

No. 711,332.

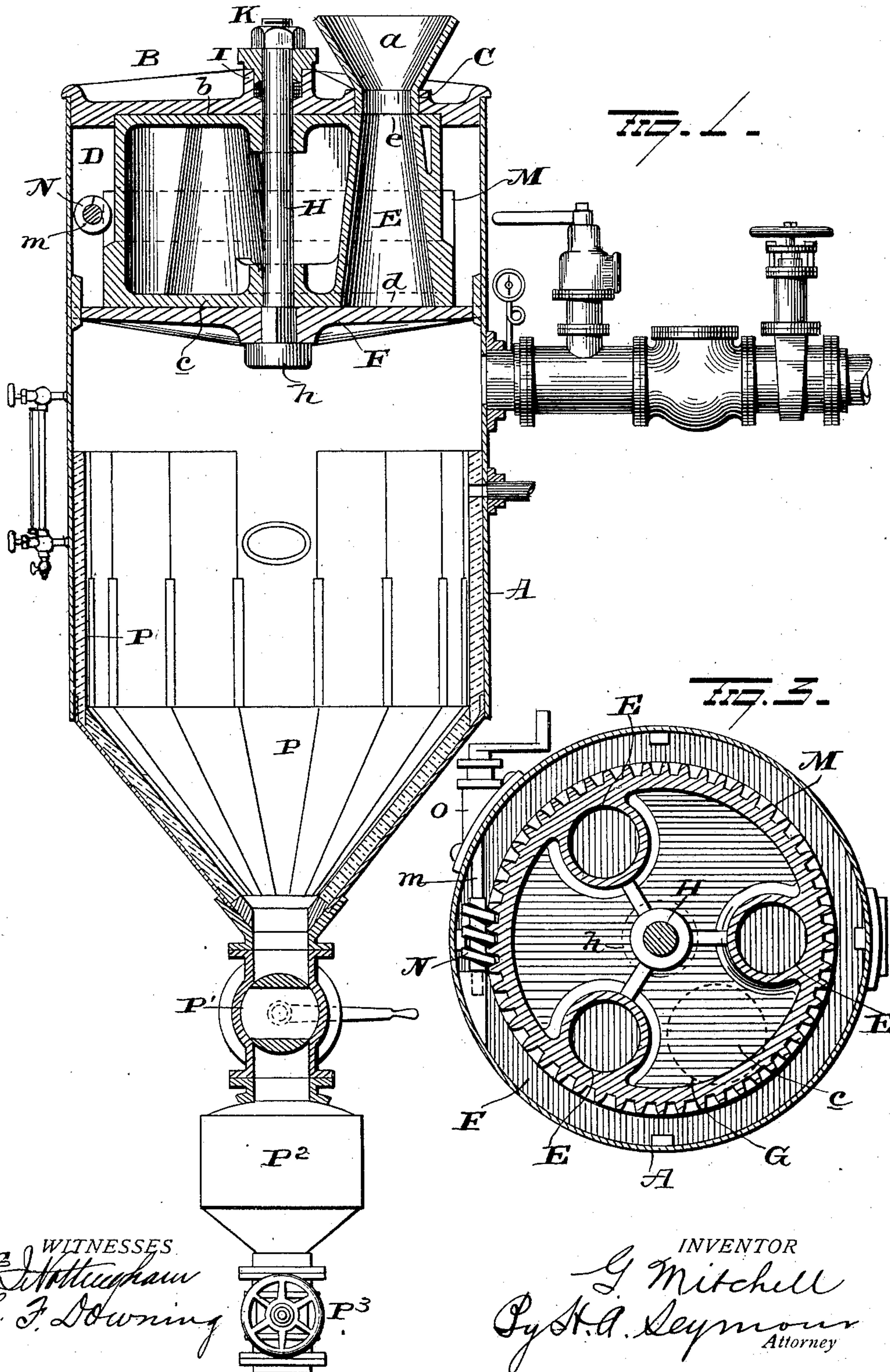
Patented Oct. 14, 1902.

G. MITCHELL.  
SLAG STEAM GENERATOR.

(Application filed June 10, 1902.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES  
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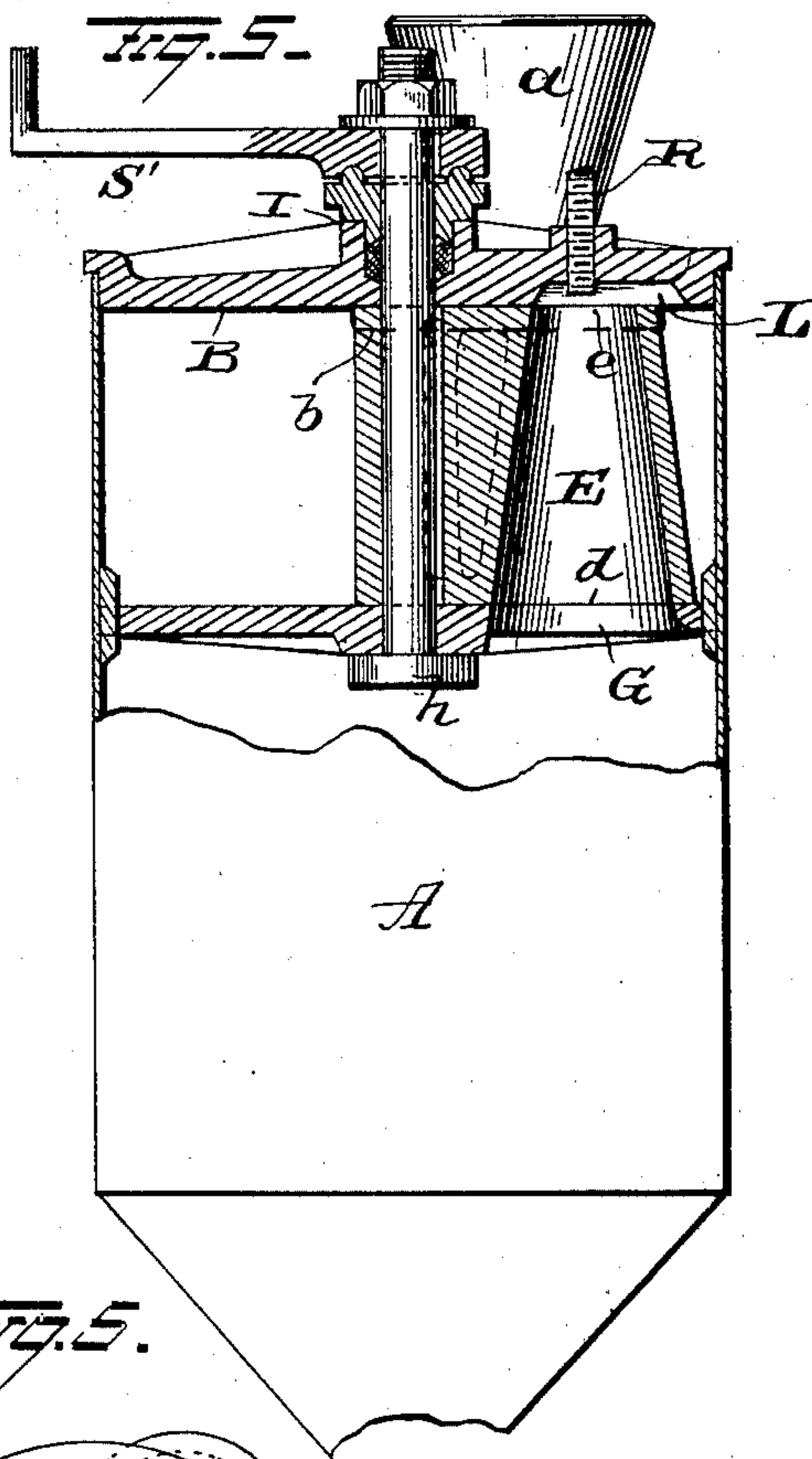
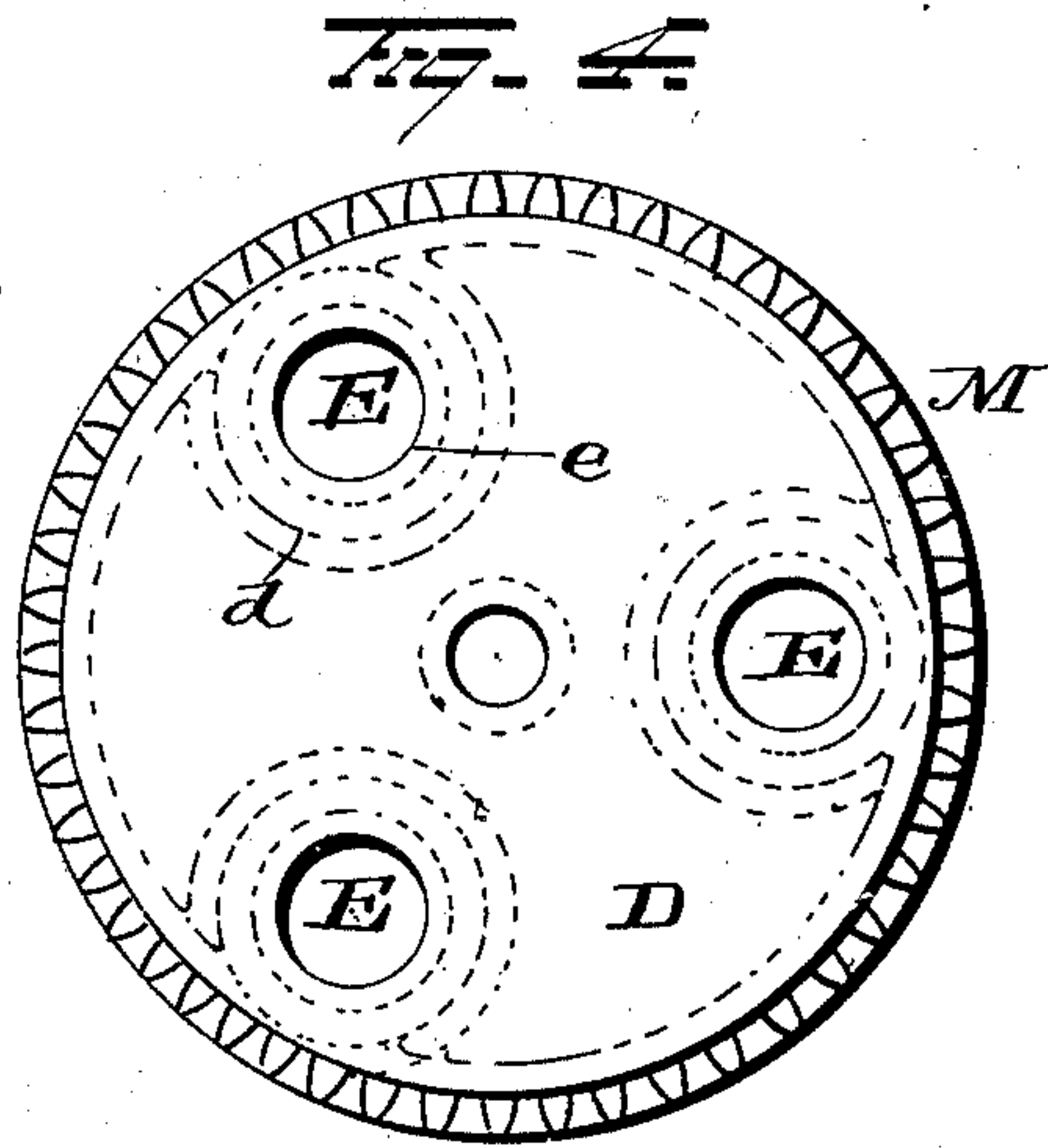
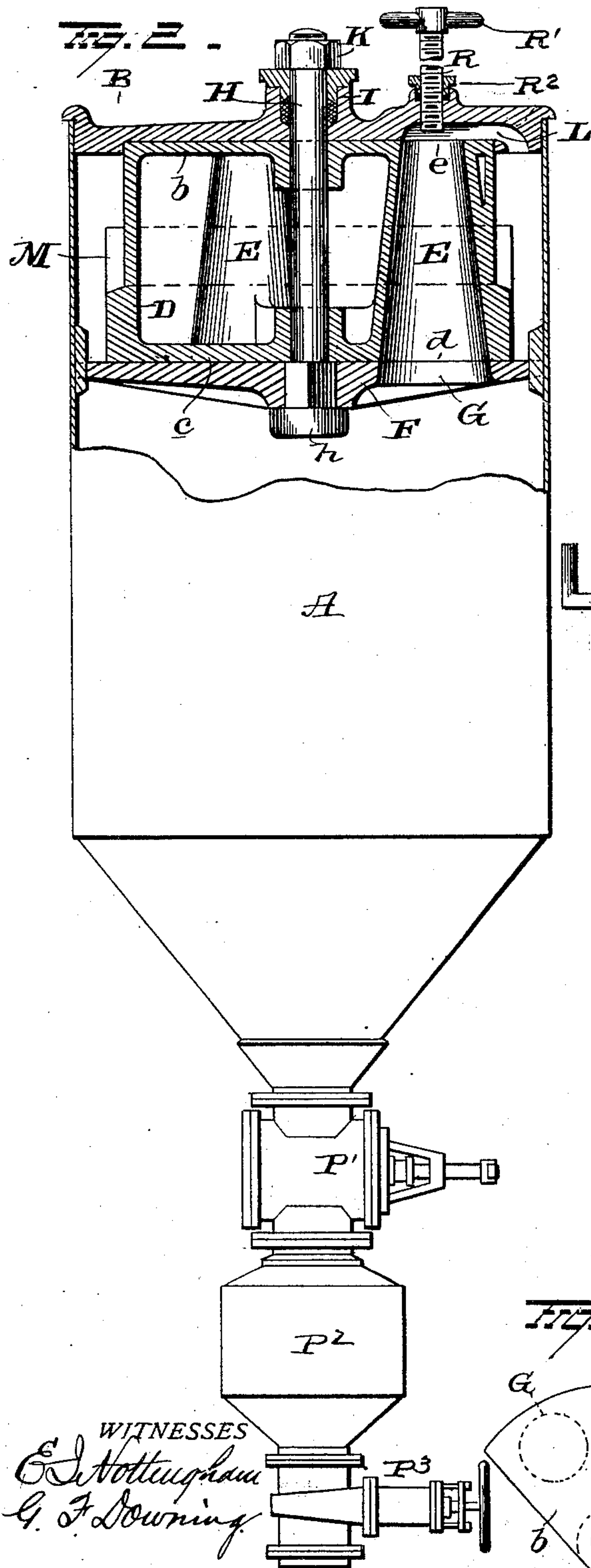
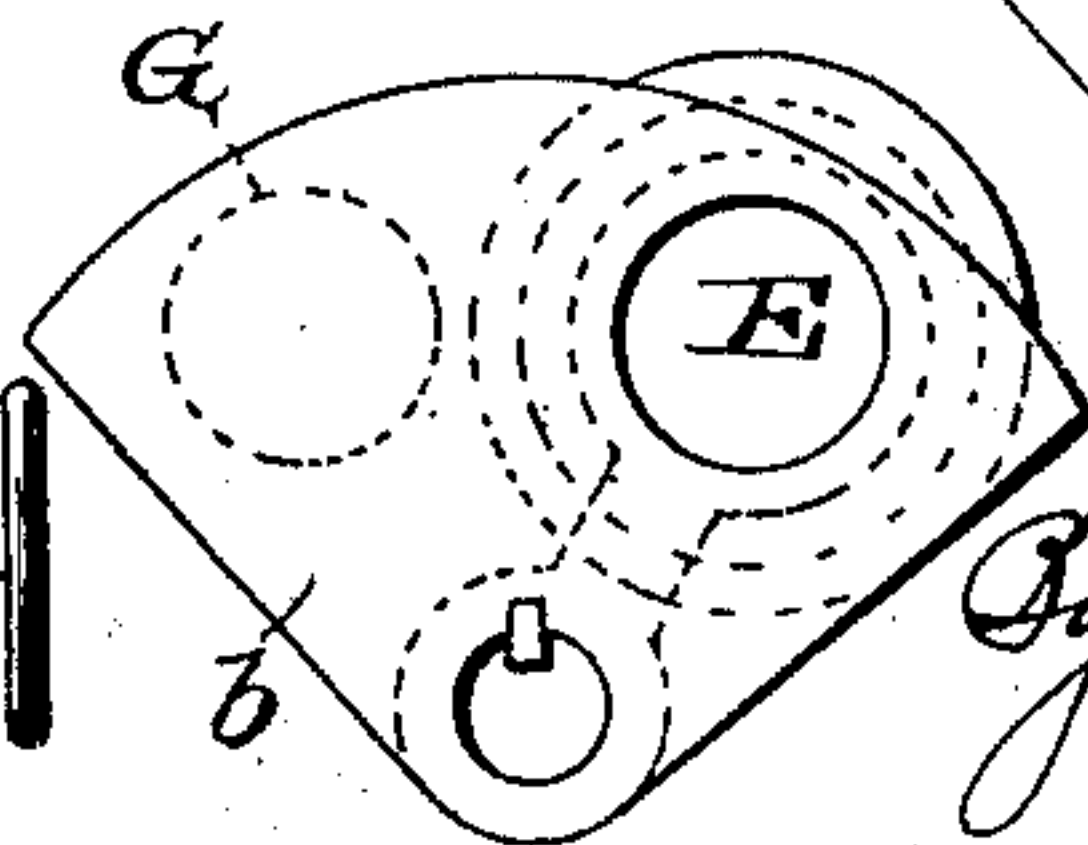


Fig. 5.



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# UNITED STATES PATENT OFFICE.

GEORGE MITCHELL, OF NACO, ARIZONA TERRITORY.

## SLAG STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 711,332, dated October 14, 1902.

Application filed June 10, 1902. Serial No. 111,069. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE MITCHELL, a resident of Naco, in the county of Cochise and Territory of Arizona, have invented certain new and useful Improvements in Slag Steam-Generators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it ap-  
10 pertains to make and use the same.

My invention relates to an improvement in slag steam-generators, and has for its object the production of an apparatus of such construction that the heat contained in slag may  
15 be conserved and utilized in generating a continuous supply of steam under pressure for use as a motive power or other purpose.

With this object in view my invention consists in an apparatus embodying certain features of construction and combinations of  
20 parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view, partly in vertical section and partly  
25 in side elevation, of my improved apparatus, one of the slag-chambers being shown in position for being charged. Fig. 2 is a similar view showing one of the slag-chambers in position for discharging its contents. Fig. 3  
30 is a plan view of the upper end of the apparatus with its head removed. Fig. 4 is a detached plan view of the slag-charging drum. Fig. 5 is a view, partly in vertical section, of a modification; and Fig. 6 is a detached plan  
35 view of the modified slag-charging receptacle.

A represents the shell of a steam-generator, the upper head B of which is made sufficiently strong for the purpose hereinafter explained. Head B is constructed with a feed-  
40 opening C, with which connects the lower end of a slag-charging funnel a.

D is a drum having formed therein two or more conical slag-chambers E, three such chambers being illustrated in the drawings.  
45 The upper and smaller ends of these slag-chambers are attached to the upper drum-head b, while their lower or larger ends are attached to the lower drum-head c. The lower head of drum D rests upon a supporting  
50 plate or disk F, which is constructed with a single opening G, which is of substantially the same diameter as each one of the dis-

charge-openings d in the lower head of the drum. The openings e in the upper head of the drum are each of substantially the same  
55 size as the feed-opening C in the upper end of the generator. Drum D is supported by a shaft H, the lower end of which has attached thereto a head or disk h, which en-  
60 engages the under side of the disk or plate F. Shaft H passes up through the center of the drum and through a stuffing-box I in the head B. The upper end of the shaft is screw-  
65 threaded and is provided with a nut K. The head B of the generator is constructed with a steam-chamber L on its under side at a point vertically above the discharge-opening  
70 G in the plate or disk F. The periphery of the drum is furnished with worm-teeth M, with which engages a worm N, the shaft m  
of which passes through a stuffing-box O in the shell and has a crank or gear-wheel se-  
cured to its outer end.

The lower portion of the generator-shell is made in the form of a cone, or it may be of  
75 any other desired shape, and is provided with removable lining-sections P. A valve P' is inserted in the bottom of the generator for regulating the discharge of granulated slag  
80 and water into the chamber P<sup>2</sup>. A valve P<sup>3</sup> governs the discharge of slag and water from chamber P<sup>2</sup>.

The operation of my improvement is as follows: The drum D is rotated by the worm-  
85 gearing, so that the upper open end e of one of the conical slag-chambers will register with the feed-opening C in the upper end of the steam-generator. When the drum is in this  
90 position, the other openings in the upper head of the drum will be covered and closed by the under side of head B, while one of the large discharge-openings d in the lower head of the  
95 drum will register with the opening G in the plate or disk F, while other discharge-openings d will be covered and closed by the plate or disk F. Heated slag is poured into the feed-opening C and is conducted into one of the conical slag-chambers E, filling the same.  
100 The drum is then rotated until another slag-chamber is made to register with the feed-opening and charged with heated slag. As the drum is rotated the lower ends of the slag-chambers are successively caused to register with the single discharge-opening G and per-



mit a charge of heated slag to fall into the body of water Q in the steam-generator and generate steam under pressure. The rotary slag-feeding drum operates as a rotary valve to successively uncover the feed-openings of the slag-chambers to admit charges of heated slag and to successively feed such charges by their gravity into the body of water in the generator; but at all times and under all conditions a steam-tight joint is maintained between the upper head B of the generator-shell and upper end of the drum and between the plate or disk F and lower end of the drum, so that there can be no escape of steam from the generator. Any wear between the ends of the drum and the head B and plate F may be readily compensated for by tightening the nut K, and thus steam-tight bearing-surfaces between such parts may be easily maintained.

In order to facilitate the discharge of slag from the conical chambers, a steam chamber or pocket L is provided on the under side of the head, the pocket being of such diameter that as one of the large openings in the lower end of the drum commences to move over the opening G in plate F steam will enter such pocket and exert a downward pressure on the top of the charge of slag, which pressure will be sufficient to counterbalance the upward pressure on the charge and permit the latter to feed by its gravity into the body of water in the generator. Should a charge stick in the chamber and refuse to feed, it may be readily forced out by means of a screw rod or plunger R, inserted through the head of the shell and provided with a hand wheel or lever R'. A suitable stuffing-box R<sup>2</sup> may encircle the rod or plunger to prevent the escape of steam. A charge of heated slag on being fed into the body of water is instantly granulated, with the result that the heat stored in the slag is quickly transferred to the water, which is converted into steam under pressure. The slag falls into the lower portion of the generator-shell, and after it has remained in the water a sufficient length of time to have parted with its heat the valve P' is opened and the accumulated slag is fed into the lower chamber P<sup>2</sup>. The valve P' is then closed and valve P<sup>3</sup> opened, which permits of the escape of the cooled slag from chamber P<sup>2</sup> into a car or any other suitable receptacle. A pipe S may be provided for conveying heated water from chamber P<sup>2</sup> to the feed-water tank, which water is supplied to the generator. The steam-generator may be supplied with a water-jacket for utilizing the heat radiated from its shell to heat the water in the water-jacket, and the water so heated may be conducted into the generator.

Fig. 5 shows a modification in which the rotary drum is provided with a single slag-chamber, and the shaft has attached at its upper end a crank S' for rotating the drum. It is evident that instead of using a crank for rotating the drum suitable gearing may be employed for that purpose.

My improvement is extremely simple in its construction, is not liable to become impaired in use, and is adapted to be easily operated, so as to utilize the heat contained in hot slag to generate and maintain a constant supply of steam under any desired pressure for motive power or other purposes. By constructing and arranging the slag-feeding drum so that its ends shall serve as rotary valves in connection with the head B and plate F the slag is prevented from crusting over or accumulating on any of the moving parts and interfering with their easy and ready manipulation. Again, by mounting the rotary slag-feeding drum in the manner described any wear of the parts may be readily compensated for by simply adjusting the nut on the shaft, and thus obviate the employment of springs or other device for such purpose.

I make no broad claim to an apparatus for feeding hot slag directly into a body of water under pressure in a closed receptacle, nor to such features of the apparatus as are illustrated and described and not specified in the claims.

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

1. In a slag steam-generator, the combination with a steam-generator provided with a feed-opening, and a plate or disk within the generator constructed with a discharge-opening, of a movable open-ended slag-chamber located within the generator and adapted to be moved so that its upper and lower ends will successively register with said feed and discharge openings, substantially as set forth.

2. The combination with a steam-generator provided with a slag-feed opening, and an adjustable head or disk within the generator provided with a slag-discharge opening, of an adjustable slag-drum located between said feed and discharge openings, and means for adjusting the inner head and slag-drum so as to compensate for wear, substantially as set forth.

3. In a slag steam-generator, the combination with the shell of the generator and a slag-chamber provided with open ends, located inside the generator, of plates or heads engaging the open ends of the slag-chamber, and provided with openings for charging and discharging the slag-chamber, and means for moving the slag-chamber so as to cause its open ends to successively register with said openings, substantially as set forth.

4. The combination with a steam-generator having a feed-opening in its head, and two or more cone-shape slag-chambers located within the generator and constructed to be moved simultaneously, of a supporting-shaft, and means for vertically adjusting the slag-chambers, substantially as set forth.

5. The combination with a steam-generator and laterally-movable slag-chamber located within the generator, of an upper head provided with a steam-chamber arranged to reg-



ister with the upper open end of the slag-chamber when in position to discharge its contents.

6. The combination with a steam-generator and laterally-movable slag-chamber located within the generator, of a plunger arranged to bear upon the upper portion of the charge and force it downwardly out of the chamber.

7. The combination with a steam-generator having a feed-opening at its upper end, a series of conical chambers and means for simultaneously rotating them, and a lower head provided with a discharge-opening, of an ad-

justable suspension-shaft for supporting the drum and lower head and adapted to vertically adjust the slag-chambers and lower head to compensate for wear, substantially as set forth. 15

In testimony whereof I have signed this specification in the presence of two subscribing witnesses. 20

GEORGE MITCHELL.

Witnesses:

A. W. BRIGHT,  
S. G. NOTTINGHAM.