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Patented Dec. 3, 1901.

J. F. HAMMOND.  
ELECTRIC FURNACE.

(Application filed Feb. 21, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1—

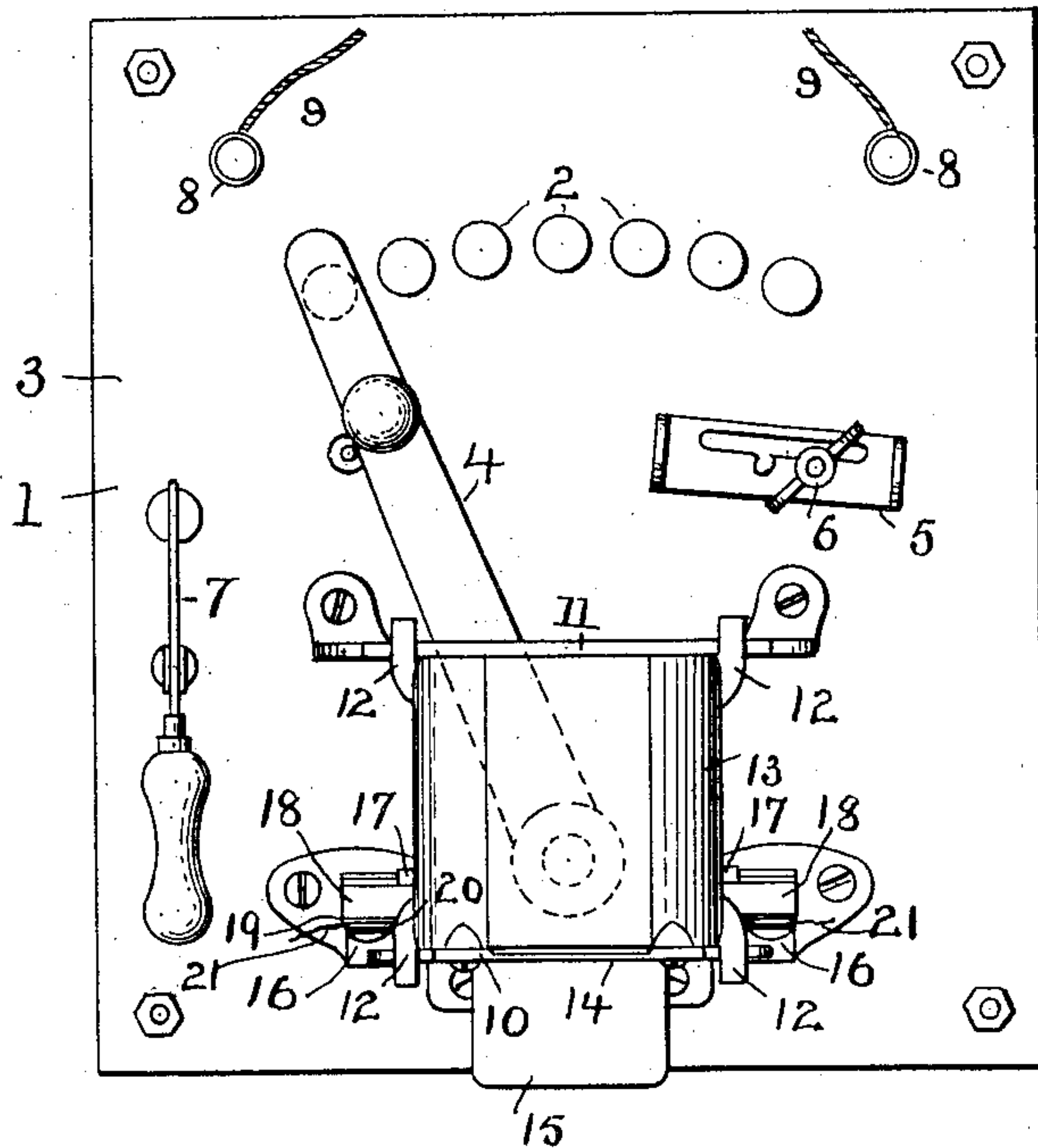
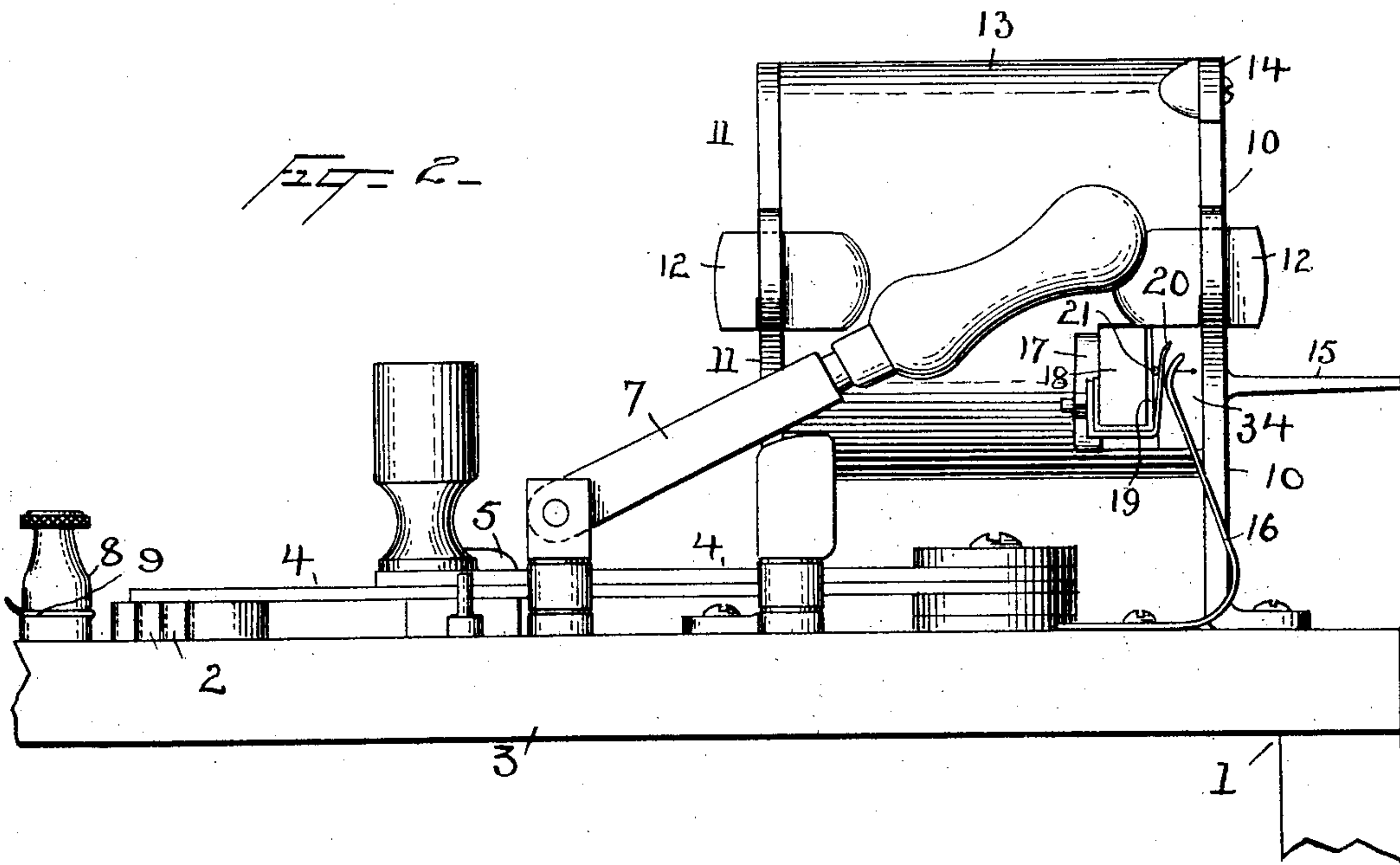


Fig. 2—



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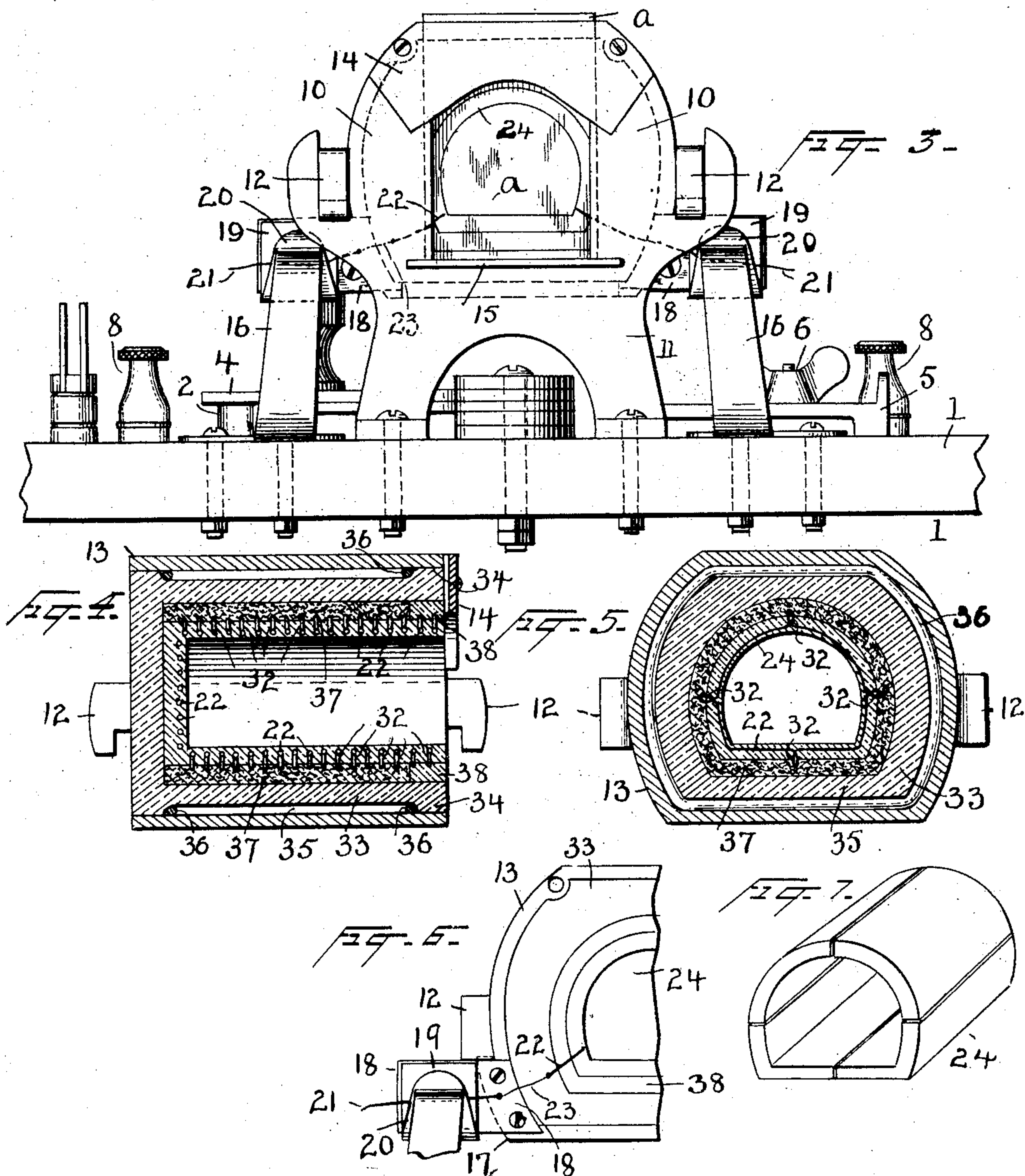
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# UNITED STATES PATENT OFFICE.

JOHN F. HAMMOND, OF NEW YORK, N. Y.

## ELECTRIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 688,170, dated December 3, 1901.

Application filed February 21, 1901. Serial No. 48,324. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN F. HAMMOND, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Furnaces; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

15 This invention aims to provide an electric heater particularly adapted for dental work, although capable of use in the industrial arts where a furnace of small size and exceeding high temperature is required.

20 A vital feature of the invention is compactness, portability, equable temperature, durability, accessibility, and ease with which repairs can be made.

25 The muffle, which forms an essential part of electric furnaces of the type aforesaid, is most susceptible to injury from wear by direct contact therewith of the work and from great changes of temperature. A vital feature is the construction of the muffle, whereby contraction and expansion are provided for, repairs of the coils easily made, and the location of a break in the conducting-wire quickly ascertained.

30 In its organization the furnace comprises, besides a rheostat, frame, and switches, a barrel, casing, and a muffle, the last-named parts being readily detachable and separable.

35 The invention is possessed of other features than those enumerated, which will be apparent to those skilled in the art as the details of the furnace are fully comprehended, and in order that the invention may be disclosed the embodiment thereof illustrated in the annexed drawings has been devised, and in which—

40 Figure 1 is a plan view. Fig. 2 is a side elevation. Fig. 3 is a front view. Fig. 4 is a longitudinal section of the oven removed from the base. Fig. 5 is a transverse section of the oven. Fig. 6 is a detail view of an electric connection between the conducting-wire

of the oven and the spring-contact of the base. Fig. 7 is a detail view of the muffle.

Corresponding and like parts are referred to in the following description and indicated 55 in the several views of the drawings by the same reference characters.

The rheostat 1 is of sectional construction, and a terminal of the several sections is in electric connection with the respective con- 60 tacts 2, arranged in the arc of a circle upon the platform 3, of insulating material. The switch-lever 4 cuts the sections of the rheostat into and out of circuit as may be required. The last two sections of the rheostat are sel- 65 dom required to be cut out of circuit; but should the current be weak and a high temperature required they are cut out of circuit by means of the plate 5, which is movable upon the platform and slotted, a threaded pin 70 and thumb-nut 6 serving to hold the plate in an adjusted position, the pin entering one of two indentations at the side of the slot to prevent slipping of the plate when the thumb-nut is turned up tight. The knife-switch 7 75 cuts the furnace in and out of circuit, the current entering and leaving by way of the binding-posts 8, to which the lead-wires 9 connect.

The frame comprises front and rear standards 10 and 11, having lateral portions notched 80 in their upper edges to receive the lugs 12, projecting laterally from the sides of the barrel 13, which fits between the standards. The front standard is cut away to admit of access to the muffle. A plate 14 is attached to or 85 formed with the upper part of the front of the barrel and corresponds with the upper cut-away portion of the front standard and fills the same when the barrel is in place. The plate 14 is of segment shape, and its ends are 90 upwardly divergent and rest upon the correspondingly-inclined edges of the separated portions of the standard 10, upon which they rest. This plate 14 forms, in effect, a detachable part of the standard 10. The rear side 95 of the plate and standard are cut away to provide a space in which a door *a*, of mica, slides vertically. This door closes the muffle and confines the heat and prevents chill, and being transparent admits of the work being at 100 all times under observation. A step 15 projects out from the front standard to support



the work when placing it in or removing it from the muffle. Spring-contacts 16 are arranged at each side of the front standard to make electrical connection with the terminals 5 of the conducting-wire of the muffle when the latter is in place.

The barrel 13 is preferably of metal for strength and durability, brass being the preferred material, and is provided with offstand- 10 ing lugs 12 to fit the vertical notched portions at the sides of the standards 10 and 11 and with other lugs 17, to which are fastened blocks 18 of porcelain or other insulating material. Spring-plates 19 and 20 are secured 15 to the blocks 18 and receive between their free ends the terminals 21 of the platinum conducting-wire 22. The springs 20 come in contact with the spring-contacts 16 and are pressed thereby firmly against the terminals 20 21. To prevent burning out of the conducting-wire 22 by an abnormal electric current, a short length of wire 23 of smaller gage than the wire 22 is included in the circuit and conveniently located, so as to be accessible for 25 replacement when destroyed by the passage of an electric charge of high potential.

The muffle 24, of fire-clay or other refractory material, is open at one end only, the top, bottom, sides, and back being closed and con- 30 taining the conducting-wire 22 in the form of coils slightly embedded therein and having the coils spaced and electrically insulated from one another. In constructing the muffle the wire is wrapped around a core and an end 35 portion of the wire is formed into a series of coils covering one end of the core, which end corresponds to the back of the muffle. After the wire is thus laid it is covered with soft or plastic clay, which binds all the coils and 40 forms the shell of the muffle. After the clay has become hard the shell is removed from the core and its interior coated with soft or plastic clay, thereby embedding the coils. When this inner coating of clay is dry, the 45 muffle is baked and is then ready for use.

The wire 22 is formed into loops 32, which extend to the outer surface of the muffle to facilitate repairs in the event of a break in the wire. These loops also permit the coils 50 to contract and expand. In the event of a break in the wire 22 the point of interruption can be quickly located by connecting the outer ends of the loops and passing the current. When the break is located, it is bridged 55 by connecting the adjacent loops 32 at opposite sides of the break. These points extending from the coils to the exterior of the muffle may be provided in any convenient way, the loops being preferred, because of the additional advantage in allowing for contraction 60 and expansion.

The casing 33 is formed of some refractory material, such as fire-clay, and approximates the shape of the muffle and is formed at its 65 ends with outer flanges 34, which fit snugly within the barrel 13, the middle portion being of less diameter than the barrel, so as to

provide a space 35 to allow for expansion of the casing when heated. Wires or binders 36 encircle the end portions of the casing to pre- 70 vent its parting in the event of cracking. The muffle 24 is of less dimensional extent than the casing, so as to leave a space when placed therein. This space extends around 75 the sides and back of the muffle and is filled with sand, as shown at 37, or any loose refractory material to within a short distance of the outer end or mouth of the muffle, and the outer end portion of the space is filled 80 with soft clay or like plastic material to hold the loose filling 37 in place and seal the outer end of the space. When it becomes necessary to replace or repair the muffle, the latter can be removed from the casing easily by 85 breaking the seal 38 and running out the loose filling material 37. This seal 38 may be a mixture of silicate of soda and soapstone or plaster-of-paris.

In assembling the parts the muffle is first placed within the casing and the latter slipped 90 into the barrel, after which the latter is fitted to the standards 10 and 11. The terminals 21 of the wire 22, being confined between the springs 19 and 20, can be readily disconnected therefrom when it is required to remove the 95 casing and muffle from the barrel. Moreover, the frictional connection between the parts 20 and 16 admits of the ready removal of the furnace from the base or frame.

I do not confine myself to the use of an ex- 100 clusive mica door on the larger-size furnaces, but can use an iron swing-door having an opening in which mica is placed.

To further provide for the expansion and contraction of the winding wire, longitudinal 105 grooves are cut in the clay of the muffle, as shown in Fig. 7. As the wires become hot and expand slight longitudinal cracks appear in the muffle, thereby increasing its diameter and taking up the greater length of the ex- 110 panded wire. As the wires become cold they contract, the muffle is drawn together, and the cracks are closed.

What I claim is—

1. In a furnace, a base having electric con- 115 tacts forming terminals of an electric circuit, standards secured to the base, and having side portions notched in their upper edges, an oven having offstanding lugs to fit the notched portions of the standards and admit 120 of detachable connection of the oven therewith, and an electric heating-circuit in the walls of the oven and terminating in electric contacts to complete the circuit with the source of electricity by making electrical 125 connection with the said electric contacts of the base, substantially as described.

2. In a furnace, a base having electric con- 130 tacts forming terminals of an electrical circuit, standards secured to the base, the front standard having its upper portion cut away, an oven detachably fitted to the standards, and an electric heating-circuit in the walls of the oven and terminating in electric contacts



to complete the circuit with the source of electricity by making electrical connection with the said electric contacts of the base and a plate secured to the front upper part of the oven to fit the upper cut-away portion of the front standard, substantially as specified.

3. In a furnace, a base having electric contacts forming terminals of an electrical circuit, standards secured to the base, having notched side portions and the front standard having its upper middle portion cut away, an oven having offstanding lugs to fit the notched parts of the standards, and an oven detachably fitted to the standards, and an electric heating-circuit in the walls of the oven and terminating in electric contacts to complete the circuit with the source of electricity by making electrical connection with the said electric contacts of the base and a plate secured to the front upper part of the oven to fit the upper cut-away portion of the front standard, and a segment-plate attached to the upper front end of the oven and having its ends matching the ends of the separated parts of the standards, substantially as and for the purpose specified.

4. A heater comprising a muffle having an electric heating-circuit in its walls for connection with a source of electricity, a casing of refractory material inclosing the muffle, and a metal barrel receiving the casing and having its middle portion spaced therefrom, substantially as and for the purpose described.

5. A heater comprising a muffle having an electric heating-circuit in its walls for connection with a source of electricity, a casing of refractory material inclosing the muffle, loose filling of refractory material between the muffle and casing, and a seal for holding

the loose filling in place, substantially as described.

6. In a furnace, a muffle having embedded heating-coils of wire for connection with a source of electricity, and having folded portions forming contact-points extending from the coils to the surface of the muffle to facilitate locating and repairing of a break in the wire forming the coils, substantially as described.

7. In a furnace, a muffle having embedded heating-coils of wire for connection with a source of electricity, and having loops in the coils extending to the surface of the muffle, substantially as and for the purpose described.

8. In a heater, a casing, metal strips attached to the casing and electrically insulated therefrom, springs for coöperation with the metal strips, a muffle, and a heating-coil of wire in the walls of the muffle having its ends extended to be clamped between the said metal strips and springs, substantially as specified.

9. In a heater, a base, spring-contacts attached to the base and forming terminals of an electric circuit, a muffle removably fitted on the base, a heating-circuit in the walls of the muffle, and a second set of spring-contacts having the terminals of the heating-circuits connected therewith, and adapted to make electrical connection with the spring-contacts of the base, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN F. HAMMOND.

Witnesses:

EMANUEL SOLOMON,  
CHARLES WOLFF.