March 22, 1949. G. DE GELLEKE 2,465,208

TUBULAR ELECTRICAL HEATING UNIT

Filed April 30, 1947 3 Sheets-Sheet 1

FIG. 1.

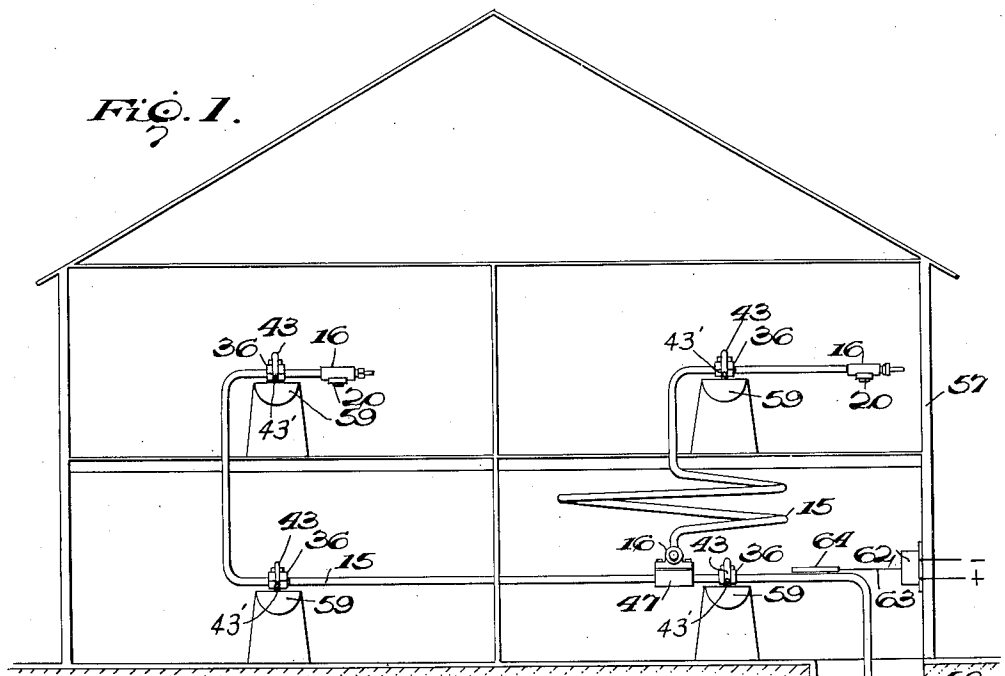



FIG. 2.

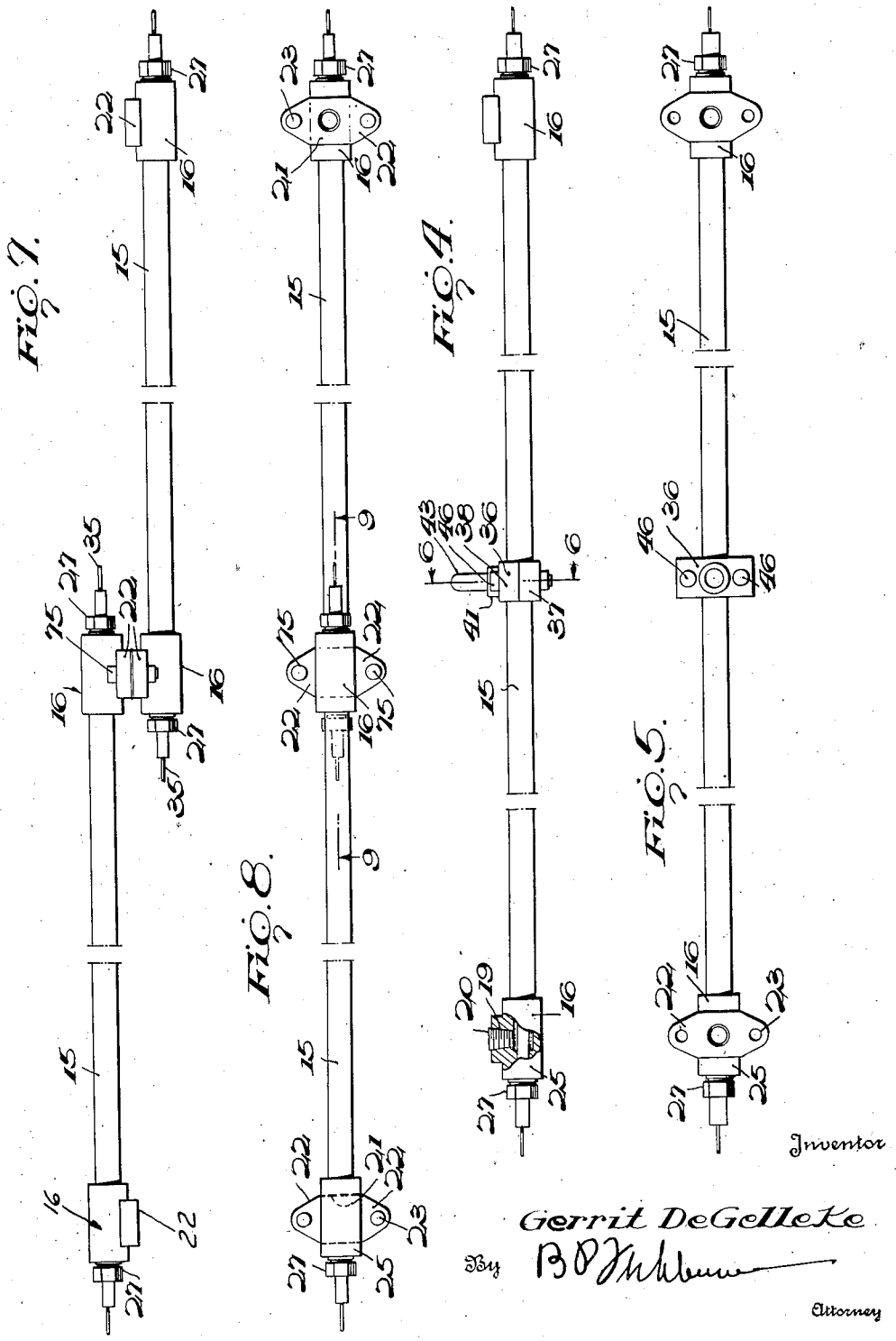
FIG. 3.

Inventor
Gerrit DeGelleke
Attorney

March 22, 1949. G. DE GELLEKE 2,465,208

TUBULAR ELECTRICAL HEATING UNIT

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Inventor

Gerrit DeGelleke

By B P Thebaum

Attorney

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TUBULAR ELECTRICAL HEATING UNIT

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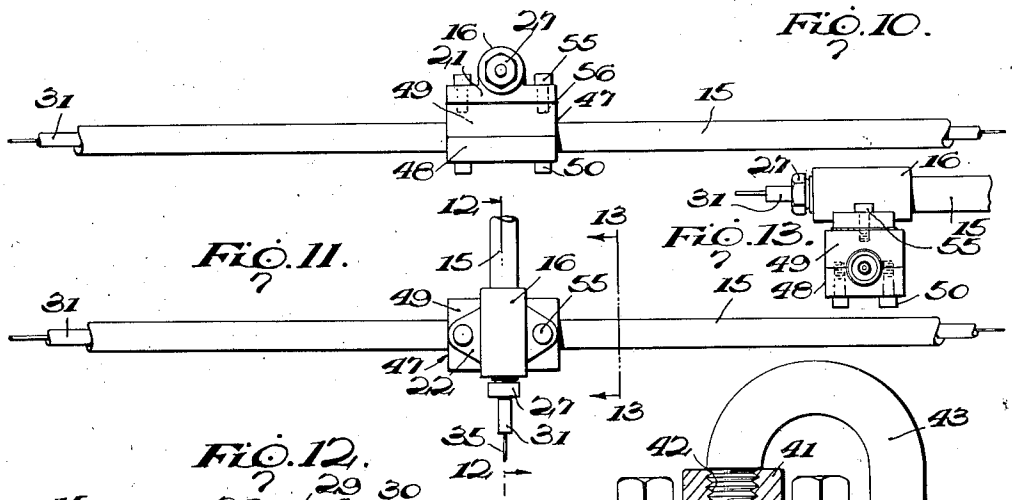


FIG. 10.



FIG. 11.



FIG. 13.

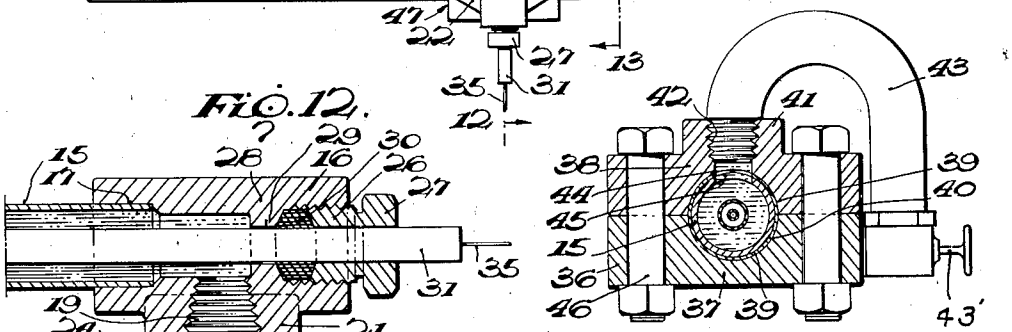


FIG. 12.

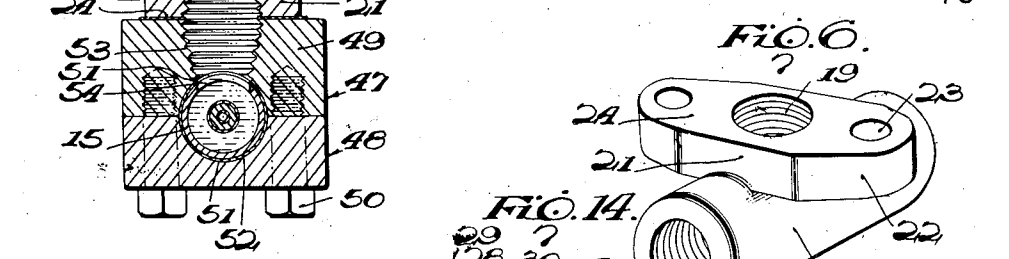


FIG. 6.

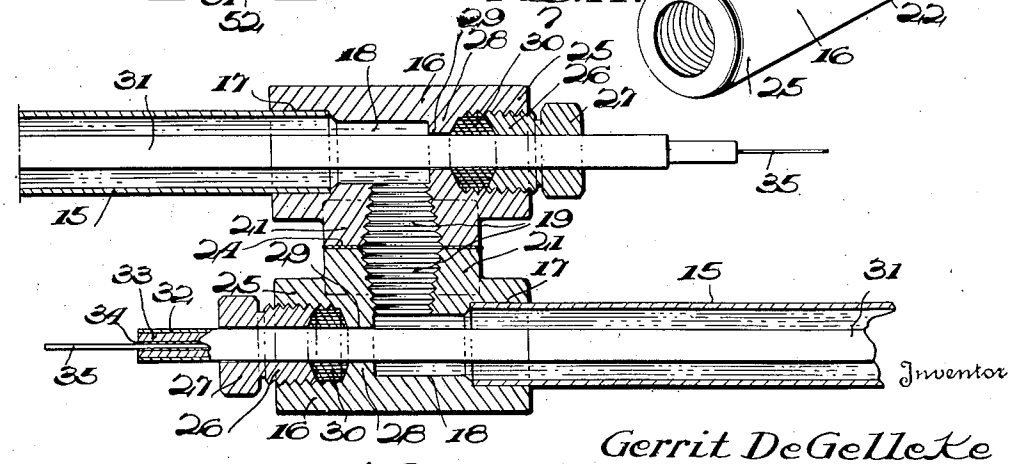


FIG. 14.

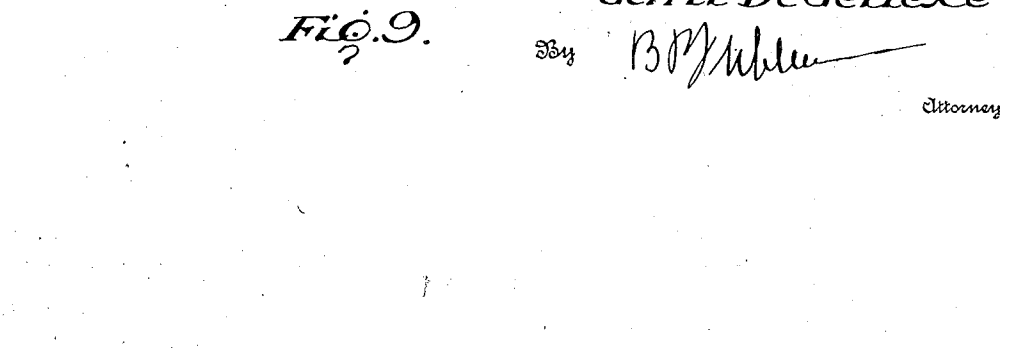


FIG. 9.

Inventor

Gerrit DeGelleke

By B P Mueller

Attorney

Patented Mar. 22, 1949 2,465,208

# UNITED STATES PATENT OFFICE

2,465,208

## TUBULAR ELECTRICAL HEATING UNIT

Gerrit De Gelleke, Troy Hills, N. J., assignor of one-third to Peter De Gelleke, Asbury, and one-third to Carl Herzog, Belleville, N. J.

Application April 30, 1947, Serial No. 744,966

8 Claims. (Cl. 219—38)

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My invention relates to tubular electrical heating units.

Important objects of the invention are to provide means for preventing the freezing of water in pipes and the resultant bursting of the pipes, to establish one or more liquid outlets, to cause all heat generated by the resistance cable to be absorbed without loss by the surrouunding liquid, to provide liquid outlets and unit extensions, at any place, without disassembling the existing unit, to protect the resistance element by the surrounding tube from external damage, and to protect all liquid in the system against freezing since there are no cold or unheated spots.

A further object of the invention is to provide a tubular electrical heating unit which is flexible and may be readily formed into the desired shape.

A further object of the invention is to provide a unit of the above mentioned character which may be readily connected with a companion unit for increasing the overall length of the device.

A further object of the invention is to provide means for connecting branch pipe or pipes with the tubular unit between the ends of the unit.

A further object of the invention is to provide means for connecting one tubular unit with a companion tubular unit, between the ends of such companion tubular unit and arranging such units generally at right angles to each other.

A further object of the invention is to provide tubular electrical heating units which are of simple construction, easy to install or assemble and practical in operation.

A further object of the invention is to provide tubular electrical heating units so constructed that when they are connected or assembled, their resistance wires may be easily connected in circuit with a source of current.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this application and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a side elevation of tubular electrical heating units embodying my invention, showing the same installed within a poultry house.

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Figure 2 is a diagrammatic view, showing a circuit connected with the units of Figure 1,

Figure 3 is a diagrammatic view showing another assembly of tubular electrical heating units and associated circuit,

Figure 4 is a side elevation of one tubular electrical heating unit,

Figure 5 is a plan view of the same,

Figure 6 is a transverse section taken on line 6—6 of Figure 4,

Figure 7 is a side elevation of two tubular electrical heating units arranged in longitudinal relation and connected at their ends,

Figure 8 is a plan view of the same.

Figure 9 is a longitudinal section taken on line 9—9 of Figure 8, parts in elevation.

Figure 10 is a fragmentary side elevation of a tubular electrical heating unit and a companion unit arranged at right angles thereto and connected therewith,

Figure 11 is a plan view of the same,

Figure 12 is a transverse section taken on line 12—12 of Figure 11,

Figure 13 is a transverse section taken on line 13—13 of Figure 11,

Figure 14 is a perspective view of one of the end couplings.

Each tubular electrical heating unit comprises a pipe 15, shown in all figures but see most particularly Figures 4, 5, and 9. This pipe is preferably formed of copper and is sufficiently stiff so that it will tend to hold its shape, when formed into a desired shape, but is sufficiently flexible so that it can be bent into the desired shape. The pipe 15 may be formed of other suitable flexible material.

Secured to the opposite ends of each pipe 15 are tubular couplings 16 which are elongated and are provided at their inner ends with openings 17 for receiving the ends of the pipe 15 which are soldered therein. Each coupling 16 has a longitudinal bore 18, in communication with a transverse bore 19, which is preferably tapered and internally screw threaded. The bore 19 may be closed by a removable plug 20. Each coupling 16 is provided at its periphery with a transverse web or plate 21, carrying knuckles 22 having openings 23. The web 21 is integral with the coupling 16 and extend transversely thereof and

has an outer flat face 24 for engagement with the corresponding face of a companion web 21. Each coupling 16 is provided at its outer end with a tubular gland 25, internally threaded for receiving a tubular threaded plug 26 having an outer head 27, provided with flats for convenient turning by means of a wrench or the like. Disposed inwardly of the tubular gland 25 is a transverse web 28, having a contracted opening 29. Suitable packing 30 is arranged within the gland 27 to be compressed by the plug 26.

Extending longitudinally within and through each pipe 15 and held in more or less concentric spaced relation therein is an electric heating cable 31. This heating cable is preferably of the type made and sold by General Electric Company, although other forms of electric heating cables may be used. This cable comprises an outer lead sheath 32 within which is arranged a varnished cambric insulation tube 33, holding a felted asbestos insulation tube 34, through which passes the resistance wire 35, Figure 9. This heating cable is of course flexible. The ends of the heating cable pass through the tubular plug 26 and are clamped in the gland 25 by the resilient packing 30. The heating cable extends outwardly beyond the tubular plugs 26, as shown.

It is thus seen that each tubular electrical heating unit comprises a flexible pipe, the couplings at its ends, and the resistance cable extending through the pipe and couplings. The pipe and the cable are flexible so that they may be formed into the desired shape. When one coupling 16 is not connected with a companion coupling, its bore 19 will be closed by the plug 20.

I provide a coupling 36, to be applied to the pipe 15 between its ends. This coupling 36 comprises companion blocks or members 37 and 38, Figure 6, having circularly curved recesses 39 formed in their meeting faces, and these assembled circularly curved recesses are adapted to receive the pipe 15 and compressible packing 40 is preferably arranged within these recesses to form a liquid tight joint with the pipe 15. The block 38 has a boss 41, having a tapered screw threaded opening 42, which is preferably tapered to receive the tapered screw threaded end of a short branch outlet pipe 43, equipped with a valve 43' or the like. The opening 42 leads into an inner opening or bore 44, to register with an opening 45, which is cut in the pipe 15, if the coupling 36 is to be applied thereto. The blocks 37 and 38 are clamped together by bolts 46 passing through openings formed therein, as shown.

It may be desired to connect one tubular electrical heating unit with a companion unit, between the ends of such companion unit and arrange the units at right angles to each other. I provide a coupling 47 for this purpose, Figure 12, and this coupling comprises blocks or sections 48 and 49 connected by bolts 50. The meeting faces of these blocks have semi-circular recesses 51, to receive the pipe 15 and packing 52 is arranged between the pipe and the blocks, to provide a liquid tight joint. The block 49 is provided with a transverse threaded opening 53, preferably of the same size as the opening 19 and adapted to be covered by the plug 20, if desired. The opening 53 will lead into an opening 54 cut in the pipe 15, when the coupling 47 is applied to this pipe. When the coupling 47 is applied to the pipe 15, Figures 10 and 11, the companion pipe 15 is arranged above and at right angles thereto, and the coupling 16 at the end of the companion pipe is placed upon the top of the coupling 47 and the web 21 engages the top face of the block 49 and the opening 19 registers with the opening 53. The coupling 16 is therefore clamped to the upper block 49 by bolts 55, passing through the openings 23 in the knuckles 22 and tapped into the block 49 as shown at 56. Packing may be arranged between the faces of the block 49 and web 21, if desired. Each pipe 15 carries the end couplings 16, Figures 10 and 11.

It is obvious that any suitable number of couplings 36 may be applied to the pipe 15, between its ends, and the same is true with respect to the couplings 47.

Referring now to Figure 1, it will be seen that a tubular electrical heating unit including the pipe 15 has the major portion of its length arranged within the first story of the poultry house 57 and the coupling 16 at its intake end is arranged beneath the ground level and is connected with a water supply pipe 58, engaging within the screw threaded opening 19. The water supply pipe 58 is arranged beneath the surface of the ground for a suitable distance to prevent freezing and the exposed portion of this pipe is short and the water in this short portion will be heated sufficiently to prevent freezing. The coupling 16 at the opposite end of the pipe 15 has its opening 19 closed by the plug 20. The pipe 15 extends from the lower story into the upper story and has been bent into the desired shape or form. As illustrated in Figure 1, two branch couplings 36 have been applied to the lower horizontal portion of the pipe 15 and one branch coupling 36 to the upper horizontal portion, and short outlet pipes 43, Figure 6, connected with the couplings 36. The short pipes 43 are arranged to discharge the water to desired points which may be into receptacles or troughs 59. As shown in Figure 1, a main branch coupling 47 is applied to the lower horizontal portion of the lower pipe 15, and a pipe 15 of the companion electrical heating unit arranged at right angles to the lower pipe 15 and connected therewith through the medium of the couplings 16 and 47, Figures 10, 11 and 12. The companion upper pipe 15 may extend into the upper story of the building and the coupling 16 at its opposite end has its opening closed by the plug 20. The upper pipe 15 is shown as equipped with a branch coupling 36, having the short outlet pipe 43, and discharging into the trough 59 or the like, as heretofore explained. The upper pipe 15 has its lower portion bent into turns to take up the length of the same but this pipe may be bent into any desired shape or form.

I will now describe the circuit used in connection with the arrangement of tubular electrical heating units shown in Figure 1. Line wires 60 and 61 lead into a junction box 62. A wire 63 is connected with the wire 60 and has a thermostatic switch 64 connected therein. This switch is in thermal contact with the lower pipe 15. The switch embodies a stationary contact 65, and an upper movable bimetal contact 66. When contact 66 engages contact 65 the circuit is closed. A second wire 67 is connected with the wire 61. Connected with one end of the resistance wire 35 of the lower pipe 15 is a wire 68, connected with the wire 67, as shown at 69. The opposite end of the resistance wire 35 is connected with the wire 63 as shown at 70'. The upper end of the resistance wire 35 of the other pipe 15 is connected with a wire 71, connected with the wire 67 at 72 while the opposite end

of this resistance wire 35 is connected with a wire 73, connected with the wire 63, at 74.

In view of the foregoing description, it is thus seen that the water will be supplied to the tubular electrical heating units and as soon as the temperature of the water drops to a selected degree, such as slightly above the freezing point, the thermostatic switch will close and current will be supplied through the resistance wires 35, which are connected in parallel. These resistance wires will heat the water so that its temperature will be brought slightly above the freezing point, at which time the thermostatic switch opens and cuts off the current.

I also contemplate arranging two or more of the tubular electrical heating units 15 in longitudinal relation, forming a long pipe of any desired length. Two of the units are shawn connected in this manner in Figures 7, 8, and 9, although any suitable number may be connected. The companion couplings 16 at the ends of the pipes 15 are connected, and one coupling is inverted so that the flat faces of the webs 21 are brought into contacting relation. If desired, compressible packing may be arranged between these flat faces. The webs 21 extend transversely of the couplings 16 and these webs are connected by bolts 75, Figures 7 and 8. Water is supplied into the coupling 16 at the free end of one pipe 15 and will be discharged from the coupling 16 at the opposite end of the companion pipe 15 or this coupling may have its opening closed by the plug 20 in the event that it is provided with other outlet or outlets.

In Figure 3, I have shown three of the pipes 15 connected and arranged in longitudinal relation. The same wires 60 and 61 are provided and wire 63 is connected with wire 60 and wire 67 is connected with wire 61. The same thermostatic switch 64 is connected in the wire 63. In this circuit corresponding ends of the resistance wires 35 are connected with wires 76, connected with the wire 63 at 77 while the opposite corresponding ends of the resistance wires 35 are connected with wires 78, connected with the wire 67 as shown at 79. It is seen that the several resistance wires are connected in parallel and when the thermostatic switch 64 is closed, current will pass through the same to heat the water.

While the liquid heating pipe units are shown as installed in a poultry house, it is of course to be understood that this has been done solely for the purpose of illustration as these devices may be used in any desired manner for suitably heating liquids.

It is to be understood that the forms of my invention herewith shown and described should be taken as preferred examples of the same, and that various changes in the shape, size, and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the subjoined claims.

Having thus described my invention, what I claim is:

1. Tubular electrical heating units, each unit comprising a flexible pipe, couplings extending longitudinally of the flexible pipe and mounted upon the opposite ends of such pipe, each coupling being provided with a transverse web having bolt receiving openings, each coupling having a transverse opening extending through the web, a tubular packing device mounted upon the outer end of each coupling, a flexible heating cable arranged within the flexible pipe and held within the packing devices, the heating units being arranged to extend longitudinally of each other with the web of the coupling of one unit coacting with the web of the coupling of the other unit, and bolts to secure such webs together.



2. Tubular electrical heating units, each unit comprising a flexible pipe, couplings extending longitudinally of the flexible pipe and mounted upon the opposite ends of such pipe, each coupling being provided with a transverse web having bolt receiving openings, each coupling having a transverse opening extending through the web, a tubular packing device mounted upon the outer end of each coupling, a flexible heating cable arranged within each flexible pipe and held within the packing devices of each pipe, the flexible pipe of one heating unit being provided between the couplings at its ends with an opening, a two part coupling having recesses to receive the flexible pipe having the opening, one part of the two part coupling having a transverse opening in communication with the opening of the flexible pipe, one heating unit having the transverse web of one coupling arranged adjacent to the two part coupling and having its transverse opening in communication with the transverse opening of the coupling part, and bolts extending through the openings in the last named transverse web and engaging the last named coupling part.

3. A tubular electrical heating unit, comprising a flexible tube provided between its ends with an opening, couplings mounted upon the opposite ends of the flexible tube, a flexible heating cable arranged within the flexible tube and couplings, and a split coupling including parts having recesses to receive the tube, one part having an opening for communication with the opening in the tube. the split coupling having means for connection with a pipe which communicates with the opening of said part.

4. Tubular electrical heating units, each heating unit comprising a flexible pipe, couplings mounted upon the opposite ends of the flexible pipe of each unit, a flexible heating cable arranged within the flexible pipe of each unit and extending through the couplings, the heating units extending longitudinally of each other and the end coupling of one unit being mounted upon the end coupling of the other unit, wires connected with the opposite poles of a source of current, wires connected with corresponding ends of the cables and with one of the first named wires, and wires connected with the opposite ends of the cables and with the other first named wire.

5. A tubular electrical heating unit, comprising a flexible pipe for receiving water or other liquid, tubular couplings mounted upon the ends of the flexible pipe and extending axially thereof and receiving the water from the flexible pipe, transverse webs formed upon the tubular couplings and contiguous therewith and having contact faces and extending beyond the opposite sides of the couplings and provided near their ends with bolt receiving openings, the transverse webs having water receiving openings which lead into the bores of the tubular couplings and pass through the contact faces of the webs, a flexible heating cable extending through the flexible pipe and tubular couplings, and adjustable tubular packing devices mounted upon the outer ends of the tubular couplings and receiving the flexible heating cable, the arrangement being such that the water receiving openings are relatively short.

6. A tubular electrical heating unit, comprising a flexible pipe for receiving water or other liquid, a tubular coupling mounted upon one end of the flexible pipe and extending axially thereof and receiving the water from the pipe, a transverse web formed upon the tubular coupling and contiguous therewith and extending beyond the opposite sides of the coupling and provided near its opposite ends with bolt receiving openings, the transverse web having a water receiving opening which leads into the bore of the tubular coupling and passes through the contact face of the web, a flexible heating cable arranged within the flexible pipe and extending through the tubular coupling, the arrangement being such that the transverse web of one unit may have its contact face arranged opposite the contact face of a transverse web of the companion unit and the webs secured together by bolts passing through the holes in the transverse webs, such bolts being disposed upon opposite sides of the flexible pipes and the water receiving openings being relatively short.

7. A tubular electrical heating unit, comprising a flexible tube for receiving water or other liquid and provided between its ends with an opening, couplings mounted upon the opposite ends of the flexible tube, a flexible heating cable arranged within the flexible tube and couplings, a split coupling mounted upon the flexible tube adjacent to the opening and including opposed parts having recesses to receive the flexible tube, one part having a contact face and a transverse water receiving opening leading into the recess of such part for communication with the opening in the tube and also passing through the contact face of such part, the contact face being adapted to be arranged in opposed relation to a contact face of a companion coupling.



8. A tubular electrical heating unit, comprising a flexible tube for receiving water or other liquid and provided between its ends with an opening, couplings mounted upon the opposite ends of the flexible tube, a flexible heating cable arranged within the flexible tube and couplings, and a split coupling mounted upon the flexible tube adjacent to the opening and including opposed parts having recesses to receive the tube, one part having a face and a transverse water receiving opening leading into the recess of the part for communication with the opening in the tube and passing through the face of such part, said opening being screw threaded for receiving the screw threaded end of a pipe.

GERRIT DE GELLEKE.

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