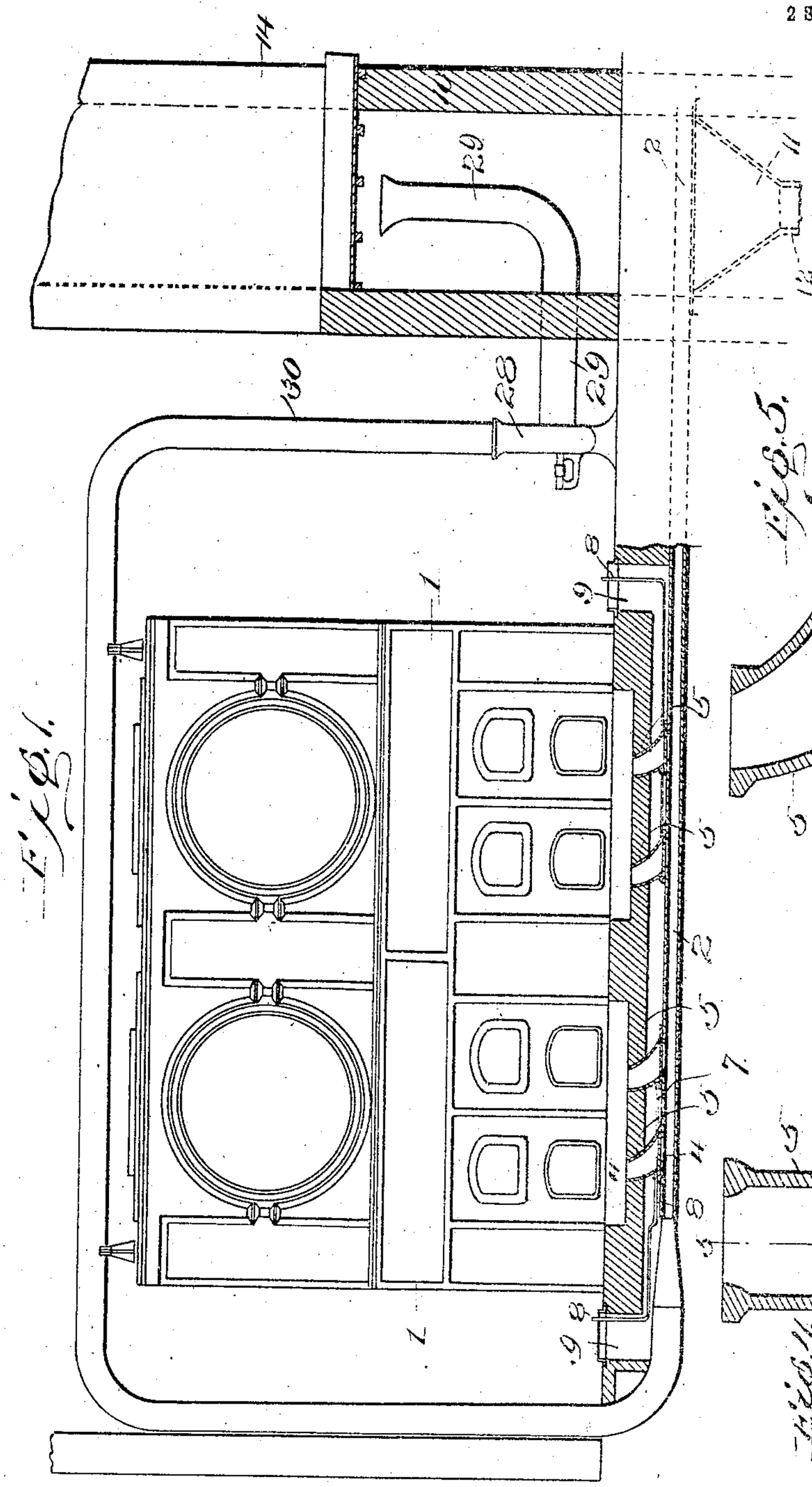
No. 867,068 PATENTED SEPT. 24, 1907.

W. McCLAVE.

PNEUMATIC DELIVERY SYSTEM.

APPLICATION FILED MAY 20, 1907.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 2.

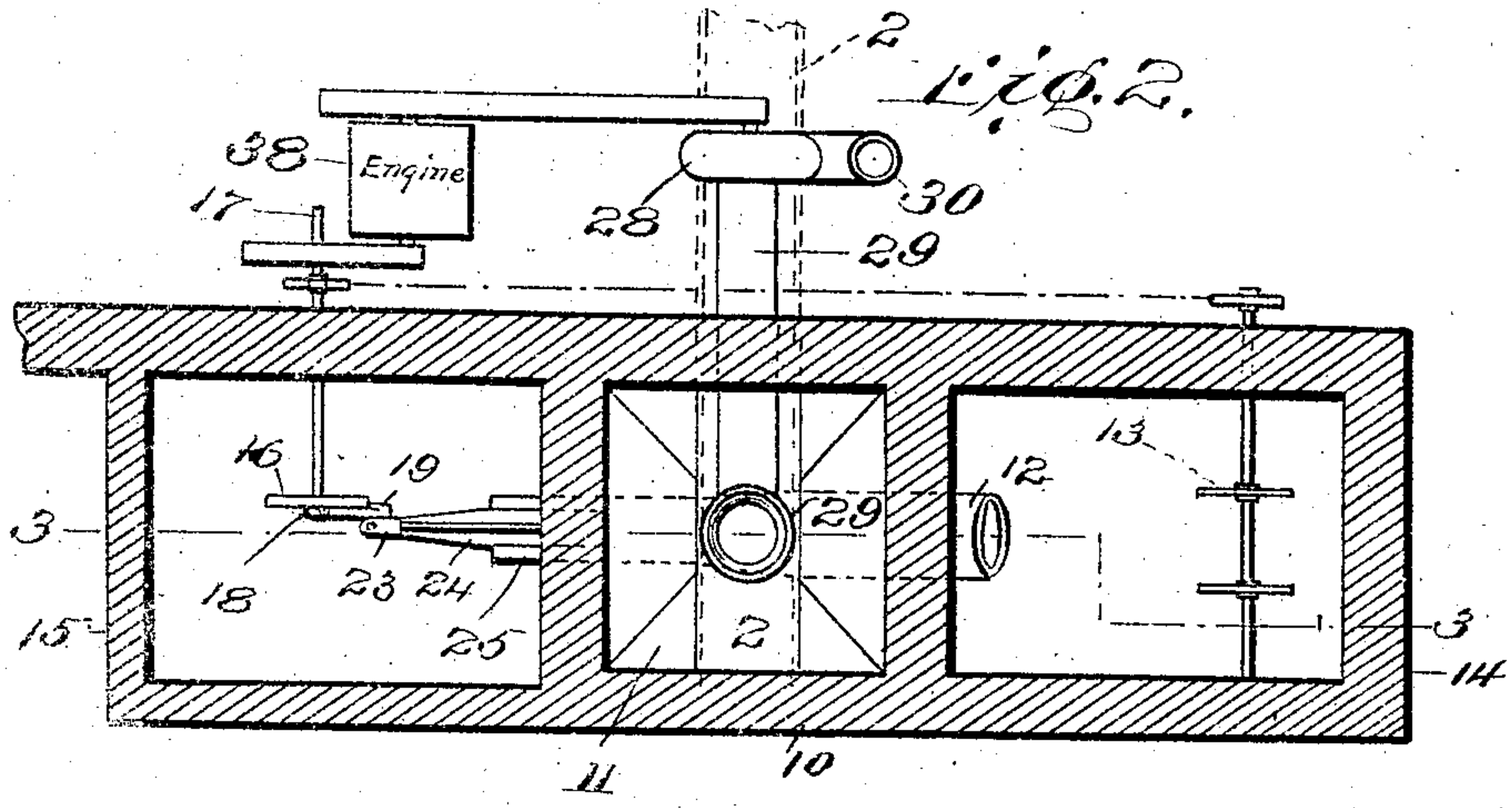
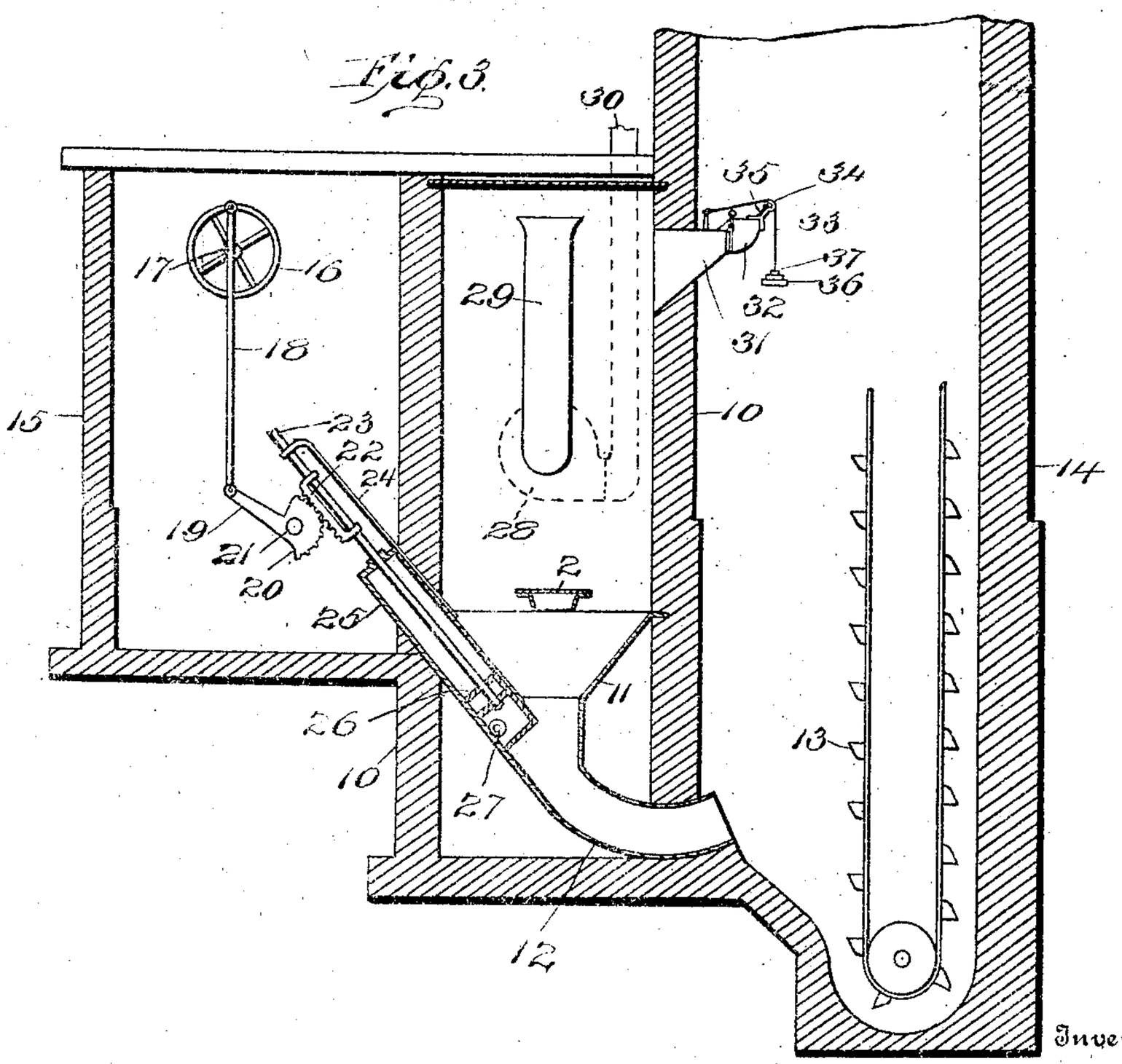


Fig. 3.



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UNITED STATES PATENT OFFICE.

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PNEUMATIC DELIVERY SYSTEM.

No. 867,068. Specification of Letters Patent. Patented Sept. 24, 1907.

Application filed May 20, 1907. Serial No. 374,718.

To all whom it may concern:

Be it known that I, WILLIAM McCLAVE, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented certain new and useful Improvements in Pneumatic Delivery Systems; 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 appertains to make and use the same.

This invention relates to improvements in pneumatic delivery systems, and more particularly to the type designed to be largely automatic in its operation.

One of the objects in view is the delivery of ashes, sawdust, or other light substances, from a point of intake to a point of discharge, by a continuous circuit of air, means being provided for maintaining the circuit practically sealed against the intake or discharge of air while admitting of the intake and discharge of the ashes or other light or fine substances.

With this and other objects in view, the invention comprises certain novel constructions, combinations and arrangements of parts as will be hereinafter fully described and claimed.

In the accompanying drawings:—Figure 1 is a view, partly in section and partly in side elevation, of a battery of boilers having connected with the ash pit thereof one embodiment of the present invention. Fig. 2 is a top plan view of the lower and contiguous mechanism for separating the ashes or other substances from the circulating medium. Fig. 3 is a vertical section taken on the plane indicated by line 3, 3 of Fig. 2. Fig. 4 is a transverse, vertical section on an enlarged scale, taken on the plane indicated by line 4, 4 of Fig. 1. Fig. 5 is a longitudinal, vertical section taken on the plane indicated by line 5, 5 of Fig. 4.

The present invention is particularly well adapted for use in the conveying of ashes, and is therefore illustrated as applied to the ash pits of a battery of boiler furnaces, which obviously may be of any size desired. It is, of course, at once obvious that the invention may readily be employed for the handling of sawdust, grain or other light or fine substances.

Arranged beneath the ash pits of the boiler furnaces 1, 1 or otherwise positioned in proximity thereto, is a conveyer tube 2, which is rectangular in transverse section, as clearly seen in Fig. 4.

Leading from the respective ash pits are intake tubes 5, 5 in any suitable number, the said intake tubes being preferably curved forwardly or in the direction of travel of the ashes being conveyed. At the lower end, or point of juncture of each of the tubes 5 with the conveyer tube 2 is arranged a slide valve 6, of any ordinary or preferred type, fitted in position to be slid across the end of the respective tube 5 for cutting off communication between said tube and the conveyer tube 2. The slide valves 6 of each ash pit are connected by a suitable connecting rod 7, and the outermost valve 6 is engaged by an operating rod 8, which extends to a point beyond the respective furnace 1, and extends upwardly through a slot 9 in position for being engaged for enabling manual or other manipulation of the slide valves 6. The slides 6 as will be obvious from the disclosure in Fig. 1, are all arranged to be opened by being slid in a direction opposite the direction of travel of the material being conveyed, and are, of course, designed to be closed by movement in the direction of the travel of such material.

The conveyer tube 2 extends from beneath the furnaces 1 into any suitable air-tight housing or casing 10, to a point above a hopper 11, arranged within said housing, the bottom of the tube 2, at the point of the hopper 11, being cut away for permitting the discharge of ashes into the hopper. The hopper 11 discharges into a tube 12, which curves downwardly and outwardly through one of the walls of the housing 10, and preferably for a very short distance curves upwardly. In front of the discharge end of the tube 12 is arranged a bucket or other suitable conveyer or elevator 13, which receives the discharge from the tube and lifts the same to a position for being delivered to a car, or otherwise disposed of, as desired. The conveyer 13 may be inclosed by a suitable housing 14, which is either open at its upper end or otherwise formed with openings communicating with the atmosphere.

At the opposite side of the housing or chamber 10, from the conveyer 13, is a chamber or housing of any suitable type 15, in which is arranged a crank wheel 16, carried by a driving shaft 17, extending through the wall of the housing 15 and suitably journaled. The wheel 16 may, of course, assume the form simply of a crank, if preferred, and the wrist pin of the said wheel is engaged by a link 18, which extends downwardly to and is pivotally connected with a lever arm 19 of a segmental rack 20. The rack 20 is pivotally mounted as at 21, and its teeth mesh with the teeth of a straight rack 22. The rack 22 is fixed to a piston rod 23, which rod is guided by a bracket 24 at one end, and at the opposite end extends through a stuffing-box into a tube 25. Within the tube 25 the rod 23 is provided with a head 26, of any preferred type. As illustrated, the head 26 consists of a hollow casing provided with an antifriction roller or rollers 27, engaging the lower portion of the wall of the tube 25, the parts being disposed in such relation to each other that the said head, which in operation constitutes a plunger or tamper,

reciprocates from a point with its lower end in line with the lower end of the tube 25, to a point with the upper end of the head, contiguous to the lower end of said tube. The tube 25 is preferably square, but may be cylindrical and extends to one side of the discharge end of the hopper 11, where it connects with tube 12, tube 12 having an extension of its two sides and bottom of suitable shape for that purpose, so that the plunger 26, in its reciprocation, first moves back to permit ashes to drop into the tube 12 and then moves downwardly and forwardly for forcing the ashes along the tube.

It is obvious, of course, that the rotation of the wheel 16 imparts a swinging movement to the lever 19, and oscillates the rack 20 in such manner as to reciprocate the plunger 26.

It is to be observed that the horizontal portion and the upwardly-extending outer end of the tube 12 prevent the ashes from falling by gravity out of the tube 12 and as the plunger 26 has but a very short travel, a charge of ashes will always be present in the tube 12 and will form a seal against the admission of air into the chamber 10, through said tube. The outer end of the tube may be curved upwardly as far as desired for accomplishing this result, and it is obvious, of course, that the tube may be differently shaped and differently placed from what is illustrated in Fig. 3, and the same results attained without in the least deviating from the spirit of the present invention.

Just outside the housing or chamber 10 is arranged a blower 28, which has its intake end communicating with a tube 29, which extends into the chamber 10 and curves upwardly therein and extends to a point contiguous to the ceiling of said chamber. Of course any suitable filter devices may be provided for the upper portion of the chamber 10, or for the upper end of the tube 29, for preventing the intake of floating particles of ashes. In practice, however, I find that comparatively good results may be secured by making the distance from the hopper 11 to the upper end of the tube 29 sufficiently great, without the employment of filtering devices, the greater amount of the ashes settling by weight into the hopper. The discharge end of the blower 28 communicates with a pipe 30, which extends in any suitable manner and by any suitable course back to the outer end of conveyer tube 2. I have illustrated the return pipe 30 as extending up and over the furnaces 1; but it is, of course, obvious that the said pipe may be positioned in any manner found most convenient.

A funnel or other suitably shaped outlet casing 31 extends from the chamber 10 to the housing 14, and has its outer end closed by a pivotally mounted relief valve 32, which is maintained normally in a closed position by means of a cord, wire or chain 33, suitably connected at its upper end and extending over a pulley 34, carried by a bracket 35, fixed to the valve 32, the lower end of the cord 33 being provided with any suitable stop or supporting device 36, designed to sustain weights 37—37 on said cord. Any number of weights 37 may be employed and their number increased or decreased for varying the resistance of the valve 32, in opening.

The circuit composed of the closed chamber 10, tube 29, blower 28, pipe 30, and conveyer tube 2, is maintained with substantially equal and constant pressure, any appreciable increase in pressure being relieved by the automatic opening of the valve 32.

It will be observed that while I have called the element 28 a blower, any device may be employed at the point indicated, which is capable of producing a draft at its intake, and a force pressure at its exhaust, or, in other words, any form of pump or fan which is capable of drawing in the air at one side and forcing it out at the other may be employed, so long as it is found efficient for creating, maintaining and accelerating circulation of air within the circulating system. It is to be observed that as air is drawn into the pipe 29 and forced out through pipe 30, the current of air passing along the conveyer tube 2 would tend to draw in air from the tubes or intakes 5 when the slide valves 6 are open, and the pressure within the system would thus be increased, but for the relief provided for in the valve 32. At the same time it is noted that the particular curve given to the intakes 5 obviates any tendency of the air passing along conveyer tube 2 from discharging into the ash pit against the influx of the ashes.

In operation, when it is desired to empty the ashes from an ash pit, the respective operating rod 8 is moved over in slot 9 to the desired extent for moving the slide 6 to an open or partly open condition, as desired, and the ashes fall by gravity into the conveyer tube 2. It is to be noted that the cross-sectional area of each of the inlet pipes 5 is less than the transverse area of the tube 2, and that each of said pipes 5 is disposed centrally of the tube 2, so that as the ashes drop into the conveyer tube 2, they assume the form of a frustum of a cone if the intakes are round and the frustum of a pyramid if the intakes are square or rectangular, and leave spaces at the sides so that the circulation of air is not stopped, but is permitted to continue in somewhat reduced areas, so that the entire bulk of the ashes discharged need not be picked up at once, but portions thereof may be carried from the sides of the ash heaps. I have heretofore endeavored to convey ashes in an open circuit, employing a cylindrical tube as a conveyer tube, and I find that even though the intake to such cylindrical tube is of less cross-sectional area than the tube, the said tube will nevertheless fill transversely and leave no space at either side, and therefore a relatively high pressure must be maintained, and the expense of maintaining such pressures has been found too excessive to justify the use of the open system with the cylindrical conveyer tube. On the other hand, the employment of the substantially rectangular tube 2 with the centrally disposed inlet pipes therefor, and the maintenance of the circuit in a practically sealed condition, obviates the necessity for such high pressure and materially reduces the expense of operation, it being obvious however that the return pipe 30 may be round, as it conveys air only, with possibly a small quantity of fine dust.

It is obvious, of course, that the relief valve 32 may be positioned at any point in the circuit which may be found desirable or convenient, and it is also obvious that the blower 28 may be positioned at any desirable point in the circuit.

As indicated in Fig. 2, the blower 28 and the shaft

17 may be driven from power supplied by a steam engine 38, or an electro motor or from any other suitable source of power.

What I claim is:—

1. In combination, a transversely rectangular conveyer tube, an intake for delivering material to said tube, a sealed circuit for said tube, means for maintaining circulation of air within said circuit and tube, and a sealed discharge for said conveyer tube.

2. In combination, a transversely rectangular relatively wide conveyer tube, an intake for said tube of less width than said tube and centrally located with respect to the width of said tube, a discharge for said tube, and means for maintaining a current of air within the tube.

3. In combination, a conveyer tube, an inlet tube communicating therewith, a discharge tube also communicating with the conveyer tube, said discharge tube being arranged to deliver only a portion of its contents at one time, so as to remain constantly sealed, sealed means of communication between the discharge end of said conveyer tube and the opposite end thereof, and means for maintaining a circuit in said conveyer tube and communicating means.

4. In combination, a conveyer tube provided with a discharge end, sealed means of communication between the discharge end of said tube and the opposite end thereof, means for maintaining circulation of air within said tube and said means of communication, and a curved inlet pipe communicating with said tube and being curved in the direction of travel of the current of air within the tube.

5. In combination, a conveyer tube provided with a discharge end, sealed means of communication between the discharge end of said tube and the opposite end thereof, means for maintaining circulation of air within said tube and said communicating means, an inlet pipe inclined at an angle with respect to the conveyer tube and communicating therewith, and a slide valve positioned at the point of juncture between the intake pipe and the conveyer tube, for controlling the communication between said pipe and tube, said valve being arranged to be opened by being moved in a direction opposite the direction of flow of air circulating within said tube.

6. In combination, a conveyer tube provided with a discharge end, sealed means of communication between the discharge end of said tube and the opposite end thereof, means for maintaining circulation of air within said tube and communicating means, an inlet communicating with said tube, and a relief valve arranged for governing the pressure of the circulating air.

7. In combination, a conveyer tube having an intake and a discharge, a sealed chamber surrounding the discharge, a tube leading from said sealed chamber, a blower having its intake communicating with said tube, and a pipe communicating with the discharge of said blower and extending to the said conveyer tube at a point beyond the intake thereof.

8. In combination, a conveyer tube having a discharge end, a sealed chamber surrounding said discharge end, means for delivering material from said sealed chamber without breaking the seal, means of communication between the said chamber and the end of the conveyer tube opposite the discharge end, means for maintaining a circulation of air in said tube and communicating means, an intake communicating with said tube intermediate the length thereof, and a variable pressure relief valve controlling discharge from said communicating means, for governing the pressure therein.

9. In combination, a conveyer tube, an inlet therefor, the conveyer tube being provided with a discharge end, a sealed chamber surrounding said discharge end, a discharge pipe extending from said sealed chamber and adapted to deliver material from the chamber only when the material is subjected to greater pressure than is maintained in the chamber, means of communication between the said sealed chamber and the end of the conveyer tube opposite the discharge end, means for maintaining a circulation of air in said conveyer tube and communicating means, and means for at times discharging material from the sealed chamber.

10. In combination, a sealed chamber, a sealed circulating system communicating with said chamber for delivering material thereto, a tube extending from said sealed chamber for facilitating delivery of material from the chamber, the tube being arranged to deliver material only when the material is subjected to pressure in excess of the pressure within the sealed chamber and in addition to the force of gravity, and a plunger, movable only part way of the length of said delivery tube, and means for reciprocating said plunger.

11. In combination, a sealed chamber, a substantially sealed circulating system communicating with said chamber for delivering material thereto, a delivery tube extending from said sealed chamber and arranged to remain at all times partly filled with material, and means for forcing material longitudinally of said delivery tube.

12. In combination, a sealed chamber, a substantially sealed circulating system communicating with said chamber for delivering material thereto, a delivery tube extending from said chamber, a plunger movable only part way of the length of said tube, and an operating rod extending from said plunger outside the wall of said sealed chamber, the said delivery tube being so positioned as not to deliver material by gravity or by the pressure maintained within the sealed chamber.

13. In combination a sealed chamber, a substantially sealed circulating system communicating with said chamber for delivering material thereto, a tube extending through the wall of the sealed chamber for delivering material therefrom, said delivery tube being downwardly inclined for a portion of its length and then turned from the downward incline sufficiently for preventing discharge by gravity or by the pressure contained within the sealed chamber, and means movable part way of the length of said tube for forcing material longitudinally of the same.

14. In combination, a sealed chamber, a substantially sealed circulating system communicating therewith for delivering material thereto, a hopper arranged for receiving the delivery from said system, a tube curving downwardly from said hopper and communicating therewith, and extending through the wall of said sealed chamber and curved to a position preventing delivery of material through said tube by gravity or the pressure maintained within the sealed chamber, a tube arranged at one side of and communicating with the discharge from the hopper, a plunger longitudinally movably mounted in said tube and adapted to be projected beyond the same for a suitable distance to push a portion of the conveyed material which falls from the discharge opening in the hopper into the sealing tube, and a corresponding portion of the material out of the discharge end of the sealing tube, and means for reciprocating said plunger.

15. In combination, a sealed chamber, a substantially sealed circulating system communicating therewith for delivering material thereto, a discharge pipe extending from said sealed chamber in position for preventing discharge of material under the action of gravity or by the pressure maintained in the sealed chamber, a plunger arranged to reciprocate in position for engaging material within the discharge pipe and forcing the same longitudinally thereof for discharging portions of the material from the outer end of said pipe, means for limiting the amount of movement of the plunger to less than the length of the pipe, and a conveyer for receiving the discharge from said pipe.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM. McCLAVE.

Witnesses:

LOUIS LA FONTAINE,

THOMAS E. JONS.