

(No Model.)

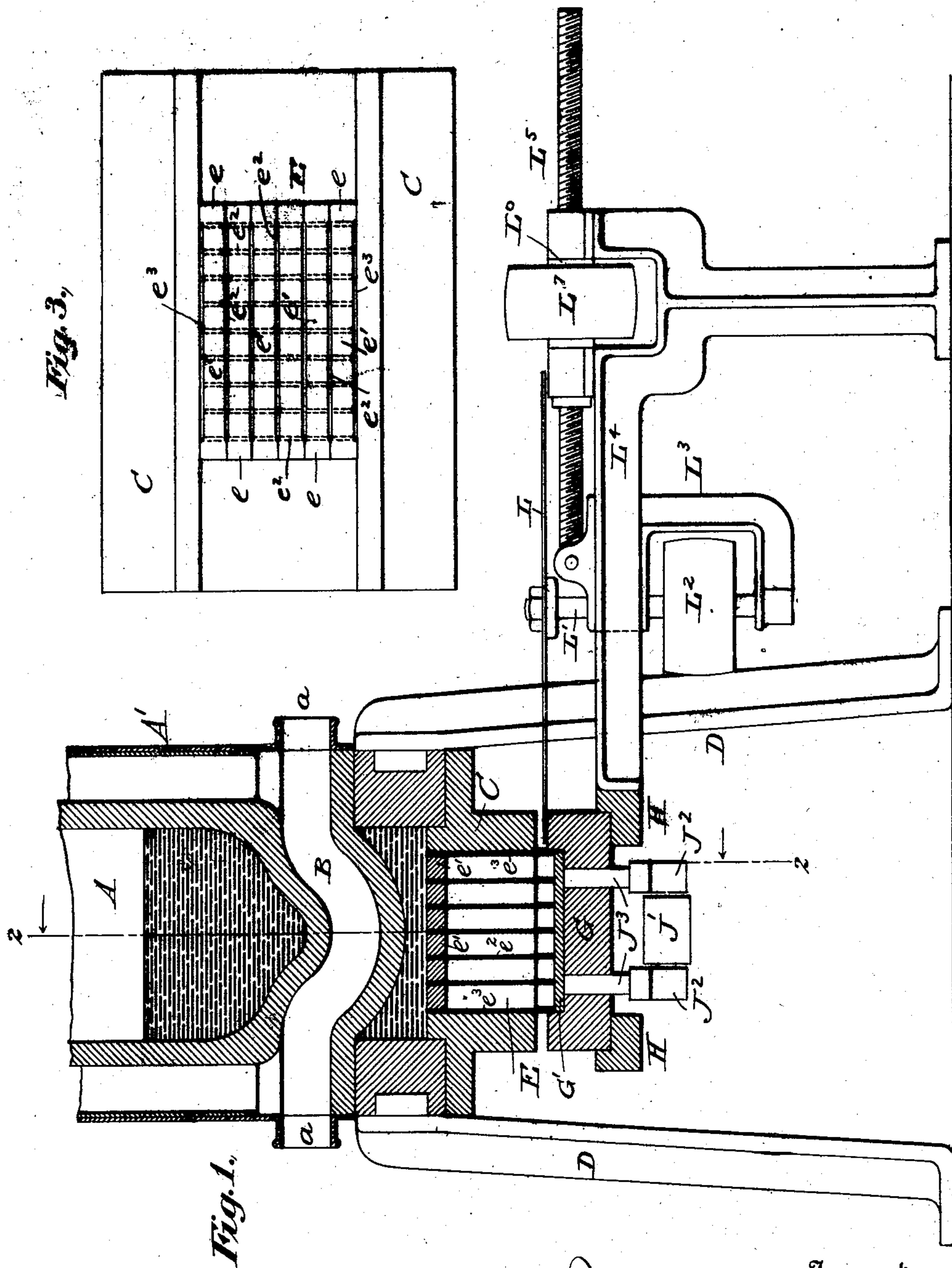
2 Sheets—Sheet 1.

J. M. PENDLETON.

METHOD OF AND APPARATUS FOR FORMING GRIDS OR PLATES FOR  
SECONDARY BATTERIES.

No. 516,337.

Patented Mar. 13, 1894.



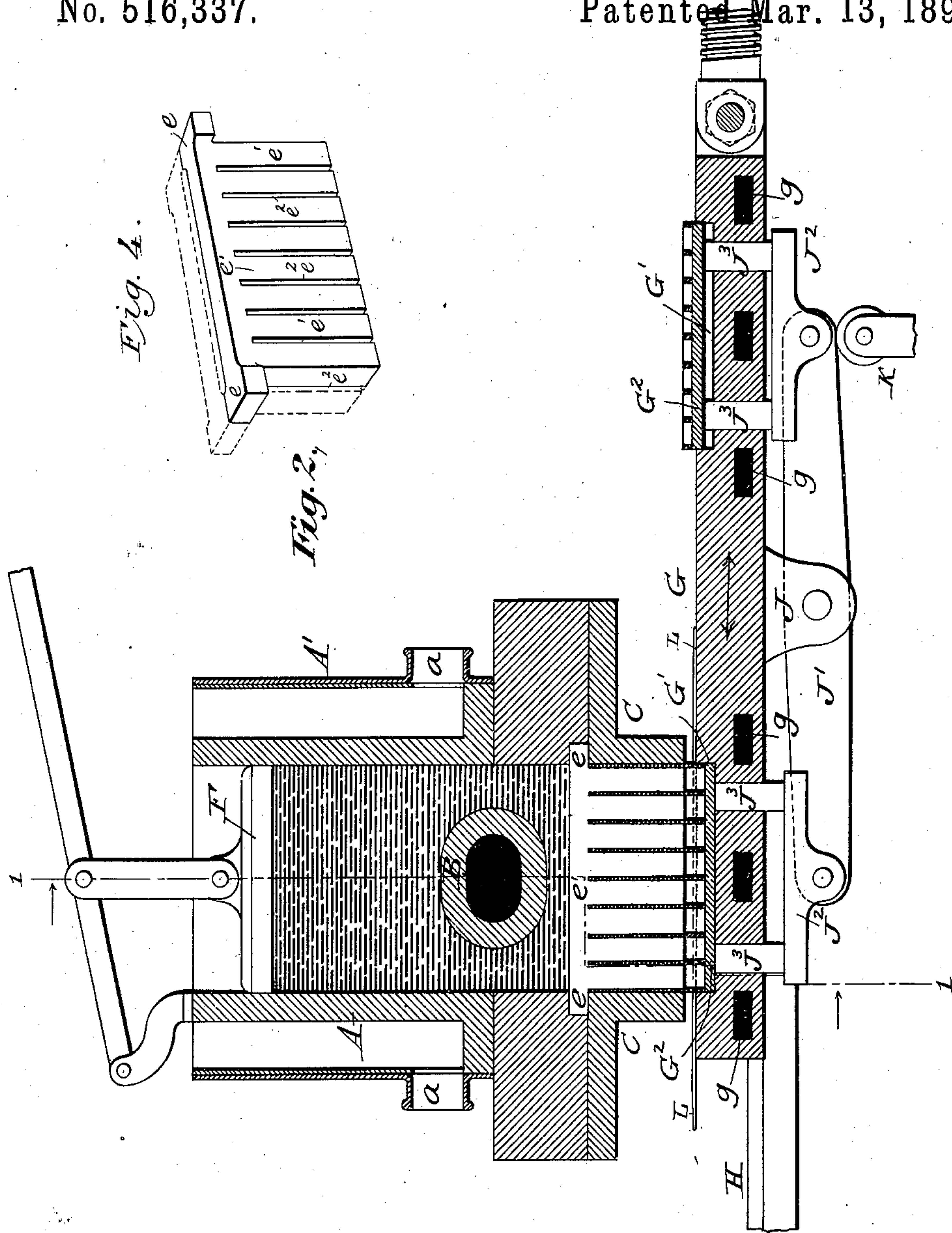
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Riddell, Davidson & Wright

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# UNITED STATES PATENT OFFICE.

JOHN M. PENDLETON, OF NEW BRIGHTON, NEW YORK.

METHOD OF AND APPARATUS FOR FORMING GRIDS OR PLATES FOR SECONDARY BATTERIES.

SPECIFICATION forming part of Letters Patent No. 516,337, dated March 13, 1894.

Application filed March 2, 1891. Serial No. 383,368. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN M. PENDLETON, a citizen of the United States, residing at New Brighton, county of Richmond, State of New York, have invented certain new and useful Improvements in Methods of and Apparatus for Forming Grids or Plates for Secondary Batteries, of which the following is a specification.

10 In carrying out my invention I form plates or grids for secondary batteries by forcing molten metal such as lead, into and through a die and then cut a plate from the projecting end of the cellular mass thus formed. I preferably arrange at the delivery end of the die a carriage having two receptacles adapted to alternately receive the end of the cellular mass as it emerges from the die. When the molten metal has been forced through the die and into a recess or receptacle in the carriage, a cutter severs the plate from the mass and means are automatically brought into operation to raise the plate from the recess and permit its ready removal.

25 In the accompanying drawings—Figure 1 is a vertical central section of an apparatus embodying my invention: on the line 1, 1 of Fig. 2. Fig. 2 is a vertical central section on the line 2, 2, of Fig. 1. Fig. 3 is a plan view of the die, and Fig. 4 is a perspective view of one of the core bars.

The molten metal receptacle A has an open bottom across which is arranged a passage way B for a gas-flame or other heating medium. 35 The molten metal receptacle is connected with the die-block casing C arranged below it, and may be supported by standards D. I have shown the receptacle A inclosed by a jacket A' having entrance and exit ports a. The die E may be of any suitable construction adapted to form a cellular mass or block from which battery plates or grids may be severed. As shown it is constructed with upper cross-bars e adapted to rest on the top of the casing C on opposite sides of its central opening and with downwardly projecting core-bars e'. The core-bars are all separated from each other and from the inner walls of the die casing by narrow spaces e<sup>2</sup> and the cross-bars e are separated by spaces e<sup>3</sup> from the casing on opposite sides. By this construction

molten metal will first enter the narrow channels between the cross pieces at the top and between the end pieces and the die casing, and will be forced downwardly into both the longitudinal and transverse spaces between the core-bars.

When the molten metal is forced into and through the die by a plunger F, it will be molded into shape to form a cellular mass or block, and the lower end of the mass will emerge from the die as indicated in the drawings. This projecting end of the block will be solidified and hardened sufficiently to retain its form. Beneath the mouth of the die 65 is mounted a carriage G adapted to be moved back and forth on the rails H. The carriage is formed with openings g through which air, water or other cooling agent may circulate. At each end of the carriage is formed a recess or receptacle G' similar in size and shape to the plate or grid to be formed. Each of these receptacles is provided with a false bottom G<sup>2</sup>. The carriage is formed with a downwardly projecting lug or hanger J in which 75 is pivoted a lever J'. At each end the lever J' carries a frame J<sup>2</sup> provided with upwardly projecting rods J<sup>3</sup> connected with or secured to the false bottoms. When one end of the lever J' is raised it raises the false bottom G<sup>2</sup> from the corresponding recess as indicated in Fig. 2, and the opposite end being depressed allows the false bottom to rest at the bottom of the recess. As the carriage is reciprocated the ends of the lever J' come in 85 contact with uprights K, K, carrying rollers, which effect the vibration of the lever to raise and lower the false bottoms G<sup>2</sup>. A sufficient space is left between the upper surface of the carriage and the delivery end of the die to permit a thin flat cutter to pass transversely through the block of semi-molten metal which projects from the die, rests upon the false bottom and fills a recess of the carriage. A reciprocating rotary or other cutter may be employed.

I have shown in the drawings a cutting disk L, mounted on a shaft L', carrying a driving pulley L<sup>2</sup>. The shaft is mounted in a bearing block or hanger L<sup>3</sup> adapted to move back and forth on horizontal guide rails L<sup>4</sup>. The means for reciprocating the hanger L<sup>3</sup> is



shown as consisting of a quick threaded screw  $L^5$  connected with the hanger and extending through a nut  $L^6$  which may be rotated by power applied to a pulley  $L^7$ . Any suitable means may be employed for rotating the pulley  $L^7$ .

When the cellular block is formed and its lower end rests in a recess of the carriage as shown in Fig. 1 the disk  $L$  is rotated and moved transversely across the top of the carriage, thus severing from the block a plate which remains in the recess. The carriage is then fed forward and the end of lever  $J'$  coming in contact with the upright  $K$  lifts the false bottom  $G^2$  which carries the plate to the surface of the carriage. The plate may then be readily removed. In the act of raising the false bottom carrying the grid, the false bottom connected with the other end of the lever is lowered and is in position to receive the metal from the die from which another grid is coming. The operation may be repeated and grids rapidly formed.

I claim as my invention—

1. The combination of a die, a carriage at the end of the die constructed to receive the end of a mass of metal projecting from the die and to hold the same in a fixed position, a cutter at the end of the die, and means for moving the cutter transversely between the die and the carriage.

2. The combination of a receptacle for molten metal, a die fixed at an opening in said receptacle and provided with core-bars, a cutter arranged adjacent to the die, and

means for moving the cutter across the outer end of the die.

3. The combination of a receptacle for molten metal, a die fixed at an opening in said receptacle, a reciprocating carriage having a recess or receptacle provided with a false bottom, means for raising and lowering the false bottom, a cutter, and means for moving the cutter between the die and the carriage.

4. The combination of a receptacle for molten metal, a die fixed at an opening in said receptacle, a plunger for forcing molten metal through the die, a carriage constructed to receive the metal projecting from the die, a cutter, means for actuating the plunger, and means for moving the cutter between the die and the carriage.

5. The method herein described, which consists in forcing metal through a die and forming cells therein, and then cutting the metal projecting from the die, while in a semi-molten state, into plates.

6. The method herein described of producing battery plates, which consists in pushing molten metal through a die and forming cells therein, and then cutting transversely through the projecting end of the metal to sever a plate therefrom.

In testimony whereof I have hereunto subscribed my name.

JOHN M. PENDLETON.

Witnesses:

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