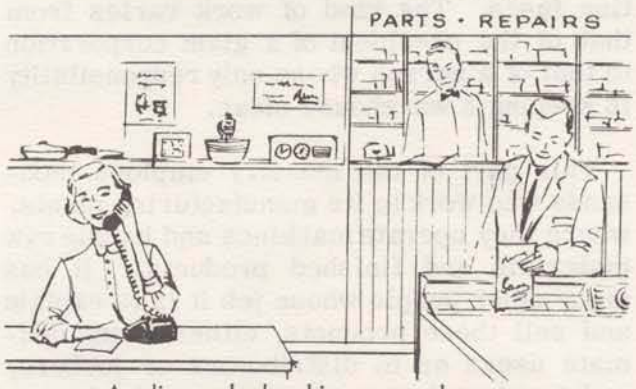
When people in the electric industry speak of appliances, they are usually referring to power-consuming equipment as used in the home.

There are dozens of manufacturers of appliances, hundreds of wholesalers, and thousands of dealers. In addition, there are many independent appliance repairmen.

Like the makers of apparatus and equipment for industry and agriculture, the manufacturers of appliances must buy and convert raw materials into finished products.

Then they must sell and distribute these products to distributors. Then the latter must sell the appliances to dealers, and the dealers in turn sell to consumers.

Of course there are career opportunities with the manufacturers and distributors, similar to those described under Apparatus or Equipment. These opportunities are more concentrated in centers of population.



Appliance dealers hire men and women.

Scattered over the whole country, however, are the places of business that sell appliances to consumers and provide the repair services needed. These businesses vary all the way from a giant department store to a one-man shop. In the larger stores, the functions of buying, advertising, selling, billing, handling parts, and repairing will be divided among many different people. In a small place, however, one person may do many different kinds of work.

Contracting (Wiring)

Electrical contractors and electricians are the ones who install and maintain the wiring in homes, stores, offices, factories, farms, mines, and public buildings.

Most of the people employed by this part of the giant electric industry are those who actually do the wiring, but there are others whose work is not so obvious. Included are those who supervise, plan, estimate costs, hire and train employes, purchase and keep track of materials, and handle office details.

Like the appliance dealers, electrical contractors vary in size from the very large to the very small, and the number of jobs performed by any one person will be fewer in the large establishment, greater in the small place.

Trade Associations

There are many organizations within the electric industry. Some are national, others are statewide, and some are local or regional. Many have full-time employes.

A small trade association may have only two employes--an executive secretary or director, and an office worker. But a large one may have a dozen or more--including an executive, plus specialists in many different fields such as safety, public relations, home economics, agriculture, and other areas.

What Kinds Of People?

Careers in the electric industry are open to people with a wide variety of interests, aptitudes, and training.

All parts of the industry employ both men and women. Women are needed in manufacturing for light assembly work, in the appliance and power supply businesses in both research and sales, and throughout the industry to handle office detail and special jobs like nursing.

Of course, all employers are looking for people who are honest, dependable, sincere, willing to work, and who are able to get along with others.

Training Essential

A minimum of a high school education is recommended for a job in the electric industry, but some jobs require much more training.

Here are the more common types of training that are helpful to those who would like to find a career in this field:

Electrical engineering--Many men, and even some women, have met the requirements for the jobs of their choice with this kind of training. Top positions throughout the industry are filled by such people.

Other engineering--Civil, mechanical, industrial, chemical, and electronics engineers also find employment in the industry, but to a lesser extent than electrical engineers.

Agricultural engineers are employed by many power suppliers in their rural sales departments, and by manufacturers of electrical farm equipment.

Business college--Women in particular will find this or similar training helpful. Some employers seek young men with business administration degrees as sales and management trainees.

Technical school--Many trained technicians, whose work does not require a college degree, are hired by the industry.

Apprenticeship--This form of on-the-job training is often the way that a newcomer qualifies himself for work in the field.

Home economics--Women with degrees in this field are sought by power suppliers for home service work; by appliance companies for research, testing, and selling; and by advertising and public relations departments and agencies.

Which Career For You?

Choosing a career is one of the most important things that you will do in your life.

Your chances of making the right choice will be better if you will do two things:

1. Learn something about a great many different careers, so that you will be more likely to find one that you are interested in and fitted for.

2. Learn as much as possible about yourself, so that you will know which careers you are qualified for.

Questions that will help you on point 2, above, are ones like these:

What are your special interests?
What are your hobbies?

Which activities do you enjoy most?
What has been your school record?
Do you like indoor or outdoor work?
Do you enjoy working with others, or do you prefer being by yourself?
Where do you live now? If a suitable career is not open to you there, would you be willing to move elsewhere, such as to a large city, or to a remote area?
What type of training is available to you?

What Did You Learn? (True or False)

1. The electric industry refers only to supplying power to consumers.

2. Meter readers, linemen, and cashiers are the three major groups of people who work for power suppliers.

3. Electronic computers are sometimes used by power suppliers.

4. A girl has no chance of a career in electrical equipment.

5. Everyone who works in the industry must have an electrical engineering degree.

6. Manufacturers, distributors, and dealers are parts of the appliance industry.

7. In a town of 2,000 population, there is a good chance that you could have a career strictly as an appliance parts man.

8. If a man works for an electrical contractor, chances are he's an electrician.

9. Honesty and dependability are not very important in the electric industry.

10. To know thyself is important in choosing a career.

For More Information

Consider part-time or vacation work in some part of the electric industry that interests you. Visit with your school guidance counselor. Write to the placement directors of technical schools and colleges. Ask your leader to secure one or more film strips or motion pictures on careers. Attend a careers program at your school.

Special Project

As advanced work in the 4-H electric project the 4-H member is encouraged to initiate his or her own work. It can be almost anything as long as the use of electricity is required for the major part of its construction or operation. Such projects as mechanizing jobs now done by hand, for example, feeding poultry or livestock; installing water supply and sewage disposal systems; building communications equipment; installing crop drying equipment or any other similar project, is acceptable. Planning major electrical installations such as wiring of an entire farmstead or a major building would be acceptable.

Procedure

Prepare an outline of the proposed work, have it approved by your leader and submit it to your County Extension Agent for approval and assignment of credit points. The minimum requirements for a one year project of such advanced work is 21 credit points. The County Extension Agent in assigning credit points will compare your proposed project with the number of credit points assigned to the various lessons in this workbook. The basis of comparison will include the amount and complicity of the work, the amount of electrical learning it will offer the 4-H member and possibly others if the work is a demonstration, exhibit or other educational material. The practibility of the project will also be considered.

Report

A detailed report shall be written describing the project, its value, cost, degree of success, and so forth.

HOW TO USE THIS BOOK IN FULFILLING THE GOALS OF THE 4-H ELECTRIC PROJECT FOR THE FIRST AND SUCCEEDING YEARS

The minimum goals for credit in the 4-H Electric project vary according to the 4-H member's age and the number of years he or she has taken the electric project. For example, if you are a 4-H member beginning the 4-H Electric project at the age of 10, you will not be required to earn as many credit points as a 14-year-old 4-H member beginning the 4-H Electric project. However, if you are a 12-year-old in your second year of electricity you must earn as many credit points in that year as a 14-year-old does in his or her first year.

Each lesson or goal has been designated a certain number of credit points. These are shown near the title of each lesson or goal. You decide on the lessons you want to study, list them, and add up the credit points.

For a full year's 4-H project credit, the total of your credit points should be at least as many as shown in the following table:

Examples of reading the table below are as follows: (a) An 11-year-old member is required to complete 13 credit points the first year. (b) A 14-year-old is required to complete 17 credit points his first year. (c) A 14-year-old taking the electric project for the third year must complete 21 credit points that year.

There are enough lessons in this book to give you credit for two or more years in the 4-H Electric Project. Do at least all of the lessons that interest you. If you wish, and your leader approves, you may combine any of the lessons in this Division with those in other Divisions to earn credits for a year's work.

Minimum Number of Credit Points
Required for Each Year's Work in the 4-H Electric Project

4-H Member's Age	4-H Member's Year in 4-H Electric Project			
	1st Year	2nd Year	3rd Year	4th or Later Years
10 - 11	13	15		
12 - 13	15	17	19	20
14 - 15	17	19	21	21
16 & over	19	21	21	21

This system of credit points makes it possible for you to do the things you want to do with electricity and get credit for them in the 4-H Electric project.

Supplemental Information Available

T-5 Leaders Idea Book
T-21 Members Idea Book

See your County Extension Office concerning the availability of electrical kits, films and other information.