

No. 719,520.

PATENTED FEB. 3, 1903.

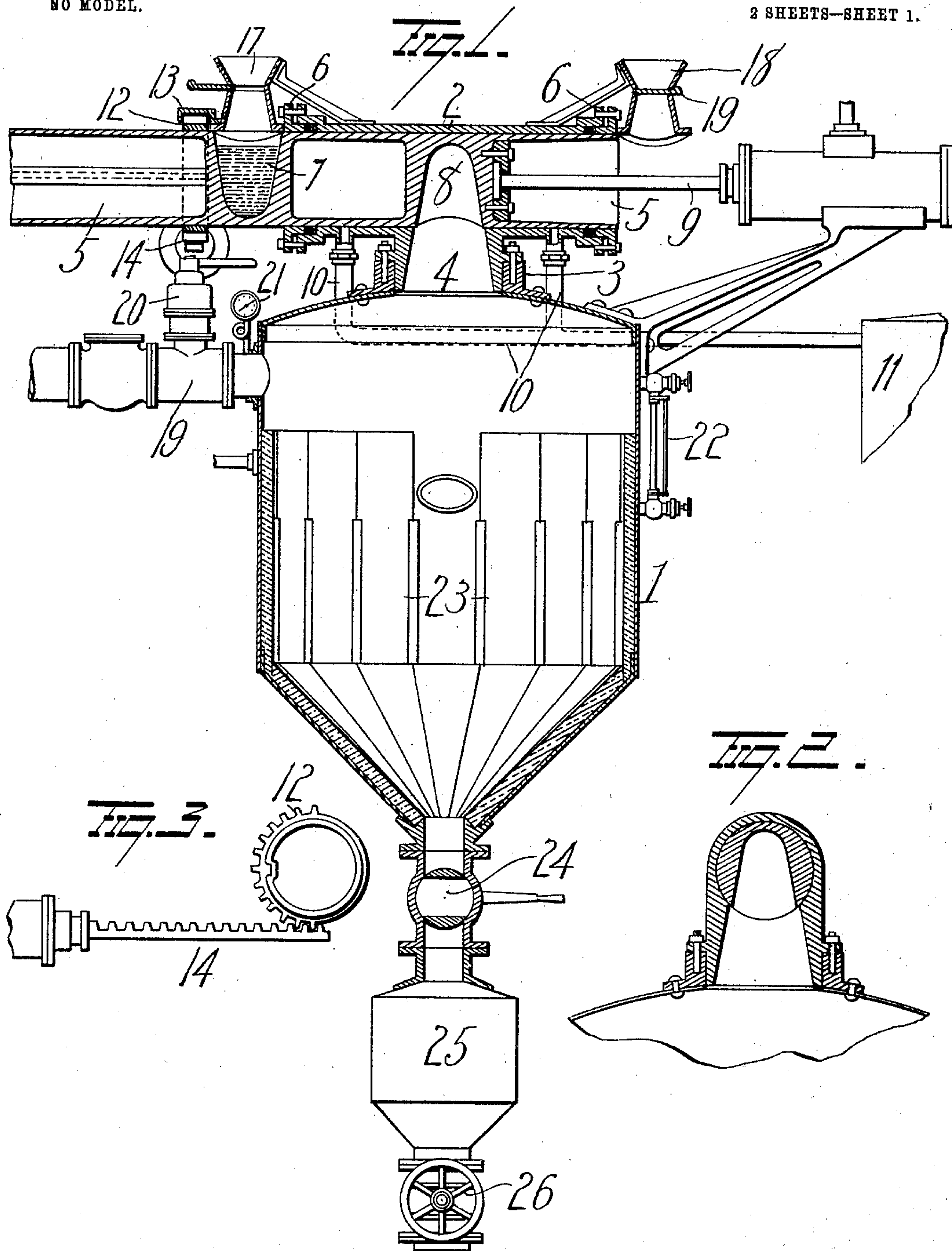
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APPARATUS FOR GENERATING STEAM FROM HOT SLAG.

APPLICATION FILED SEPT. 25, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES  
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*G. J. Downing*

INVENTOR  
*Henry A. Seymour*

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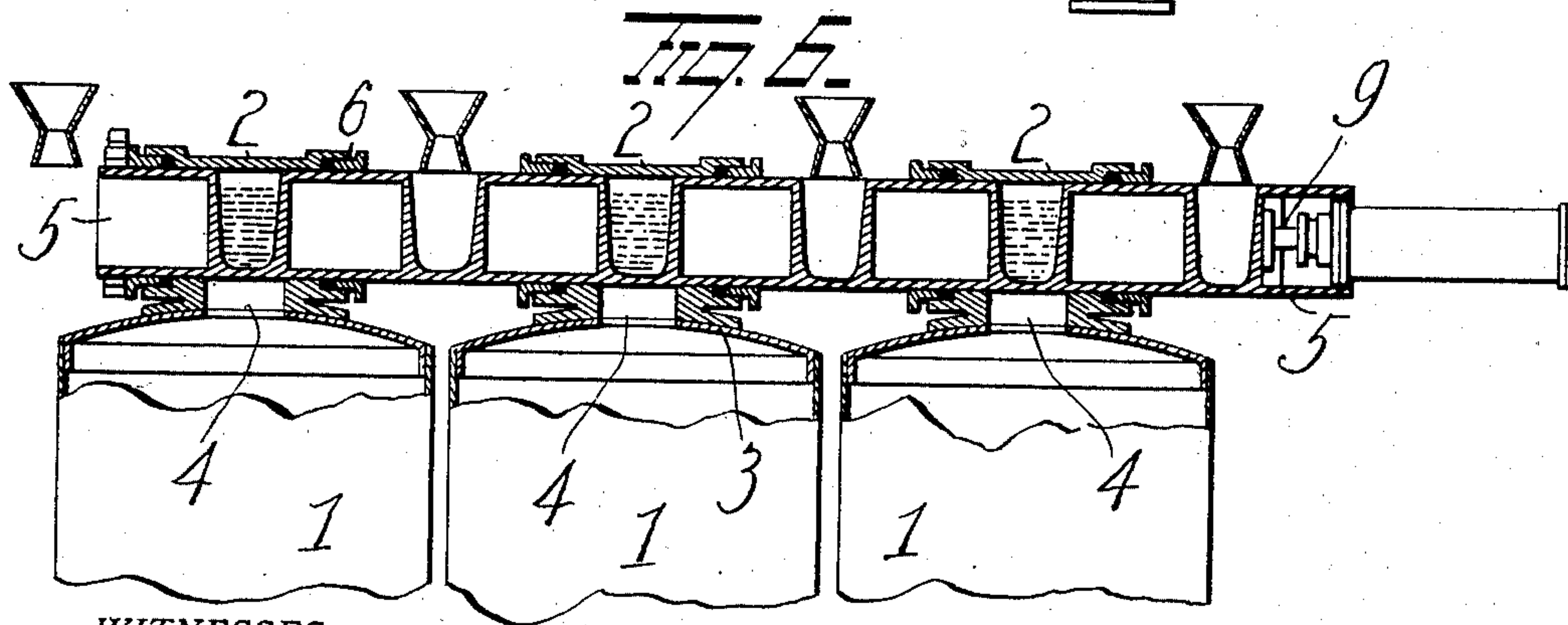
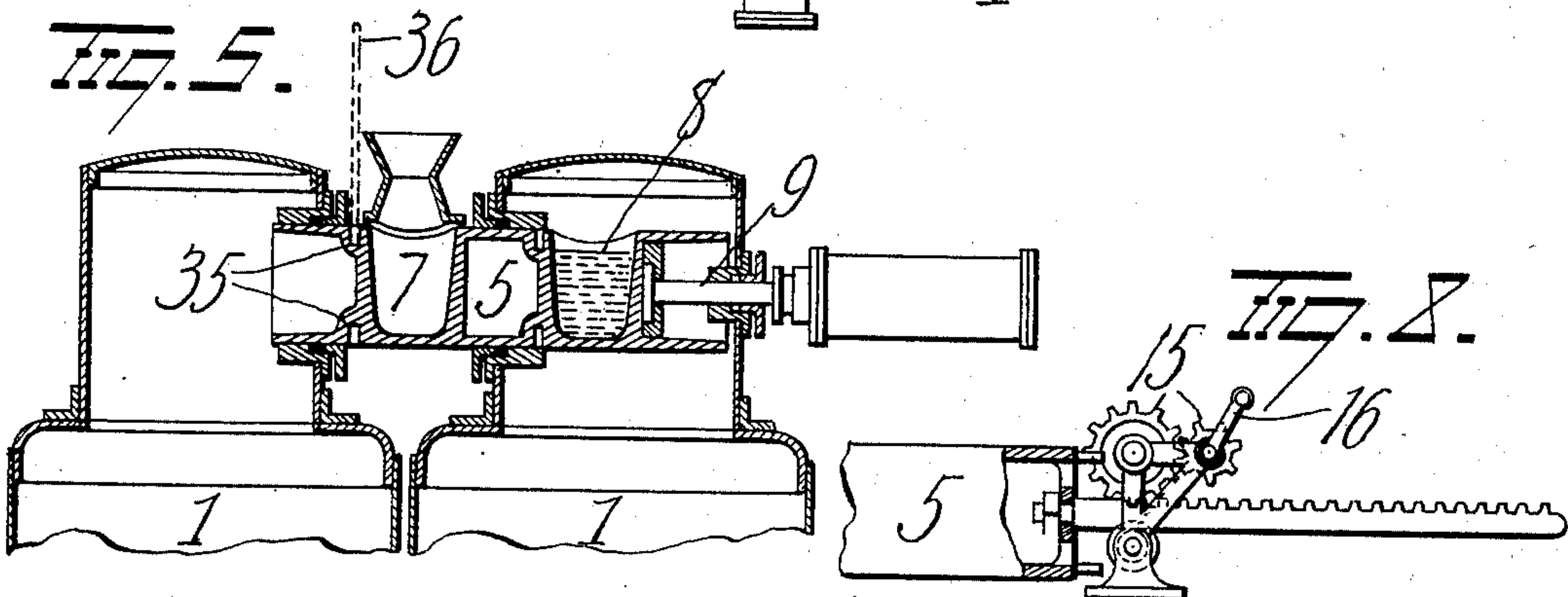
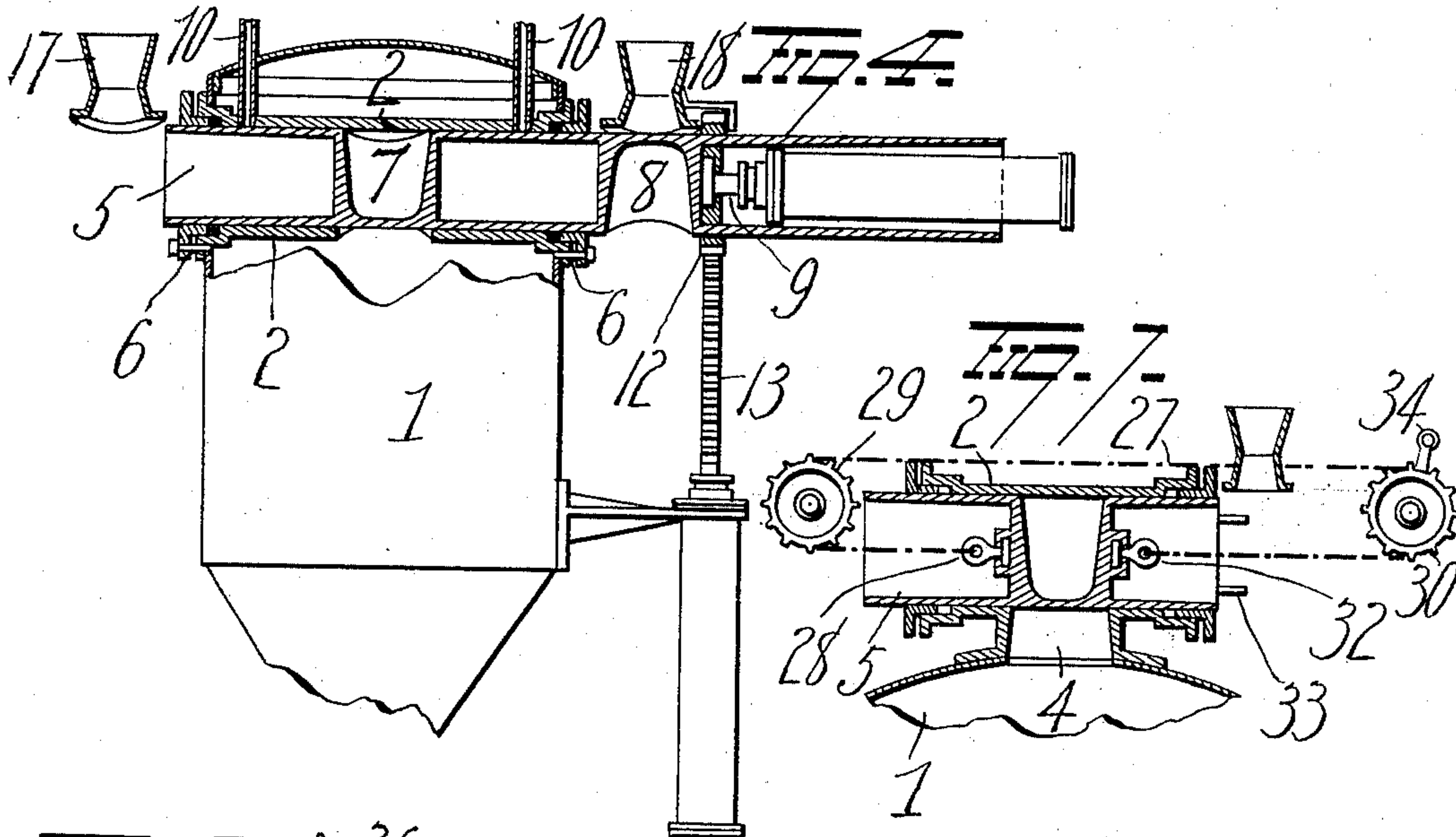
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# UNITED STATES PATENT OFFICE.

HENRY A. SEYMOUR, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR  
TO GEORGE MITCHELL, OF LOS ANGELES, CALIFORNIA.

## APPARATUS FOR GENERATING STEAM FROM HOT SLAG.

SPECIFICATION forming part of Letters Patent No. 719,520, dated February 3, 1903.

Application filed September 25, 1902. Serial No. 124,835. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY A. SEYMOUR, of Washington, in the District of Columbia, have invented certain new and useful Improvements in Apparatus for Generating Steam from Hot Slag; 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 apparatus for generating steam from hot slag, its object being to provide a simple and efficient construction of apparatus for feeding  
15 and discharging charges of hot slag into a body of water confined in a steam-generator.

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

In the accompanying drawings, Figure 1 is a view, partly in vertical section and partly in side elevation, of one embodiment of my improvement. Fig. 2 is a transverse section  
25 taken through one of the slag-receptacles when turned to discharge the slag therefrom. Fig. 3 is a detached view of the rack-bar and gear for rotating the plunger. Figs. 4, 5, 6, 7, and 8 are modifications.

30 1 is a steam-boiler having a cylinder 2 of any desired diameter secured to a saddle 3, surrounding a feed-opening 4 in the upper end of the boiler.

5 is a plunger, packed steam-tight by stuffing-boxes and glands 6 6, located at opposite  
35 ends of the cylinder.

7 and 8 represent slag-receptacles formed in the plunger or constructed separately and removably secured therein. The plunger  
40 may be reciprocated by the steam-actuated piston-rod 9 or by hand-actuated gearing or lever. Steam-pipes 10 communicate with cylinder 2 and serve to conduct the steam that is trapped into the slag-receptacles to  
45 the feed-water heater 11 or to any other desired point.

Upon plunger 5 is mounted a gear-wheel 12, which is connected thereto by a spline and groove and is retained against lateral  
50 movement by fingers or stops 13. The gear may be rotated by a steam-actuated rack-

bar 14 or may be rotated by hand by the gears 15 and crank 16, as indicated in Fig. 8.

At the opposite ends of the cylinder 2 are located the hoppers 17 and 18, each of which  
55 is furnished with a valve or gate 19 for controlling the feed of hot slag into the slag-receptacles 7 and 8. Hot slag may be supplied to the hoppers from a car running on a track-way between the hoppers. Steam-pipe 19  
60 conveys steam from the boiler to any desired point for use. This pipe is provided with a valve 20 and may be furnished with a steam-gage 21 and a check-valve. The boiler is furnished with the usual water-gage 22.  
65 Within the boiler are removably secured the sectional cast-iron linings 23 for protecting the shell against wear and injury. The lower end of the boiler is funnel-shaped and provided with a discharge-valve 24. A slag-re-  
70 ceptacle 25 connects with the discharge-opening of the boiler and is furnished with a discharge-valve 26.

The operation is as follows: A charge of hot slag is supplied from hopper 17 to slag-recep-  
75 tacle 7, and the plunger is moved to the right until slag-receptacle 7 registers with feed-opening 4 and slag-receptacle 8 with the hopper 18. A half-rotation is then imparted to the plunger, with the result that the charge of  
80 hot slag will be discharged into the body of water in the boiler, while at the same time the slag-receptacle 8 will be turned upright and into position to be filled from hopper 18. The plunger is then moved to the left, and the  
85 charge in slag-receptacle 8 is next dumped into the boiler. In this way one receptacle is being filled while the other is being dumped. Should the receptacles become clogged by the  
90 adherence of chilled slag to their walls or should they become unduly worn, they may be readily cleaned or renewed without disturbing the boiler. One great advantage of the apparatus is that it obviates the use of  
95 valve-seats and actuating mechanism inside of the boiler. The packing for the ends of the plunger serves to prevent the escape of steam and may be readily tightened and removed when necessary. After a charge of slag has  
100 been discharged into the boiler and the empty slag-receptacle is being withdrawn the steam that is trapped therein will escape through



either one of the steam-pipes 10 and be conveyed to a feed-water heater or other point for use. When a charge of hot slag is discharged into the body of water in the boiler, the hot or molten slag will be instantly granulated and quickly part with its heat, due to the direct contact of the water with the small particles of heated slag, with the result that the water is quickly transformed into steam.

Any desired pressure of steam may be generated and maintained by varying the size of the charges and the rate of discharging them into the boiler. The granulated slag that collects in the boiler may be discharged from time to time into the slag-receptacle 25, from which the slag is discharged into any suitable car or receptacle.

While I have shown and described one form of mechanism for reciprocating and rotating the plunger, it is evident that such mechanism may be widely varied. The plunger may be rotated by a sprocket-chain running on sprocket-wheels, or it may be rotated and reciprocated by hand-gearing or hand-levers, and hence I in no wise restrict myself to any particular arrangement of mechanism or devices for reciprocating or rotating the plunger.

Fig. 4 is a modification in which the cylinder 2 is located inside the upper end of the boiler. The steam-pipes 10 extend through the boiler and communicate with the ends of the cylinder inclosed therein.

Fig. 5 is another modification, showing the plunger 5 interposed between the upper ends of two steam-boilers or of two domes on the upper end of a single boiler. The plunger is provided with two series of sockets 35, which are arranged at any desired distance apart in the circumference of the plunger. By inserting a removable bar 36 in these sockets the plunger may be readily rotated by hand. The slag-receptacles 7 and 8 face in the same direction instead of in opposite directions, as shown in Fig. 1. Receptacle 8 is shown as being charged and ready for dumping. After its charge has been dumped the plunger is rotated back, so as to restore both receptacles to their upright position, and then receptacle 7 is charged and moved to the left into its boiler or dome and discharged therein. The object of this construction is to permit the slag-receptacles after the plunger has been rotated to discharge their contents to be restored to their upright position before the plunger is moved endwise in order to prevent any slag that may remain in the receptacles after they are dumped from dropping onto the cylinders in the passage of the receptacles through them. In this construction of apparatus the slag-receptacle 8 is represented as being charged with molten slag, while the receptacle 7 is empty and in position beneath the spout to be charged. Before charging receptacle 7 the plunger is rotated so as to discharge the slag from receptacle 8, and the plunger is then rotated so as to restore both receptacles to their upright

position, and then the receptacle 7 is charged with molten slag. The plunger is then moved toward the left, with the result that receptacle 7 is moved into the left-hand dome or boiler, while receptacle 8 is moved out of its dome or boiler and into position beneath the spout. Hence it will be seen that the slag-receptacles are always in an upright position while being moved through their cylinders, and therefore should any molten slag remain in the receptacle after it has been dumped it will be prevented from dropping onto the cylinder in the passage of the empty receptacle through it.

Fig. 6 is another modification, showing a single plunger provided with six slag-receptacles for supplying charges of hot slag to three boilers. In this construction of apparatus all the slag-receptacles face in the same direction, as in the construction shown in Fig. 5, and are discharged and operated in the same manner.

Fig. 7 represents a plunger provided with a single slag-receptacle and adapted to be operated by hand. A sprocket-chain 27 is connected by a swiveled joint 28 to one end of the plunger and passes over the sprocket-wheels 29 and 30, and its opposite end is connected by a swiveled joint 32 to the opposite end of the plunger. One end of the plunger is provided with any number of handles or spokes 33. The plunger is reciprocated for filling and feeding the slag-receptacles by turning the crank 34 in the desired direction, while it is rotated by turning the handles 33. Any other suitable device or mechanism may be employed for actuating the plunger.

Fig. 8 illustrates a modified arrangement of devices for reciprocating and rotating the plunger. To one end of the plunger 5 is swiveled one end of a rectangular rack-bar which reciprocates between the standards of a frame-supporting gearing and is thereby retained against rotary movement. The underside of the rack-bar rests and moves on a roller. The rack-bar is actuated by two gears 15. The large gear-wheel meshes with the teeth of the rack-bar and is driven by the small gear-wheel, which is manually operated by a crank-handle. The end of the plunger is provided with one or more handles, by means of which it is rotated, as in the construction shown in Fig. 7.

All of the various constructions shown and described obviate the use of steam-tight joints, valves, or operating mechanism inside of the boiler and provide sliding steam-tight joints, which are packed by devices located outside the boiler and adapted to be quickly adjusted, repaired, and removed. The steam-pressure in the boiler exerts an outward pressure in opposite directions on the plunger, and as such pressure is equal the plunger is balanced and can be easily operated.

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



1. The combination with a steam-generator, of a reciprocating and rotary plunger provided with a slag-receptacle and adapted to feed charges of hot slag into the generator and to discharge them into the body of water contained therein, substantially as set forth.

2. The combination with a steam-generator, of a reciprocating and rotary plunger provided with two or more slag-receptacles and adapted to feed charges of hot slag into the generator and discharge them into the body of water contained therein, substantially as set forth.

3. The combination with a steam-generator, and hoppers, one or more, of a plunger provided with one or more slag-receptacles, and suitable means for reciprocating and rotating the plunger, substantially as set forth.

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

HENRY A. SEYMOUR.

Witnesses:

GEO. F. DOWNING,  
S. G. NOTTINGHAM.