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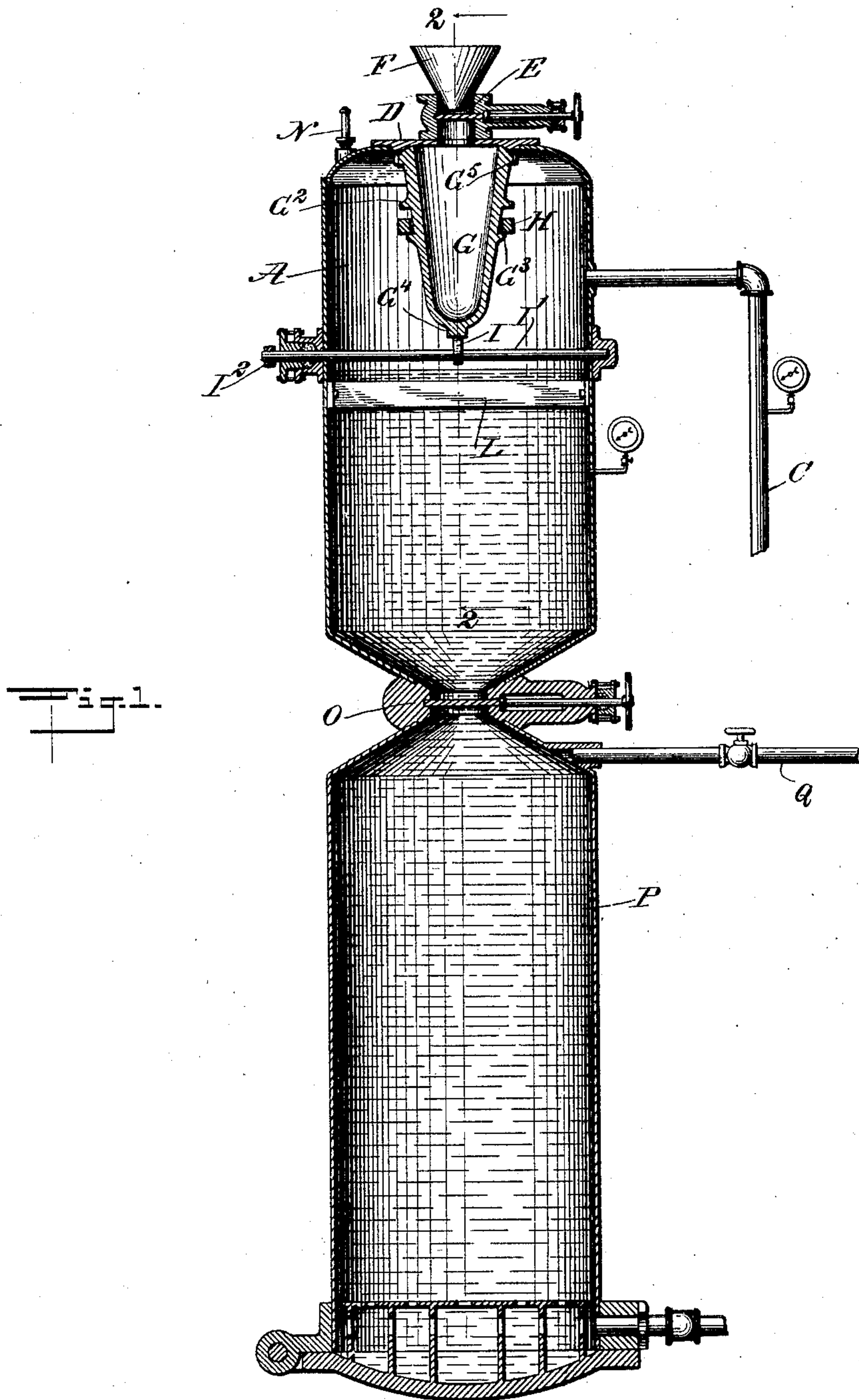
Patented Oct. 14, 1902.

L. D. COPELAND.
SLAG STEAM GENERATOR.

(Application filed Mar. 13, 1902.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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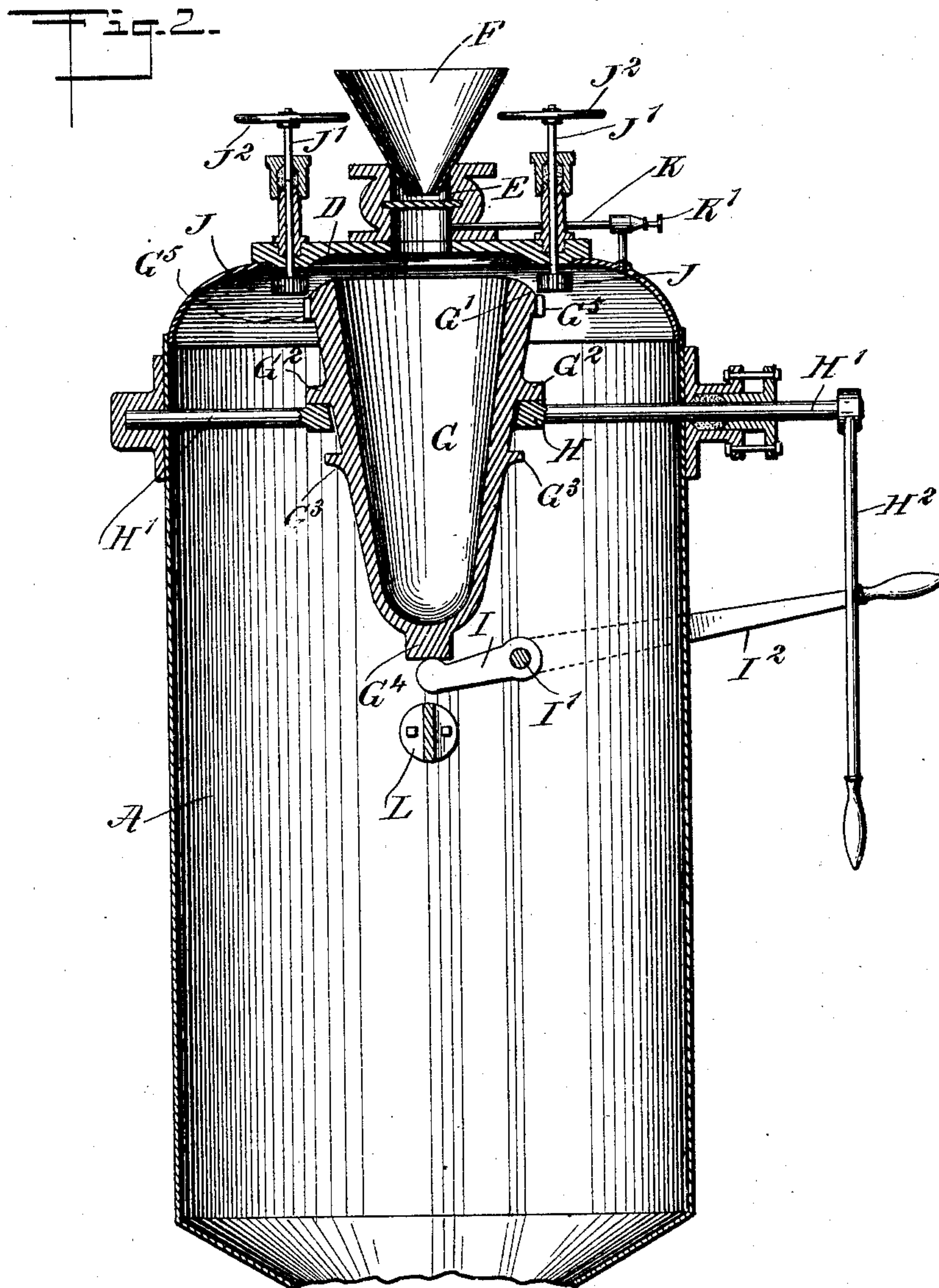
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UNITED STATES PATENT OFFICE.

LUCIUS DAY COPELAND, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF ONE-HALF TO GEORGE MITCHELL, OF LOS ANGELES, CALIFORNIA.

SLAG STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 711,290, dated October 14, 1902.

Application filed March 13, 1902. Serial No. 97,988. (No model.)

To all whom it may concern:

Be it known that I, LUCIUS DAY COPELAND, a citizen of the United States, and a resident of Los Angeles, in the county of Los Angeles and State of California, have invented a new and Improved Slag Steam-Generator, of which the following is a full, clear, and exact description.

The invention relates to steam-generators in which molten or hot slag is brought in contact with water.

The object of the invention is to provide a new and improved slag steam-generator which is simple and durable in construction and arranged to permit proper control of the operating parts by the workmen, to prevent escape of steam when recharging with molten slag, and to insure complete utilization of the units of heat in the molten or hot slag for converting the water into steam.

The invention consists of novel features and parts and combinations of the same, as will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in both views.

Figure 1 is a sectional side elevation of the improvement, and Fig. 2 is an enlarged transverse section of part of the same on the line 2 2 of Fig. 1.

From the upper end of the generator-casing A, containing the water to be converted into steam, leads the steam-pipe C for carrying off the generated steam to other machinery. On the top of the generator-casing A is arranged a seat D, into which opens centrally the charging device E, preferably in the form of a gate-valve, adapted to support a funnel F, into which the molten or hot slag is poured at the time of recharging the generator, as hereinafter more fully described.

The seat D is adapted to be engaged by the open upper end G' of the slag-receiving receptacle G, preferably cone or bell shaped, and constituting a valve for preventing the entrance of steam thereto while being charged, as hereinafter more fully described. The receptacle G is engaged by a ring H, having limited slid-

ing movement between sets of lugs G² and G³, as plainly indicated in the drawings. The ring H is provided with trunnions H', journaled in suitable bearings in the generator-casing A, one of the trunnions extending to the outside of the casing and carrying at its outer end a handle H² under the control of the operator for turning the trunnions, so as to tilt the ring H and with it the receiving-receptacle G to discharge the contents thereof into the casing, as hereinafter more fully described, or for turning the receptacle back again into a filling position, as indicated in Figs. 1 and 2.

The receiving-receptacle G is adapted to be lifted to its seat by an arm I, adapted to engage a projection G⁴ on the bottom or closed end of the said receptacle G. The arm I is secured on a shaft I', journaled in suitable bearings held on the generator-casing A, and on one outer end of the said shaft is secured a handle I² under the control of the operator for turning the shaft I' to swing the arm I into engagement with the projection G⁴ to lift the receiving-receptacle G and move its open end G' into engagement with the seat D. It is understood that the spaced sets of lugs G² G³ permit such movement of the receptacle on the ring H.

Now by the arrangement described the receiving-receptacle G is firmly seated on the seat D, so that when the gate-valve of the charging device is opened and molten or hot slag is poured into the funnel F then this slag passes into the receptacle G without danger of steam contained in the casing A escaping through the charging device.

In order to insure an exceedingly fine contact between the end G' and the seat D, I prefer to revolve the receiving-receptacle G at the time the latter is moved to its seat by the operator manipulating the handle I². For this purpose the end G' is provided with a gear-wheel G⁵, adapted to move in mesh with pinions J at the time the receiving-receptacle G is lifted to its seat. The pinions J are secured on the lower ends of shafts J', journaled in suitable bearings carried by the casing A, and on the outer ends of the said shafts J' are secured hand-wheels J² under the control of the operator for turning the

said shafts J' and pinions J around for revolving the receiving-receptacle G by the pinions turning the gear-wheel G⁵.

Now in case any molten slag becomes lodged between the open end G' and the seat D it is evident that when the receiving-receptacle is rotated at the time it moves to its seat then such particles are ground by the revolving receptacle, and the latter finally makes firm contact with its seat to prevent the escape of steam. After the receiving-receptacle G is filled with molten or hot slag then the gate-valve is closed, and in order to equalize the pressure in the receiving-receptacle and the inside of the generator A, I provide an equalizing-pipe K, leading from the casing A into the lower portion of the charging device, so as to equalize the pressure on the receiving-receptacle to permit of conveniently lowering the latter on moving the handle I² upward. Usually the weight of the charged receptacle G is sufficient to move the latter downward into the position shown in Fig. 2 as soon as the pressure is equalized.

The pipe K is provided with a suitable valve K' under the control of the operator for opening or closing the pipe.

Below the receiving-receptacle G is arranged a cross-bar L, secured to the generator-casing A, its object being to break the contents of the receiving-receptacle to avoid an explosion, which would result if dropped into the water unbroken at the time the receptacle is tilted by the operator moving the handle H², as previously explained. By this arrangement the molten or hot slag in the receptacle G is divided on leaving the receptacle, and falling in a divided state into the casing A causes a quick generation of steam.

The top of the generator-casing A is provided with a suitable safety-valve N, (see Fig. 1,) and the lower end of the said casing A is preferably connected by a gate-valve O with a vessel P, in which the slag and the water not converted into steam can accumulate. The water and accumulated slag are periodically removed from this vessel P at the time the gate-valve O is in a closed position by means of a hinged bottom R. This bottom R constitutes a valve for maintaining pressure while slag is being discharged from the generator into the said vessel. The water-supply pipe Q is preferably located near the top of the vessel P to fill the latter and the generator-casing with water at the time the valve O is open.

The apparatus herein described is an improvement in the apparatus disclosed in my application, Serial No. 78,321, filed October 11, 1901. In the latter no provision is made for feeding slag into the generator-casing and discharging it therefrom without permitting the steam to escape from the generator, while the apparatus disclosed herein is constructed and adapted to generate a continuous supply of steam under pressure, its construction being such that slag may be fed into the gener-

ator and discharged therefrom while the water therein is under pressure.

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

1. In a slag steam-generator, the combination with a shell or casing provided with valves for closing the same steam-tight while the slag is being fed therein and discharged therefrom, of a slag-receiving receptacle, and means for discharging the molten slag into water under pressure, in the generator, as set forth.

2. In a slag steam-generator, the combination with a shell or casing provided with valves for closing the same steam-tight while slag is being fed therein and discharged therefrom of a slag receiving and discharging receptacle located inside the shell or casing, and means for discharging the molten slag into water under pressure in the generator, as set forth.

3. In a slag steam-generator, the combination with a steam-generator provided with valves for maintaining a constant steam-pressure therein, of a slag receiving and discharging receptacle permanently located inside the generator, and means for charging molten slag into the receptacle and maintaining the steam-pressure within the generator, substantially as set forth.

4. A slag steam-generator having a generator-casing, a feeding device, a receiving-receptacle within the casing, adapted to receive the slag from the said feeding device and to be closed while being charged, and a pressure-equalizer between the casing and the receptacle, as set forth.

5. A slag steam-generator provided with a generator-casing having a seat, a receiving-receptacle within the casing, seated with its open end on the said seat, and a pressure-equalizer between the casing and the mouth of the said receiving-receptacle, as set forth.

6. A slag steam-generator provided with a generator-casing, a slag receiving and discharging receptacle within the said casing, means for emptying the receiving-receptacle of its contents, and a fixed bar extending below the receptacle and in the path of the slag discharged from the said receptacle, as set forth.

7. A slag steam-generator having a generator-casing, a slag-feed on the said casing, and a vertically-movable slag-receiving receptacle within the casing, open at one end, the open end being adapted to be seated on the generator-casing and to receive the slag from the feeding device, as set forth.

8. A slag steam-generator having a generator-casing, a slag-feed on the said casing, a pivotally-mounted slag-receiving receptacle within the casing, open at one end, and means for closing the open end of the receptacle steam-tight while slag is being fed therein, the said receptacle being adapted to move out of communication with the feeding de-

vice, and to be tilted for discharging its contents, as set forth.

9. A slag steam-generator comprising a generator-casing having a seat, a tilting and vertically-movable slag-receiving receptacle in the casing and adapted to be seated with its open end on the said seat, and a charging device on the generator at the said seat and adapted to deliver the molten or hot slag to the said receiving-receptacle, as set forth.

10. A slag steam-generator comprising a generator-casing having a seat, a slag-receiving receptacle movable in the casing and adapted to be seated with its open end on the said seat, a charging device on the generator at the said seat and adapted to deliver the molten or hot slag to the said receiving-receptacle, and means for raising the said receptacle to its seat, as set forth.

11. A slag steam-generator comprising a generator-casing having a seat, a slag-receiving receptacle movable in the casing and adapted to be seated with its open end on the said seat, a charging device on the generator at the said seat and adapted to deliver the molten or hot slag to the said receptacle, and means for rotating the said receptacle while moving onto its seat, as set forth.

12. A slag steam-generator comprising a generator-casing having a seat, a slag-receiving receptacle adapted to engage the said seat with its open end, a charging device on the generator at the said seat and adapted to deliver the molten or hot slag to the said receiving-receptacle, means for moving the said receptacle to its seat, and means for rotating it while moving to its seat, as set forth.

13. A slag steam-generator comprising a generator-casing having a seat, a slag-receiving receptacle movable in the casing and adapted to be seated with its open end on the said seat, a charging device on the generator at the said seat and adapted to deliver the molten or hot slag to the said receiving-receptacle, and a pressure-equalizing connection between the said casing and the lower portion of the said charging device, as set forth.

14. A slag steam-generator comprising a generator-casing having a seat, a slag-receiving receptacle movable in the casing and adapted to be seated with its open end on the said seat, a charging device on the generator at the said seat and adapted to deliver the molten or hot slag to the said receiving-receptacle, and means for supporting and tilting the receiving-receptacle when moving off its seat, as set forth.

15. A slag steam-generator comprising a generator-casing having a seat, a slag-receiving receptacle movable in the casing and adapted to be seated with its open end on the said seat, a charging device on the generator at the said seat and adapted to deliver the molten or hot slag to the said receiving-receptacle, means for supporting and tilting the receiving-receptacle when moving off its seat,

and a cross-bar held in the casing and adapted to divide or break up the slag when dumped from the receiving-receptacle, as set forth.

16. In a slag steam-generator, a generator-casing having a feed-opening, and a vertically-movable slag-receiving receptacle mounted in the generator-casing and adapted to seat on the generator-casing around the feed-opening thereof, as set forth.

17. In a slag steam-generator, a generator-casing having a feed-opening, a slag-receiving receptacle mounted in the casing below the feed-opening to turn and move vertically, means for raising the receptacle, and means for rotating said receptacle while being raised, as set forth.

18. In a slag steam-generator, a generator-casing having a feed-opening, a dumping slag-receiving receptacle mounted in the casing below the feed-opening thereof and means for closing the receptacle steam-tight while being charged, as set forth.

19. In a slag steam-generator, a generator-casing having a feed-opening, a slag-receiving receptacle mounted in the casing below the feed-opening thereof to tilt to dump the slag into the generator-casing, and means for closing the casing steam-tight while slag is being fed into the tilting slag-receptacle and discharged therefrom, as set forth.

20. In a slag steam-generator, a generator-casing, a valved charging device, a slag-receiving receptacle mounted in the generator-casing so as to be out of communication therewith when receiving the molten slag from the charging device, and means for emptying the contents of the receptacle into the generator-casing, as set forth.

21. In a slag steam-generator, a generator-casing, a valved charging device, a slag-receiving receptacle mounted in the casing to tilt and move vertically, means for raising the receptacle into contact with the inner face of the generator-casing to receive the charge of molten slag, and means for tilting the receptacle to discharge the slag into the generator-casing, as set forth.

22. The combination with a steam-generator, and means for intermittently discharging charges of hot slag directly into the water contained in the generator, and for discharging granulated slag therefrom, of means for closing the generator steam-tight while slag is being fed therein and discharged therefrom, whereby a constant supply of steam under pressure is maintained, as set forth.

23. The combination with a steam-generator, of two valves for controlling the feed of molten or heated slag into the generator, and two valves for controlling its discharge whereby a constant supply of steam may be maintained, substantially as set forth.

24. The combination with a steam-generator, and a slag-feeding receptacle located inside the generator, of means for conveying steam to the upper portion of said slag-feed-

ing receptacle after it has been charged with molten or heated slag, substantially as set forth.

25. The combination with a steam-generator, and a slag-feeding receptacle located within the generator and constructed with converging walls, of means for closing the receptacle against the entrance of steam while it is being charged with molten or heated slag, and means for discharging its contents into the water in the generator, substantially as set forth.

26. The combination with a steam-generator and an auxiliary chamber communicating with its lower end, of means for feeding heat-

ed slag directly into the water contained in the chamber, means for discharging granulated slag from the generator into the said chamber, and means for maintaining the pressure in the generator while the slag is being fed into and discharged from the same, substantially as set forth.

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

LUCIUS DAY COPELAND.

Witnesses:

EFFIE L. STEPHENSON,
BARTON DARLINGTON.