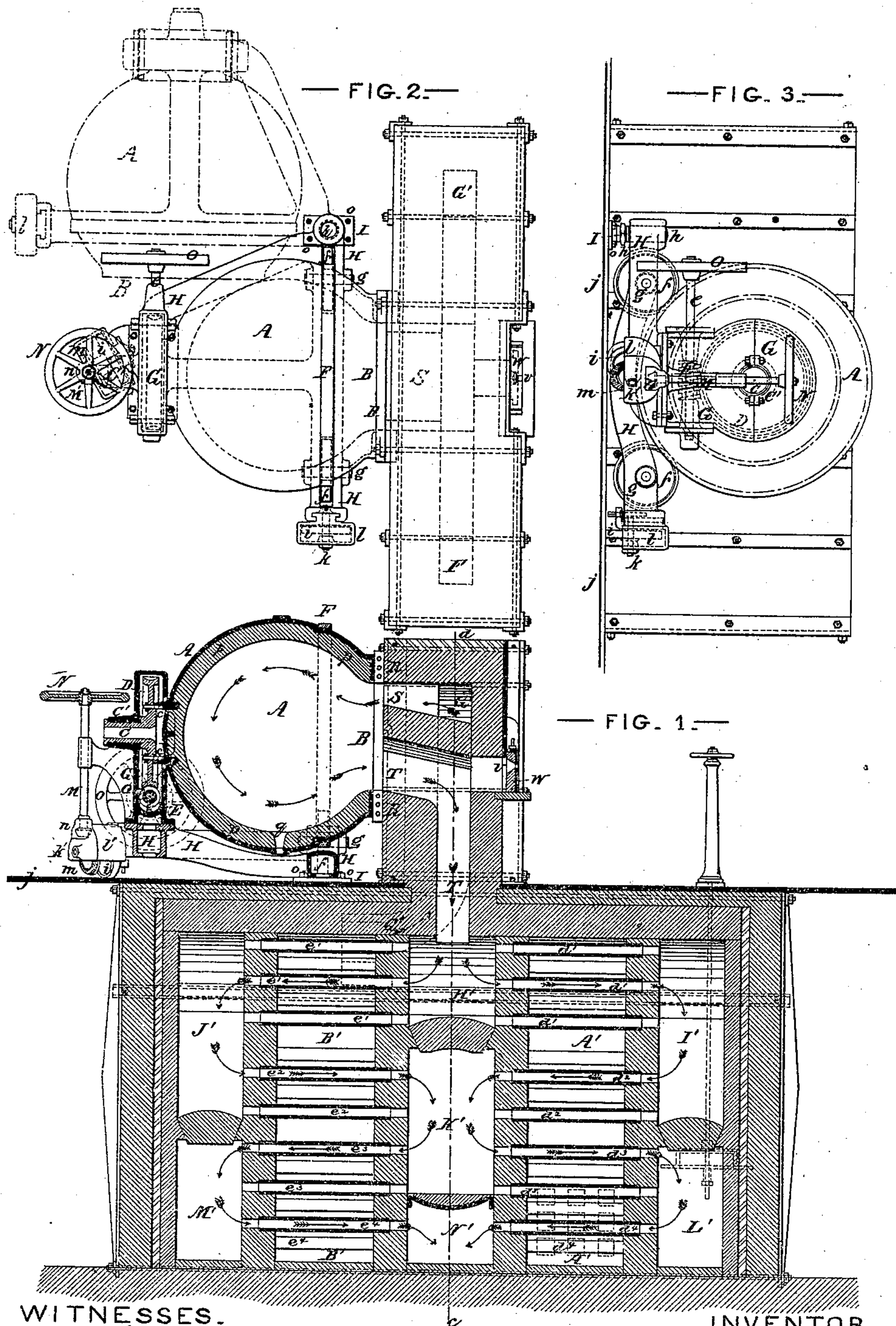


W. SELLERS.

Improvement in Puddling Iron.

No. 129,430.

Patented July 16, 1872.



WITNESSES.  
Wm B. Dayton  
J. Snowden Bell.

INVENTOR.  
Wm Sellers.  
by his Attorney  
Henry Baldwin & Co.

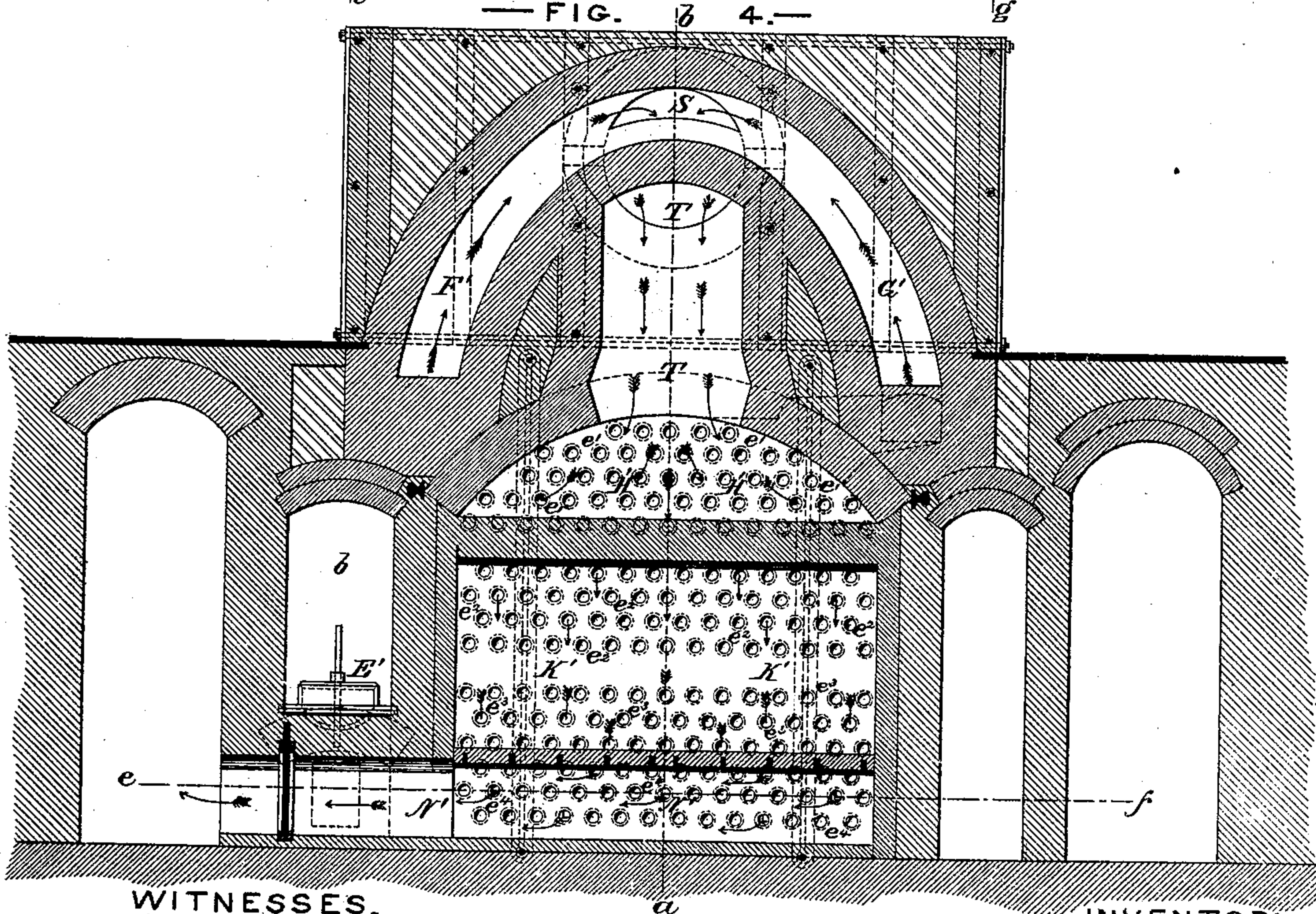
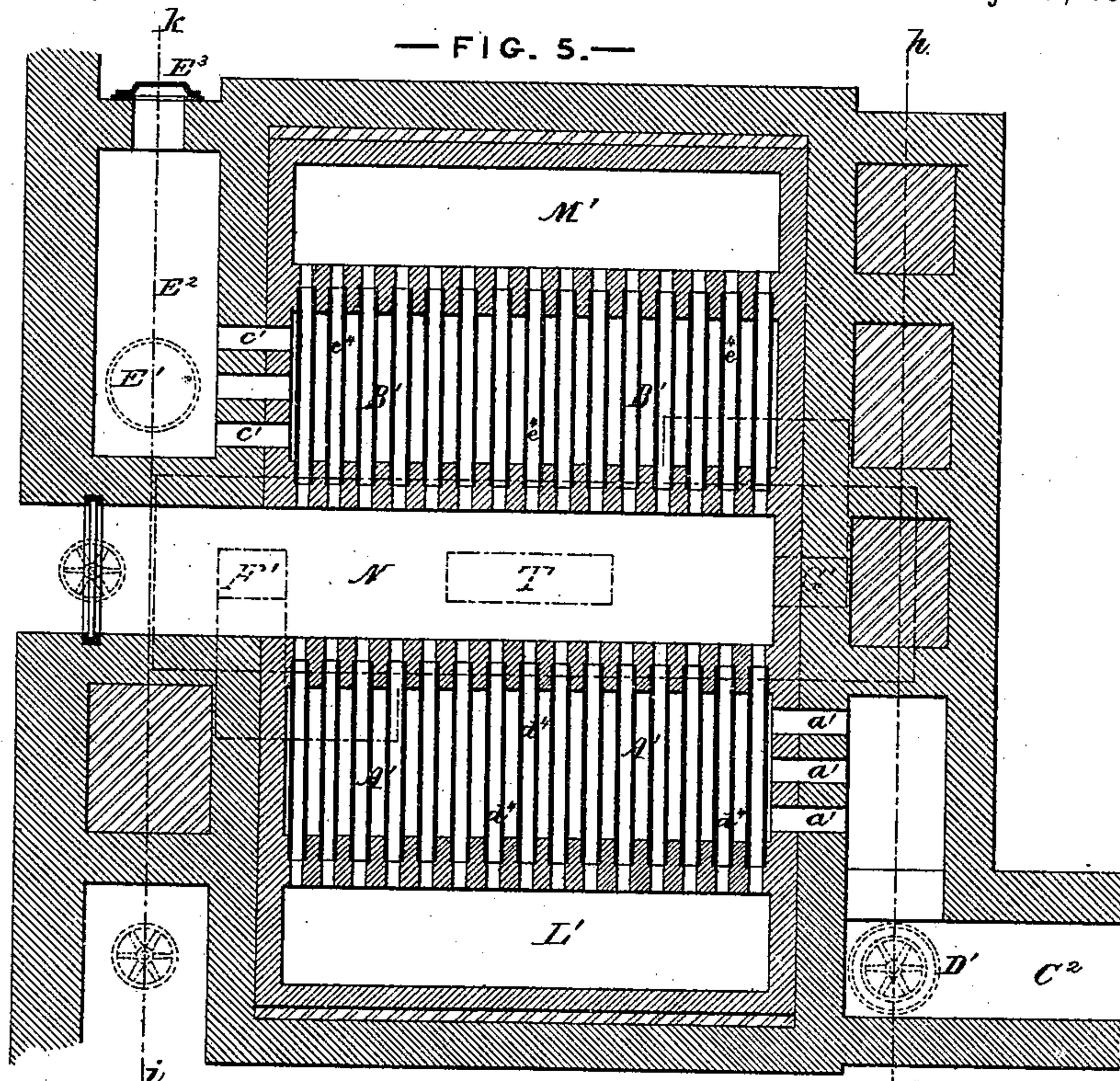


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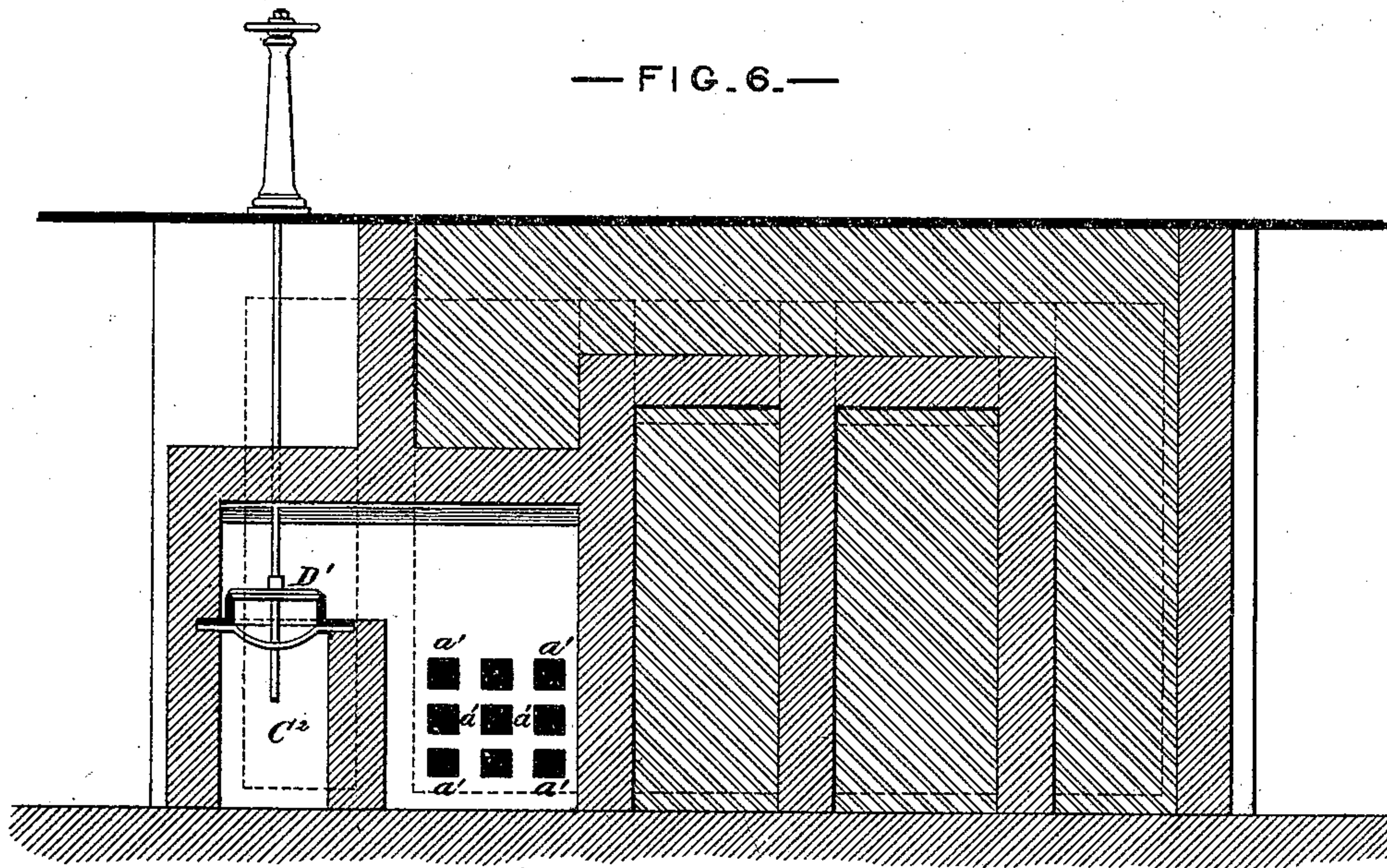
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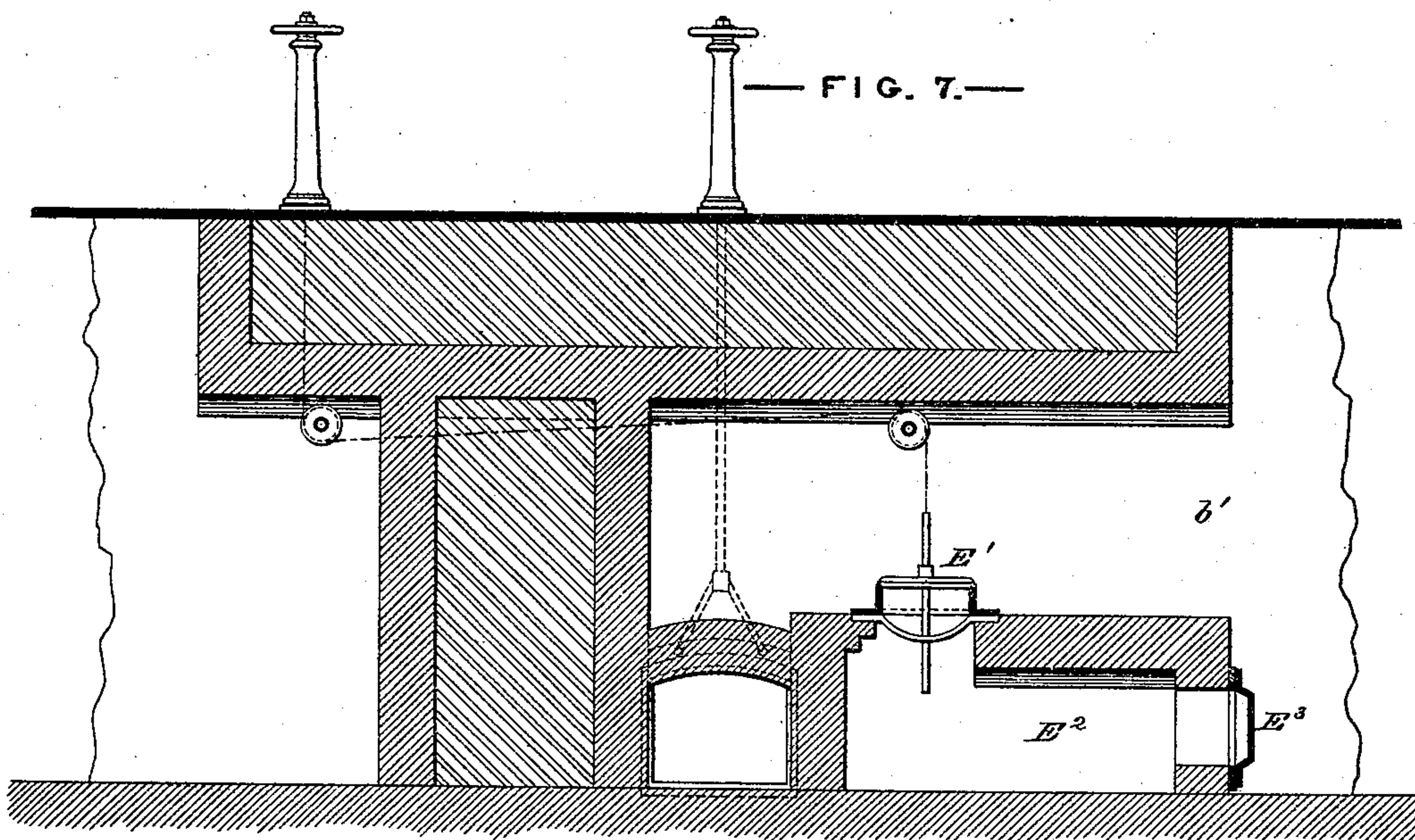
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— FIG. 6. —



— FIG. 7. —



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J. Snowden Pell.

INVENTOR.

Wm Sellers.  
by his Attorney  
Henry Baldwin & Co.



# UNITED STATES PATENT OFFICE.

WILLIAM SELLERS, OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVEMENT IN PUDDLING IRON.

Specification forming part of Letters Patent No. 129,430, dated July 16, 1872.

*To all whom it may concern:*

Be it known that I, WILLIAM SELLERS, of the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful combination of apparatus for the mechanical puddling of iron, of which invention the following is a specification:

In the practice of the art of puddling iron, as conducted prior to my invention, the process is carried on and effected in furnaces of various constructions, with adaptations of appliances equally varied. But the majority of these furnaces are of the ordinary reverberatory type, in which the metal is manipulated by means of iron rabblers or tools controlled and operated entirely by the workmen. Attempts, however, have been made to lessen the manual labor by mechanical devices for operating the rabbling-tools, leaving the workmen only to control and regulate the necessary changes of the direction in which they work; and in another class of furnaces these tools have been altogether dispensed with, their functions being fulfilled by the revolution of the furnace itself, and the workmen's labor being restricted to the regulation of the speed at which the puddling-furnace revolves, (this speed differing at different stages of the process,) and to the determination of the proper duration of the work. In the puddling operation as ordinarily conducted—that is, with a stationary furnace or puddling-vessel—the boiling operation is first completed, the iron is then worked into balls of suitable size by the workmen and removed, one ball after another, to the squeezer or hammer for further manipulation, and after all the balls have been removed from the furnace the cinder is tapped off. The operation is materially varied from this when performed in a rotating vessel, (as, for example, such as that described in the patent granted to me March 5, 1872, and numbered 124,224,) from which, after the boiling operation is completed and the iron has “natured,” as it is technically termed, the cinder is tapped off, and the speed of the rotating vessel is increased so that the iron will be prevented from balling, and the small particles or lumps will be exposed to the action of the flame for the purpose of sweating or burning out impurities, such as sulphur or phosphorus. When this operation has been continued long enough,

which will be determined in view of the amount of impurities which it is desired to thus expel, the speed of the rotating vessel is slackened, so that the metal will fall into a mass and be rolled into a single ball, which may then be removed to the hammer or other subsequent operation. When puddled in a stationary furnace the iron is protected from the action of the air by the cinder, so that the character of the flame is not so important as it is in the rotating vessel, where the metal is exposed, and preferably so, to the action of the flame without any protection whatever.

In rotating puddling-vessels, however, it becomes most important to regulate the character of the flame by controlling its constituents so that the metal may be exposed to its action for purification without being wasted. This control, in the present state of the art, can be best exercised by the use of gaseous fuel, the relative proportions of its constituents (air and gas) being regulated by valves; but the requisite intensity of flame cannot be obtained if the constituents of the flame are brought to the place of combustion at the ordinary temperature of the atmosphere. In order, therefore, to produce the requisite intensity of flame and at the same time control the relative proportions of the constituents thereof, it is necessary that these constituents shall be previously heated, either one or both, and to accomplish this I use, preferably, the system of heat restoration or regeneration, described in my patent of even date herewith for such regenerative apparatus. If, however, the gas should be brought to the place of combustion at the temperature, or nearly so, at which it left the gas-producer, and the air which supports the combustion should alone be heated by the waste products from the puddling-vessel, a very effective heat can be obtained. The adaptation of the different systems for restoring heat now in use, and of the different rotary puddling-machines to each other, is sufficiently exemplified in the drawing and description herein, which comprise provisions for all the requirements of such adaptation, leaving only such simple matters to be determined by the constructor of the combined apparatus as are within ordinary skill.

I wish it to be explicitly understood, however, that my present invention, while contem-



plating the use of different rotating puddling-vessels and different regenerative apparatus, does not contemplate, nor do I desire it to include any regenerative apparatus except such as use gaseous fuel only, with the necessary provisions for generating the gas and delivering it to the point at which it is combined with the air and consumed.

It is the object of my invention to improve the art of mechanical puddling, and to this end my invention consists in the combination of a rotating puddling-vessel and a heat restoring or regenerative apparatus, substantially such as above described, and by means of this combination I have attained the following advantages: First, I am enabled to utilize to any desirable extent that capacity of the rotary pudler for maintaining the iron in such a state of division as is utterly impracticable in a stationary puddling-vessel. Second, I am enabled to maintain the iron in this state of division without wasting it, which would be impracticable except with such a regenerative apparatus. Third, by maintaining the iron in this state of division and exposing it to a properly regulated flame, I am enabled to deprive it of impurities, such as sulphur and phosphorus, which could not be expelled except under these two co-operating conditions. Fourth, by this combination of apparatus I am enabled to produce from a given material a quality of iron superior to what could be produced from the same material by a regenerative apparatus and a stationary furnace, or by a rotating puddling-vessel without such regenerative apparatus.

In the accompanying drawing, which makes part of this specification, Figure 1 is a sectional side view of a heat-regenerating apparatus combined with a rotary puddling-machine, and illustrating the operation of my invention in the best form which I have used, and in what I deem the best form for attaining all the advantages of my improvement. Fig. 2 is a plan of the puddling-machine, and of the flues of the regenerative apparatus. Fig. 3 is an elevation of the parts shown in Fig. 2. Fig. 4 is a transverse section at the line *cd* of Fig. 1. Fig. 5 is a sectional plan at the line *ef* of Fig. 4. Fig. 6 is a vertical section at the line *gh* of Fig. 5. Fig. 7 is a vertical section at the line *ik* of Fig. 5.

The details of the construction and operation of the regenerative apparatus will be found fully set forth and described in Letters Patent of the United States for improvement in regenerative furnaces, issued to me of even date herewith, and I therefore deem it unnecessary to describe in this patent more than the

following particulars to enable those skilled in the art to which my invention pertains to combine and use the two elements of my invention.

The revolving puddling-vessel A is preferably constructed, mounted, and operated as described in my first-mentioned Letters Patent No. 124,224. The currents of air and gas are brought, respectively, through flues F and G from their heating-chambers A' and B', Fig. 4, to the point S, at which they unite and burst into flame, and the products of combustion pass downward into the regenerative apparatus through the flues T T, as described in my above-mentioned patent of same date herewith for improvements in regenerator-furnaces. In the patent No. 124,224 the axis of vibration of the frame which carries the puddling-vessel is the pintle *h*, which is so located with reference to the flues S and T that when the puddling-vessel is in the position shown in Fig. 2 the mouth of the vessel shall inclose the openings of these flues. The same location will be seen by reference to Figs. 1 and 2 of the accompanying drawing, so that the flame which issues from the flue S will pass around the interior of the puddling-vessel A, and the products of combustion will pass through the flue T, in the direction of the arrows, to the regenerative apparatus. (See Fig. 1.) The connection between the puddling-vessel A and the flues S and T, so as to permit the revolution of the puddling-vessel while the escape of flame shall be prevented, is made by the flat ring R, which surrounds the openings of the flues. The surface of this ring is made sufficiently broad to correspond with the surface of the open end of the vessel A, so that when the vessel is brought up to the ring these broad surfaces, without being in actual contact, will be so close together as to prevent the escape of flame between them. The back of the ring R is so secured to the casing of the flue as to prevent the escape of the air or gas on that side.

Having thus described the nature and object of my invention, what I claim as new, and desire to secure by Letters Patent, as an improvement in the art of mechanical puddling, is—

The combination of a heat-restorer or regenerative apparatus, substantially such as described, and a rotating puddling-vessel.

In testimony whereof I have hereunto subscribed my name.

WM. SELLERS.

Witnesses:

JOE I. PEYTON,  
BALTIS DE LONG.