No. 620,086. Patented Feb. 21, 1899.

L. CASPER.

ELECTRIC HEATER.

(Application filed Nov. 15, 1897.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.

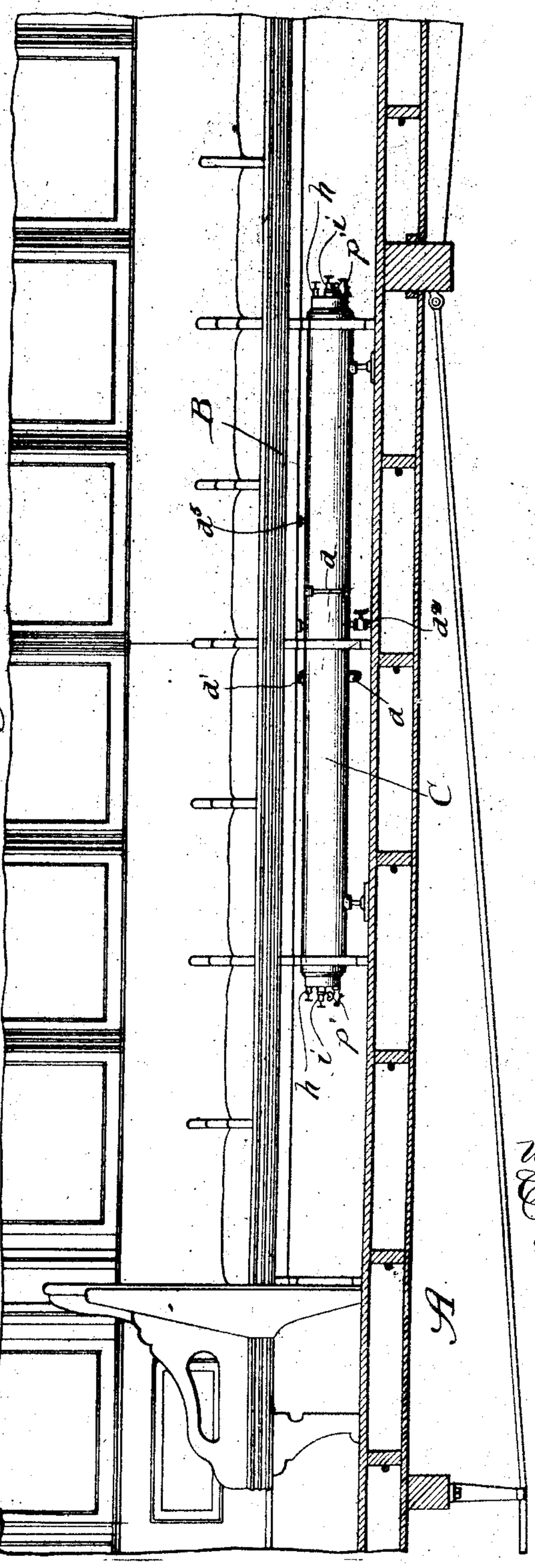

FIG. 2.

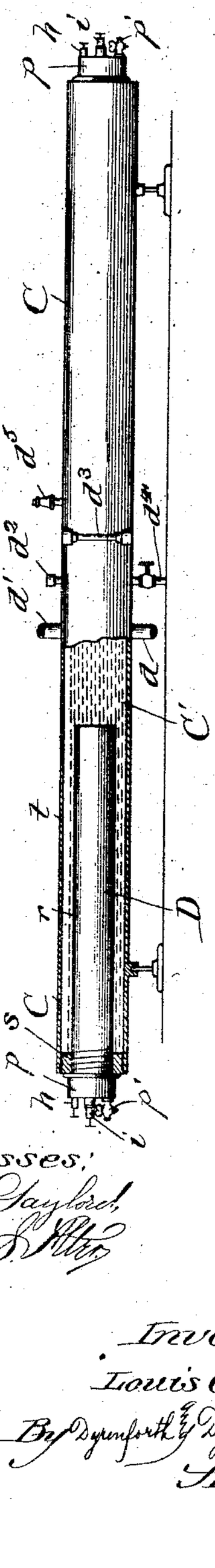

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Fig. 3.

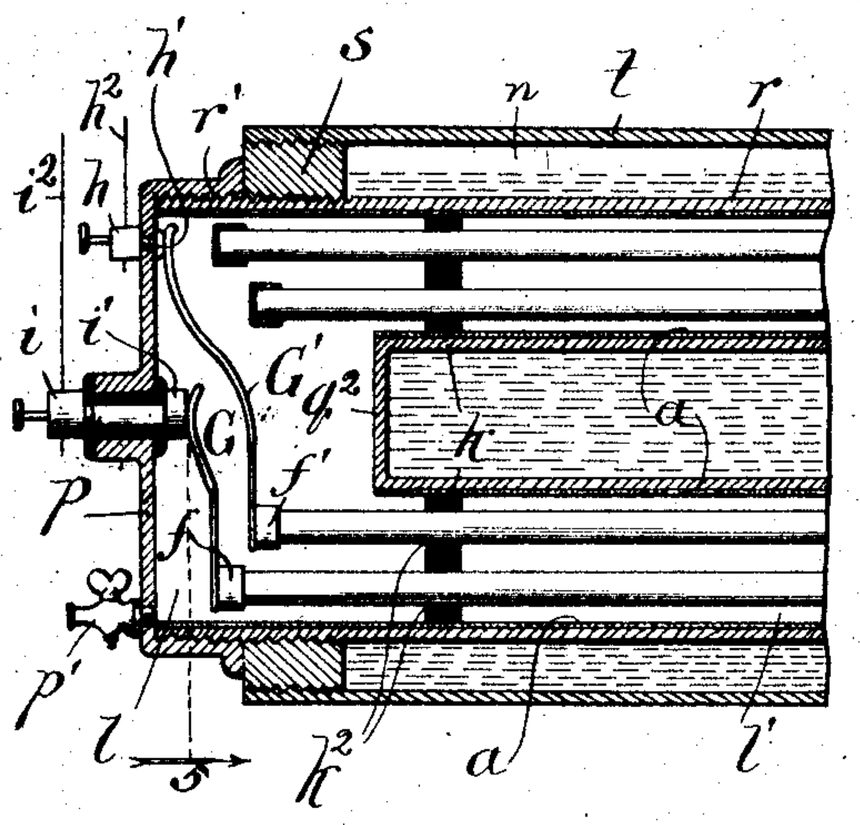


Fig. 4.

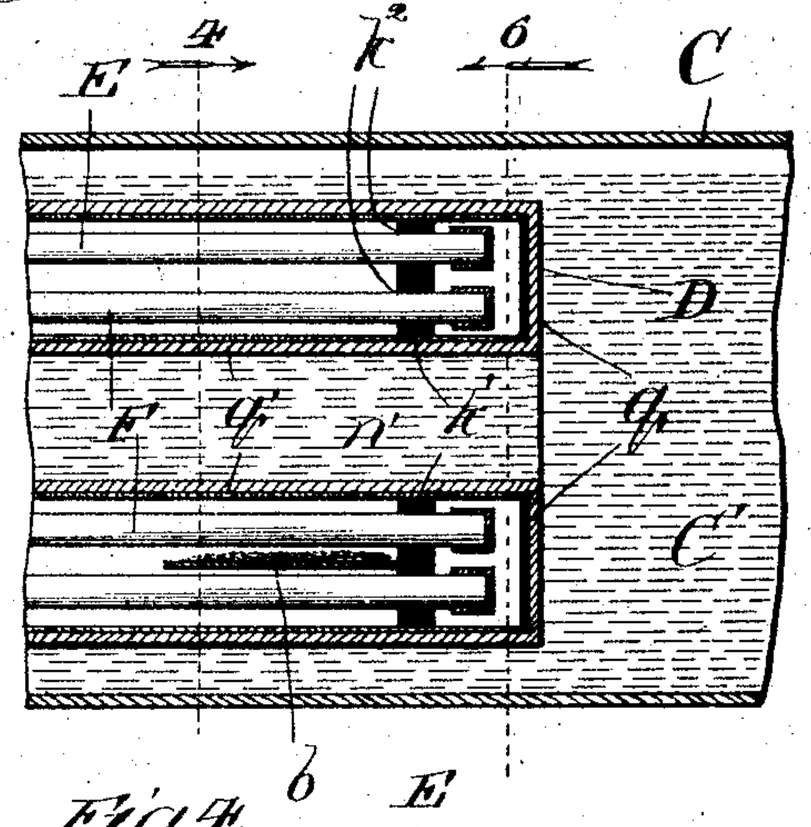


Fig. 5

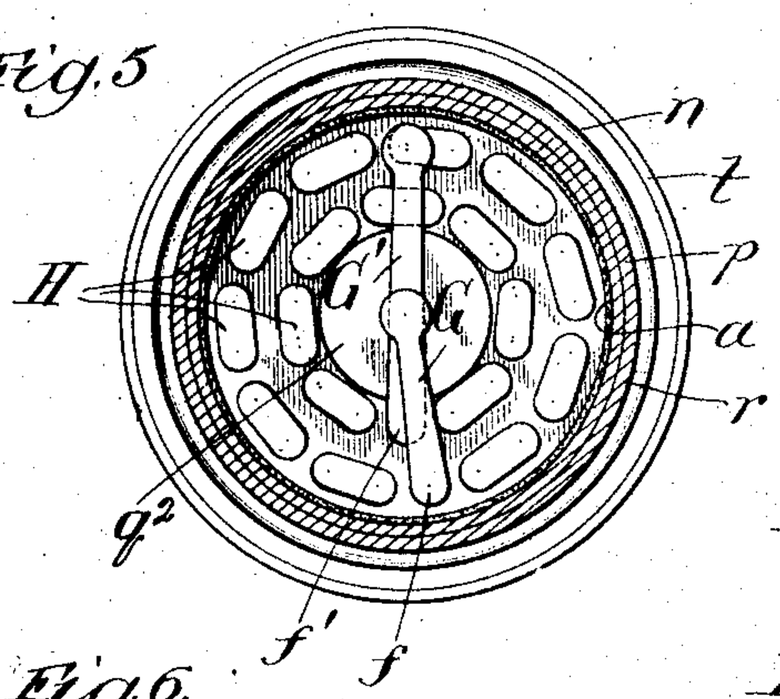


Fig. 6.

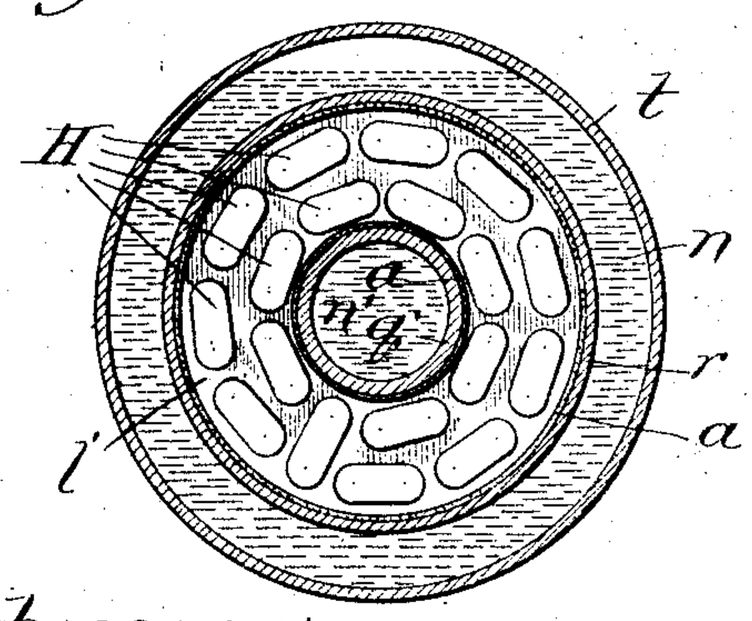


Fig. 8.

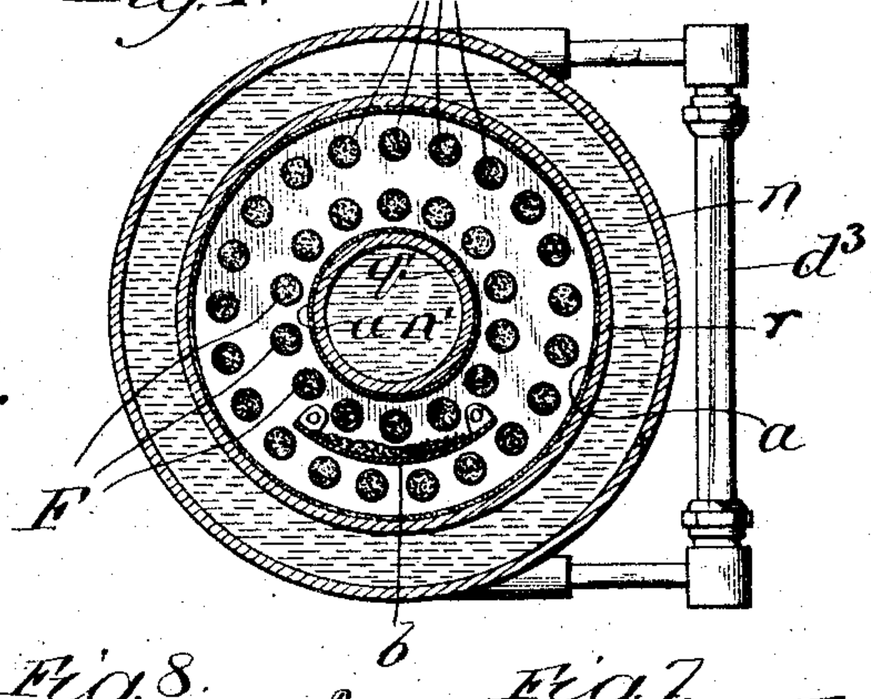
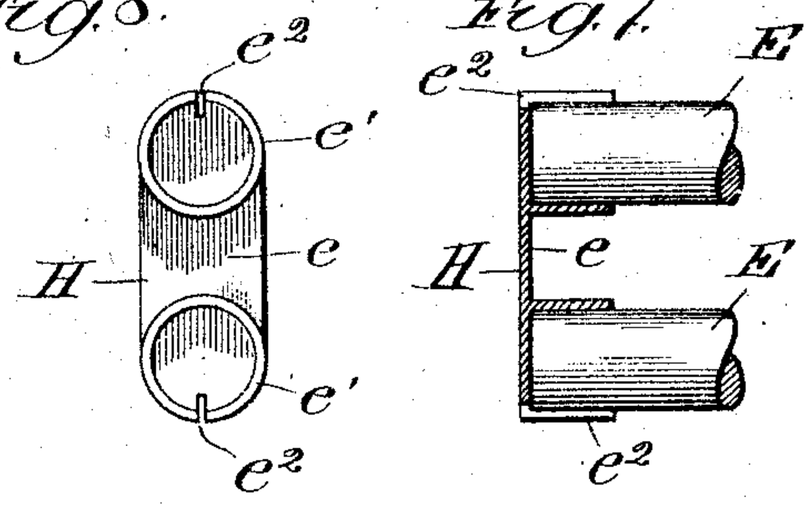


Fig. 7.



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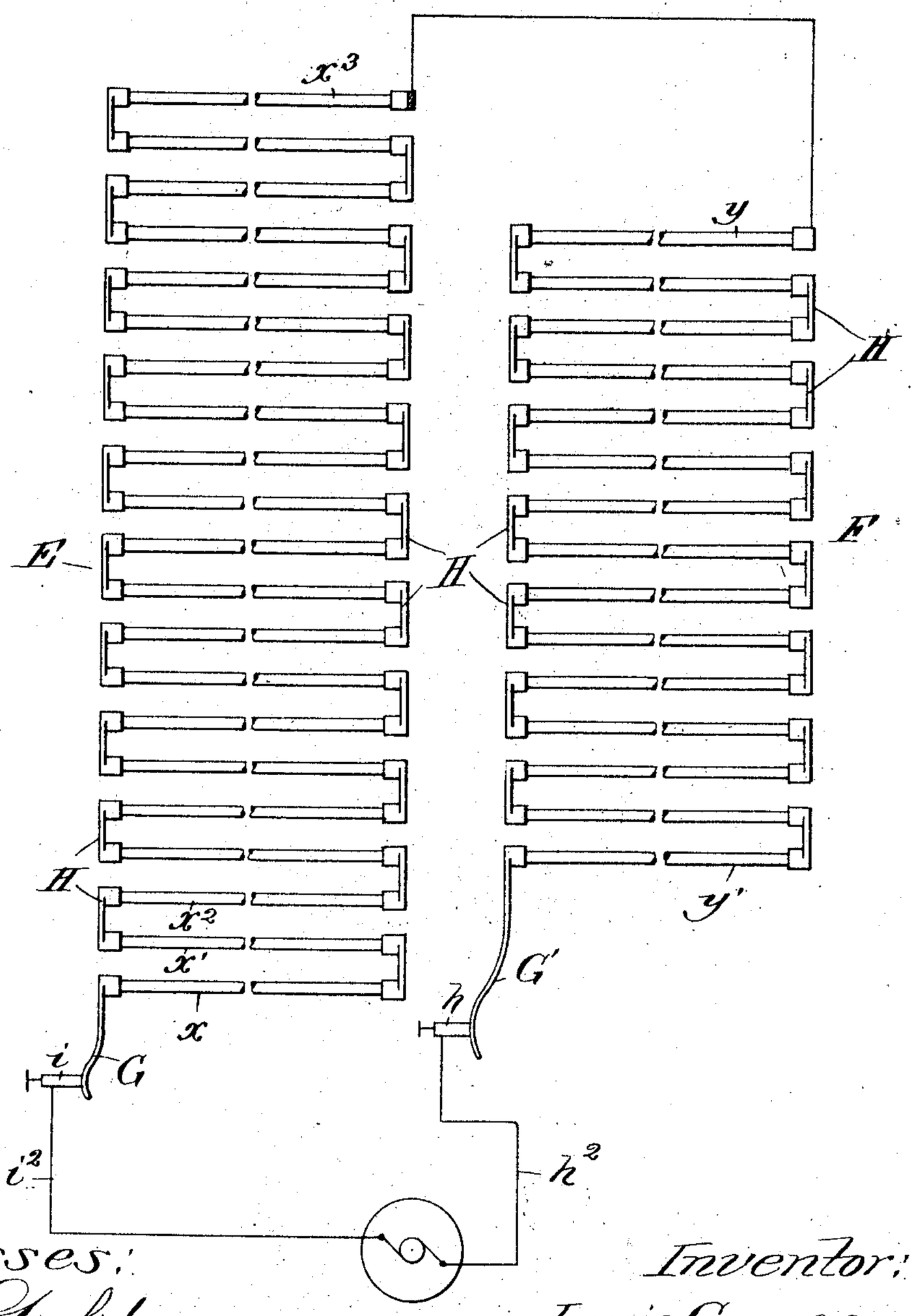
(No Model.) 3 Sheets—Sheet 3.

Fig. 9.



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UNITED STATES PATENT OFFICE.

LOUIS CASPER, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO ARTHUR H. PEIRCE, OF SAME PLACE.

ELECTRIC HEATER.

SPECIFICATION forming part of Letters Patent No. 620,086, dated February 21, 1899.

Application filed November 15, 1897. Serial No. 658,556. (No model.)

To all whom it may concern:

Be it known that I, LOUIS CASPER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Electric Heaters, of which the following is a specification.

My invention relates to improvements in electric heaters for cars and apartments generally, and more especially, though not necessarily, to an electric-heating system wherein the electric current converted into heat energy heats a body of liquid in a hot-liquid heating system.

My object is, first, to provide a particularly durable and efficient electric-heating device, and, second, to provide the improved device, in connection with a hot-water heating system, in a manner to adapt the system more particularly for cars and render it especially desirable for the purpose of a car-heater.

In the drawings, Figure 1 is a broken longitudinal section of a passenger-car, showing my improved electric-heating device under the seat at one side; Fig. 2, a broken view, partly in section and partly in elevation, of the electric-heating device; Fig. 3, an enlarged broken section of one end portion of the device; Figs. 4, 5, and 6, sections taken, respectively, on lines 4, 5, and 6 of Fig. 3 and viewed as indicated by the arrows; Fig. 7, an enlarged broken sectional view showing the ends of carbon or other rods of high resistance coupled together in circuit; Fig. 8, a view in elevation of the coupling-piece, and Fig. 9 a broken diagram illustrating the electric circuit.

A is a railway-car, having the seat or bench B at one side.

C is my improved heating device formed with an outer shell or cylinder *t*. Screwed into the end of the cylinder is an internally-threaded spacing-ring *s*.

D is a heating-chamber having an outer cylindrical wall *r*, an annular end wall *q*, an inner cylindrical wall *q'*, and an inner end wall q^2. The cylinder *r* is provided along its open end portion with a thread *r'*, at which it is secured in the spacing-ring *s* to extend with its walls *r q'* concentric with the wall *t* and extend at its threaded end beyond the end of the cylinder. Screwed upon the thread *r'*, against the spacing-ring *s*, is a cap *p*. The shell *t* surrounds or contains a chamber C', into which the device D projects, leaving an outer annular space *n* between the walls *t r* and an inner space *n'*, the said spaces being in open communication with the chamber C'. The device D, with the cap *p*, forms a close preferably gas-tight holder, having the end chamber *l* between the wall q^2 and cap *p* and annular chamber *l'* between the walls *q' r*. Fitting the chamber *l'* are annular supporting and spacing rings *k k'*, of slate, asbestos, magnesia, or other non-conducting material. The rings are provided with inner and outer series of coincident openings k^2.

E and F are outer and inner series of resistance-rods which rest in and are spaced by the openings k^2 of the rings *k k'*. I prefer to employ rods of carbon, though I do not limit myself to that material, as any other substance possessing the desired resistance and strength and in other respects suitable for the purpose may be employed. Extending through the center of the head *p* and insulated from the head is a binding-post *i*, having a contact *i'* at the inner side of the head. Also extending through the head *p* is a binding-post *h*, having a contact *h'* at the inner side of the head.

G is a contact-finger, preferably of spring metal, terminating at one end in a sleeve or collar *f*, which fits upon the end of one of the rods E. At its free end the finger bears against the contact *i'*.

G' is a contact-finger having a sleeve or collar *f'*, which fits upon the end of one of the rods F, the finger at its opposite end bearing against the contact *h'*.

H H are metallic coupling-pieces, each comprising a body portion or web *e*, with sleeves *e'* at opposite ends. The sleeves *e'* of each coupling are just far enough apart to engage the ends of two adjacent resistance-rods, and in order that they may fit the ends of the rods closely and conform to slight differences in size of the rods I prefer to form the sleeves with slots e^2 to permit limited expansion and contraction. The couplings H are disposed as shown in Figs. 5 and 6, which show the opposite ends of the heater. The binding-

posts *i h* are connected through wires i^2 h^2 into circuit with a suitable electric generator or supplier. Presuming that the current enters at the binding-post *i*, it passes through the contact G to the first rod *x* of the series of rods E. The rod *x* at its opposite end is joined by a coupling H to the next rod *x'* of the series, the rod *x'* being joined at the end adjacent to the head *p* with the next rod x^2 of the series, the coupling being performed in the manner indicated by the diagram in Fig. 9, whereby the series of rods form a convoluted passage for the current. The last rod x^3 of the series E is joined by a coupling H with the first rod *y* of the series F. The rods of the series F are also joined by couplings H to form a convoluted passage for the current, as indicated by diagram in Fig. 9, the final rod *y'* carrying the finger G'.

The chamber C' may form the heater for a hot water or other liquid heating system and have the return-pipe *d* and outlet-pipe *d'*, which connect with suitable radiators. The chamber C' is filled with water through a short projecting pipe having a screw-cap d^2, and at the side of the shell is a glass gage d^3, which shows the water-level in the shell. At the under side of the shell is a drainage-valve d^4, and at the top of the shell is a safety-valve d^5. The chamber *l l'*, as before stated, is preferably gas-tight, and I prefer to exhaust the atmosphere therefrom to prolong the life of the carbon rod. The head *p* is provided with a cock *p'*, through which the air may be exhausted. If desired, the chambers *l l'* may be filled with nitrogen or other suitable and incombustible gas. I prefer, as before stated, to withdraw the air from the chambers *l l'*, and as a further means for abstracting the oxygen from the chamber I provide a shelf or trough *b* at the under side of the series F, between it and the series E, to hold copper filings or the like, which when heated to a high temperature will absorb oxygen. I prefer to provide the inner surfaces of the walls *q' r* with a thin coating *a* of heat-absorbing material, such as lampblack.

In practice the current in its passage through the convoluted series of resistance-rods is converted into heat energy and heats the water in the outer and inner chambers *n n'*, and consequently the body of water in the chamber C'. As I prefer to construct the device, the shell C is provided with heaters in opposite ends, and the shell may be of any length desired.

While I prefer to construct my improvements throughout as shown and described, they may be variously modified without departing from the spirit of my invention as defined by the claims. If desired, the water heating system may be dispensed with, and the carbon rods confined in a close chamber the walls of which are exposed directly to the atmosphere to heat a car or apartment by direct radiation. I prefer, however, to employ the hot-liquid heating system for the reason that a single heating device may be provided for one or more cars of a train by locating radiators of the hot-liquid heating system at different points in the car or cars and connecting them through circulating-pipes with the heating device. The liquid employed may be water, as stated, or it may be oil or other fluid which will circulate freely, but remain fluid under a lower temperature than water to prevent freezing when out of use in very cold weather.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an electric-heating device, the combination of a fluid-chamber, a heating-chamber arranged within the fluid-chamber to provide a surrounding space, insulated supports in the heating-chamber, a series of resistance-rods mounted in the supports, coupling-conductors connecting the rods at opposite end portions in convoluted series, a removable cover closing the outer end of the heating-chamber, electric-circuit posts on said cover, and fingers on the first and last rods in contact with said posts, substantially as described.

2. In an electric-heating device, the combination of a cylindrical fluid-chamber, a cylindrical heating-chamber concentrically supported in the fluid-chamber by a spacing-ring and having inner and outer walls in fluid contact, a cover removably secured to the outer end of the heating-chamber and provided with electrical circuit posts and contacts, insulating-rings in the heating-chamber between the inner and outer walls, a series of resistance-rods mounted in the insulating-rings, coupling-conductors connecting the rods at opposite end portions in convoluted series, and fingers on the first and last rods of the series for said contact, substantially as described.

3. In an electric-heating device, the combination of a cylindrical fluid-chamber, a cylindrical heating-chamber having inner and outer walls, an inner closed end and an opened outer end exteriorly threaded, a spacing-ring concentrically supporting the heating-chamber within the fluid-chamber with the outer threaded end of the heating-chamber projecting from the end of the latter, a cover removably screwed on the projecting end of the heating-chamber and provided with electrical circuit posts and contacts, insulating-rings in the heating-chamber between the inner and outer walls, a series of resistance-rods mounted in the insulating-rings, coupling-conductors connecting the rods at opposite end portions in convoluted series, and fingers on the first and last rods of the series for said contacts, substantially as described.

LOUIS CASPER.

In presence of—
M. J. FROST,
R. T. SKINNER.