(No Model.)

3 Sheets—Sheet 1.

C. B. CUTLER.

HOT AIR FURNACE.

No. 280,455. Patented July 3, 1883.

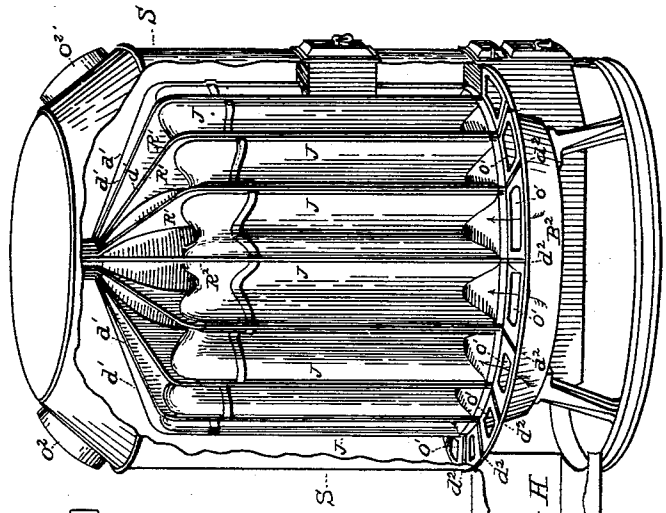


Fig. 2

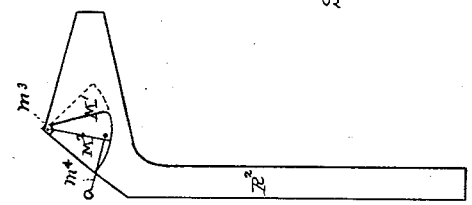


Fig. 3

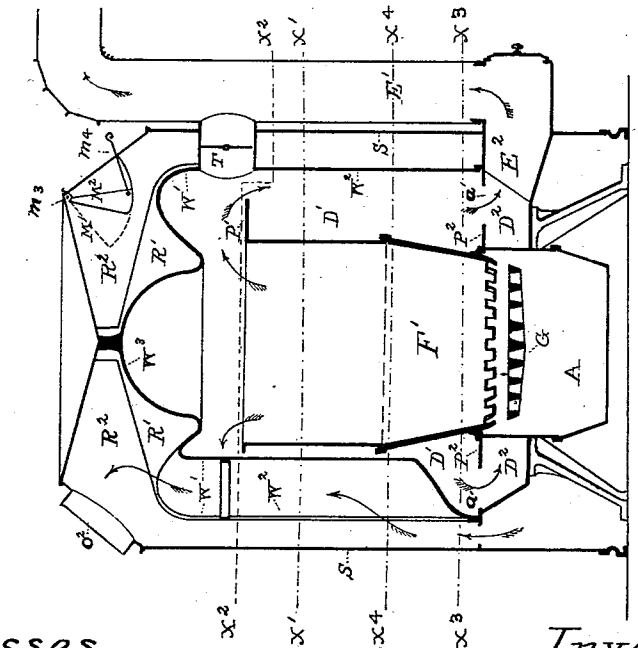


Fig. 1

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(No Model.)

3 Sheets—Sheet 2.

C. B. CUTLER.

HOT AIR FURNACE.

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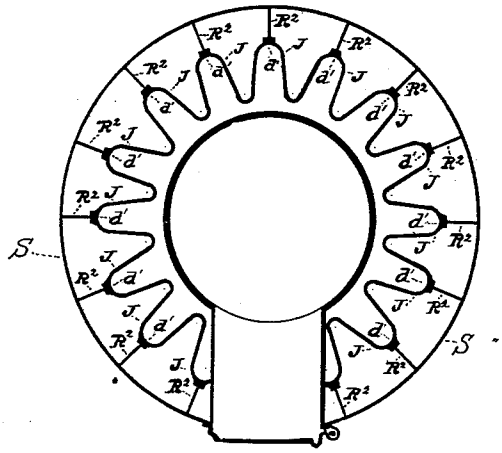


Fig. 4

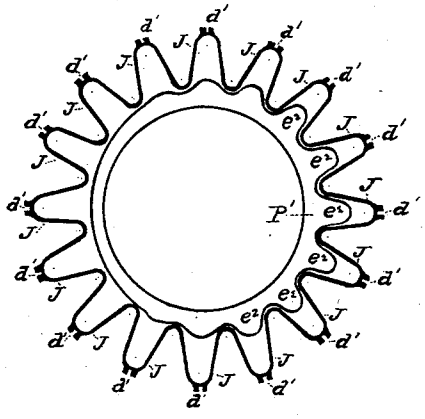


Fig. 5

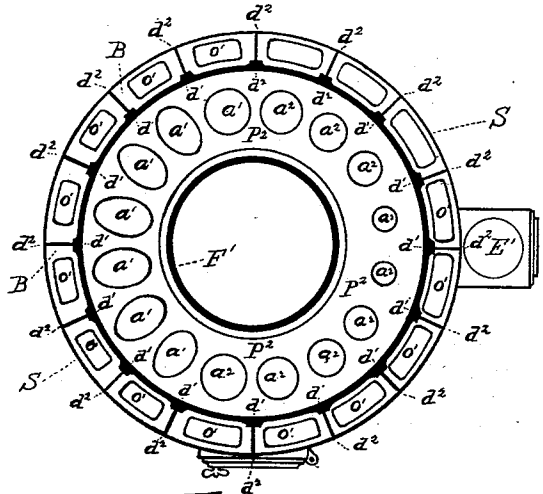


Fig. 6

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(No Model.) 3 Sheets—Sheet 3.

C. B. CUTLER.

HOT AIR FURNACE.

No. 280,455. Patented July 3, 1883.

Fig. 7

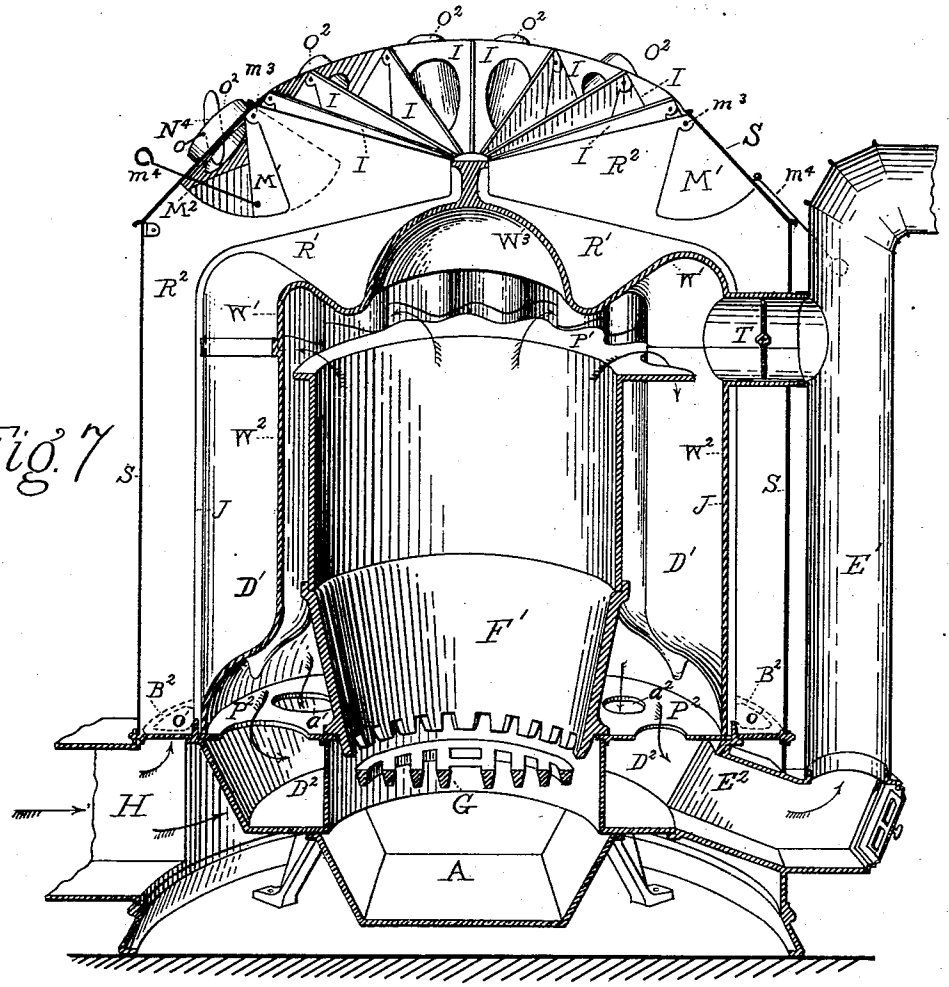
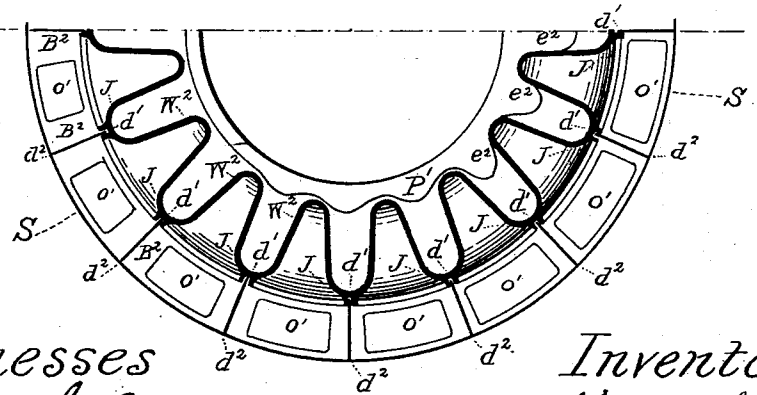


Fig. 8



Witnesses
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UNITED STATES PATENT OFFICE.

CLARENCE B. CUTLER, OF SCHODACK, NEW YORK.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 280,455, dated July 3, 1883.

Application filed January 20, 1883. (No model.)

To all whom it may concern:

Be it known that I, CLARENCE B. CUTLER, of the town of Schodack, county of Rensselaer, and State of New York, have invented a new and useful Improvement in Hot-Air Furnaces, of which the following is a specification.

My invention relates to hot-air furnaces; and it consists, as will hereinafter be more fully described, in a method of construction for dividing up the interior of the furnace, where the air is heated that is conveyed away to be utilized in heating apartments, and the construction of such separated and divided-off inclosures with separate ingress and egress openings, to receive, to heat, and distribute the air separately and independently of each other.

My invention also consists, as will hereinafter be more fully described, in a method for the construction and arrangement of dampered openings in the radiate walls that divide off the air-heating chamber of the furnace, so that two or more of the separated inclosures may be connected by opening such dampers, and their united capacity to heat the air be concentrated upon one egress-pipe, the other egress-pipes of such a connected series of inclosures being stopped off.

My invention further consists, as will hereinafter be more fully detailed, in a method for reducing the area of the top opening of a descending flue surrounding the fire-pot, that connects with an annular base-flue, and the latter with the exit-pipe on the furnace side, said reduced area of top opening being applied to that part of the top of said descending flue that is nearest to where the annular base-flue (into which the descending flue discharges) connects with the exit-pipe, the object of which construction is to equalize the circulation of the gases and developed heat while *in transitu* from where produced in the fire-pot on their passage therefrom over its top to and through the descending annular flue surrounding the fire-pot to the annular base-flue, and thence to the exit, by reducing the intake of said descending flue on the line of its most direct connection with the exit through the annular base-flue, and in enlarging the intake of said annular descending flue where most remote from its connection with the exit through the annular base-flue.

My invention further consists, as will hereinafter be more fully described, in the method of constructing the top plate of the annular base-flue of the heater with which the annular flue surrounding the fire-pot connects, by means of openings in said plate, with the openings in said plate that are nearest to the exit-pipe with which the annular base-flue connects made smaller than those most remote from where the said flue connects with the exit.

My invention further consists, as will be subsequently detailed herein, of a method of construction applied to the interior wall of the hot-air chamber which incloses the combustion-chamber, its domes, sides, and the exterior wall of the annular descending flue surrounding the fire-pot, by making said wall of a zig-zag form, in combination with vertical radiately-positioned plates, which connect the outwardly-projected portions of the undulations in the wall with the exterior shell of the heater.

My invention further consists in the subcombination of certain elements of construction shown in the drawings, which will be subsequently described herein and designated in the claims.

Accompanying this specification, and forming a part thereof, are three plates of drawings containing eight figures illustrating a heater containing my invention, in all of which the same designation of parts by letter of reference is used.

Figure 1 is a vertical section of a heater containing my invention, taken through the center of the heater and exit-pipe. Fig. 2 is a perspective view of the heater or hot-air furnace with a part of the outer shell removed, showing the manner of constructing the interior wall of the hot-air chambers. Fig. 3 illustrates the form of the radiately-positioned plates used to divide off the hot-air interior of the furnace by uniting the plates and projections formed on the interior wall of the hot-air space with the shell of the heater. Fig. 4 is a horizontal section of the furnace or heater, taken on the line x' x' of Fig. 1. Fig. 5 is a horizontal section taken on the line x^2 x^2 of Fig. 1. Fig. 6 is a horizontal section taken on the line x^3 x^3 of Fig. 1. Fig. 7 shows in vertical section and combined recessional perspective a view of my improved furnace, and shown as

taken at the rear of the furnace through the outward extension of one of the corrugations that inclose the annular descending flue surrounding the fire-pot, and on the opposite side through the inward projection of one of the vertical corrugations, also illustrating the position of a plate upon the top of the fire-pot employed to reduce at the rear of the furnace and where nearest the exit-flue the passage from the fire-pot to the said annular flue by the extension of said plate into the corrugations. Fig. 8 illustrates the rear half of a horizontal section taken on the line x^2 x^2 of Fig. 1, enlarged.

The several parts of the furnace are designated by letter reference, and their function and construction are described as follows:

The letter F′ indicates the fire-pot, and G its grate. W′ the wall of the combustion-chamber, and W² that part of it in continuity which forms the exterior wall of an annular descending flue, D′, surrounding the fire-pot. W³ designates that portion of the same wall which is curved inwardly, downwardly, and upwardly from each side to the center to form the dome.

The letter P′ indicates an annular diaphragm, plate, or flange upon the top of the fire-pot, over and across which the heated gases generated in the fire-pot pass to reach the beforenamed descending flue D′.

The letter P² designates the top plate of the annular base-flue, with which the descending annular flue D′ connects by means of openings in said plate, arranged with reference to area and location as will be subsequently described. These openings in the plate P² are indicated at a' a^2, and the annular base-flue at D², the latter connecting with the exit-flue E′ at E².

The interior wall of the hot-air chamber at its sides, and that which in continuity also forms the wall of the combustion-chamber at W′, the exterior wall of the descending annular flue D′ at W², and the dome W³, is made to have a zigzag form, so as to produce by horizontal undulations of the latter the vertically faced projections or corrugations J on the sides of the furnace proper. The top of the combustion-chamber is curved downwardly, inwardly, and in succession upwardly in revolution from the sides about and to the center to produce the dome W³. The top of the furnace-dome and the curves in it which connect with the zigzag corrugations of the side walls of the hot-air interior are constructed with a series of radiately-arranged plates, which are projected from it and at right angles to its curved surfaces, which plates are designated at R′, where joined to the dome exterior and the curves of the top of the furnace proper. The interiorly-placed edges of the plates R′ are made to join and coincide with the curved surfaces of the dome and top. The exterior edges of the plates R′ are grooved, as indicated at Fig. 5, and they are continued from the top of the dome downwardly on an incline to the vertical sides of the combustion-chamber and hot-air chamber interior wall, and from thence to the base upon the exterior of each one of the projections J as a grooved projection upon the latter. (Indicated at d'.)

The letter S indicates the heater-shell, and R² radiately-placed partition-plates, which latter, on their inner edges, when in position, as shown at Fig. 7, are inserted in the grooves d', formed on the exterior edges of the plates R′ and projections J, and the grooves d^2 in the base-plate B², and their outer edges are in contact with the furnace shell or jacket S, the purpose of which is to divide off vertically the hot-air space between the exterior of the furnace proper and the shell in separate inclosures or apartments.

The letters O′ designate cold-air ingress-openings, and O² egress-openings for the air having been heated within the inclosure, an ingress and egress opening being constructed in each of the latter, and dampers of the usual kind are made in the egress-pipes, which is shown in one of the latter at N⁴, Fig. 7.

Within and at the top of the partition-plates R² are made the damper-openings M², which are opened and closed by means of the dampers M′, the latter being made of a quadrant form and corresponding to that of the openings M². The dampers M′ are each of them, at their upper ends, pivoted to one of the partition-plates R², so as to cover the opening M², made in each partition. The damper-rods (indicated at m^4) connect at one of their ends with the dampers, and therefrom pass out through the heater-shell S, so that as the rods are pushed in the dampers are opened, and when pulled out the dampers are closed. As thus constructed and arranged, by closing all the dampers N⁴ of the exit hot-air pipes O² but one, the heating capacity of all the interior spaces (the dampers M′ being open) may be connected and concentrated on one outlet, and by a varied arrangement of these dampers as constructed in the partition-plates and hot-air exit-pipes the heating capacity of the furnace hot-air interior may be localized to heat those parts of the building which are most exposed to the influence of wind and weather.

The annular descending flue D′ is formed on its inner side by the exterior wall of the fire-pot, and its outside by the inside of the corrugated wall W². As the heat evolved in the fire-pot, and which passes over the plate P′ to descend in the flue D′ to the annular base-flue D², will seek the most direct passage to the exit under the draft impulse, and thus heat the walls of the flue D′ more upon one side than the other, I reduce the area of the opening to said descending flue D from the fire-pot where nearest to the exit by extending into the corrugations of the outer wall of said flue the plate P′, to reduce their area at that point, as indicated at e^2, Figs. 5 and 8. The annular base-flue D² is formed in the heater below the grate G and around the ash-pit A. This an-

nular base-flue D^2 receives the heat and gases generated in the fire-pot from the descending annular flue D′ through perforations or openings a' a^2, formed in the top plate, P^2, of said annular base-flue, said latter flue connecting with the exit smoke-flue E′ at E^2. To cause a uniform circulation of the heat in the base-flue D^2, the openings leading to it from the descending flue are reduced in area where nearest to the exit-pipe, as indicated at a^2 of Fig. 6.

The letter H indicates the cold-air box from which the air to be heated is supplied to the base of the heater, and from whence, through openings O, it passes up through the chambers L, formed by the corrugations, the partition-plates, and the exterior heater-jacket. Where nearest to the cold-air box H, and where more directly influenced by the proximity of the latter, the openings O′ are made of smaller area than where most remote therefrom, to equalize the action of the entering current and make its distribution more uniform, as shown at Fig. 6.

The letter T designates the ordinary direct-draft damper used in hot-air furnaces and stoves, which is opened when the fire is being kindled and closed to force the descent of the heat to and through the base and exit.

Hot-air furnaces, as ordinarily constructed to have one hot-air interior, from which are led several conduit-pipes, do not operate uniformly, as some of the pipes which convey away the heat, having a more favorable location and surroundings, will draw off and appropriate more of the heat than the others, and these conditions will often vary in their action according to the direction of the wind-pressure, so that at times it will be almost impossible to heat the more exposed parts of the house in which the furnace is placed. By constructing the furnace so as to heat independently and separately measures of air for each register, these difficulties are avoided, and the heating capacity of several inclosures can, if desired, be concentrated to heat one part of the house which is more exposed than others to the influence of cold.

While I have shown the partition-plates which divide off the hot-air interior of the furnace and produce the separate heating-chambers I as made in two parts, R′ and R^2, with a groove made in the outer edge of one of them to receive the inner edge of the other, if desired, the partitions may be made in one piece instead of two, and grooves be formed to receive the inner edges of such plates on the exterior wall and dome of the furnace proper, there being also grooves in the base to receive the lower ends of the plates, and with the latter constructed to be in contact with the heater-shell on their outer edges.

While I have shown my invention as applied to a portable heater having a metallic shell, it may be applied in all its features to one set in brick by extending the radiate partitions from the exterior of the wall of the furnace proper to the inside of the brick wall, forming with the latter an air-heating inclosure, the relative position and application of an ingress and egress opening for each separate inclosure being the same, substantially.

I am well aware that the annular descending flue and the annular base-flue are old and well known features of furnace and stove structure, and that my invention relating thereto is limited to the manner of constructing the inlets to these flues and their location with reference to the exit-flue with which they connect, to better and make more uniform their action.

While I have shown a quadrant-form opening and damper as employed to connect and disconnect the areas of the hot-air inclosures I, any form of opening and dampers may be used which will operate in substantially the same manner to perform the same office.

I am well aware that, broadly considered, it is not new to divide off the hot-air space of a furnace and to provide such divided-off spaces with separate ingress and egress openings, with plates radially placed to make such divisions, my improvement on this class of devices relating to a manner of constructing them so that two or more of them can be concentrated on one outlet by means of dampers and certain elements of construction that I employ to make them thus operative. I am also aware that it is not new, broadly considered, to construct the furnace-wall with vertical corrugations, and, apart from the elements of construction that I combine with corrugations so located, I disclaim them.

I am also well aware that steam-radiators have been patented which contained interiorly a series of vertical flues or hot-air tubes, which at their lower ends connected with a cold-air chamber and at their tops opened into a dome, within which latter the air heated in the tubes or flues was discharged, and this dome or chamber was constructed with radial partitions to divide off its interior. The top of the radiator-dome of this patented construction was perforated to allow the heated air to escape into the room, and the perforated cover of the dome was provided with dampers, so that more or fewer of the openings could be covered, if desired. This chamber had conduit-pipes for conveying away the air to other points of application by closing the openings from the radiator into the room where the latter was placed; but there were no dampers in the radial plates and no dampers in the conduit-pipes leading from the chamber, by which the capacity of all of the hot-air spaces can be concentrated on one or more outlet-pipes, if desired—one of the principal features of my invention. Again, the radially-divided chamber of this patented radiator was constructed to utilize the heated air after it had been heated by its passage through vertical tubes, while in my device the air is heated in the radially-divided-off spaces which extend from the top to the bottom of the furnace, each be-

ing provided with a cold-air ingress-opening, a hot-air egress-opening, and damper, and each partition is provided with a damper—a combination of co-operating factors not found in any or all of these older devices which I have described.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a hot-air furnace, the combination of radially-placed partitions between the exterior wall of the furnace proper, and the furnace wall or shell which incloses the hot-air space to divide off said hot-air space into separate inclosures, an ingress cold-air opening in the bottom of each of said inclosures, an egress-opening for the passage of heated air in the top of each separate inclosure, a damper in each of the hot-air egress-openings, and a damper in each of the partition-plates, arranged and constructed to operate substantially as described.

2. In a hot-air furnace, the combination of the projections J in the vertical walls of the furnace proper, the radially-placed division-plates R' and R^2, the exterior shell, S, the ingress cold-air openings O′, and the hot-air egress-openings O^2, arranged and constructed substantially as shown and described.

3. In a hot-air furnace, in combination with an annular descending flue that surrounds the fire-pot and is constructed with a corrugated exterior wall, the plate P′, made to project into and over the top of said annular flue, and to tongue into the spaces formed by the corrugated wall, to gradually reduce the top opening of said flue on the side of the furnace nearest the exit-pipe, as and for the purposes herein set forth.

4. In a hot-air furnace, the combination of the annular descending flue D′, surrounding the fire-pot of the furnace and connecting therewith, the annular base-flue D^2, the top plate, P^2, of which has openings therein to connect said annular base-flue with said annular descending flue, said openings in the plate P^2 being gradually reduced in area from a point where most remote from the exit-pipe of the furnace toward said exit-pipe with which said annular base-flue connects, as and for the purposes herein described and set forth.

5. In combination with the air-heating interior of a hot-air furnace formed by the exterior wall of the furnace proper and the exterior shell or wall of the furnace, the base-plate B^2, forming the bottom of said hot-air interior, having the inlet cold-air openings O′, said openings being smallest in area where nearest to the cold-air pipe H, which supplies air to said openings, and gradually enlarged toward the point where most remote therefrom, as and for the purposes herein described and set forth.

6. In a hot-air furnace constructed with separate hot-air spaces formed by the wall of the furnace proper, the exterior shell, and radially-placed partition-plates, the combination of the openings M′ in the radial plates and the dampers M^2, arranged to operate as shown and described.

Signed at Troy, New York, this 13th day of January, 1883.

CLARENCE B. CUTLER.

Witnesses:
JUSTIN KELLOGG,
SUMNER P. HUNT.