

Feb. 14, 1933.

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1,897,883

ELECTRIC HEATING FURNACE

Filed March 6, 1931

2 Sheets-Sheet 1

FIG. 1.

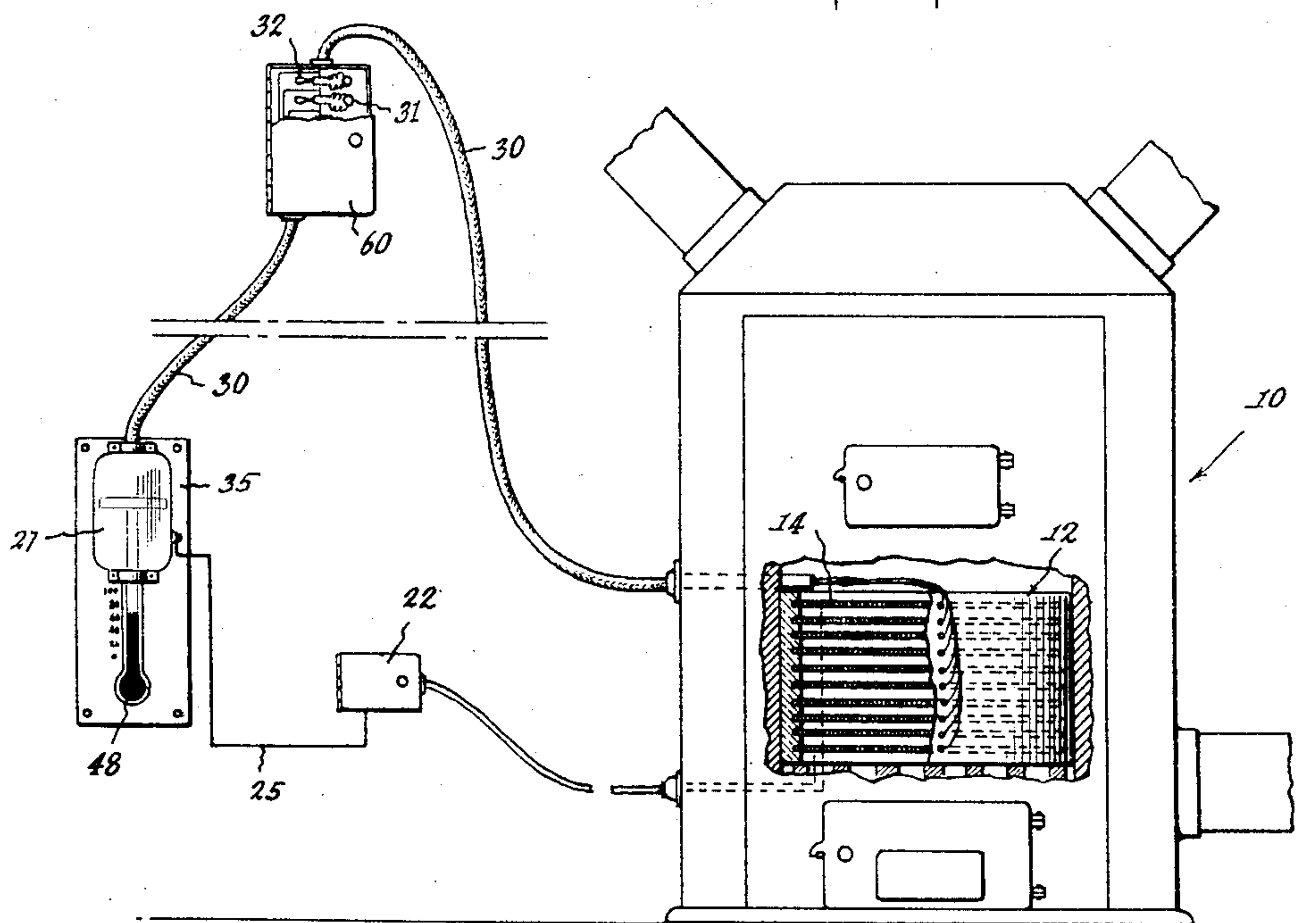
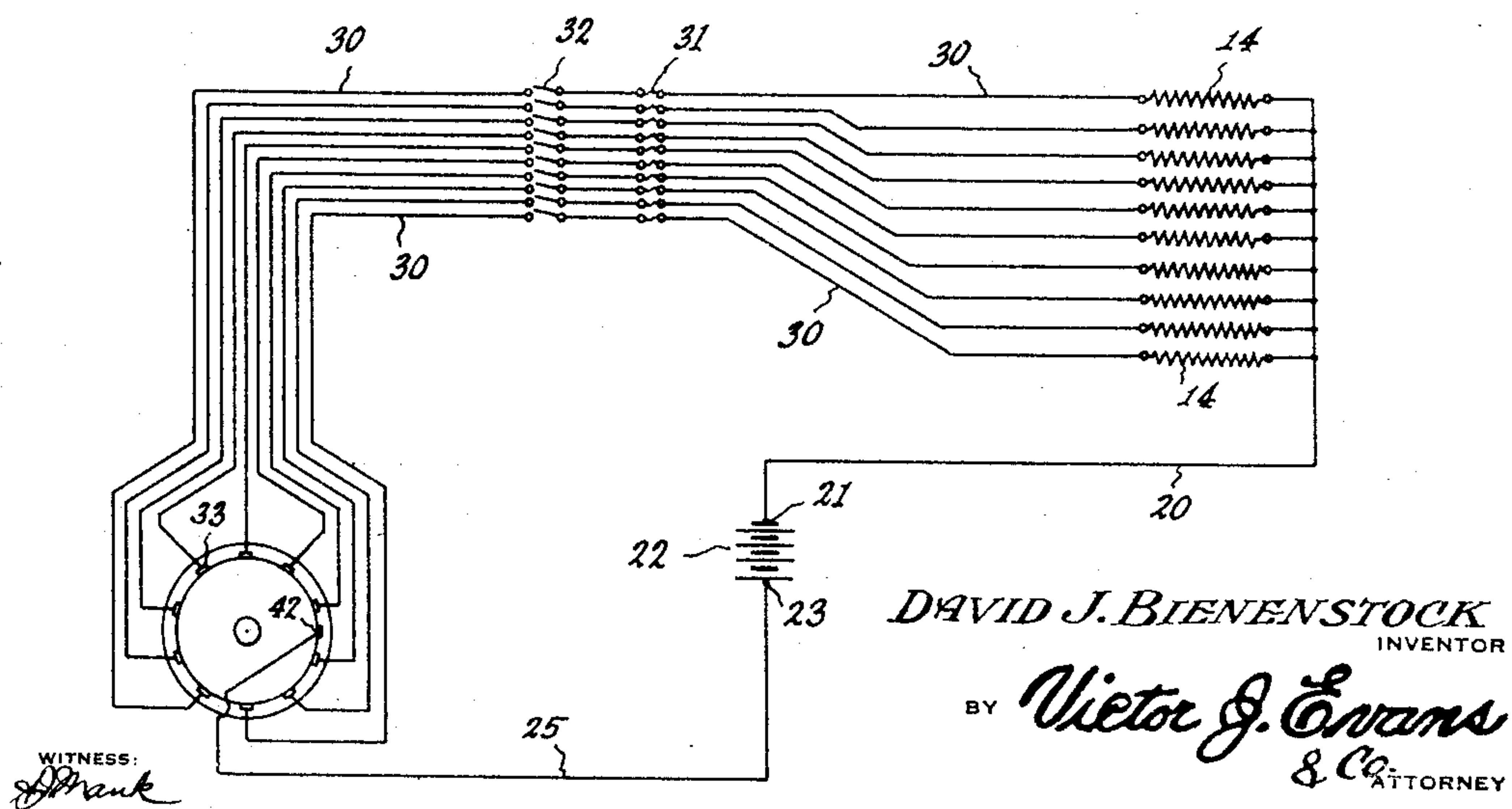


FIG. 2.



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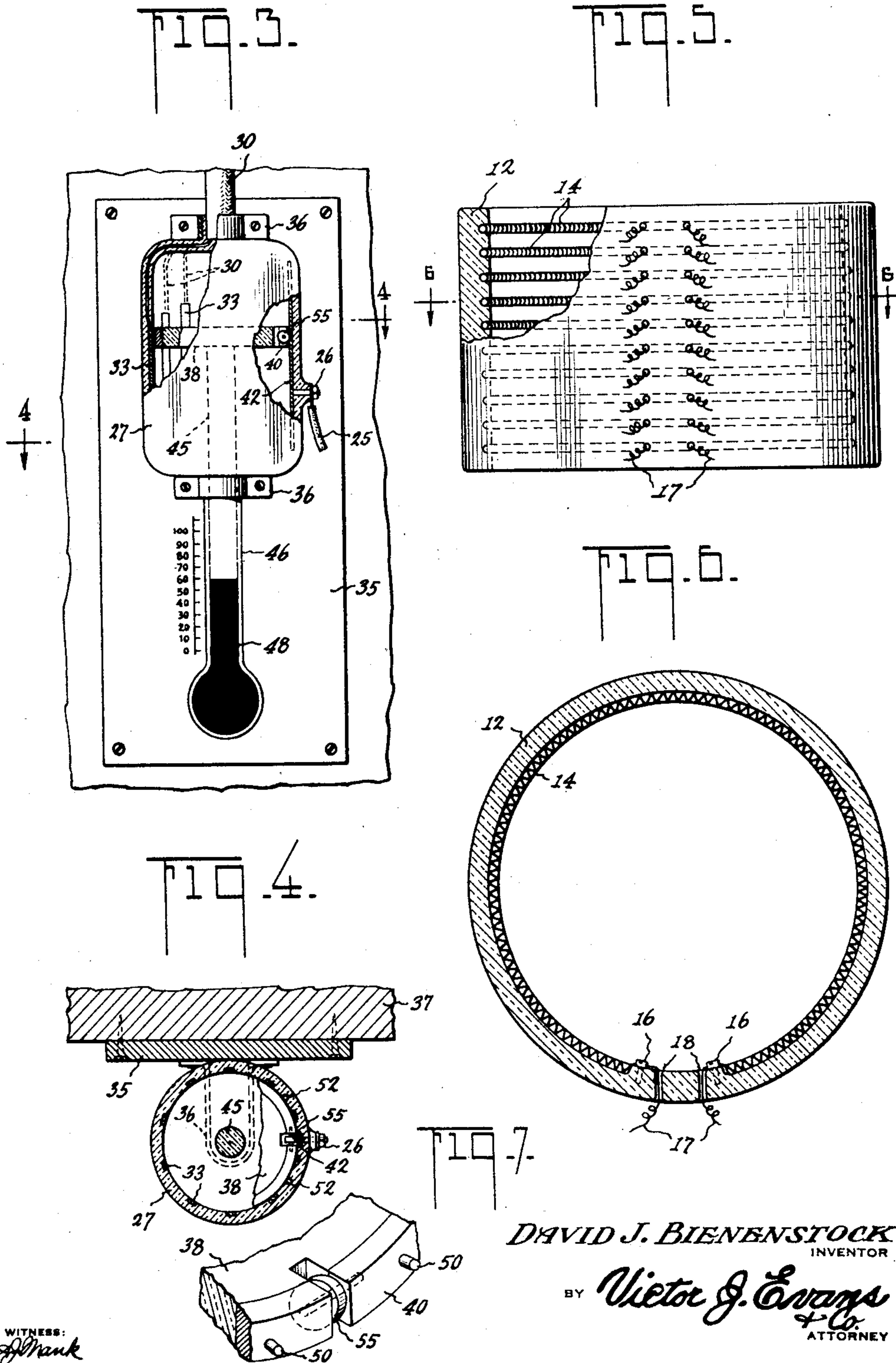
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2 Sheets-Sheet 2





REISSUED

## UNITED STATES PATENT OFFICE

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ELECTRIC HEATING FURNACE

Application filed March 6, 1931. Serial No. 520,659.

This invention relates to electric heating furnaces and controlling apparatus.

An object of the invention is to use a coal or wood burning furnace as an electric furnace adapted for the latter use.

Another object of the invention is to provide apparatus which will automatically regulate the amount of heat given by the furnace in accordance with the demand.

Other objects will be seen from a reading of the following specification and the practice of the invention.

The invention comprises a plurality of independent electrical heating units, a source of power, electrical circuits connecting the heating units with the source of power and automatic means responsive to temperature changes electrically associated with said circuits and adapted to throw said units into and out of action in succession and in accordance with temperature demands.

The invention will be fully and comprehensively understood from a consideration of the following detailed description when read in connection with the accompanying drawings which form part of the application, with the understanding, however, that the improvement is capable of extended application and is not confined to the exact showing of the drawings nor to the precise construction described and, therefore, such changes and modifications may be made therefrom as do not affect the spirit of the invention nor exceed the scope thereof as expressed in the appended claims.

In the drawings:

Fig. 1 shows a furnace adapted to be operated electrically, part of the furnace being broken away to show the electrical heating units. The view also shows apparatus adapted to automatically control the amount of heat given by the furnace.

Fig. 2 is a diagrammatic sketch of the electrical circuits involved in the apparatus shown in Fig. 1.

Fig. 3 is an enlarged view of the automatic regulator shown in Fig. 1, the same being mounted on a panel.

Fig. 4 is a cross section taken on the line 4-4 of Fig. 3.

Fig. 5 is a view showing the electrical heating units mounted in the fire box of the furnace.

Fig. 6 is a horizontal sectional view taken on the line 6-6 of Fig. 5; and

Fig. 7 is a fragmentary perspective view of the horizontally mounted vertically movable disc carrying a roller as best shown in Fig. 3.

Referring to the drawings in more detail the numeral 10 indicates a furnace having a fire box 12 shown in Figs. 1, 5 and 6. A plurality of helical electrical resistors 14 of circular form are mounted in the inner surface of the fire pot 12 being disposed one above the other with a space between adjacent coils or heating units. The ends of each heating unit 14 are secured to the fire pot 12 by means of screws 16 shown in Fig. 6, the ends of terminals 17 of the heating units being brought to the outside of the fire pot through apertures 18. One of the terminals 17 of each heating unit or coil is connected to a conductor 20 best shown in Fig. 2, this conductor being connected to a terminal 21 of a source of power 22. The terminal 23 of the source of power 22 is connected by means of a conductor 25 to a bolt 26 shown in Fig. 3. The bolt 26 passes through a circular insulating casing 27 of a controlling device hereinafter described and shown in detail in Figs. 3, 4 and 7.

The other terminals of the heating units 14, as best shown in Fig. 2, are connected one to each of a series of conductors 30. Each of the conductors 30 includes a fuse 31 and a switch 32. The conductors 30 are connected to vertically disposed conducting bars 33, one conductor to the top of each bar as shown in Fig. 3. From the latter figure it will be seen that the bars 33 are of different heights, the reason for which will be hereinafter explained.

The conducting bars 33 are vertically disposed, spaced apart and are arranged in a circle, being set in the inner surface of the circular casing 27, as clearly shown in Fig. 4, the casing 27 being mounted on a panel 35 by means of brackets 36 as shown in Figs. 3 and 4. The panel 35 is secured to a wall



37, which wall is preferably on the exterior of a building so that the controlling device is subjected to outside temperatures.

A horizontally disposed circular disc 38 is placed within the casing 27 and is provided at its periphery with an electrically conducting circular band 40 which contacts with the vertical bars 33. The horizontal disc 38 is secured to the top of a rod 45 which extends downwardly and slidably fits into a tube 46 which is essentially a thermometer, being filled with a column of mercury 48 which floats the rod 45 and the disc 38. The rod 45 and the disc 38 rise and fall with the mercury which moves up and down in response to changes in temperature. To prevent the disc 38 and the rod 45 from rotating, pins 50 shown in Fig. 7 are provided, these pins projecting from the circular band 40 and riding in grooves 52 provided in the inner surface of the casing 27, these grooves being indicated in Fig. 4. To provide a rolling electrical contact, a conducting roller 55 shown in Fig. 7 is rotatably mounted in the circular band 40, this roller making contact with an electrically conducting strip 42 shown in Fig. 3. This strip is connected to the bolt 26 which is secured to the conductor 25.

As the disc 38 rises and falls due to changes in the level of the mercury column which is responsive to changes in temperature, the electrically conducting band 40 makes contact with a varying number of vertically conducting bars 33 on account of these bars being of different heights, and thus throws into or out of action successively one or more of the heating units 14. The switches 32 as shown in Fig. 1 are enclosed within a box 60 which is preferably conveniently located so that the number of heating units which may be actuated may be manually controlled. From the foregoing it will be readily seen that the colder the temperature the greater will be the number of heating units actuated, and as the temperature rises one or more units will be automatically cut out.

What is claimed as new is:

1. In combination, a tube, a rod slidably mounted in the tube, a column of mercury in the tube below the rod to elevate the latter on expansion as a result of temperature change, a circular conducting band secured to the top of said rod and movable therewith, a plurality of conducting bars of varying lengths arranged in a circular series with the axis of said rod as a center, the rods being so arranged that the same ends of all lie in a common plane transverse to the axis of the rod, a conducting roller mounted in said circular band, and a wiper fixed with relation to the movement of the rod and bearing upon said roller.

2. In combination, a tube, a rod slidably mounted in the tube, a column of mercury in

the tube below the rod to elevate the latter on expansion as a result of temperature change, a circular conducting band secured to the top of said rod and movable therewith, a plurality of conducting bars of varying lengths arranged in a circular series with the axis of said rod as a center, the rods being so arranged that the same ends of all lie in a common plane transverse to the axis of the rod, a conducting roller mounted in said circular band, a wiper fixed with relation to the movement of the rod and bearing upon said roller, a cylindrical housing enclosing said bars and band and having the former disposed against the interior walls thereof, and a binding post carried by the housing and electrically connected with said wiper.

In testimony whereof I hereby affix my signature.

DAVID J. BIENENSTOCK.