

# *Electric Fences*

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# Electric Fences

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*According to Oregon law, electric fence control units must be approved by the State Electrical Inspector before they can be sold in Oregon. The purpose of the law is to protect the public by preventing the sale of hazardous electrical devices. Controller units that have been approved for sale and use in Oregon carry an approval stamp in a prominent place on the case.*

***Home-made electric fence controllers are not recommended.***

## The electric fence

An electric fence is a fence built with one or more charged wires, so that an animal touching it receives an electric shock. Animals, like human beings, do not like electric shocks, and quickly learn to refrain from touching a charged wire. Hence an electric fence controls animals through fear and not by the physical strength of the fence, as is the case with other fences. For this reason, an electric fence can be built much lighter than other fences. Less wire is required and posts may be lighter and placed farther apart. This results in a considerable saving in both initial cost of materials and in the labor required for construction. Electric fences are not recommended for permanent boundary line or corral fences, but can be utilized for many other fencing applications about the farm. For temporary fences that are moved frequently, the electric fence is excellent.

### **Effectiveness**

Electric fences have been used successfully by many farmers for controlling cattle, horses, and hogs. Sheep and goats have been controlled in some instances, but electric fences have not always been effective for these animals. The effectiveness of an electric fence depends principally on the following points: (1) A safe, effective controller unit must be used to energize or charge the fence wire. (2) The controller must be properly installed. (3) The proper kind of wire must be used for the fence. (4) The wire must be the proper height for the livestock to be controlled. (5) The charged wire must be insulated from the ground. (6) Animals must be trained to understand that the fence will produce shock. (7) The wire must be kept free from conditions that will short-circuit the charge, such as contact with vegetation.

### **The controller unit**

Controllers are usually manufactured to operate from 6-volt batteries or 110-volt alternating current. Some controller units are designed to operate on either 110-volt alternating current or 6-volt direct current by providing suitable connections for each current source. Some controllers are built with "weatherproof" cases for outdoor use, while others must be mounted inside a building or other suitable shelter. A few of the many makes and models of electric fence controller units are illustrated on the cover page.

### **Home-made devices**

The design and construction of a safe but effective electric fence controller is much more complicated than appears at first glance. The electric current, voltage, wave form, frequency, peak values of current and voltage, duration of shock, off period, inductance from power lines, insulation, grounding of circuits, accuracy of timing, body and surface resistance of animals and human beings, inductance and capacitance within the control unit and along the fence wires, and short circuits within the apparatus and to power lines are some of the factors to be considered when designing and building an electric fence unit. It is obvious that thoughtful designing, skillful construction, and rigid testing are necessary to produce a safe piece of equipment.

Home-made electric fence controllers are definitely not recommended for the following reasons: (1) The state law requires that a sample unit of each model be tested and approved, as indicated in

a previous paragraph. (2) The cost of testing a unit exceeds the price of the average commercial unit, thus making it impracticable for a person to have a single home-made unit tested. (3) The instruments required for properly testing a unit are too expensive to purchase in order to test a single unit or even a limited number of units. (4) If a person uses a fence controller that is not officially approved, he weakens his defense against legal action in case human beings or livestock are injured from contact with a fence energized by such a unit.

Some farmers have connected the 110-volt electric circuit to their fence, using electric bulbs in series between the fence and power line. This is *very hazardous*, and *should not be permitted under any circumstances*. Should an accident occur from contact with such a fence, the owner could be held for maintaining a hazard. Any fence of this type should be reported to the State Electric Inspector, Salem, Oregon.

The loss of only one animal through contact with such a fence will exceed the cost of an approved controller, to say nothing of the danger to human life from the use of home-made controller devices. For this reason **ONLY THE USE OF APPROVED ELECTRIC CONTROLLERS IS RECOMMENDED.**

### Posts

Wires for electric fences are normally strung on stakes or posts spaced from 40 to 50 feet apart. Light posts or stakes may be used for supporting the fence wire between corners, as the animals do not push against the wire. (See Figure 1.) Posts are needed only at corners where the strain of the fence is absorbed. Either wood or steel posts may be used.

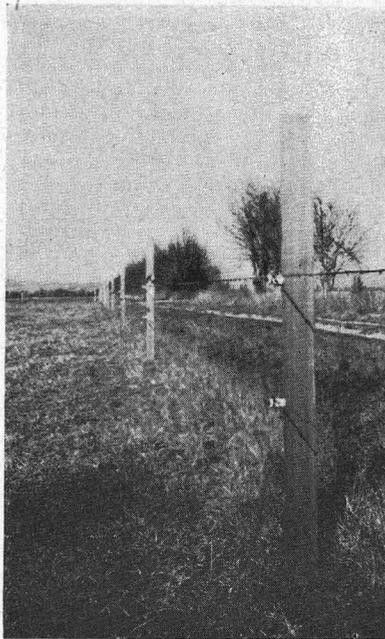


Figure 1. Two-by-four stakes make neat and satisfactory supports for an electric fence.

### Kind of wire

Four-point barbwire is recommended for general use, as it gives best results with hogs and sheep. For cattle and horses light barbwire has given satisfactory results.

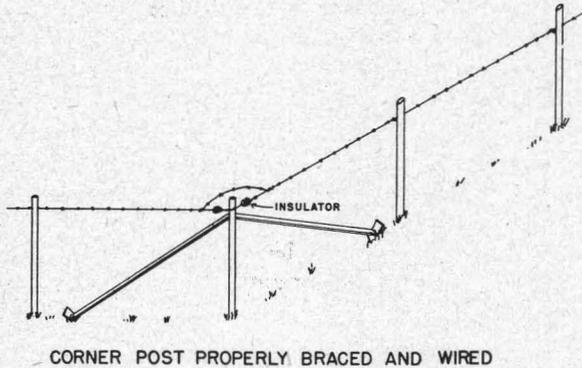


Figure 2.

### Proper height of wire

The correct height for the fence depends on the size of the animals to be controlled. A safe rule is to place the charged wire at about the height of the animal's nose. Usually 30 to 36 inches will be about right for horses and cattle, 14 to 16 inches for large hogs, and 6 to 8 inches for smaller hogs. For sheep, two wires are normally used at heights of about 8 and 22 inches. In cases where two sizes of livestock are in a field, it is necessary to use more than one wire in order to have an effective fence.

### Splicing wire

Splices in an electric fence must not only stand the mechanical strain of stretching the wire but must also conduct electricity. The correct way and a wrong way of making splices are illustrated in Figure 3.



RIGHT WAY



WRONG WAY

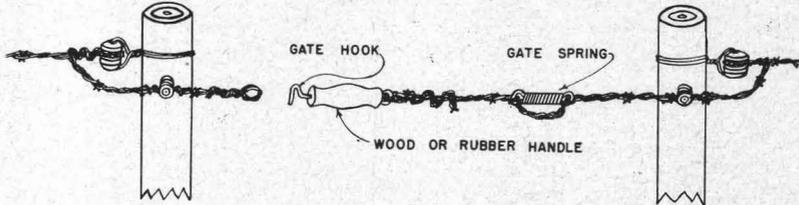
SPLICED WIRE

Figure 3.

### Gates

Gates in electric fences must provide protection against shock for the person opening and closing them, and still conduct the electric

current satisfactorily when closed. A satisfactory gate is illustrated in Figure 4. Some gate hooks are on the market that have a spring in the insulated handle. A spring of some sort is essential to keep the gate wire tight and maintain a good contact between the gate hook and wire loop.



GATE FOR ELECTRIC FENCE

Figure 4.

### Insulators



ONE PIECE INSULATOR

Figure 5.

The general practice in installing an electric fence is to string the barbwire on solid knob insulators (Figure 5) that are nailed to wooden stakes or fastened to steel posts. Insulators are essential to the satisfactory operation of the fence. The wire can be attached to the insulators with a tie wire, or with quick detachable wire clips (Figure 6). The clips are especially convenient when the fence is dismantled and moved from time to time. The use of double-headed nails facilitates removal of in-

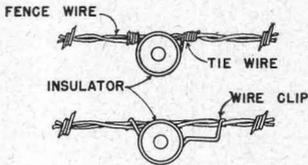
PROPER METHODS OF FASTENING  
WIRE TO THE INSULATOR

Figure 6.

sulators from the posts when desired. (See Figure 7.) Strain insulators, as illustrated in Figure 7, are used at the beginning and end of the wire, and when the fence must turn a corner.

### Controller location and connections

Controllers built to receive their current from the power line are usu-

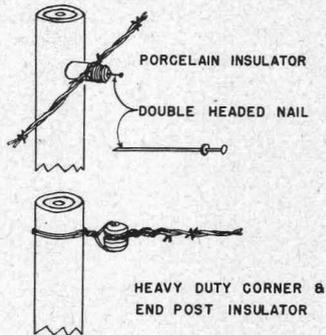


Figure 7.

ally designed for mounting inside a building, where they are sheltered from moisture. A diagram of a typical installation is shown in Figure 8. Controller units operating from batteries, especially those operating from dry cells, may have a compartment for the battery in the controller case. Such units are commonly provided with rain-proof cases and can be mounted on a post in the field. Units of this type are convenient for charging fences around isolated hay stacks or other areas remote from the farmstead.

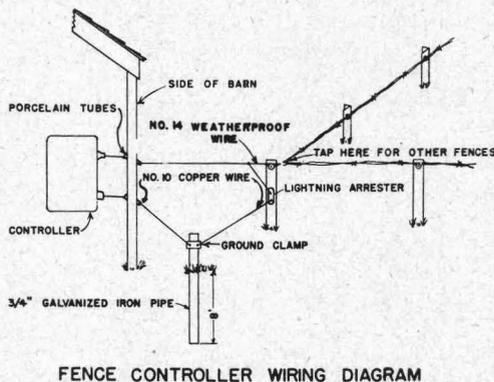


Figure 8.

### Length of fence

Electric fences are generally effective for about 1 mile, which meets the need of most farmers. Many owners have reported satisfactory results with longer fences, although longer fences often develop special problems.

### Training

Best results with an electric fence are obtained when the animals to be controlled are trained to avoid contact with wire fences by experiencing the shock delivered by an electric fence. An animal that has never experienced a shock from an electric fence may go through the fence before it knows that the fence is charged. Training may be accomplished by stringing one or more barbwire on insulators around a relatively small area, such as just inside an existing corral, or across one corner of the corral. Choice feed is placed where the animals will come in contact with the wire when trying to reach the feed, the fence controller is turned on, and the animals then placed in the corral. One wire may be adequate for training cattle while two wires are needed for hogs. For training

sheep, three wires are recommended, placed approximately 8, 20, and 26 inches above the ground. Training sheep is best accomplished soon after shearing, as they are less resistant to shock at that time. For stubborn animals, food can be attached to the fence with wire so they will receive a shock when they attempt to eat it. Moistening the ground in front of the training fence aids in giving the animals an effective shock.

The foregoing training program will greatly reduce the danger of injury from wire cuts caused by livestock running into one- or two-wire electric fences before they have learned to respect a fence consisting of only one or two charged barbwire.

New animals should be trained before being turned in with animals already accustomed to electric fences, otherwise the untrained animals may lead the entire flock or herd astray. This is especially true with sheep.

### **Vegetation**

Weeds or other growth must be kept from touching the wire, as any vegetation that touches the wire tends to drain the current from it or "ground" it. The program of management for any electric fence installation must include a periodic cleaning out under the fence, unless livestock will keep down the growth by grazing.

### **Soil moisture conditions**

In humid sections where the soil is generally moist the wire on insulators forms one side of the circuit, the ground the other. By touching the wire the animal completes the circuit between ground and fence and receives the charge from the wire.

Under very dry soil conditions the ground may not complete the circuit effectively. Under such conditions a wire connected to the ground terminal of the controller may be mounted on the posts a short distance below the charged wire. An animal touching both wires will then receive an effective shock, regardless of soil moisture conditions. The ground wire need not be insulated from the posts and at the controller. The ground connection to the earth should be maintained as usual.

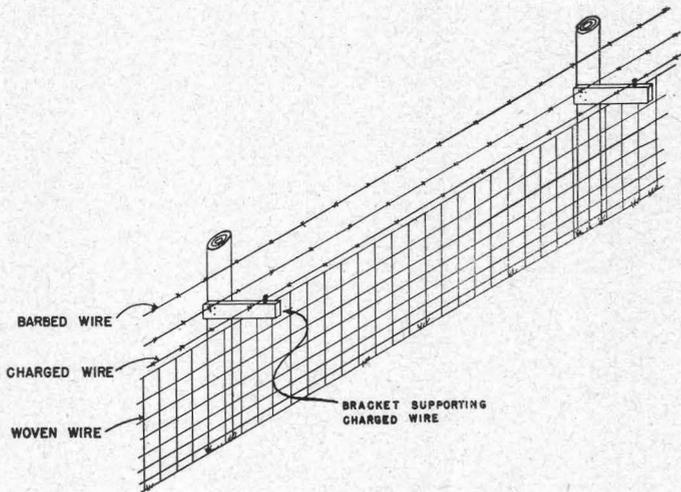
### **Testing a fence**

Many fence controllers have meters or signal lights that show when the fence is grounded or is otherwise ineffective. Some manufacturers provide separate meters or other testing devices. If instruments for testing the fence are not available and a person does not

wish to risk receiving the full charge from the fence by touching it, a piece of green grass or weed stem 12 inches or so in length can be used for testing the fence to see whether it is charged. Grasp the stem at one end and touch the fence wire with the other end. If no shock is felt after a reasonable interval, grasp the stem about 2 inches from the end and again touch the fence. Continue moving the hand along the stem toward the fence wire until a shock is felt. The stem offers some resistance to the shock and prevents the full charge from reaching the person doing the testing.

### Applications

Electric fences, as previously stated, are adapted to many uses on the farm. Being light, easily moved, and quickly installed, they are excellent for fencing temporary pastures, and for use when hogging down corn or other crops. Since the wire does not have to be as tight as in other fences, the stakes or posts supporting it can follow the curves of terraces, or crops, or pastures planted on the contour, without the need of bracing the posts each time the fence changes direction. Since the cost for materials is small, fences can be placed about narrow strips of nontillable land, such as sloughs or irrigation ditches, that it would not be economical to fence otherwise, and the vegetation growing therein utilized for pasture.



PERMANENT FENCE PROTECTED BY ELECTRIC FENCE

Figure 9.

Regular boundary line or corral fences can be protected by placing one or more charged wires inside them, the insulators being mounted on brackets nailed to the fence posts and extending outward horizontally 12 to 15 inches, as shown in Figure 9. The height of the brackets and wire will depend on the animals to be controlled, just as when the charged wire is used alone. Damage to woven wire from large hogs can be greatly reduced by placing a charged wire inside the woven wire fence at a height of 16 to 18 inches.

This practice greatly lengthens the life of the regular fence, as it discourages livestock from touching it in any way. Owners of unruly dairy bulls report that 3 or 4 charged wires placed at varying heights about the inside of the bull pen do wonders in decreasing the destruction previously wrought on the pen by the bull.

Electric fence wires placed on the interior walls of weighing stalls or pens are useful in keeping animals in place.

A charged wire across the rear of the stall will discourage horses from halter pulling.

A fence-jumper can usually be broken of the jumping habit by a short wire looped around the animal's neck, with the end hanging down so as to come in contact with the fence.

Wires attached to a dead chicken placed in the hog pen will soon cure hogs of chicken-killing.

For loading animals a whip or prod of electric fence wire saves time and temper and reduces bruising of the animals.

Everything considered, the electric fence, if properly used, will be found to be a time, labor, and money saver on practically every farm.

### Safety rules

Part 6 of the National Electrical Safety Code contains Safety Rules for Electric Fences as set up by the National Bureau of Standards of the U. S. Department of Commerce. Sections 60, 61, and 62 are quoted herewith:\*

#### SECTION 60—SCOPE AND INTENT OF RULES

##### 600—Scope

These rules apply to the installation, use, and identification of electric fences and to the construction and characteristics of the controllers used with them and through which electric energy is delivered to the fence.

##### 601—Intent

The nature and use of electric fences are such that a person, as well as an animal, will receive an electrical shock if the electric-fence wire is

\* From *Safety Rules for Electric Fences*, National Bureau of Standards Handbook H 36, issued April 17, 1940. For sale by Superintendent of Documents, Washington, D. C. Price 5¢.

touched while standing on the ground. It is the purpose of these rules so to limit such electrical shock that it will not cause serious or permanent injury.

#### SECTION 61—IDENTIFICATION OF FENCE WIRE

##### 610—Identification

Any electric fence or portion thereof installed along a public highway or as a property-line fence shall be identified by approved markers or signs clamped to the fence wire or fastened to posts at intervals not greater than 200 feet.

##### 611—Approved Marker

An approved marker shall be as follows: A metal plate, wooden board, or other durable waterproof material not less than 4 inches by 8 inches, painted on both sides with a pure chrome-yellow background, with the following text on one or both sides: "ELECTRIC FENCE." The lettering of the text shall be in black letters not less than 1 inch high. Other lettering, with letters not more than  $\frac{5}{8}$  inch high, may be placed on the reverse of the side with the required lettering.

#### SECTION 62—CONDITIONS OF USE

##### 620—Control Device Required

No fence shall be energized from any electric source except through an approved controller. No device will be approved which fails to comply with these regulations or is of poor construction.

##### 621—Number of Controllers

No metallicly continuous fence or set of electrically connected fences shall be supplied by more than one controller.

##### 622—Maximum Supply Voltage

Controllers shall not be used to operate electric fences from electric sources having a voltage rating higher than 125 volts (effective or rms value).

##### 623—Use of Controllers

###### A. Battery Type

A controller designed and approved for battery operation shall not be connected to any other type of power supply or connected to a supply voltage higher than the voltage for which it is designed, except through a converter approved for use with this controller.

###### B. Alternating-Current Type

Alternating-current controllers shall not be connected to any supply circuit having different characteristics than the supply circuit for which the controller is designed.

##### 624—Charging Batteries

Batteries shall not be charged while the fence is in use.

##### 625—Grounding

The grounding terminal of the controller and the grounding terminal of any converter shall be effectively grounded in accordance with the rules of section 9.

##### 626—Lightning Arrester

Where lightning is prevalent and the controller is located in or on a building, a lightning arrester of approved type shall be installed on the fence circuit and shall be effectively grounded in accordance with the rules of section 9 of this code.

Cooperative Extension Work in Agriculture and Home Economics

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