No. 672,067. Patented Apr. 16, 1901.

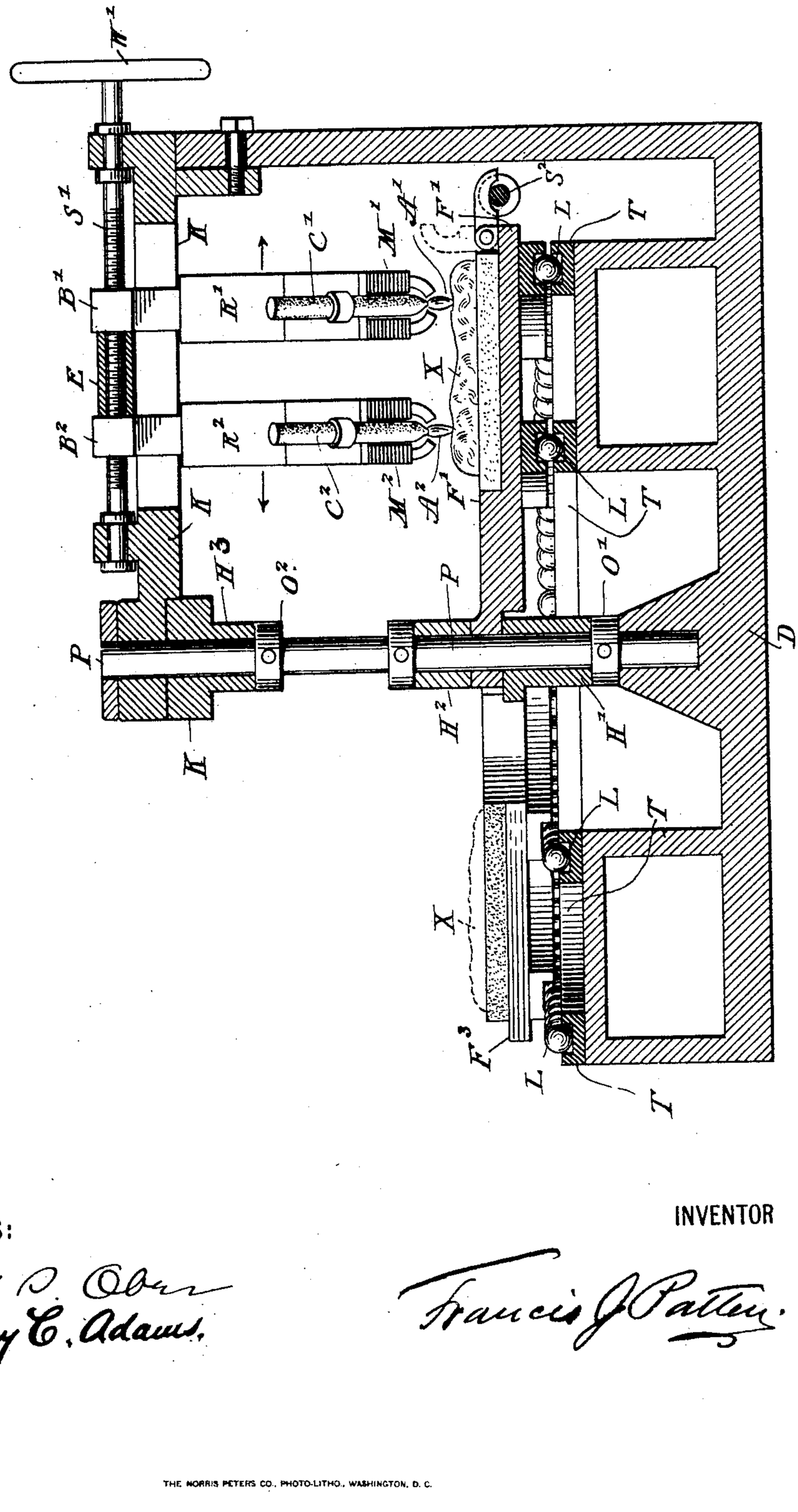
F. J. PATTEN.

ELECTRIC FURNACE.

(Application filed June 16, 1900.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



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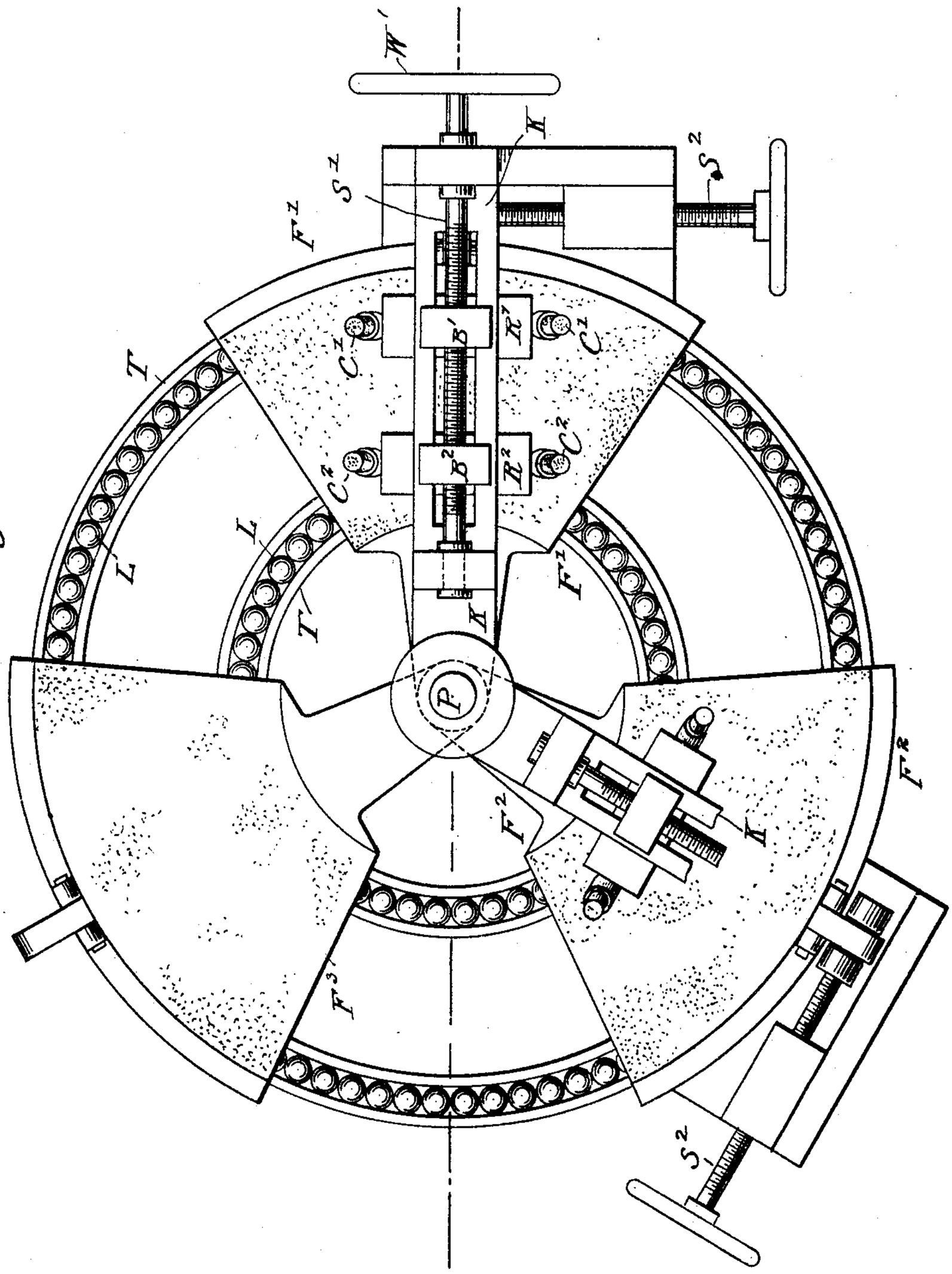
4 Sheets—Sheet 2.

Fig. 2.



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4 Sheets—Sheet 3.

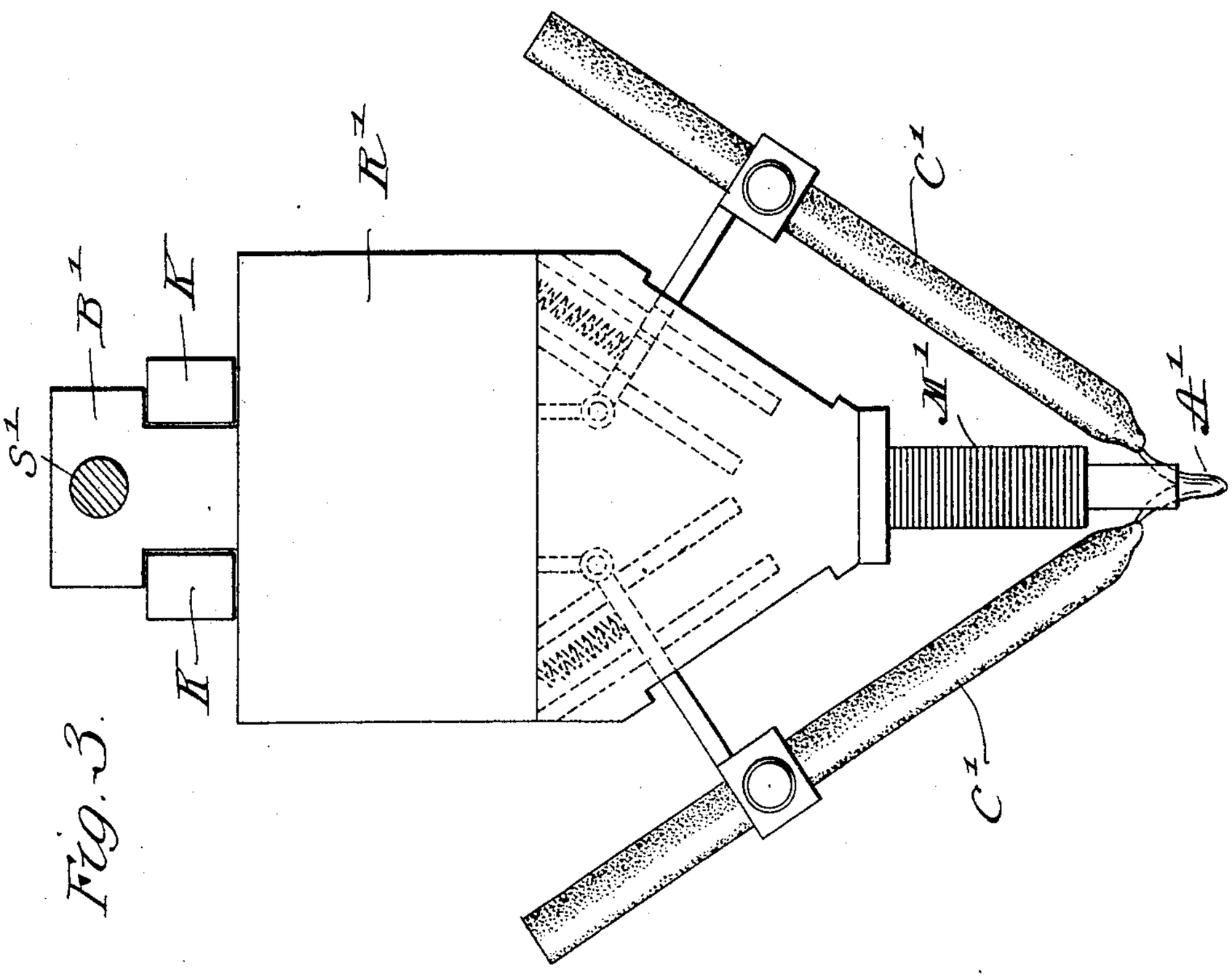

Fig. 3.

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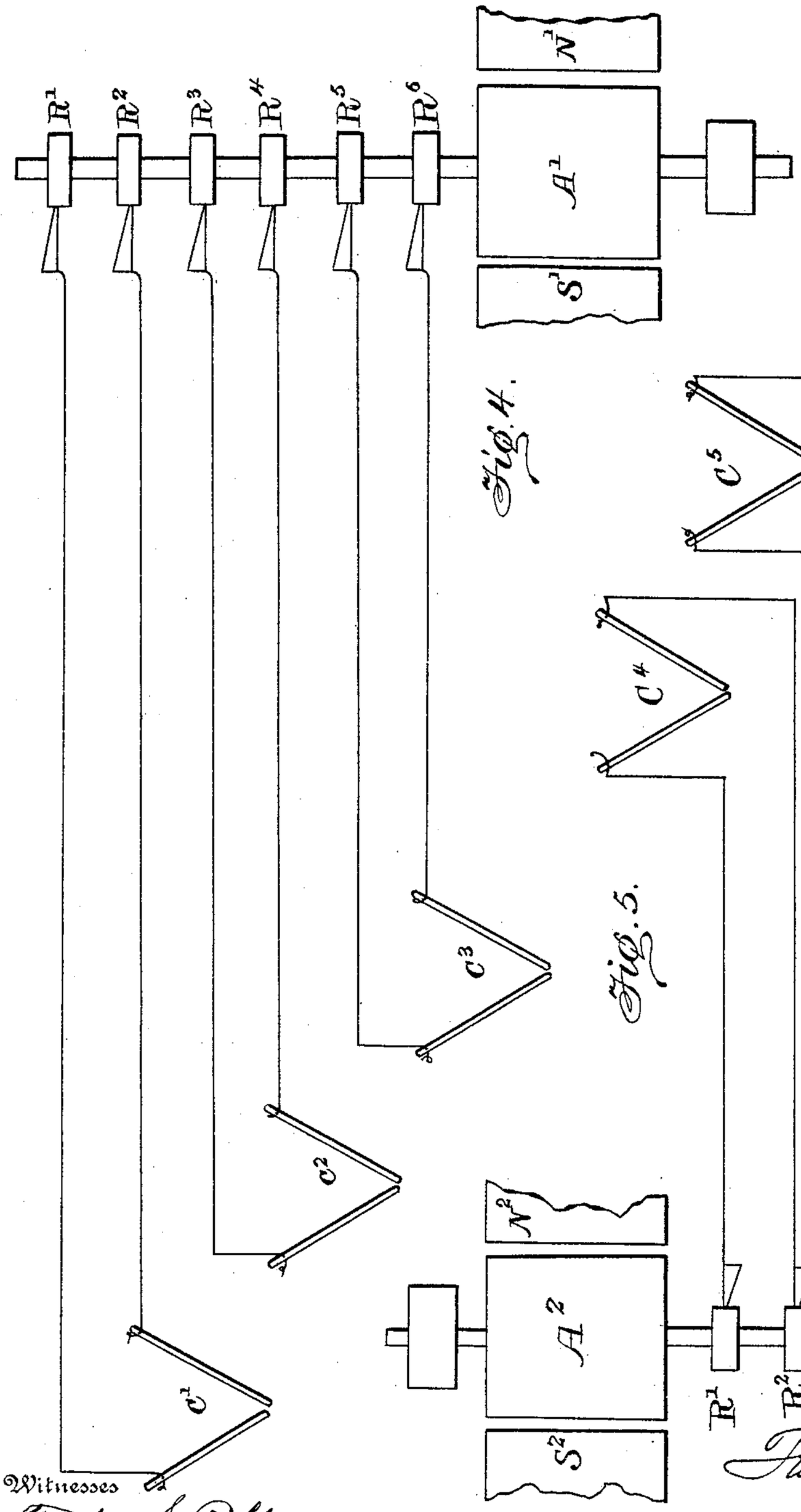

Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

FRANCIS JARVIS PATTEN, OF NEW YORK, N. Y.

ELECTRIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 672,067, dated April 16, 1901.

Application filed June 16, 1900. Serial No. 20,495. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS JARVIS PATTEN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Furnaces, of which the following is a full, clear, and exact description.

My invention is an improved form of electric furnace so designed and arranged mechanically and electrically that it permits of continuous operation of the electric smelting process without the delays incident to the removal of the converted or smelted material and the recharging of new material for further operation. Although adapted to a variety of uses or processes, I shall describe it as a furnace designed for the production of calcium carbid. Most furnaces used for this purpose are not continuous in operation and are wasteful of energy by reason of the reheating necessary at each recharging.

The furnace and its method of operation will be understood by reference to the accompanying drawings, in which—

Figure 1 is an elevation, partly in section, of the structure. Fig. 2 is a plan view. Fig. 3 shows the arrangement of the carbons; and Figs. 4 and 5 are diagrams of the operative circuits when the furnace system is worked by triphase and biphase alternating currents, respectively.

It is a furnace of the "open-hearth" type, the electric arcs playing downward against an open furnace-floor, the process being plainly open to view. It is in a sense a multiple furnace, as there are two or more furnace-floors. I show and prefer three, two of which are always working while the other is being recharged and prepared for action.

Referring now to Fig. 2, the ground plan is of a circular form, and the furnace floors or hearths F' F^2 F^3 are sectors of the circle of about seventy degrees of arc each, thus leaving fifty degrees of arc open space between the three floors. These hearths or "furnace-floors," as I will style them, are revoluble about a central post or supporting-axis P, Figs. 1 and 2, revolving on a hinge H' H^2, Fig. 1, which surrounds the supporting-post, and further supported at the outer rim of the floor by resting upon ball-bearings L L, that are held in a pair of concentric circular grooved tracks T T, Fig. 1, which give the furnace-floor substantial support. All the floors can be swung completely around the circle; but there are three working positions to which each floor in turn is successively removed, chasing each other from one stage of operation to the next. Two of these positions are working positions for the electric arcs, while the other has no arcs and is a charging position. From the charging position the floor is moved, with its charge of lime and coke, to the next position, where the preliminary heating is done with a number of arcs of comparatively low power. This done the floor moves to the third position, where the actual smelting is done, and then to the first position, where the product is removed and a new charge is placed on the floor. In each of the arc working positions the floor on arrival at the central line is clamped to a tangent screw apparatus S^2, Fig. 2, by means of which the floor may be swung backward or forward circumferentially by a distance of about half its breadth. We thus have a circumferential movement of the floor in its own plane under the working arcs.

Referring now to Fig. 1, the arrangement of the carbons is shown. Two or more sets are suspended from a swinging arm K over the two working floors. These arms or carbon-carriers are revoluble about the central post P just the same as the floors and can be turned circumferentially at will to any position; but when the floor is in the working position the arm or carrier K is clamped centrally over the floor and is not moved circumferentially while the arcs are working. Two sets of carbons C' and C^2 are shown supported on the arm K, which has a vertical slot along its middle line. In this slot the actual carbon-holders are fixed in such a way that they can be moved along the arm to or from the central post radially. This movement is effected by turning the hand-wheel W' and screw S', which being itself fixed and passing through the screw-threaded blocks B' B^2 at the tops of the carbon-carriers causes the carbons and their arcs to be traversed radially over the furnace-floor. This arrangement is plainly seen in Figs. 1 and 3. We thus have two movements at command—a cir-

cumferential one of the furnace-floor and a radial one of the arcs. Evidently by using both the arcs can be placed immediately over any particular spot of the floor, and thus made to act upon any part of the charge it may be desired to reach.

The carbon system and their arrangement are shown in Fig. 3. Two carbons in each set are inclined to each other in such a position that the arc between them is just over the furnace-floor. Between the carbons, with its poles across or bridging the arcing space, is a powerful electromagnet M′ M², Fig. 1, and this magnet when excited blows the arc down, as shown, in a pointed and vertical stream of flame against the charge X of lime and coke below and which the carbons themselves do not touch. In the boxes R′ and R², Figs. 1 and 3, is placed suitable regulating mechanism for feeding the carbons as they are consumed.

The essential features of the furnace, then, are the multiple furnace-floors horizontally revoluble about a common center, the multiple carbon system for two of the three floors, the carbons being movable radially at will in a horizontal direction parallel to and just over the furnace-floors, and the magnetically-deflected arcs directed from the carbons downward against the charge on the furnace-floors.

When using three arcs over each floor, I use triphase alternating currents, sending one of the three currents through each pair of carbons, as indicated by the diagram of circuits in Fig. 4, in which each of the separate pairs of carbons C′ C² C³ is given one of the independent alternating currents of the triphase currents delivered by the dynamo (shown in the diagram) by the field-poles N′ S′, armature A′, and terminal rings R′ to R⁶. When using two carbons, I use biphase alternating currents, sending one current through each pair of carbons, as indicated by the diagram of circuits in Fig. 5, in which C⁴ C⁵ represent the two sets of carbons, each set being given one of the two independent alternating currents of the biphase system. In this figure, A² represents the armature of the alternator. N² S² are the field-poles, and R′ to R⁴ are the ring-terminals of the two independent armature-circuits. The system is thus exceedingly flexible, as it enables one to use an ordinary biphase alternator for the source of electricity, and then passing the currents from it through a suitable transformer. The volts and amperes are changed to suit the requirements of the work.

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

1. An electric furnace provided with two or more furnace floors or hearths having each the form of a sector of a circle, all pivoted to a common upright support or column, and revoluble about the latter in a horizontal plane in combination with electrodes coöperating with the furnace-floors.

2. An electric furnace having two or more sector-shaped furnace-hearths revoluble about a common center in a horizontal plane and two or more revoluble arms or carbon-carriers above said hearths supporting two or more sets of carbons over each hearth, and means for deflecting the arcs downward from the ends of the carbons toward the furnace floors or hearths.

3. In an electric furnace, three working hearths or furnace-floors of the form of a sector of a circle, all arranged to revolve in the same horizontal plane about a central supporting-post to which they are hinged and a circular supporting-track around the outer edges of the floors on which they roll, following each other in succession to each of three positions, one for discharging and recharging, a second for preliminary heating, and a third for final smelting, in combination with electrodes and working electric arcs coöperating with said furnace-floors in the two latter positions.

4. In an electric furnace three working hearths having the form of a sector of a circle all hinged so as to revolve about a central support, in a horizontal plane, and carbons with working electric arcs supported in a similar manner above the floors, means for traversing the furnace-floors circumferentially beneath the working electric arcs, and other means for traversing the carbons in a radial direction whereby every part of the furnace hearth or floor can be brought under the working electric arcs substantially as described.

In witness whereof I subscribe my signature in presence of two witnesses.

FRANCIS JARVIS PATTEN.

Witnesses:
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J. S. DONNELLY.