

(No Model.)

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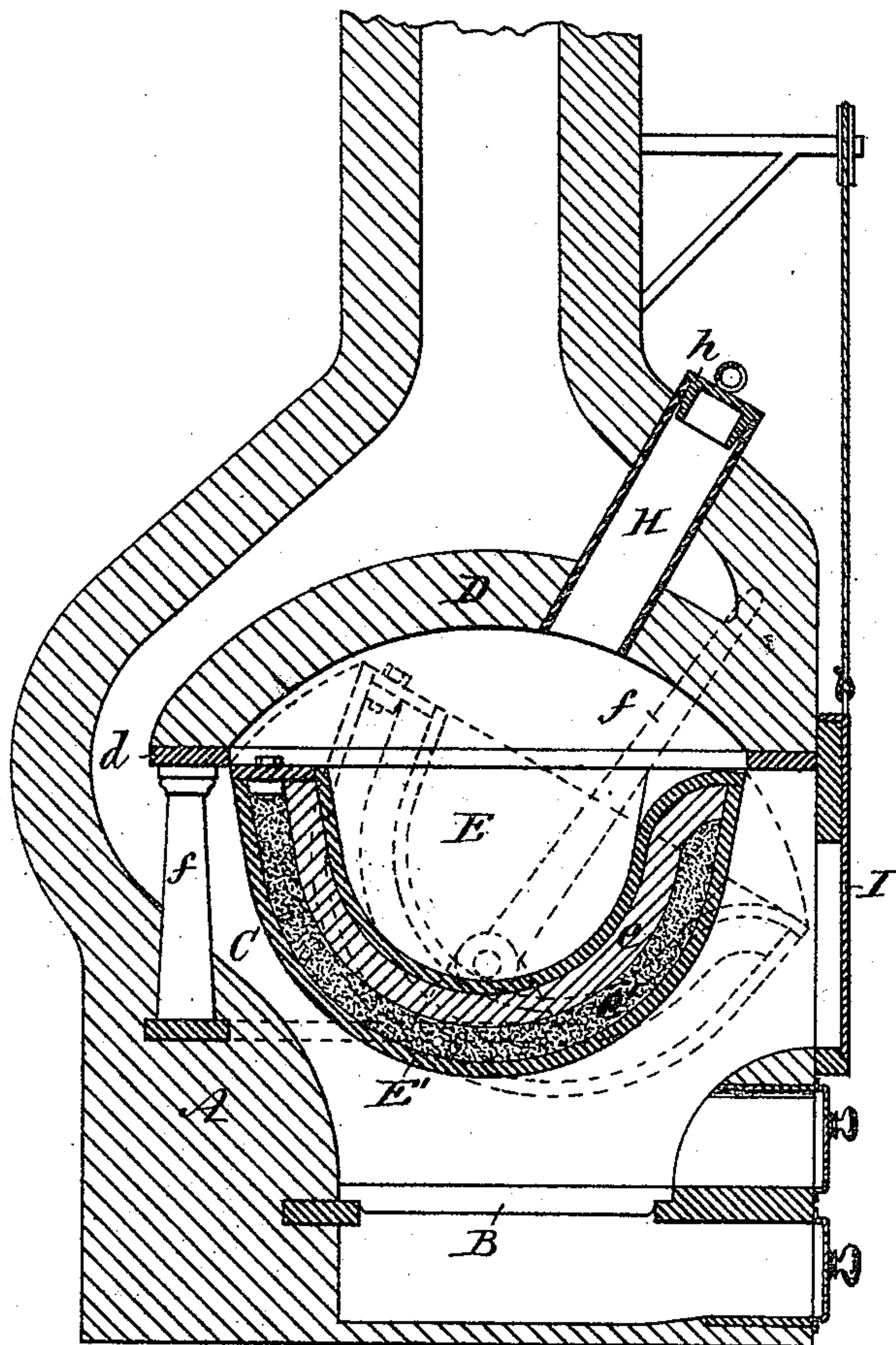
C. PAYEN.

PROCESS OF PRODUCING POROUS CRYSTALLIZED METAL PLATES.

No. 440,276.

Patented Nov. 11, 1890.

Fig. 1.



WITNESSES:

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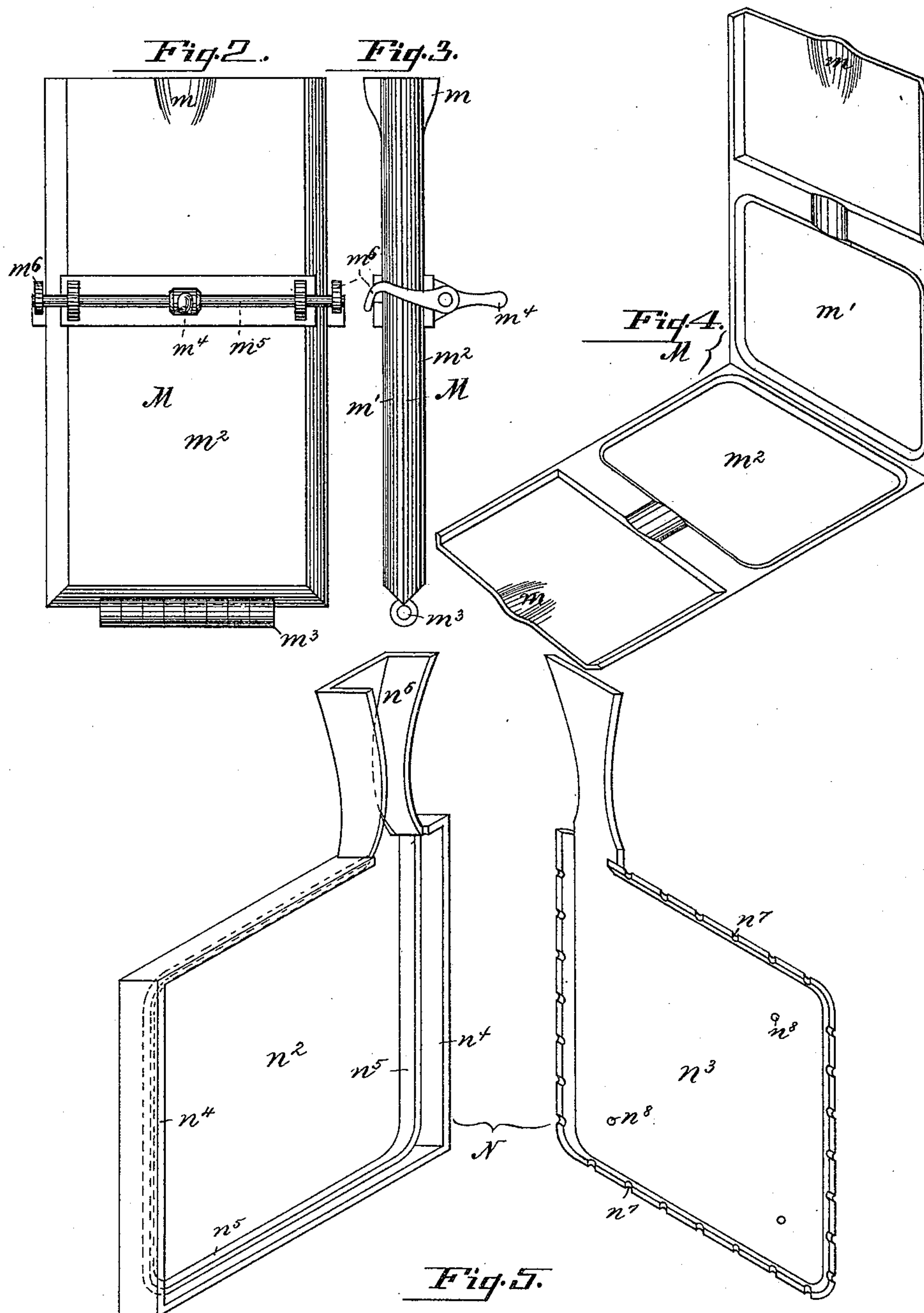
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C. PAYEN.

PROCESS OF PRODUCING POROUS CRYSTALLIZED METAL PLATES.
No. 440,276.

Patented Nov. 11, 1890.



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(No Model.)

4 Sheets—Sheet 3.

C. PAYEN.

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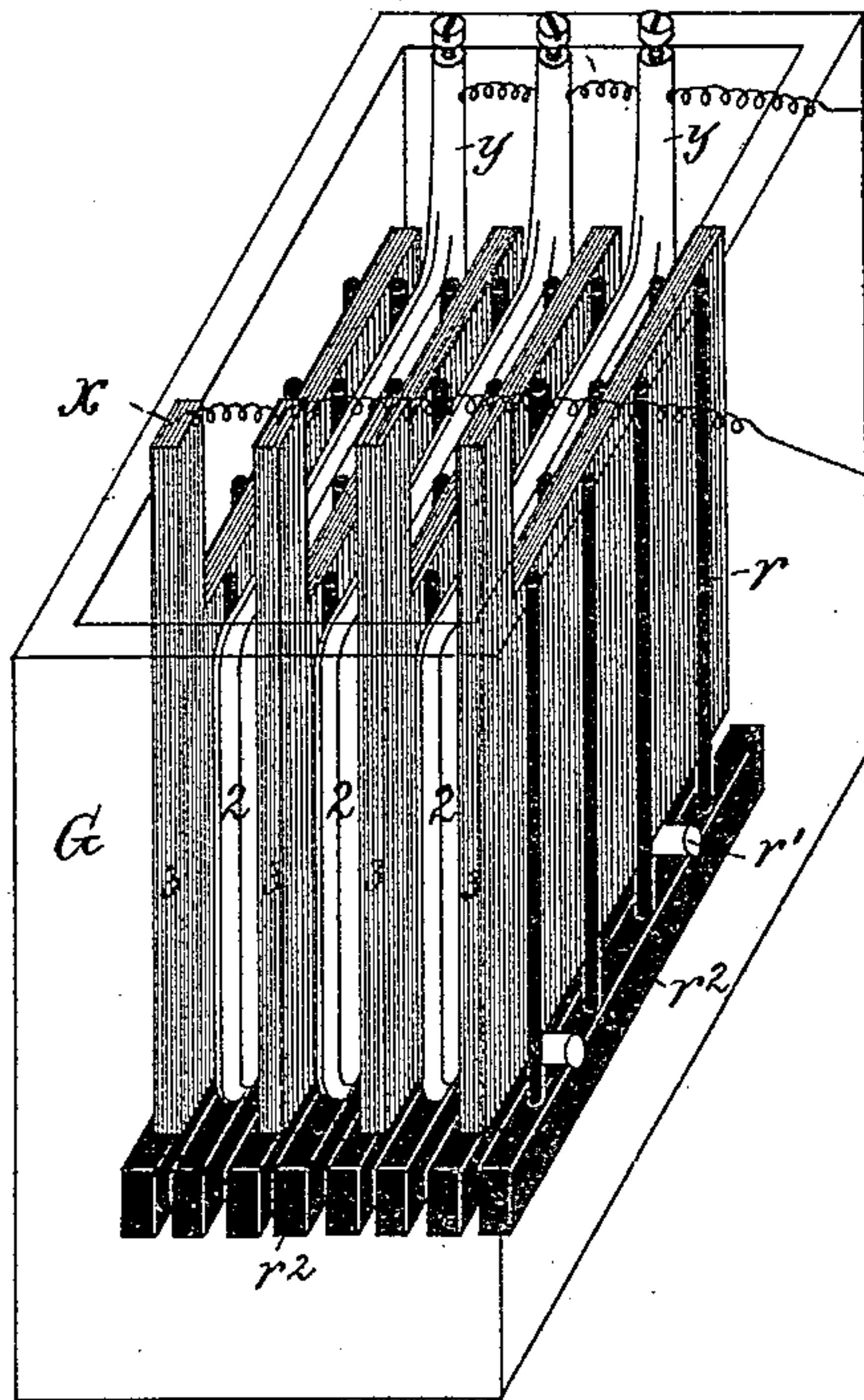


Fig. 6.

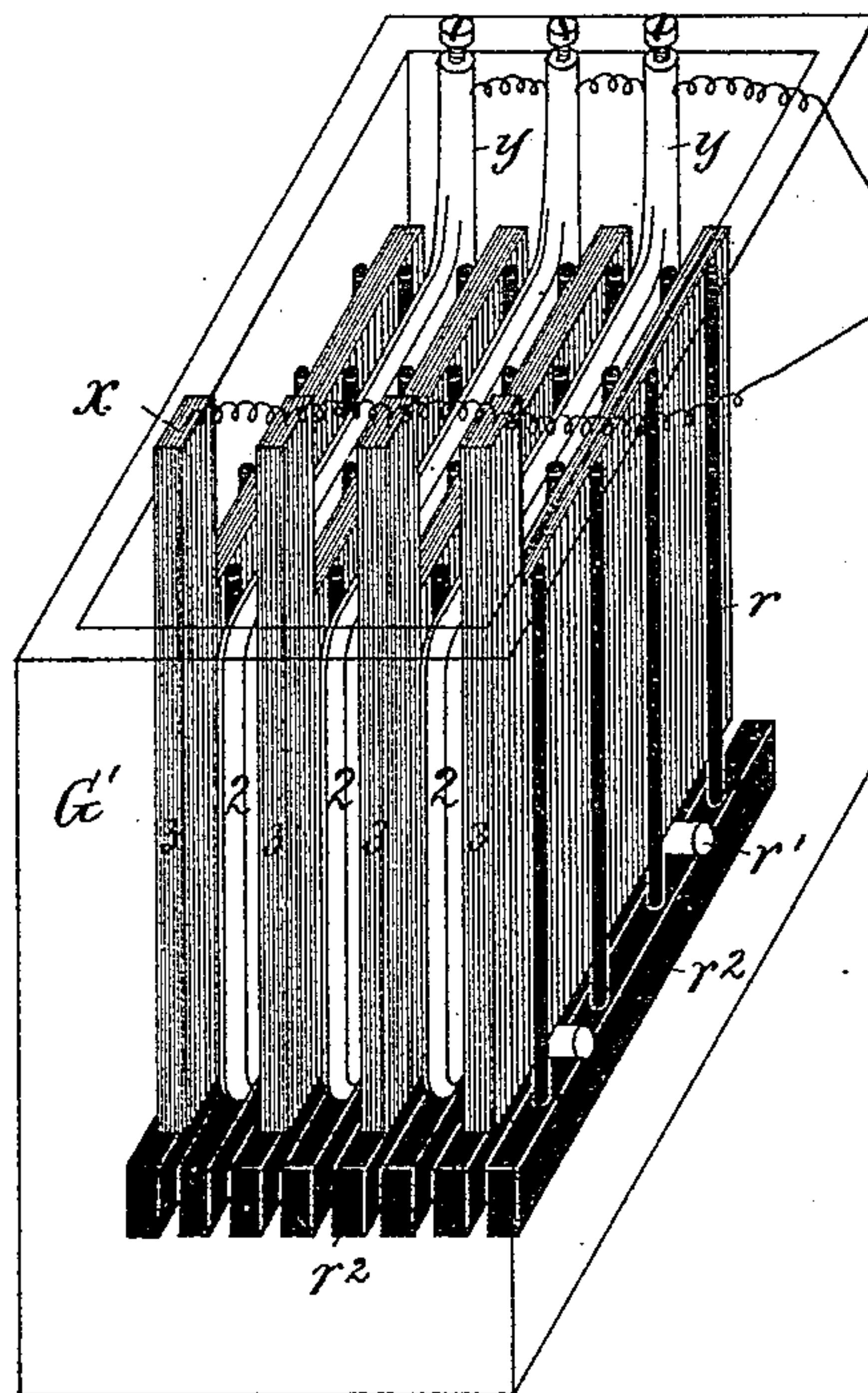
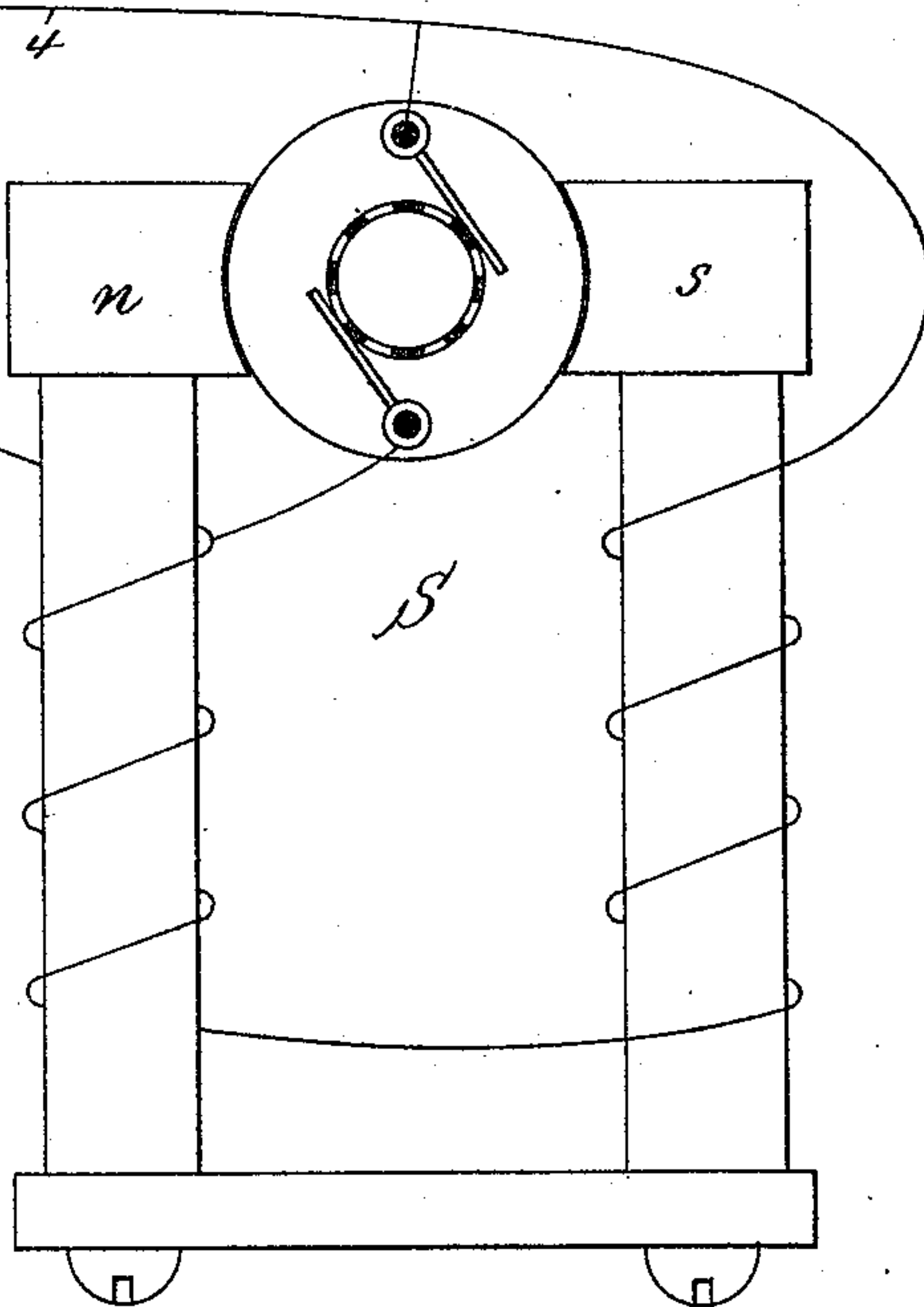
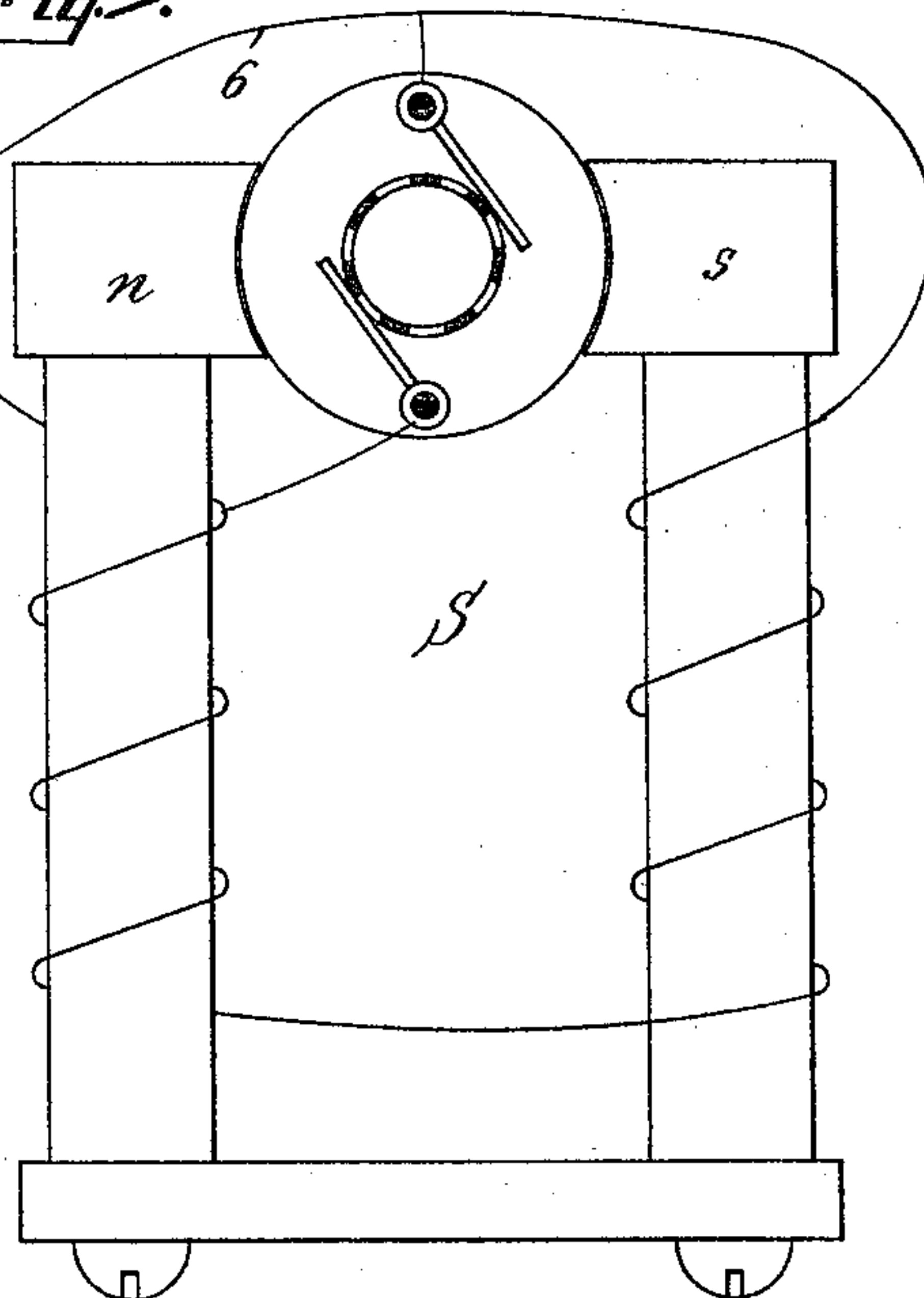


Fig. 7.



WITNESSES:

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INVENTOR:

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(No Model.)

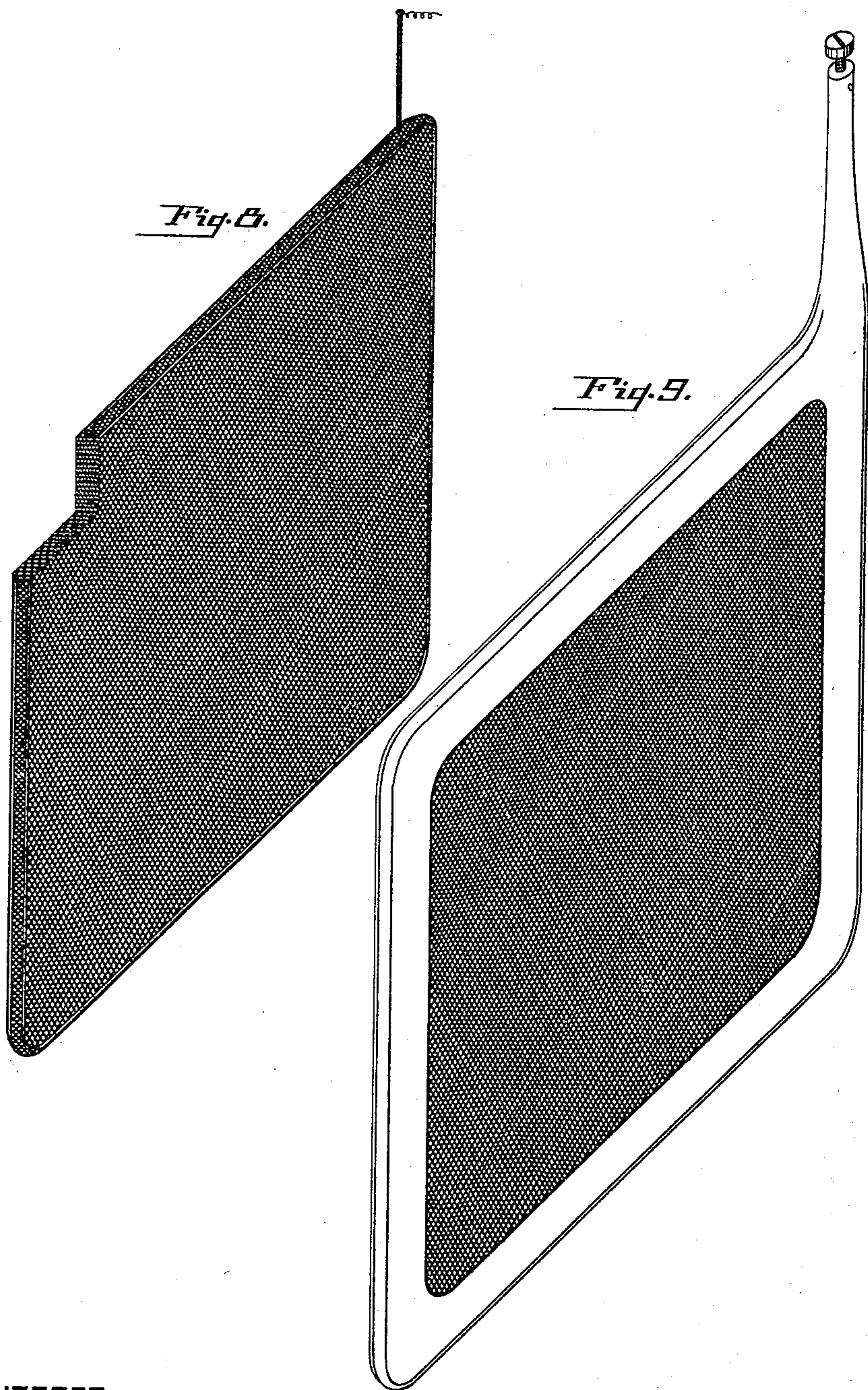
4 Sheets—Sheet 4.

C. PAYEN.

PROCESS OF PRODUCING POROUS CRYSTALLIZED METAL PLATES.

No. 440,276.

Patented Nov. 11, 1890.



WITNESSES:

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UNITED STATES PATENT OFFICE.

CLÉMENT PAYEN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE
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PROCESS OF PRODUCING POROUS CRYSTALLIZED METAL PLATES.

SPECIFICATION forming part of Letters Patent No. 440,276, dated November 11, 1890.

Application filed June 20, 1888. Serial No. 277,676. (No model.)

To all whom it may concern:

Be it known that I, CLÉMENT PAYEN, a citizen of the Republic of France, but now residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in the Process of Producing Porous Crystallized Metal Plates, of which the following is a specification.

10 The principal object of my present invention is to provide a porous crystallized metal plate or element for a secondary or storage battery.

My invention consists in fusing with an inorganic metallic salt or salts an organic salt or salts of an acid or basic nature, then casting the mass in a suitable appliance and allowing the same to cool, and then reducing to a metallic state.

20 The nature and characteristic features of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, for conducting the method of producing the same, and in which—

Figure 1 is a vertical central section of a furnace, showing the crucible pivotally supported therein. Fig. 2 is a top or plan view of a mold. Fig. 3 is an end view thereof. Fig. 4 is a perspective view of the mold, showing its interior formation. Fig. 5 is a view in perspective of a bivalved mold for casting a frame with a conductor or terminal to the plate. Figs. 6 and 7 are respectively diagrammatic views of a double electrolysis, being one of the methods in which the crystallized plates may be reduced to a metallic state; and Figs. 8 and 9 are views in perspective of a crystallized metal plate with and without a frame and showing the manner in which the crystals exist therein.

Referring to the drawings, A is a furnace constructed of brick or other suitable material, and B is a grate supported in the lower part thereof.

C is the draft-flue, and D an arch in the upper part of the furnace, supported by a ring *d*, which is held in position by columns *f*.

E is a crucible open at the top, and around which is formed a layer of amianthus, asbes-

tus, or other material forming a capsule *e*, and between this capsule *e* and the metal pot *E'* is interposed a layer of sand *e'*. The metallic pot *E'* is operated from the outside by a lever *f'*, whereby the crucible may be readily tilted to permit of the discharge of its contents for further treatment.

H is an inclined hopper provided with a removable stopper *h*.

I is a door to allow of the discharge of the fused mass into a mold for causing the same in cooling to assume a crystallized form.

The method of producing a porous crystallized plate of my invention may be carried out in the following manner: To a charge composed of a salt of lead containing an organic acid as an acetate is added an oxalate or binoxalate of lead in the proportion of two (2) to ten (10) per cent., by weight, more or less, and the mixture or mass brought to a state of fusion in the crucible *E* of the furnace without ebullition or bubbling thereof. The mass is then poured into a mold, wherein it becomes cool or perfectly cold, and the cast structure is then reduced to a metallic state by electrolytic or chemical action, or both, for use as a plate or element of an electric battery. Again, to a charge composed of a salt or chloride of lead containing an organic acid—as basic acetate of lead or bibasic acetate of another metal—may be added from two to five per cent. (more or less) of oxalate of lead or other metal before or during the fusion of the combined mass, and the same then cast in a suitable mold and subsequently reduced in any preferred manner to a metallic state. Again, to a charge composed of chloride of lead or zinc and acetate of lead or zinc may be added five to ten per cent. (more or less) of oxalate of lead, and the compound or mixture then fused, cast, and reduced to a metallic state. Again, to a charge composed of lead and acetate of lead may be added in similar proportions, as hereinbefore mentioned, an oxalate of lead and acetate of zinc or binoxalate or lead, or to a charge composed of a salt of lead as a base, may be added two or more of said materials in variable proportions, and the mass, after being fused and cast, reduced electrolytically or chemically, or by both

means, to a metallic state to form a plate or other structure suitable to form an element of an electric battery.

Any of the charges above mentioned after having become sufficiently fluid in the crucible E may be discharged therefrom into a two-part mold M, suitably clamped together through the mouth m thereof, and after the mass charged therein has set or become cold the cast structure is removed therefrom by unclamping the parts m' and m'' of the mold by means of the lever m^4 , mounted on the rod m^5 , which is provided with catches m^6 , engaging with strips m^7 . The cast plate or other structure is then mounted in a bivalved mold N, in order that a supporting-frame with a terminal may be cast around the same, or the supporting-frame may be dispensed with, if preferred, and a platinum, aluminum, or other wire inserted directly into the plate to form a terminal or conductor therefor. The crystallized plates having been subjected to the foregoing treatment may then be reduced to a metallic state by electrolytic or chemical action, or both, in the following manner:

A series of crystallized plates is placed in a vase G, containing water and sulphuric acid in the proportion of ten per cent., more or less. These crystallized plates 2, immersed in the solution in the vase G, are alternated with plates of equal dimensions composed of lead, charcoal, or other material 3, each having a terminal x , all the crystallized plates 2 being connected through their terminals y with a wire 4, while the lead, charcoal, or other plates 3 are connected through their terminals x with a wire 5. The two systems of plates are insulated from each other by means of insulating-rods r and from the vase G by means of the insulators r' , mounted on the horizontal rods r^2 in the bottom of the vase G, as shown in Fig. 5, the system of crystallized plates being connected with the negative electrode s of the dynamo S, while the system of lead, charcoal, or other plates are connected with the positive electrode n of the dynamo S, and the electrolytic action thus permitted to take place. The crystallized plates thus treated are then removed and immersed in another vase G', containing water and sulphuric acid in about the same proportions. In this second vase G' the crystallized plates are again alternated with others of lead, charcoal, or other material, as in the previous instance, and the two systems of plates insulated, respectively, from each other and the vase G' are again connected by two separate wires 6 and 7 with the positive and negative electrodes n and s of the dynamo S', as in the first instance mentioned, with this exception, that the negative electrode s is

connected with the system of lead, charcoal, or other plates through the terminals x , while the positive electrode n is connected with the system of crystallized plates through the terminals y , as shown in Fig. 6, and by the second electrolytic action which takes place the plates are reduced to a porous crystallized metallic state or condition.

Still another method for the reducing of the plates to a metallic state by chemical action may be availed of and carried out in the following manner: In a vase containing a solution of a salt or chloride and water, preferably dilute sal-ammoniac, in the proportion of five (5) to ten (10) per cent., more or less, a series of the crystallized plates are arranged alternately in contact with metallic zinc or other plates of equal dimensions. A series of crystallized plates arranged in contact with zinc plates of equal dimension are immersed in a solution composed of sal-ammoniac and water in a vase for from twelve to fifteen hours, more or less, which causes by the chemical action taking place the gas held in the crystallized plates to be eliminated and salts contained in the crystallized plates to combine with the solution of the vase, thereby leaving said plates in a porous metallic condition. The porous crystallized metal plates treated in either of the above ways may then be removed from the vase, washed and dried by a gentle heat, whereby they will be brought to a chemically pure, porous crystallized metallic state—such as illustrated in Figs. 8 or 9—for use as the plates or elements of a secondary or storage battery.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The method of producing a porous crystallized plate or element for an electric battery, which consists in fusing an inorganic metallic salt or salts with an organic salt or salts, as described, then casting the mass and reducing to a metallic state.

2. The method of producing a porous crystallized plate or element for an electric battery, which consists in fusing an inorganic metallic salt or salts with an organic salt or salts, as described, then casting the mass in a mold and allowing the same to become cool, and then reducing electrolytically to a metallic state.

In witness whereof I have hereunto set my signature in the presence of two subscribing witnesses.

CLÉMENT PAYEN.

Witnesses:

FRANK. C. LEWIN,
THOMAS M. SMITH.