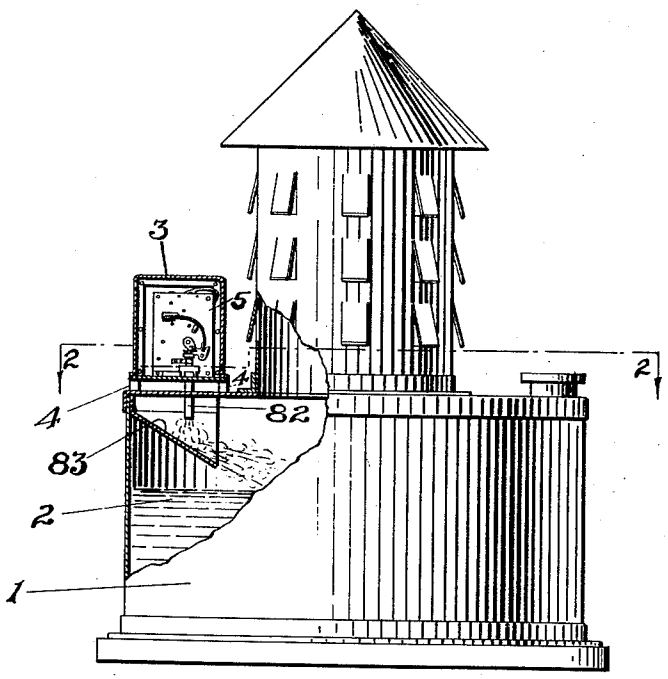
Aug. 18, 1925. 1,550,007

A. CIRAOLO

AUTOMATIC IGNITION DEVICE

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Fig 1



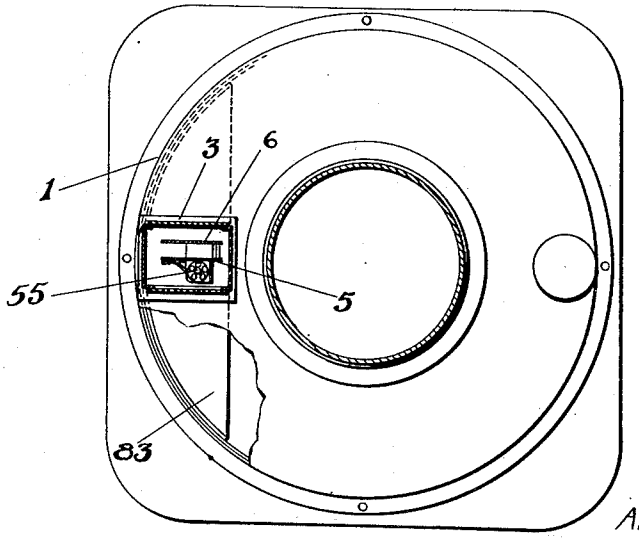


Fig 2

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Fig 3

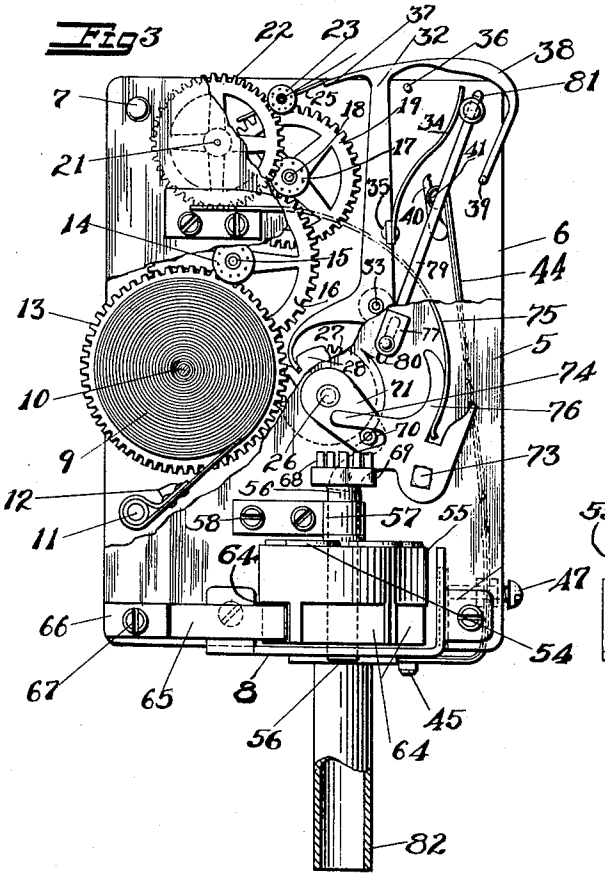
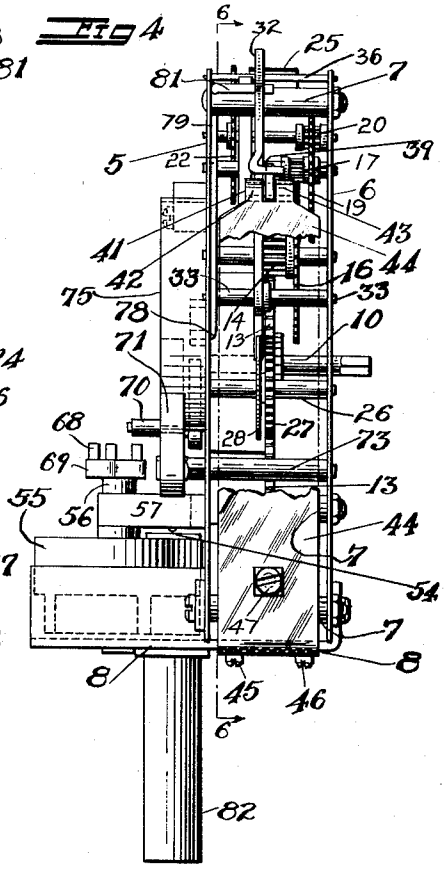


Fig 4



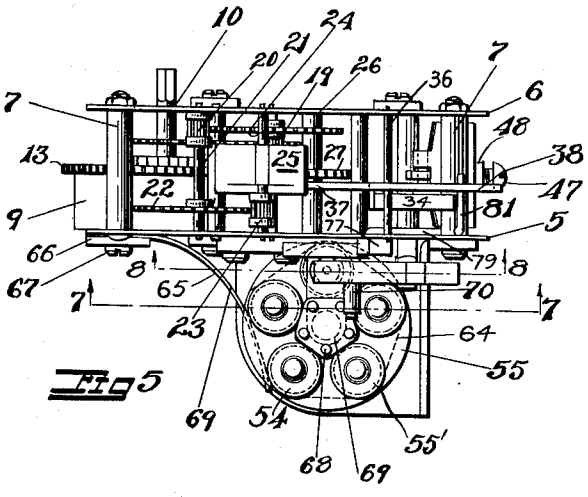


Fig 5

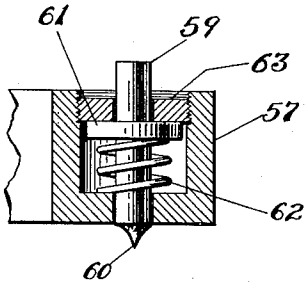


Fig 5a

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Fig 6

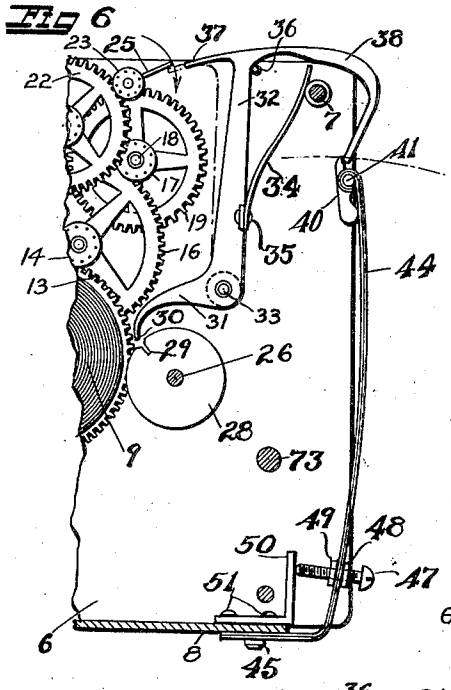
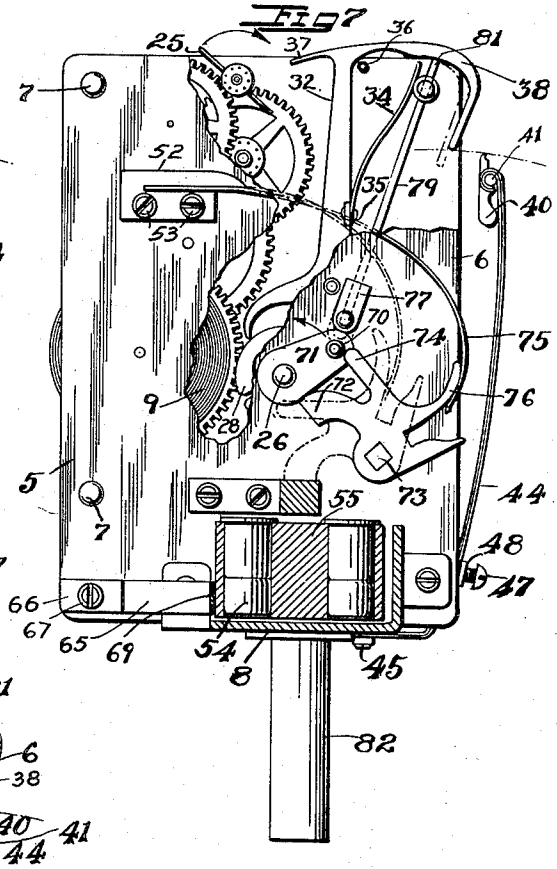


Fig 7



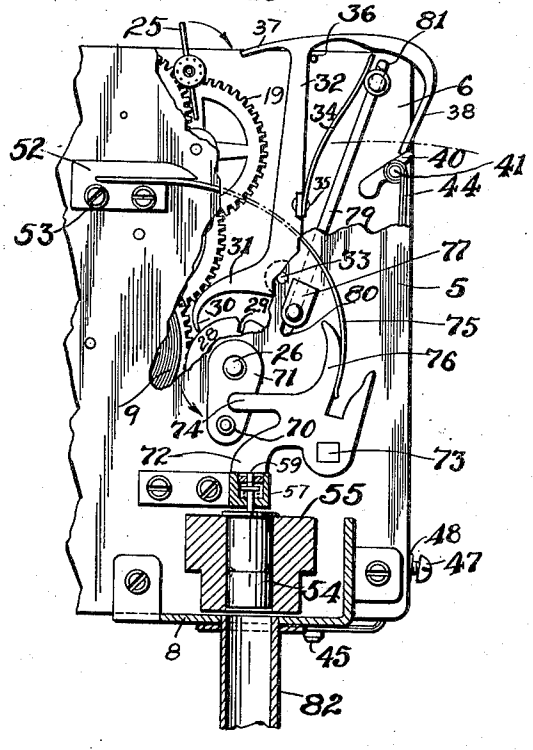


Fig 8.

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UNITED STATES PATENT OFFICE.

ANTONIO CIRAOLO, OF OAKLAND, CALIFORNIA.

AUTOMATIC IGNITION DEVICE.

Application filed September 17, 1924. Serial No. 738,305.

To all whom it may concern:

Be it known that I, ANTONIO CIRAOLO, a subject of the King of Italy, and a resident of Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Automatic Ignition Devices, of which the following is a specification.

My present invention relates to automatic ignition devices of the class adapted to cause ignition by the flame from cartridge explosive agents. The invention is designed primarily for use in combination with oil heaters or smudge pots that are used in orchards particularly, when the temperature of the atmosphere approaches or reaches a predetermined degree considered injurious to the orchard.

At the present time, the large number of orchard oil heaters in use to protect budding trees or ripening fruit from frost are lighted individually by hand, and in some instances by the use of expensive electrical ignition systems, and it requires close watching of thermometers located in different sections of an orchard to note a sudden and dangerous fall of temperature, and quick action to get all the heaters lighted in time to avoid possible damage to the trees. In many sections fuel is costly and to light the heaters too soon is unnecessary and expensive, and if too late failure and ruin may be the result.

The prime object of my invention, is the provision of an inexpensive and reliable automatic igniter which will light the heater when the temperature drops to a predetermined point. As stated this is particularly advantageous in orchards during the spring season when the temperature drops to or near the freezing point during the night, the automatically-lighted heater protecting the fruit buds and blossoms on the trees from the cold and frost.

Another object is to use an ordinary clock movement as the base mechanism for the device and controllable by a thermostat to fulminate a blank cartridge, the flash and burning powder and wad of which ignites the oil in the heater.

A further object is to provide such an automatic ignition device that can be attached to existing oil heaters or smudge pots and made a permanent part thereof.

And a still further object is to provide many ignition charges to the device, one charge being sufficient to light the heater.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the following description where I shall outline in full that form of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings I have shown one form of my invention, but it is to be understood that I do not limit myself to such form, since the invention, as expressed in the claims, may be embodied in a plurality of forms.

Referring to said drawings:

Figure 1 is a side elevation of a typical orchard heater with parts broken away and showing, partly in section, the application of my automatic ignition device therewith. The view shows that an ignition charge has just been fired and the flame of which is spreading on the fuel surface to light the fuel.

Fig. 2 is a sectional plan taken on the line 2—2 of the preceding figure, and with a portion of the fuel container broken away to show the charge-deflecting plate.

Fig. 3 is a face view of the invention with part of the frame-plate broken away to show the spring, some of the gears and other parts therebehind. All the parts are in normal position and at rest.

Fig. 4 is a side view of the preceding figure with part of the thermostat broken away to clearly show certain parts therebehind.

Fig. 5 is a plan of Fig. 3 showing clearly the governor fan and cylinder loaded with cartridges.

Fig. 5[a] is a detail sectional view of the firing pin on an enlarged scale.

Fig. 6 is a partial and sectional view on line 6—6 of Fig. 4 to show the first step in the functioning of the device, namely, the thermostat releasing the mechanism for action; other parts are omitted for clearness.

Fig. 7 is a sectional view taken on line 7—7 of Fig. 5, and with part of the frame-plate broken away to show the second and third steps in the functioning of the device, namely, the hammer raised by the crank and just about to be released, and the trip-rod raised to allow the thermostat to pass unimpeded.

Fig. 8 is a partial and sectional view taken on line 8—8 of Fig. 5 through a spent cartridge and just previous to the turning of the cylinder to position an unexploded cartridge. This may be considered the fourth step, and the final step may be considered the termination of the cylinder movement, and back to the normal position of Fig. 3. This completes the cycle of operations.

Similar numerals of reference refer to similar parts throughout the several figures of the drawings.

The numeral 1 in Fig. 1 indicates a conventional orchard heater, and 2 the liquid fuel therein. Mounted on the heater is a casing 3 which completely incloses the ignition mechanism of the invention. The bottom of the casing is raised above the top of the heater by means of supporting nipples 4, to allow air to circulate between the casing and heater top to prevent undue heating of the mechanism.

The ignition mechanism is supported in a frame composed of frame-plates 5 and 6, spaced apart by shouldered rod-bolts 7. The mechanism consists, in this instance, of a standard clock-striking movement including a spring 9, wound on a shaft 10 journaled in the plates 5 and 6, and thermally-actuated means to release a flame-spreading cartridge which will be later described. The other end of the spring is looped over the rod-bolt 11 and held secured by the rivets 12, Fig. 3, whereby the uncoiling of the spring will turn the shaft 10. A master gear 13 is fixed to the shaft 10 and meshes with a cage-pinion 14, on the shaft 15 journaled in the said plates and it has the gear 16 fixed thereto.

The gear 16 meshes with a cage-pinion 17 on the shaft 18, and which latter also is journaled in the frame plates and has the gear 19 fixed thereto. The latter gear is in mesh with the cage-pinion 20 on the shaft 21, which has the gear 22 fixed thereon, and which is in mesh with the cage-pinion 23 on the shaft 24 similarly journaled in the frame-plates, and which shaft 24 has affixed thereon the retarding fan or governor 25.

On a shaft 26, Fig. 3, journaled in the frame-plates is fixed a gear 27 in mesh with the master gear 13, and adjacent said gear is fixed a disk 28, Fig. 6, which has a notch 29, on its periphery adapted to receive the end portion 30 of the short arm 31 of the lever 32, which is fixed on the shaft 33 also pivotally supported in the frame-plates.

Extending across the top of the frame, Fig. 6, is a light rod 36 that acts as a stop to limit the outward throw of the lever 32. On the lever and near the light rod a projecting finger 37 is adapted to engage the fan blade 25 to prevent its rotation when the lever is in the locked position as shown in Fig. 3. This position is the at-rest or normal position of the igniter. A spring 34, Fig. 6, bearing against a frame rod-bolt 7, and attached to the lever 32 by means of the rivet 35, tends to hold the lever in the locked position. On the opposite side of the lever 32 is a projecting and down-curving spring-arm 38, which has the lateral finger 39, Fig. 4, adapted to engage a pawl 40, Figs. 6 and 8, pivoted on a pin 41 secured in the eyes 42 and 43 on the end of a thermostat 44 of themostat metal, and which latter is secured to the base 8 by means of the screws 45 and 46. An adjusting mechanism is connected to the thermostat and consists of the screw 47 engaging threads in the thermostat and having lock nuts 48 and 49 on either side, and a bracket 50 attached to the base by means of the rivets 51 and adapted to receive the thrust of the screw 47; the purpose of the said adjustment will be set forth presently.

The base projects laterally from the frame-plate 5, Figs. 4 and 5, and mounted thereon is a revolvable chambered cylinder 55 adapted to receive standard cartridges 54 and in this instance five in number, and has its central shaft 56 journaled in the base and in a projecting bracket 57 secured to the frame by means of screws 58. A firing pin 59, Fig. 5a, is mounted in the bracket 57 having the customary point 60 adapted to strike the fulminating cap of each cartridge in turn, at a certain point in the cycle of operations as each cartridge is positioned to register therewith. The pin has the collar 61 fixed thereto, and a spring 62 to hold the pin normally against a screw cap 63.

The cylinder 55 has five flat surfaces 64, on which a flat spring 65 bears to hold the cylinder periodically fixed so that each cartridge is brought into alignment with the firing pin as the cylinder is turned step by step. The spring is secured to the frame by the washer 66 and screw 67. The cylinder 55 is turned by means of the spaced pins 68, on the flanged top 69 of the shaft 56, as the said pins are engaged by the arm 70 on the crank 71 which is fixed to the shaft 26. At each revolution of the crank, the cylinder is moved to bring another cartridge under the firing pin. To strike the firing pin 59, a hammer 72 is provided and it is fixed on the shaft 73 journaled in the frame. The hammer has a finger-projection 74 adapted to be engaged by the arm 70 of the crank 71 as shown to advantage in Figs. 3, 7, and 8, to raise the hammer against the influence of a strong flat spring 75 in contact with the projection 76 of the hammer. Immediately upon the disengagement of the arm 70 with the finger 74, the reaction of the spring 75 causes the hammer to descend with much force and strike the firing pin 59. The other end of the spring is anchored in a slot-

ted block 52 by screws 53 to the frame. Just as the hammer is released, a small block 77, Fig. 7, which is riveted to the bent-over end 78 of a trip-rod 79 and adapted to slide in a slot 80 in the frame-plate 5, and its opposite end adapted to slide through a hole in the rod-bolt 7, is engaged by the crank 71 and raised and with it the arm 38 of the lever 32 by means of the lateral finger 81, Figs. 4 and 5, bent from the end of rod 79. The arm 38 has sufficient spring to allow it to be raised out of engagement with the pawl 40, Figs. 6 and 7, on the thermostat 44, to allow the spring 34 to function and cause the lever 32 to engage the notch 29 in the disk 28 when in register with the end 30 of the arm 31.

Secured to the base 8 and in line with the cartridge to be fired, is a tube or barrel 82 which is adapted to extend into the heater. In the heater, Fig. 1, a deflector plate 83 is secured at an angle and located under the tube to deflect the burning powder and wadding over the surface of the oil and thereby light the same. The cartridge 54 is loaded for this purpose with powder and wadding of inflammable material.

In operation, the cylinder 55 is filled with cartridges, and the spring 9 wound; the mechanism will be in the locked position as shown in Figs. 3, 4 and 5.

The thermostat 44 is adapted to bow inwards on a rising temperature and to bow outwards on a falling temperature. Adjustment is made by means of the screw 47 to cause the thremostat to bow outwards to the operating point at a predetermined temperature, usually 32 degrees Fahrenheit, the freezing point, with sufficient power to cause the pawl 40 to engage the arm 38, and swing the lever 32 outwards so that the end 30 is raised out of notch 29 in disks 28, and the projection 37 pulled back to release the governor fan 25, thus allowing the wound spring 9 to turn the shaft 10, and in turn, the gears 13 and 27 which cause the shaft 26 to revolve and with it the crank 71. The arm 70 on the crank engages the projection 74, and raises the hammer 72 until the arm slips off the projection and allows the spring 75 to throw the hammer down with force enough to explode the cartridge through the firing pin, the discharge passing through the tube 82 into the oil container and on striking the deflector plate 83 is deflected upon the surface of the oil, whereupon the burning powder and wad ignite the oil.

The thermostat is still in the position shown in Figure 6, and is released by the crank 71 raising the block 77 and through it the trip-rod 79 and its finger 81, which latter raises the spring arm 38 out of contact with pawl 40, thus permitting the thermostat to bow further outwards as shown in Fig. 7.

As the temperature rises, the thermostat bows inwards again and the pivoted pawl 40 swings to pass the arm 38 as shown in Fig. 8.

As the crank 71 approaches the position shown in Fig. 8, it begins to touch one of the pins 68 to turn the cylinder 55 to bring another cartridge under the firing pin, and by the time the crank reaches the at-rest position of Fig. 3, a new cartridge has been positioned.

As soon as the thermostat is released as shown in Fig. 7, the tensed spring 34 urges the lever 32 back so that the end 30 thereof will enter the notch 29 when the disk 28 is turned to register therewith, and the projection 37 will be thrown in the path of the revolving fan 25 and stop it, and thus the normal position shown in Fig. 3 is again reached. The automatic ignition device is now ready for another cycle of operations on the appearance of the next freezing spell. In the meantime the smudge pots must again be filled with fuel.

Other parts shown in the drawings but not specifically referred to, are ordinary structural parts and need no description.

Having thus described my invention in its preferred form, I do not wish to limit myself to the exact construction shown and described, as it is obvious that details may be varied without departing from the spirit of the invention as set forth in the following claims:

1. An ignition device of the class described, comprising a clockwork mechanism, a removable chambered cylinder containing explosive charges, means to fire the said charges, a thermostat in connection with lever means adapted at a predetermined degree of temperature to release the said lever means to operate the said clockwork mechanism to fire one of the said explosive charges, the flash and burning powder of which is adapted to ignite inflammable material, and means adapted to reset the said cylinder for the next firing action.

2. In an ignition device, a clockwork mechanism, a notched disk driven by said clockwork mechanism, a pivoted lever adapted to engage the notch in said disk after each revolution of the latter, a thermostat adapted to control said lever to release said disk to operate the said mechanism at a predetermined degree of temperature, and means in connection with said mechanism and operable thereby to explode a cartridge at each revolution of the said disk, the flash and burning powder of which is adapted to ignite inflammable material.

3. An ignition device comprising clockwork mechanism mounted in a frame, crank means driven by said mechanism to raise and release a spring-actuated hammer, a firing pin for said hammer, a cylinder containing a plurality of cartridges in spaced

relation and adapted to be revolved by said crank means whereby each of said cartridges may be brought under said firing pin, a thermostat adapted at a predetermined temperature to operate the said mechanism to fire a cartridge, and means for automatically arresting the mechanism after the said cartridge is fired.

4. In combination with an orchard heater, an automatic resetting ignition device comprising a casing adapted to be mounted thereon, a frame adapted to be inclosed in said casing, mechanism supported in said frame, ignition means including a plurality of explosive charges and thermostat means supported by said frame whereby the latter means may be thermally actuated to operate the said mechanism and ignition means to automatically light the heater.

5. In combination with an orchard heater, an automatic ignition device comprising a casing adapted to be mounted thereon and spaced therefrom, a frame adapted to be inclosed in said casing, clockwork mechanism supported in said frame, revolvable and resetting ignition means including a plurality of cartridges and a thermostat of metal supported by said frame whereby the said thermostat may be set to be thermally actuated at a desired temperature to operate the said mechanism to discharge one of said cartridges into the said heater to light the same by the flame of its burning materials.

6. An igniting device comprising spaced frame-plates supporting therebetween a clockwork mechanism, an automatically movable swinging thermostat, a pivoted spring-held starting lever, and a combined driven gear and notched disk adapted to drive crank means and ignition means supported exterior to the said frame-plates; the said lever having a short and a long upper arm and a single lower arm, the latter in conjunction with the said short arm adapted to engage the mechanism to hold the same at rest, and the said long arm adapted in conjunction with the said automatically movable thermostat to swing the lever to release the said mechanism and start the same, the said crank means comprising a crank and projecting arm adapted to engage a spring-controlled hammer and in turn a firing pin, a trip-rod and a pinned ignition shaft, the ignition means comprising a chambered cylinder fixed to said pinned shaft and adapted to be turned through an angle thereby, cartridges adapted to be inserted in said chambers and a barrel extending from the device and in alignment with the cartridge to be fired; the said crank effecting in one revolution the raising of the hammer against the pressure of a spring and the subsequent firing of a cartridge by the way of the firing pin through the said barrel, the raising of the said trip-rod to release the thermostat from engagement with the said starting lever, the revolving of the said pinned ignition shaft a distance to position another cartridge in line with the barrel, firing pin and hammer, and finally to engage the lower lever arm and short upper arm into stopping engagement with the said mechanism and lock the same in rest position, whereby the device is made ready for another cycle of operations on the movement of the said thermostat.

7. In an orchard heater, means for automatically igniting the same comprising a spring driven mechanism, a temperature controlled device for releasing said mechanism, a crank driven by same mechanism, a revolving cartridge cylinder, a firing pin for the cartridges, said crank adapted to progressively rotate the cylinder to position a cartridge in firing relation with the firing pin, and a hammer actuated by the crank for striking the firing pin.

8. In an orchard heater, an igniting device therefor comprising a cartridge cylinder carrying a plurality of cartridges, a firing pin and a hammer therefor, spring driven means for rotating the cylinder to progressively advance the cartridges in firing relation with the firing pin, said means also actuating the hammer, and a temperature controlled device adapted to release the spring driven at a predetermined fall in temperature.

9. An ignition device of the class described, comprising a clockwork mechanism and means connected therewith and actuated thereby to discharge a cartridge comprising a rotating crank, a cartridge cylinder, a firing pin and a hammer, said crank adapted to progressively advance the cartridges in firing position relative to the firing pin and also actuate the hammer, means for normally arresting the clockwork mechanism, and a temperature controlled device for releasing said arresting means.

10. An ignition device of the class described, comprising a clockwork mechanism and means connected therewith and actuated thereby to discharge a cartridge comprising a rotating crank, a cartridge cylinder, a firing pin and a hammer, said crank adapted to progressively advance the cartridges in firing position relative to the firing pin and also actuate the hammer, means for normally arresting the clockwork mechanism, and a temperature controlled device for releasing said arresting means, the rotation of the crank adapted to automatically reset the arresting means, and the temperature controlled device adapted to automatically return to functional engagement with the arresting means.

11. In combination, an orchard heater and an automatic igniting device therefor; said

igniting device comprising a cartridge cylinder adapted to contain a plurality of cartridges, a firing pin and a hammer therefor, means for automatically advancing the cartridges in firing relation with the firing pin and also actuating the hammer, means for arresting said advancing means at timed intervals, and a temperature controlled device for releasing the same, said device adapted to automatically return to releasing engagement with the arresting means.

12. In an orchard heater, a self setting igniting device for the same, comprising means for receiving a plurality of cartridges, means for progressively firing the cartridges and temperature controlled means for releasing said firing means.

13. In an orchard heater, a self setting igniting device for the same, comprising means for receiving a plurality of cartridges, means for progressively firing the cartridges and temperature controlled means for releasing said firing means, means for arresting the firing means after the same has fired a cartridge and the heat from the heater adapted to reset the temperature controlled means for again releasing the firing means at a predetermined fall in temperature.

14. In an orchard heater, an igniting device therefor comprising a rotatable cartridge cylinder for receiving a plurality of cartridges, firing means for said cartridges, spring driven means progressively advancing the cartridges to the firing means, said spring driven means also actuating the firing means, means for arresting the spring driven means, and a temperature controlled device for releasing the same.

15. In an orchard heater, an igniting device therefor comprising a rotatable cartridge cylinder for receiving a plurality of cartridges, firing means for said cartridges, spring driven means progressively advancing the cartridges to the firing means, said spring driven means also actuating the firing means, means for arresting the spring driven means, and a temperature controlled device for releasing the same, said arresting means for the spring driven means adapted to function after the firing of each cartridge and the temperature controlled device adapted to automatically return to normal position independently of the arresting means.

In testimony whereof I affix my signature.

ANTONIO CIRAOLO.