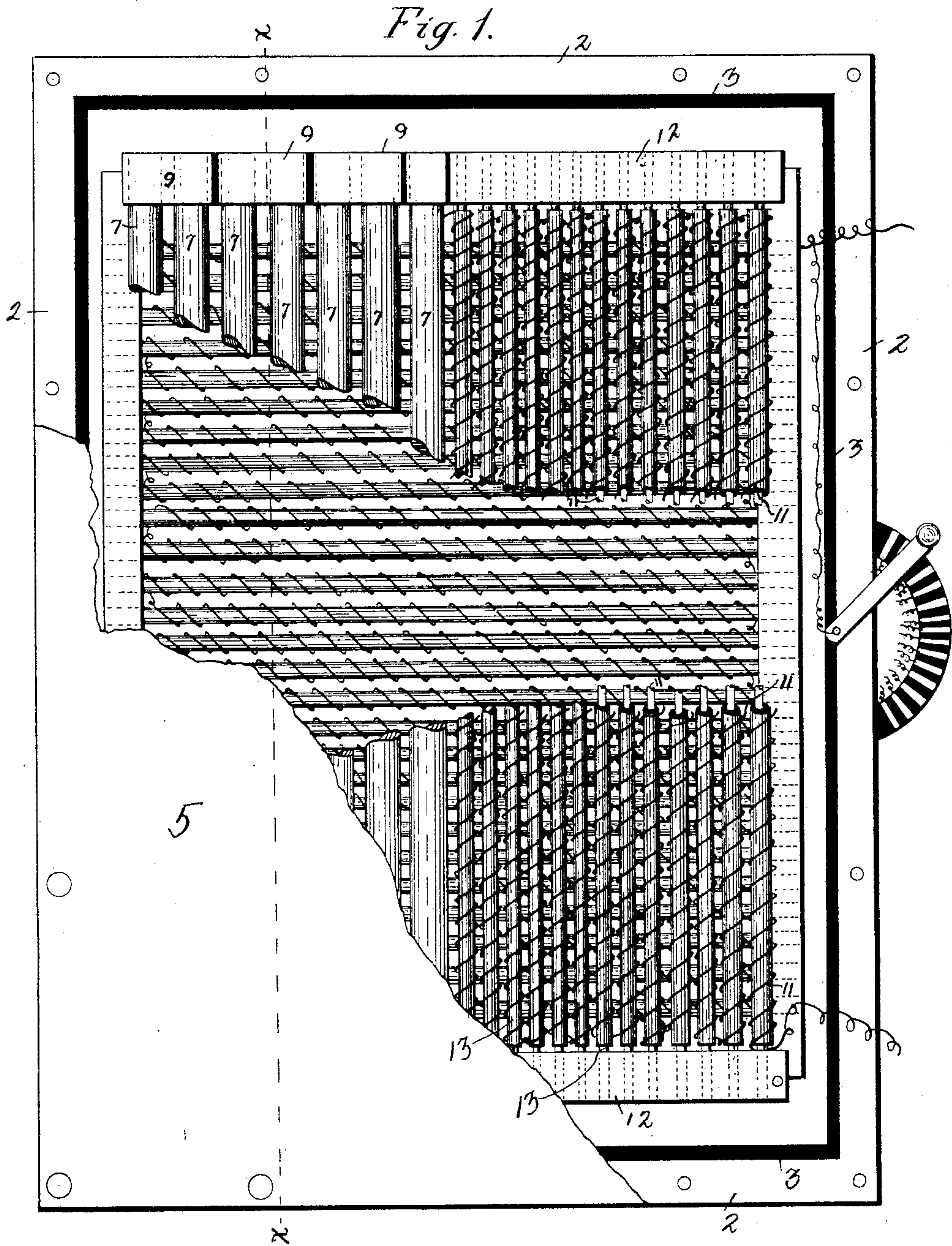


C. W. DREW & E. R. FRANCIS.
ELECTRIC HEATER.

No. 454,979.

Patented June 30, 1891.



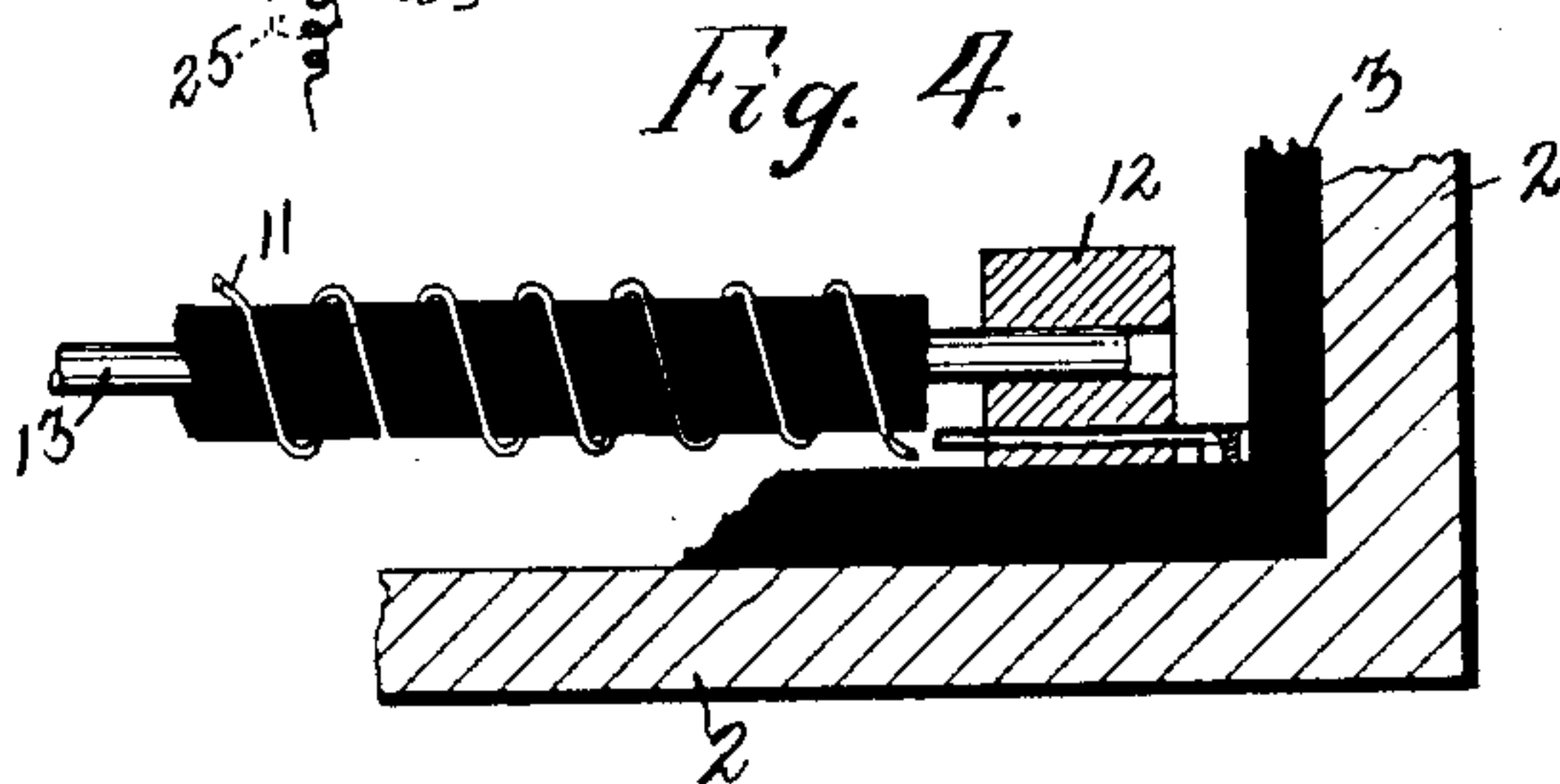
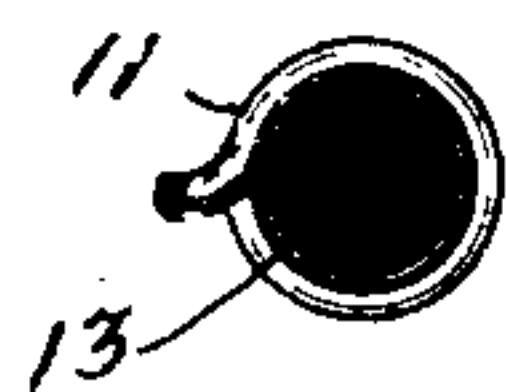
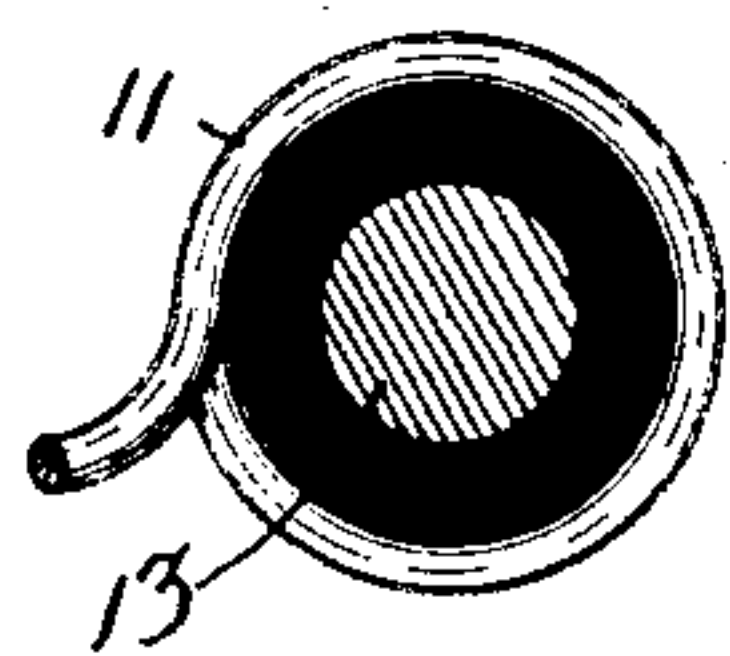
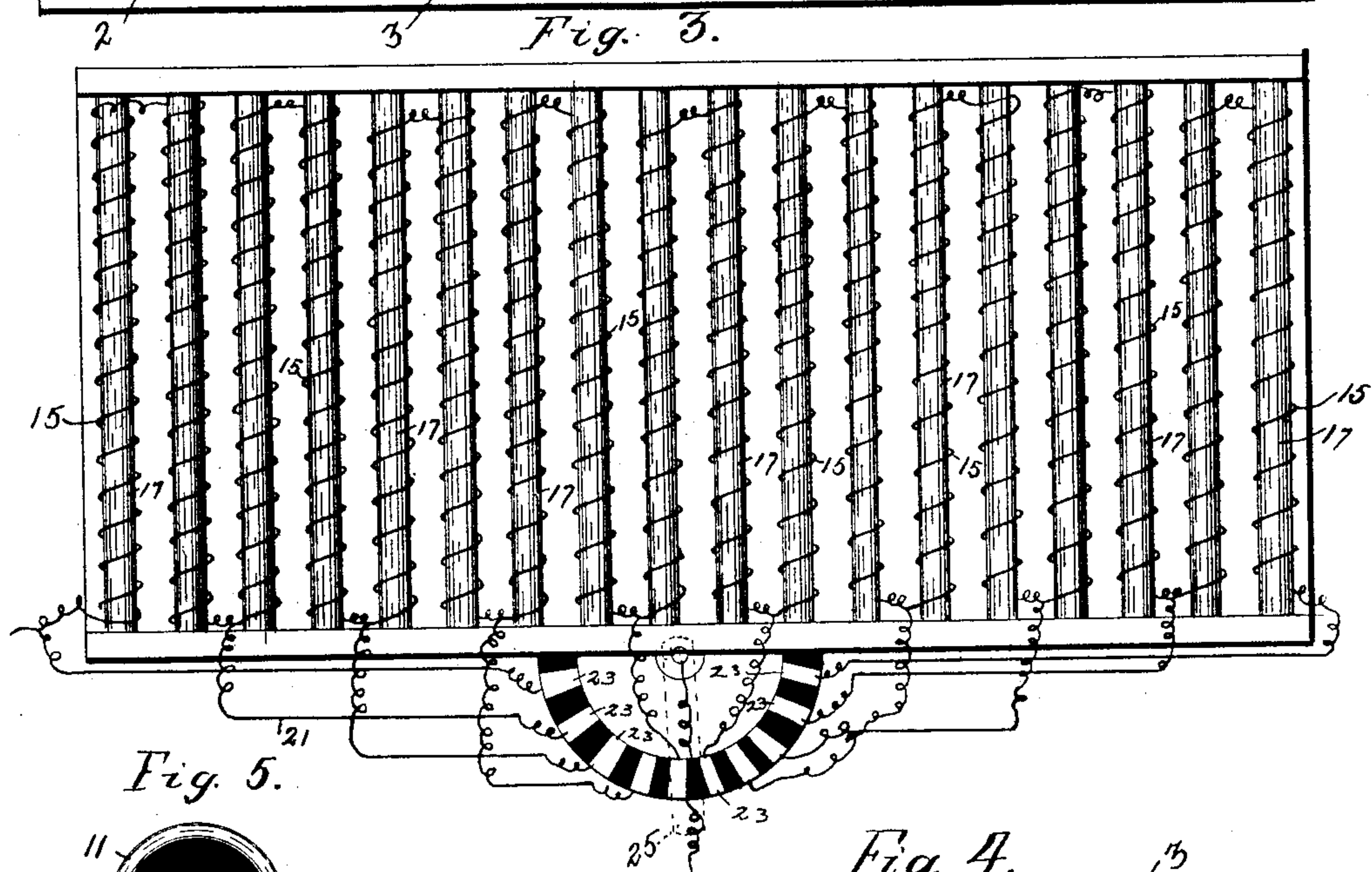
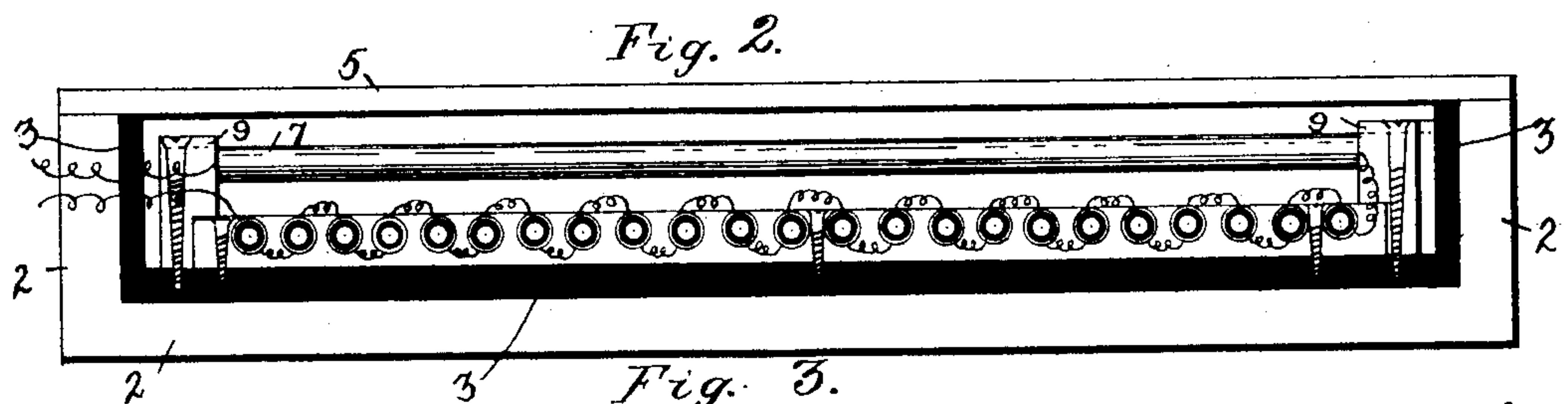
Witnesses.
S. H. Roberts.
J. Jensen

Inventors.
Charles W. Drew
Edward R. Francis
By Paul ~~W. H. H.~~ Atty's.

C. W. DREW & E. R. FRANCIS.
ELECTRIC HEATER.

No. 454,979.

Patented June 30, 1891.



Witnesses
S. W. Roberts
J. Jensen.

Inventors.
Charles W. Drew.
Edward R. Francis
By Paul & Munnich Attys.

UNITED STATES PATENT OFFICE.

CHARLES W. DREW AND EDWARD R. FRANCIS, OF MINNEAPOLIS, MINNESOTA; SAID FRANCIS ASSIGNOR TO SAID DREW.

ELECTRIC HEATER.

SPECIFICATION forming part of Letters Patent No. 454,979, dated June 30, 1891.

Application filed February 20, 1890. Renewed December 1, 1890. Serial No. 373,131. (No model.)

To all whom it may concern:

Be it known that we, CHARLES W. DREW and EDWARD R. FRANCIS, both of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain Improvements in Electric Heaters, of which the following is a specification.

The object of this invention is to provide an improved means for utilizing an electric current for heating purposes; and the invention consists in providing a heater of this class with a rheostatic device arranged in and forming a part of the heater, so that whatever heat is generated by the passage of the current through the rheostat is utilized in the heater, and with means whereby the current may be made to pass through any number of the resistant-coils of the rheostat, so that the heat generated by the passage of the current through the resistance arranged in proximity to the heating-surface may be regulated.

The invention consists, further, in the construction and combination hereinafter described, and particularly pointed out in the claims.

In the drawings, Figure 1 is a plan view of our heater, partly broken away to show the arrangement beneath of the rheostatic coils. Fig. 2 is a transverse section on line *x x* of Fig. 1. Fig. 3 is a plan showing the arrangement of the rheostatic coils. Figs. 4, 5, 6, 7, and 8 are details.

In the drawings, 2 represents a suitable casing provided, preferably, with a lining or base 3 of electric insulating and non-heat-conducting material. This casing is provided with a suitable cover or heating plate or surface 5, that is secured thereto in any suitable manner, preferably forming with said casing an air-tight receptacle. Arranged beneath said heating-plate, and preferably only a short distance therefrom, is a suitable electric resistance, through which an electric current may be passed, thereby causing heat to be radiated from said resistance, and thus to heat said plate or surface. This electric resistance may be in the form of carbon or graphitized rods or sticks 7, that are supported in suitable electric conductors 9: insulated from each other and connecting said carbon; or it may consist of suitable wires or strips

11 of suitable resistance metal or material wound upon suitable rods 13, consisting of insulating material or covered or coated with such material, and secured to the base 3; by means of supports 12; or both forms of resistance may be used in the same heater, as shown in Fig. 1. Arranged within said casing and below said resistance is a rheostatic device by means of which the current passing through the resistance next the heating-plate may be regulated. This rheostat consists of a series of electrical resistances that are coupled together and connected to a suitable switch, so that the current may be caused to pass through any desired number of coils composing said rheostat, whereby the current supplied to the upper or heating resistance may be regulated, thus making it practicable to employ currents of greater intensity than could otherwise be made use of, and regulating the heat generated by the heaters, and at the same time utilizing whatever heat is generated in the rheostat. The rheostat consists, preferably, of a series of electric resistance coils or wires 15, that are arranged on rods 17 or strips of electrical insulating material, or rods covered or coated with electrical insulating material. These coils are preferably arranged in pairs, and an electric conductor 21 extends from each pair to an insulated switch-plate 23. A switch 25, (shown in dotted lines,) having one end connected to the upper or heating resistance, is adapted to be brought into contact with any one of the plates 23, thereby forming a short circuit and cutting out a portion of the rheostat. When the switch is on the first plate 23, the rheostat is entirely cut out. When it is on the second plate, two of the coils are in use. When it is on the fourth plate, four of the coils are in use, and so on. By this means any portion or all of the rheostatic resistance may be brought into service, and thereby the supply of current to the heating-resistance regulated.

Any suitable rheostatic resistance may be used. Carbon rod may be used in place of the rheostatic coil, if preferred, it being adapted in a like manner to be operated with a switch. Any suitable resistance may also be used next to the heating-plate.

We claim as our invention—

1. In an electric heater, the combination,
with a suitable casing, of an electric heating-
resistance arranged therein, a rheostat also
5 arranged within said casing and connected
with said heating-resistance, and a switch
whereby any number or all of the coils of the
rheostat may be cut out.

2. In an electric heater, the combination,
10 with a suitable casing, of an electric heating-
resistance arranged therein, a heating-plate
arranged over said heating-resistance, a rheo-
stat arranged in said casing beneath said
heating-resistance and connected therewith,
15 and a switch whereby any portion of said
rheostat may be cut out, substantially as de-
scribed.

3. In an electric heater, the combination,
with a suitable casing having a lining of
electric insulating and non-heat-conducting 20
material, of an electric heating-resistance ar-
ranged therein, a heating-plate arranged over
said heating-resistance, a rheostat arranged
in said casing beneath said heating-resist-
ance and connected therewith, and a switch 25
whereby any portion of said rheostat may be
cut out; substantially as described.

In testimony whereof we have hereunto set
our hands this 15th day of February, 1890.

CHARLES W. DREW.

EDWARD R. FRANCIS.

In presence of—

A. M. GASKILL,

S. W. ROBERTS.