

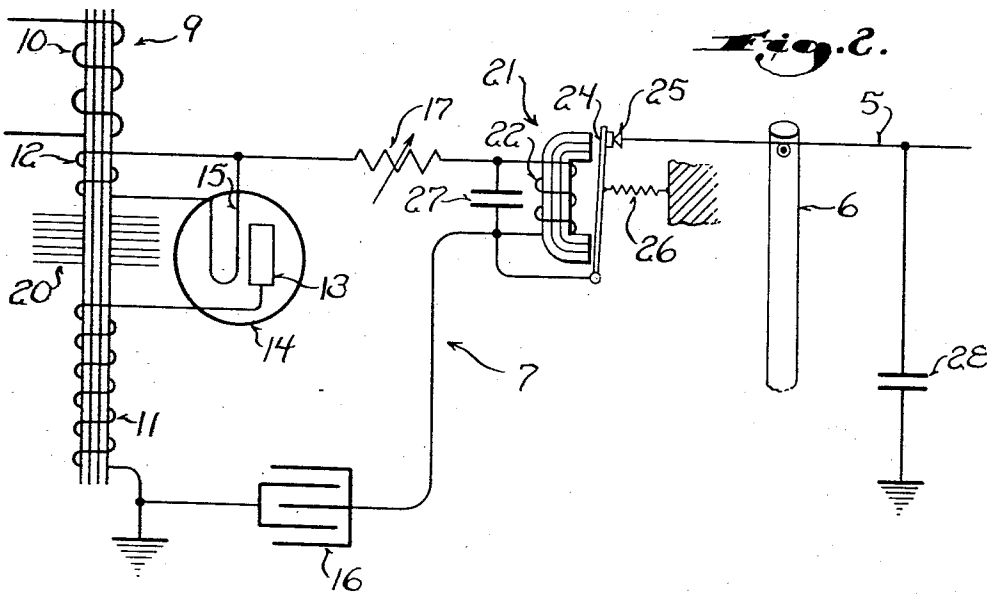
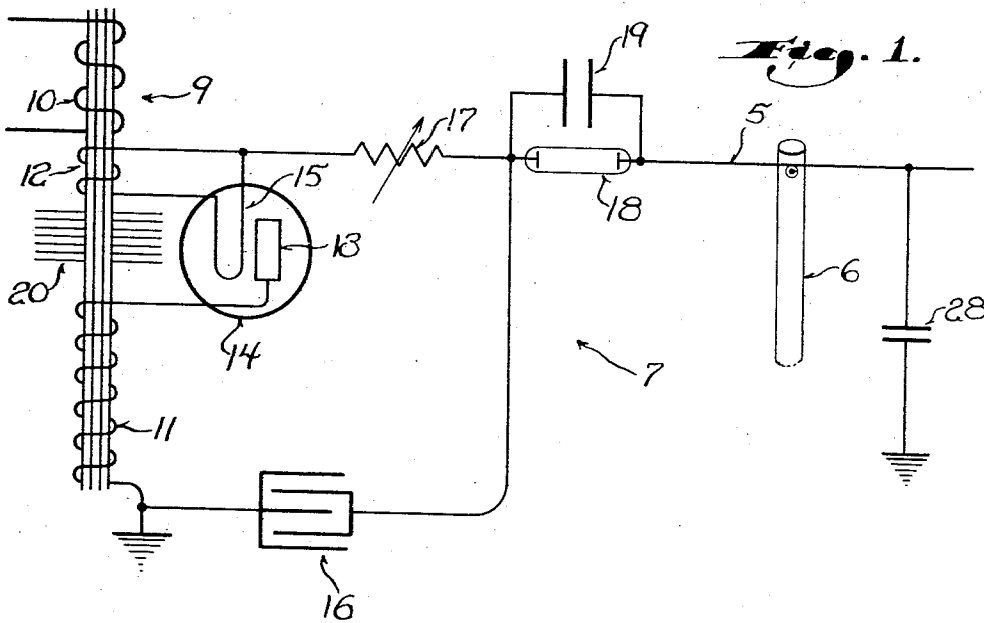
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S. G. KLUMB

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ELECTRIC FENCE

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Inventor
 Stanley G. Klumb
 By Geo. W. Burrand
 Attorney

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ELECTRIC FENCE

Stanley G. Klumb, Milwaukee, Wis.

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9 Claims. (Cl. 256-10)

This invention relates to improvements in electrically charged fences commonly termed electric fences and of the type referred to in the copending application, Serial No. 77,830, filed May 4, 1936, for Electric fence.

Heretofore, many schemes have been employed for electrically charging or energizing a fence wire; but in the majority of these schemes, the effectiveness of the shock to an animal coming in contact therewith was nullified to a large degree by leakage caused by partial grounding of the wire which precluded the application of a maximum charge on the wire.

It is, therefore, an object of this invention to provide an improved manner of charging an electric fence wire in which the impression of the desired effective charge on the fence is assured regardless of leakage in the fence circuit.

Another object of this invention is to provide a fence charger of the type shown in the aforementioned co-pending application in which a condenser is employed to build up an effective charge, having means incorporated therein for keeping the fence wire disconnected from the condenser for the interval during which the condenser is being charged so as to allow the condenser to be charged before being connected with the fence wire to thus insure maximum effectiveness.

With a view to safety, it is a further object of this invention to provide means for electrically charging or energizing a fence wire whereby an animal contacting the same does not receive a continuous high charge but receives shocks periodically for as long as the fence wire is contacted.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawing illustrates two complete examples of the physical embodiment of the invention constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a diagrammatic illustration of one application of this invention; and

Figure 2 is a diagram similar to Figure 1 showing a slightly modified embodiment of this invention.

Referring now particularly to the accompanying drawing, in which like numerals indicate like parts, the numeral 5 designates a fence wire of any suitable type carried by but insulated from posts 6 or other supports.

The fence wire is electrically charged or energized by a charging unit, indicated generally by the numeral 7; and in practice, the charging unit is preferably housed in a container and located wherever convenient. The charging unit 7 comprises a step-up transformer 8 having a primary 10 adapted to be connected with a source of alternating current of commercial frequency or any suitable A. C. supply desired, and a secondary comprising two windings 11 and 12. The secondary winding 11 has one end connected to the plate 13 of a thermionic rectifier tube 14 to which it provides high voltage and has its other end grounded.

The filament 15 of the rectifier tube is supplied with low voltage from the secondary winding 12 of the transformer. The unidirectional pulsating output of the tube 14 is utilized to charge a condenser 16 through an adjustable resistance 17, the other side of the condenser being grounded. A charging circuit including the rectifier and the condenser is thus formed.

The output of the rectifier tube and the charging circuit is normally insulated from the fence wire by means of a gas tube 18 and as a result a substantial charge is built up in the condenser.

The charge which is built up in the condenser by the unidirectional pulsating current in the charging circuit will greatly exceed the R. M. S. (root mean square) value of the rectifier output. This is due to the fact that the condenser, in the absence of any load on the rectifier, acts as a reservoir and becomes charged to substantially the peak value of the pulsating current which is usually approximately 1.4 times the R. M. S. value of such current.

Thus for purposes of illustration, if the R. M. S. value of the output of the rectifier is 850 v., the charge of peak value which the condenser is capable of storing will be approximately 1.4 times 850 v. or 1190 v.

It will be seen, therefore, that it is the function of the rectifier to provide a unidirectional charging current for the condenser to permit building up a charge therein in excess of the voltage in the charging unit. Obviously, while a half wave rectifier has been illustrated in the drawing, a full wave rectifier may be used with equal success to provide the required unidirectional

tional pulsating current. While the charge on the condenser is necessarily high so as to be effective when spontaneously discharged through the fence wire, the severity of the shock will not in anywise injure an animal coming in contact with the wire.

As stated, the gas tube 18 normally insulates the fence wire from the charging circuit to allow a charge to be built up in the condenser; but upon the attainment of a predetermined effective charge in the condenser or a charge of sufficiently high value to ionize the gas contents of the tube 18, the fence wire 5 is electrically connected with the condenser.

Hence, upon grounding of the fence wire, the entire charge of the condenser is spontaneously discharged; and if the ground connection is through the body of an animal contacting the wire, the animal receives a sudden momentary shock of sufficient intensity to be effective. Upon such discharge, the gas in the tube 18, no longer being subjected to the high charge of the condenser, deionizes to disconnect the fence from the condenser and consequently the charging circuit. Current from the rectifier tube 14 thus again flows to the condenser and builds up a new charge therein; and as soon as the condenser is fully charged, the current flow from the rectifier tube ceases and the ionization of the gas in the tube 18 electrically reconnects the fence wire with the condenser.

Thus, it will be seen that the fence wire 5, if grounded, is periodically energized at substantially regular intervals. In the event it is desired to regulate the frequency of the condenser discharge through the fence wire, the resistance 17 may be adjusted to regulate the charging rate of the condenser to any desired degree. If desired, a condenser 19 may be connected across the electrodes of the gas tube 18 to positively guard against the possibility of arcing between the electrodes of the tube in the event the gas does not completely deionize after the fence has been grounded and current again starts flowing in the charging circuit.

Magnetic shunt blocks 20 may be inserted in the transformer core to limit the current in the secondary winding 11 to a safe value and enable the charging unit to operate from any lighting source.

In the form of the invention shown in Figure 2, a relay 21 having a coil 22 connected in series with the rectifier tube output and the condenser is used to disconnect the fence wire from the condenser after the fence wire is grounded and unloads its charge.

In all respects, the charging circuit is substantially the same as that described in connection with Figure 1.

After grounding of the fence wire, the flow of charging current from the rectifier tube to the condenser passes through the coil 22 of the relay energizing the same. Upon energization of the relay, its armature 24 is moved out of engagement with the fence wire terminal 25 to break the connection between the fence wire and the condenser and its charging circuit to again permit the condenser to become charged.

After the condenser is charged, the flow of current from the rectifier tube ceases and consequently deenergization of the relay allows a light spring 26 to pull the armature 24 into contact with the terminal 25 to reconnect the fence wire with the condenser.

If desired, a condenser 27 may be connected

in parallel with the relay coil 22 to filter out the D. C. ripple, thus insuring smooth functioning of the relay.

It is also preferable to connect a condenser between the fence and the ground as shown at 28 in each of the embodiments shown, to eliminate or suppress radio interference.

From the foregoing description taken in connection with the accompanying drawing, it will be readily apparent to those skilled in the art, that this invention assures maximum effectiveness by keeping the fence wire disconnected from the condenser for the interval during which the condenser is being charged. This enables the condenser to be fully charged regardless of any electrical leakage in the fence circuit.

What I claim as my invention is:

1. In an electric fence: a fence wire insulated from the ground; a step-up transformer having a primary connectible with a source of alternating current; a rectifier connected with the high voltage secondary of the transformer; a gas tube connected between the fence wire and the rectifier and having a minimum operating characteristic such as to prevent the flow of current onto the fence wire from the rectifier, the discharge of said gas tube requiring grounding of the fence wire and ionization of its gas contents brought about by the impression thereon of a potential of predetermined value in excess of the R. M. S. value of the rectifier output; and a condenser connected with said gas tube and the rectifier for building up the rectifier potential at least to said predetermined value at which the gas in the tube is caused to ionize, whereby the condenser may spontaneously discharge through the gas tube to effect the application of a sudden electrical impulse onto the fence wire during grounding of the same.

2. In an electric fence: a fence wire insulated from the ground; a condenser; a charging circuit for the condenser including a source of unidirectional pulsating current effective to charge the condenser to a predetermined value, and in which the current ceases flowing when the condenser becomes charged to said value; and means for electrically connecting the fence wire with the condenser, said means being responsive to the flow of current in the charging circuit to disconnect the fence wire from the condenser.

3. In an electric fence: a fence wire insulated from the ground; a source of unidirectional pulsating current including a rectifier; a condenser adapted to be charged from the output of the rectifier to a value above the R. M. S. value of the rectifier output; a relay having its coil connected in series with the condenser and the rectifier to be energized by the output thereof as long as charging current continues to flow to the condenser and to be deenergized upon the cessation of current flow when the condenser becomes charged; and means controlled by said relay to electrically connect the fence wire with the condenser upon deenergization of the relay coil.

4. An electric fence comprising: a condenser; a shocking circuit constituting the sole means for discharging the condenser and consisting of the condenser, one side of which is grounded, a fence wire insulated from the ground, and means including a control device having a minimum operating characteristic connecting the fence wire with the other side of the condenser so that a charge on the condenser in excess of the minimum required to operate said control device renders the same operative and discharges the

condenser whenever the circuit is completed between the fence wire and ground; and a charging circuit for charging the condenser including a source of unidirectional pulsating current of an R. M. S. value below the critical value of said control device, and means connecting said source with the ungrounded side of the condenser so as to build up a charge therein while the control device is inoperative.

5. In an electric fence: a source of unidirectional pulsating current; a condenser connected with said source to store up an electrical charge therein of a value approximating the peak voltage of said source; a circuit fed by the condenser and constituting the sole means for discharging the same; means for holding said circuit open until the charge on the condenser attains said value approximating peak voltage of the source; and a fence wire insulated from the ground and so connected with said circuit that grounding of the fence wire is a prerequisite to closure of said circuit and current flow in said circuit effects energization of the fence wire.

6. In an electric fence: a bare fence wire insulated from the ground; a condenser in which a predetermined high voltage charge is adapted to be built up; a source of unidirectional pulsating current the R. M. S. voltage of which is less than said predetermined high voltage; means for connecting said source with the condenser so that the condenser becomes charged with said predetermined high voltage; a fence energizing circuit constituting the sole means for discharging the condenser and so connected with the fence wire that grounding of the fence wire is a prerequisite to discharge of the condenser; and a critical value control device connected in said circuit for holding said circuit open until the charge on the condenser reaches said predetermined high voltage in excess of the R. M. S. voltage of the source despite a possible grounded condition of the fence wire.

7. In an electric fence: a bare wire insulated from the ground and adapted to be grounded by an animal contacting the same; a condenser in which a predetermined high voltage charge is adapted to be built up; a source of unidirectional pulsating current the R. M. S. voltage of which is less than said predetermined high voltage; means for connecting said source with the condenser so that the condenser becomes charged with said predetermined high voltage; and a normally open shocking circuit constituting the sole means for discharging the condenser and comprising the

bare wire grounded by an animal or other grounding connection and a critical value control device connected in series, said critical value control device holding the shocking circuit open until the charge on the condenser reaches said predetermined high voltage in excess of the R. M. S. voltage of the source despite a grounded condition of the bare wire.

8. An electric fence comprising: a bare wire insulated from the ground and adapted to be grounded by an animal contacting the same; means for charging the fence wire with high voltage electricity so that an animal contacting the wire receives a shock, said means comprising, a condenser in which the high voltage is adapted to be built up, a condenser charging circuit including the condenser, a source of unidirectional pulsating current, the R. M. S. value of which is less than the voltage of the charge to be built up in the condenser, and electrical connections between said source and the condenser; and a normally open shocking circuit constituting the sole means for discharging the condenser and including the condenser, the fence wire, ground and a gaseous discharge tube all connected in series, said gaseous discharge tube holding the shocking circuit open despite possible grounding of the fence wire until the charge on the condenser reaches a predetermined value in excess of the R. M. S. value of the current source.

9. An electric fence comprising: a bare wire insulated from the ground and adapted to be grounded by an animal contacting the same; means for charging the fence wire with high voltage electricity so that an animal contacting the wire receives a shock, said means comprising, a condenser in which the high voltage is adapted to be built up, a condenser charging circuit including the condenser, a source of unidirectional pulsating current, the R. M. S. value of which is less than the voltage of the charge to be built up in the condenser, and electrical connections between said source and the condenser; and a normally open shocking circuit constituting the sole means for discharging the condenser and including the condenser, the fence wire, ground and a critical value control device all connected in series, said critical value control device holding the shocking circuit open despite possible grounding of the fence wire until the charge on the condenser reaches a predetermined value in excess of the R. M. S. value of the current source.

STANLEY G. KLUMB.