A. P. STRONG.

ASH CONVEYING SYSTEM.

APPLICATION FILED MAR. 26, 1917. RENEWED JAN. 2, 1920.

1,365,804. **Patented Jan. 18, 1921.**

2 SHEETS—SHEET 1.

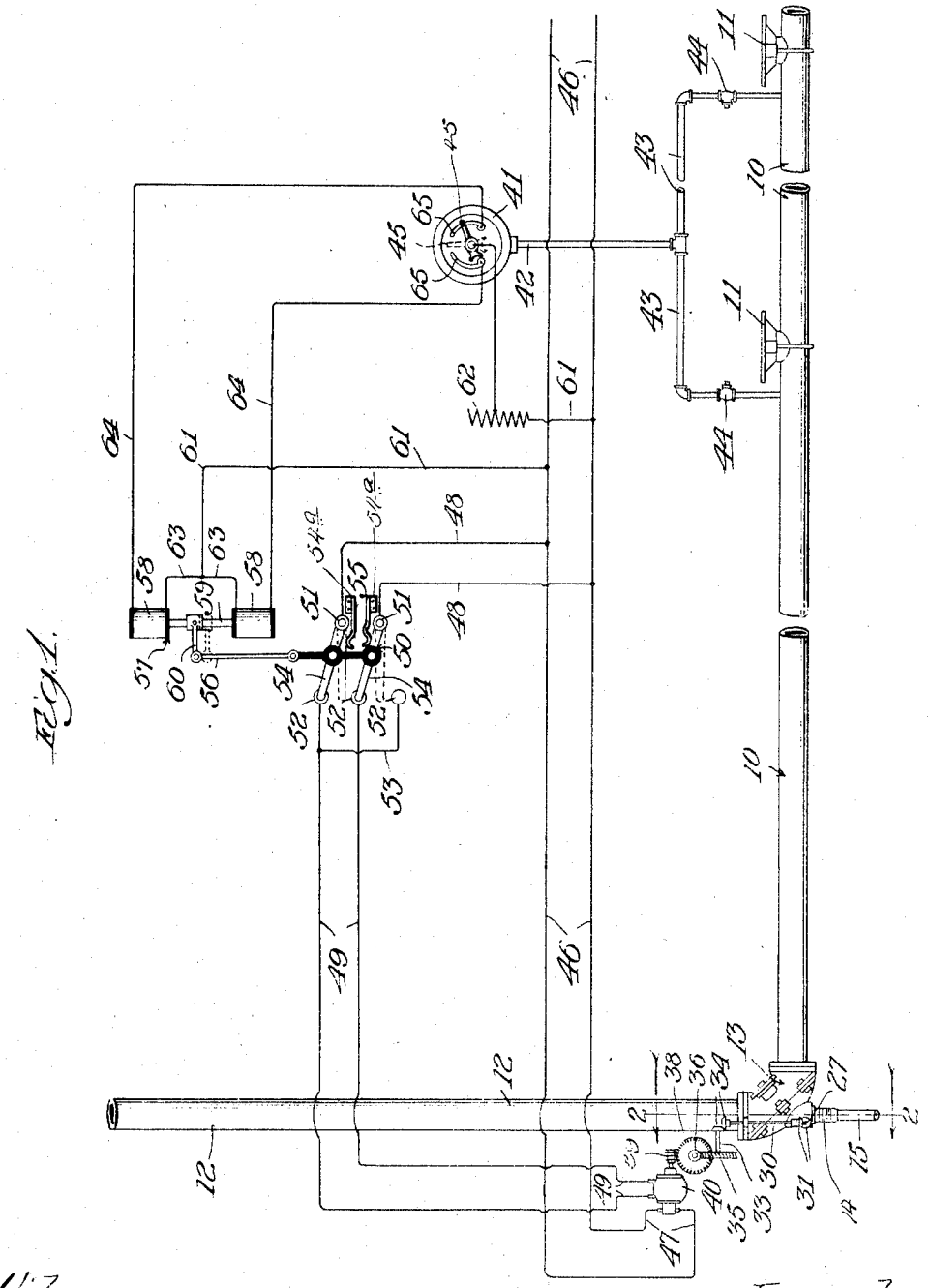


Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

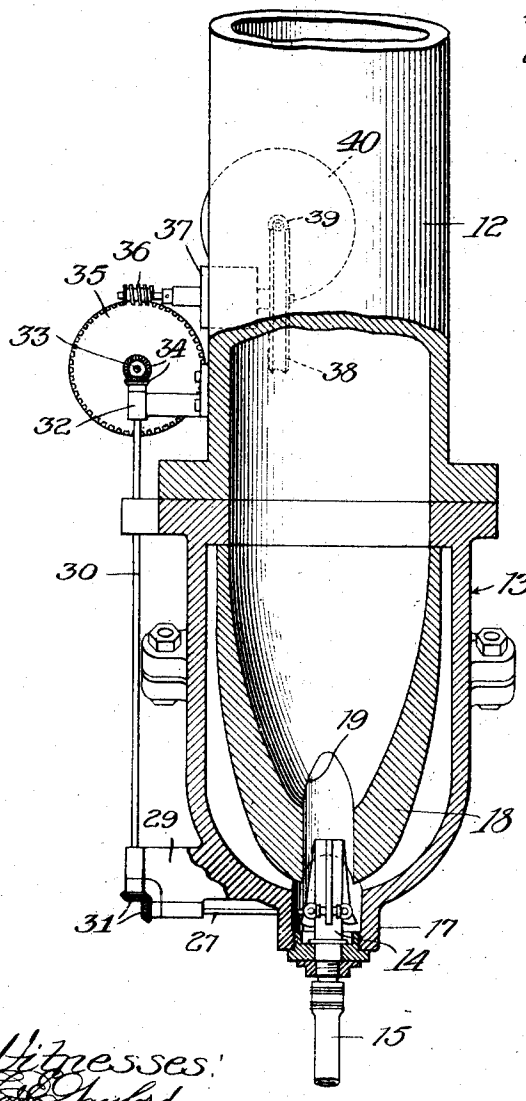


Fig. 3.

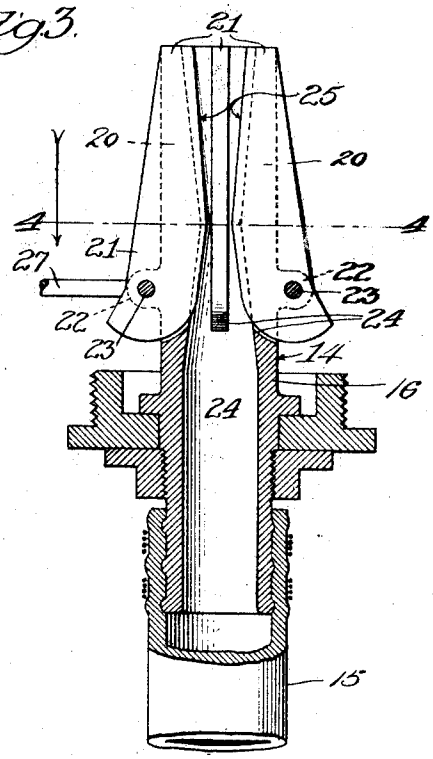
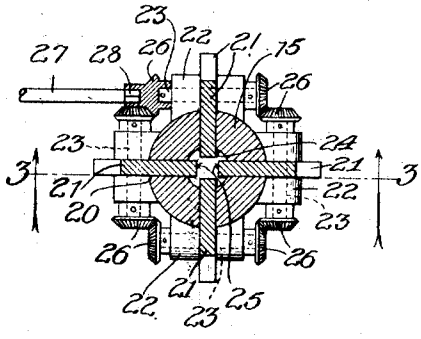


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ASH-CONVEYING SYSTEM.

1,365,804. Specification of Letters Patent. Patented Jan. 18, 1921.

Application filed March 26, 1917. Serial No. 157,303. Renewed January 2, 1920. Serial No. 349,095.

To all whom it may concern:

Be it known that I, ARTHUR P. STRONG, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Ash-Conveying Systems, of which the following is a specification.

This invention relates to improvements in conveying systems for ashes or like materials, and more particularly to systems of the character described wherein steam jets are utilized for creating suction or partial vacuum within the conduits or pipe lines of the system for impelling the material through the same.

In conveying systems of this character the conduits convey the ashes to a common point of disposal, there being provided, at various points along the conduit and in convenient access to the furnaces, a number of intake openings, which are normally closed, when not in use, by a suitable plug or closure. The steam is preferably introduced into the conduits by means of nozzles incorporated in especially designed fittings for this purpose, the nozzle fittings being of such number and located at such places as the capacity of the system demands, although in the usual arrangement at least one steam nozzle or nozzle fitting is located beyond one or more intake openings, in the direction of the point of discharge. For convenience in describing the construction embodying the invention, a system comprising an arrangement of two intake openings and a single steam nozzle located beyond the intake openings will be sufficient for a clear understanding of the principles involved.

Ordinarily the operation and maintenance of suction within the conduits is attended with considerable waste in the amount of steam consumed at the nozzles, due to the fact that heretofore nozzles having a constant volume of steam discharge, capable of producing a vacuum suitable for maximum load conditions, have been used, irrespective of variations in operating conditions or load; for instance, it is well established that less vacuum is required to handle ashes introduced at a point in close proximity to the nozzle than at a point at a greater distance, or, in other words, less steam pressure is required to move the ash introduced into the conduit at a point nearer the discharge end of the conduit than at a point remote from said discharge end, and, again, there are intervals in the emptying operation, when no ashes are being fed to the system through the particular intake opening in use, and as a result, under a constant steam discharge, the vacuum is increased, although the system is temporarily idle. Under the conditions mentioned, as well as others, there is considerable and unnecessary waste of steam and hence inefficient operation of the system.

It is the object of this invention, therefore, to improve the construction and operation of these systems, by introducing means whereby the suction or pressure produced by the steam jet can be regulated in accordance with the variations in the operating conditions, such regulation being automatic and dependent upon the conditions existing at the several intake openings during the period in which each is in use.

The arrangement and construction of the means employed for accomplishing the purposes set forth are hereinafter fully described and illustrated in the accompanying drawings, wherein—

Figure 1 is a view in elevation of a portion of a conveying system, showing the mechanical and electrical elements embodied in the invention, the electrical elements and connections being shown by the conventional symbols;

Fig. 2 is an enlarged detail view in section of the steam nozzle fitting, taken on line 2—2 of Fig. 1, and showing the nozzle operating elements;

Fig. 3 is an enlarged longitudinal sectional view of the nozzles, taken on line 3—3 of Fig. 4; and

Fig. 4 is a cross-sectional view of the nozzle, taken on line 4—4 of Fig. 3.

An ash conveying system, such as hereinbefore referred to, comprises a horizontal pipe or conduit 10, which extends adjacent to the furnaces and is provided with intake fittings 11 located at the desired points along the conduit, and ordinarily comprising funnel-shaped members communicating with openings in the conduit, said openings being closed when not in use by a removable plug or other closure. Beyond the intake fittings 11, and preferably located at the junction of the horizontal conduit and a vertical riser 12, is a nozzle fitting 13, having the general form of the ordinary elbow

connection, although having incorporated therein a steam nozzle 14 (Fig. 2) communicating with a suitable source of supply through a pipe or hose 15, and arranged to inject a jet of steam axially of the vertical riser 12 and likewise in the direction of flow of the material.

As before suggested, the nozzle is adjustable, for the purpose of controlling the discharge of the steam therefrom, and it may be stated in general terms that this is accomplished by regulating the size of the passage or orifice of the nozzle, by constructing the nozzle in such a manner as to provide movable adjusting members or fingers forming the passage or orifice, said fingers being contractible or expansible by the provision of actuating mechanism connected thereto, which is remotely controlled by the pressure in the conduit adjacent to the intake openings 11.

Referring in detail to the nozzle (Figs. 3 and 4), the same comprises a nozzle body 16, having screw-threaded engagement with a sleeve 17, integral with the elbow fitting 13 (Fig. 2) and located below and to the rear of a metal wear section 18, provided with a passage or opening 19 in alinement with the nozzle. Extending longitudinally throughout the end portion of the nozzle body 16 are a series of four slots 20 (Figs. 3 and 4) arranged circumferentially about the nozzle body and spaced apart at angles of 90°. Within each of said slots 20 is a longitudinally extending finger 21, each of said fingers being pivotally mounted upon the nozzle body between pairs of lugs 22 located in the outer surface of the nozzle body and embracing each of said fingers and a pin 23 extends through said lugs and finger. The fingers 21 project into the central passage 24 of the nozzle body, the inner faces 25 thereof conforming in contour to that of said central passage, the latter converging to a point of minimum cross-sectional area at its central point and from there diverging toward the discharge end of the nozzle body. The faces of these fingers likewise converge from their lower ends to a point adjacent the opening of minimum cross-sectional area of the central passage and from thence diverge in substantially the same degree as the wall of said central passage. By reason of the contour of the inner faces 25 of the fingers, it is possible, by rotating all of the fingers simultaneously about their points of pivoting, to vary the cross-sectional area of the central passage. Thus, if the fingers are rotated in a direction to move their upper ends inwardly, it is apparent that the discharge end of the central passage will be contracted, as well as the cross-sectional area at the junction of the diverging and converging portions thereof. Likewise, by rotating the fingers simultaneously in the opposite direction, the cross-sectional area of the orifice or opening is increased, thereby permitting greater volume of steam to be discharged from the nozzle.

As a preferable means of moving the fingers, the following construction is employed: The pins 23, or shafts as they may be called, project laterally beyond the lugs 22, each shaft having mounted on its ends bevel pinions 26, each meshing with a pinion at the adjacent end of the adjoining shaft. Thus, if one of the shafts is rotated, power will be transmitted uniformly to all of the shafts to rotate them in the same direction and at the same rate, and thus move or adjust the fingers simultaneously and with the same degree of movement.

As a means for rotating the shafts 23, a drive shaft 27, in axial alinement with one of said shafts 23, has nonrotative connection with one of the pinions, as shown at 28 (Fig. 4), said shaft extending through the wall of the sleeve 17 and journaled in a bearing 29, exterior to and integral with the wall of the elbow fitting. This bearing also supports a vertical or transversely arranged shaft 30 connected to the shaft 27 by miter gears or bevel pinions 31, 31, the upper end of said shaft being journaled in a bearing 32, and, further, being connected to a transverse worm-shaft 33 by another set of miter gears 34, 34. Upon the worm-shaft 33 is a worm-wheel 35 meshing with a worm-gear 36, the shaft of which being supported in a suitable bearing 37 and also carrying a worm-wheel 38. The worm-wheel 38 in turn meshes with a worm 39, which is mounted upon and directly driven by the armature shaft of a motor or other prime mover 40. The arrangement of gearing herein described constitutes a suitable speed reduction mechanism, although any other arrangement can be substituted therefor, the purpose of the reduction gearing obviously being to reduce the comparatively high speed of the motor to a speed suitable for operating the fingers of the nozzle.

It is now apparent that, if the motor rotates in one direction, the fingers 21 of the nozzle 14 will, through the medium of the intermediate reduction gearing, be contracted, thus decreasing the size of the steam discharge passage or orifice of the nozzle, and, likewise, if rotated in the opposite direction, said fingers will be expanded, thus increasing the size of said passage. As a means for controlling the operation of the motor 40, and particularly the direction of rotation thereof, certain electrical elements are employed, together with a certain pressure-controlled device in connection therewith, preferably in the form of a gage 41, such as ordinarily used for registering air pressures and particularly partial vacuum, that is, pres-

sure below atmospheric pressures. This gage 41 is connected by a pipe 42 and a T-connection with two branch pipes 43, 43, which communicate with the horizontal conduit 10, adjacent to each of the intake openings 11, 11. In each of the branch pipes 43, 43 are mounted shut off valves 44, 44, of the usual type, the same being adapted to close either one or the other of the branch pipes 43 from communication with the gage 41, so that said gage can indicate the pressure of air within the conduit at either of the intake openings 11, 11. The gage 41 comprises the usual mechanism, embracing a pointer 45, which also serves as an electrical contact member, as will hereinafter be more fully pointed out.

Referring now in detail to the electrical elements and connections, the motor 40, as shown, is preferably a direct current, shunt wound machine, with its connections thereto diagrammatically illustrated although any other motor having the same general characteristics could be equally well used. Electric current is supplied to the motor 40 by two main supply wires 46 connected with a commercial circuit of the usual voltage. The main supply wires 46 preferably lead directly to and are connected with the armature leads or terminals 47, 47, with an intermediate circuit breaker or fuse block. Branching from the main supply wires 46, 46 are branch wires 48, 48, which are connected to the field terminals or leads 49, 49 of the motor 40, there being interposed between the branch wires 48 and field leads 49 a pole changer 50 of the usual construction and comprising parts as follows, to wit, two terminals 51 on the supply side of the field circuit and connected to the branch supply wires 48, 48, and three terminals 52 on the motor side of the circuit, two of said terminals 52 being connected to the field leads 49 and the third connected to one of the field leads by a shunt wire 53. Extending between the terminals 51 and 52 are movable contact arms 54, 54 pivoted on the terminals 51, 51 and adapted to electrically connect said terminals 51 with two of the three terminals 52, 52 on the field side of the device and further adapted to be moved into contact with the third terminal 52 and one of the other two, thereby reversing the direction of flow of the current through the field leads 49. The function of a pole changer 50 is so well known that it is thought unnecessary to describe at length the mode of operation of this device. It is sufficient to set forth, therefore, that by moving the arms of the pole changer 50 the polarity of the field of the motor 40 can be reversed, with the result that the direction of rotation of the motor will be reversed with each reversal of the poles. This is a well known characteristic of the particular motor herein described, and therefore need not be explained in detail, except to state that, when the pole changer 50 is in the position shown in full lines in Fig. 1, its arms 54, 54 connect the terminals 51 with two of the three terminals 52, and when moved by the solenoid 57 in the opposite direction, said arms 54 connect the terminals 51 with two other of the terminals 52. When in either of such positions, the motor 40 is in operation. To stop the motor through the pole changer, the latter is moved until its arms 54, 54 reach a neutral position, that is, out of contact with any of the terminals 52, as shown in dotted lines in said Fig. 1. To accomplish such movement and hold the arms of the pole changer in neutral position, any form of construction may be provided for that purpose, but in said Fig. 1 I have shown two flat spring members 54^a, 54^a one bearing against each of said arms 54 and serving to move the same into neutral position. Said springs are strong enough to move the pole changer when the solenoid 57 is deënergized, but when the latter is energized it overcomes said springs. When said arms 54 are in neutral position, the pointer 45 stands at zero, that is, between the ends of the contact plates 65, 65, as shown in dotted lines in said Fig. 1. As diagrammatically shown, the contact arms 54, 54 are connected by a transverse bar 55, which in turn is connected to a link 56, said bar and link being adapted to be moved endwise to effect the operation of the pole changer 50. Operatively connected with the pole changer through the intermediate link 56, is a solenoid 57, comprising the usual electrically excited coils 58, 58 and an endwise movable core 59 provided with a fixed arm 60 connected at its end to the link 56.

The operation of the solenoid is controlled by means of certain electrical contacts associated with the gage or pressure-controlled device 41 and an auxiliary electrical circuit, as will be understood from the following: Branching from the main supply wires 46 are two auxiliary supply wires 61, 61, there being interposed in one of the auxiliary supply wires 61 a suitable resistance 62 for the purpose of obtaining a lower voltage in the auxiliary circuit, of say 10 volts. One of the wires 61, to wit, the wire passing through the resistance 62, is electrically connected to the pointer 45, the other wire 61 leading to the solenoid 57, where it is divided into branch wires 63, 63, each leading to one of the coils 58, 58 of the solenoid and connected to terminals of the same sign, that is, the positive or negative terminals. From the other terminals of each coil lead conductors 64, 64, which extend to the gage 41, each of said conductors 64 having electrical connection with a contact plate or sector 65, 65 located in the path of movement of the pointer 45 and properly insulated from each

other and from said pointer. The adjacent ends of the contact plates or sectors 65, 65 are spaced apart a sufficient amount so that when said pointer 45 is in upright position it will be out of contact with either of said sectors, thereby opening the auxiliary circuit. Now, if the pointer 45 is moved in one direction, the auxiliary circuit will be closed by the contact of the pointer or movable contact member 45 and one of the sectors 65, thereby energizing the solenoid 57 to move the core thereof in one direction, as determined by the direction of flow of the current through the coils 58 of the solenoid. On the other hand, if the pointer 45 is moved in the opposite direction and the circuit is closed through the other sector 65, the solenoid 57 will again be energized, but, since the circuits through the two sectors are reversals of each other as to the direction of flow of the current through the solenoid, the core 59 will be moved endwise in the opposite direction. It is now clear that the position of the pole changer 50 to secure the reversal in the direction of rotation of the motor, for either increasing or decreasing the size of the nozzle orifice, is controlled by the movement of the solenoid core, and that this movement is in turn determined by the direction of movement of the pointer 45 of the gage 41, said pointer acting as a movable contact member, which is susceptible to variations in pressure within the conduit at the point where the pressure transmitting pipes communicate with said conduit, namely, at the intake openings.

The operation of the several devices will be better understood from the following. Let it be assumed that the entire system is idle, as it would be during the period when ashes were not being emptied—to start the system in operation, the steam supply to the nozzle would be turned on, thereby creating suction in the pipe line. Now, if one of the intake openings is to be used, the valve 44 in the branch pipe 43 communicating with the conduit adjacent that particular opening, is opened, the valve or valves in the other branch pipe or pipes being closed. By so doing, the gage 41 would be put into operation, the pointer 45 immediately registering the pressure at the intake opening, it being understood that the gage is so adjusted as to indicate the required or normal vacuum for properly handling ashes, when the pointer is in upright position or at zero. If, upon opening the intake opening and emptying ashes therein, the suction is not sufficient to properly handle the ashes, that is, below the predetermined normal vacuum, the pointer or indicator will move in the direction to indicate the deficiency, and so also into contact with that sector 65 which is part of the circuit through the solenoid, which energizes the same so as to move the core 59 thereof in the direction to throw the pole changer 50 to the position required to arrange the field leads of the motor so as to produce the rotation in a direction to expand the fingers 21 of the nozzle. The expansion of the fingers, as before explained, increases the size of the nozzle and similarly the volume of steam discharged, with the result that the vacuum is increased until the required amount is obtained. The increase of the vacuum in the system obviously has its effect upon the gage, to the end that the pointer is moved toward its normal or zero position and out of contact with the sector, thus opening the auxiliary circuit. This has the effect of demagnetizing the solenoid 57, with the result that the core 59 assumes an intermediate position, such that the pole changer actually breaks the circuit through the motor field, thereby shutting down the motor. It follows, therefore, that the fingers will remain stationary and in position to form the orifice of a size required to produce the desired suction.

On the other hand, if the vacuum in the conduit at the intake opening in use is greater than normal, the position of the gage 41 will indicate this condition by its movement in the opposite direction and into contact with the other sector 65, whereupon the other circuit through the solenoid 57 will be closed, hence effecting the movement of the core 59 in a direction as to ultimately produce the contraction of the fingers 21 of the nozzle, through the medium of the intermediate electrical and mechanical elements. Thus the vacuum will be decreased, the attendant movement of the pointer 45 toward normal readily opening the solenoid circuit and shutting down the motor 40, as before.

It is apparent, therefore, that the function of the device herein described is to, first, maintain the vacuum at each intake opening at the normal amount, that is, the amount predetermined ample to properly handle the ashes; secondly, to increase the vacuum to the normal amount, if for any reason the conditions existing at the intake opening are such as to require a greater amount of vacuum to remove the ashes; thirdly, to decrease the vacuum at the intake opening, if it is in excess of normal amount required to handle the ashes, and, lastly, to control the vacuum at each of the several intake openings, thus providing for the variation in amount of steam necessary to produce the same amount of vacuum at several points throughout the system. In other words, the amount of steam pressure required to move the ash through the conduit is automatically regulated from each intake opening and is proportionate to the distance that the several intake openings are from the discharge end of the conduit.

The functioning of the device is entirely

automatic, accomplishing its end by controlling the size of the nozzle orifice, which amounts to providing a plurality of nozzles varying in vacuum producing capacities which are automatically brought into action to give the vacuum desired under particular operating conditions.

The advantages of such an arrangement are manifest, namely, that it provides a more accurate method of controlling the operation of the system, thus making it more efficient and dependable under the varying loads and operating conditions which a system of this kind is subjected to, and, again, greatly improves the efficiency of operation of the system by accomplishing a marked saving in the steam consumption of the nozzles, an item which enters materially into the cost of maintenance, not only of the system itself, but of the entire boiler or steam plant which it serves and of which it is a part.

I claim as my invention:

1. In a conveying system, the combination of a conduit, a steam nozzle communicating with said conduit and provided with means of adjustment to vary the volume of steam discharged therethrough, and operating mechanism connected with said nozzle-adjustment means and automatically controlled by the change of pressure within the conduit.

2. In a conveying system, the combination of a conduit for conveying abrasive materials, a steam nozzle adapted to inject steam into said conduit and provided with means for adjusting the size of the discharge passage thereof, and a pressure controlled device actuated by the variation in pressure within said conduit and operatively connected with said nozzle-adjusting means for automatically controlling the volume of steam discharged by said nozzle.

3. In a conveying system, the combination of a conduit, a steam nozzle communicating with said conduit and comprising a member movable to regulate the size of the orifice thereof, a prime mover connected with said orifice-regulating member, and a member actuated by the variation in pressure within said conduit and adapted to automatically control the operation of said prime mover.

4. In a conveying system, the combination of a conduit, a steam nozzle communicating with said conduit, comprising a member operable to regulate the orifice of said nozzle, a motor in driving connection with said orifice-regulating member, and means governed by the variation in pressure in said conduit, for controlling the movement of said orifice-regulating member.

5. In a conveying system, the combination of a conduit for conveying materials, a steam nozzle adapted to inject a steam jet into said conduit and comprising a movable member adapted to increase or decrease the size of the discharge passage thereof, a motor in driving connection with said member, means for reversing the direction of rotation of said motor, and means controlled by the variation of pressure in said conduit, for governing the direction of rotation of said motor.

6. In a conveying system, the combination of a conduit, a nozzle adapted to inject a jet of steam into said conduit and comprising a member movable in opposite directions to decrease or increase the size of the orifice thereof, a motor in driving connection with said member of said nozzle and rotative in opposite directions, and means for reversing said motor, comprising an electro-magnetic element controlling the flow of current to said motor, an electric circuit embracing said electro-magnetic element, and means controlled by the pressure in said conduit, for controlling the direction of flow of current through said electro-magnetic element.

7. In a conveying system, the combination of a conduit, a nozzle adapted to inject a steam jet into said conduit and comprising contractible and expansible members adapted to increase and decrease the size of the passage thereof, a motor connected with said contractible and expansible members, and means for reversing the said motor, embracing a pole changer in the field circuit of said motor, electro-magnetic means connected with said pole changer and embracing an electric circuit, and means for reversing the direction of flow of current through said circuit, comprising a fixed contact member and a movable contact member in said circuit, said movable contact member being actuated by the variations in pressure in said conduit.

8. In a conveying system, the combination of a conduit, a nozzle adapted to inject a jet of steam into said conduit and comprising a plurality of fingers movable to decrease or increase the size of the discharge passage thereof, a motor in driving connection with said fingers, a pole changer in the field circuit of said motor, a solenoid provided with a movable core operatively connected with said pole changer, fixed contact members, a movable contact member, and an electric circuit embracing said solenoid and said fixed and movable contact members, said movable contact member being actuated by the variation in pressure within the conduit, to reverse the direction of flow of the current through said solenoid.

9. In a conveying system, the combination of a conduit, a nozzle adapted to inject a steam jet through said conduit and comprising contractible and expansible fingers adapted to increase and decrease the size of the passage thereof, an electric motor, speed

reducing gears intermediate said motor and nozzle fingers, a pole changer in the field circuit of said motor, and means controlled by the variation in pressure in said conduit for actuating said pole changer.

10. In a conveying system, the combination of a conduit, a nozzle adapted to inject a steam jet into said conduit and comprising contractible and expansible members adapted to increase and decrease the size of the passage thereof, driving mechanism connected with said nozzle, including an electric motor, means for reversing the direction of rotation of said motor, comprising a pole-changing switch interposed in the field supply line, an electro-magnetic element operatively connected with said pole-changing switch, and a device controlled by the pressure in said conduit and acting through said electro-magnetic element and pole-changing switch, to stop, start, and reverse said motor.

11. In a conveying system, the combination of a conduit, a nozzle adapted to inject a steam jet into said conduit and comprising contractible and expansible members adapted to increase and decrease the size of the passage thereof, driving mechanism connected with said nozzle, including an electric motor adapted to rotate in both directions to contract or expand said fingers, means for reversing the direction of rotation of said motor, comprising a pole-changing switch interposed in the current supply line to the field of said motor, and electro-magnetic means for operating said pole-changing switch, embracing an electric circuit, fixed contact members, and a movable contact member in said circuit, said movable contact member being actuated by the variations of pressure in said conduit.

12. In a conveying system, the combination of a conduit, a plurality of intake openings in said conduit, a steam nozzle in said conduit provided with means for regulating the discharge of steam therefrom, an electro-magnetic element operatively connected with said nozzle-regulating means, an electric circuit embracing said electro-magnetic element, fixed contact members, and a movable contact member in said circuit adapted to control the action of said electro-magnetic element, said movable contact member being adapted to be actuated by pressure within said conduit, and means for transmitting the pressure, at points adjacent the several intake openings, to said movable contact member.

13. A nozzle adapted for use in conveying systems, comprising a body having a central passage, a plurality of fingers extending longitudinally of said body, means for moving said fingers into and out of said central passage to vary the diameter thereof, and each finger having the inner edge thereof inclined inwardly from the base of the finger to a point intermdiate the ends thereof and from such point inclined outwardly toward the outer end of the finger.

14. A nozzle adapted for use in conveying systems, comprising a nozzle body provided with longitudinal slots, a plurality of fingers pivotally mounted on said body and extending into said slots, and means for transmitting movement to said fingers, to operate the same in unison.

15. A nozzle adapted for use in conveying systems, comprising a nozzle body provided with a plurality of longitudinal slots arranged about the central passage thereof, a finger mounted in each of said slots and adapted to be moved into and out of said central passage, each of said fingers being provided with a shaft journaled on said nozzle body, gear members connecting all of said shafts, and means for rotating said shafts.

16. The method herein described of conveying disintegrated material from a plurality of separated points through a conduit to a common point which consists in charging the material into said conduit at said points successively and successively creating currents of fluid through the conduit having conveying capacities proportional to the distance of such charging points from the point of discharge from the conduit.

17. In a plant for conveying disintegrated material, the combination of a conduit having a plurality of openings through which material may be fed into the conduit, means for establishing a current of fluid through the conduit, and means at each inlet for proportioning the carrying capacity of such current to the distance from each of said openings to the point of discharge of the material from said conduit.

18. In a plant for conveying disintegrated material, the combination of a conduit having a plurality of openings through which material may be fed into the conduit, means for establishing a current of fluid through the conduit, and means arranged adjacent to each charging opening adapted to so regulate the current producing means that the current established by the operation of any regulating means will have a carrying capacity proportional to the distance of travel of the material through the conduit.

19. In an ash conveying system, the combination of an ash conveying conduit, having in its length a plurality of ash intake openings, means for supplying motive fluid to said conduit for moving the material therethrough, and means affected upon the happening of certain conditions at each ash intake opening for controlling the supply of motive fluid to the conduit.

20. In an ash conveying system, the combination of an ash conveying conduit, having in its length a plurality of ash intake

openings, means for supplying motive fluid to said conduit for moving the material therethrough, and means operable from any one of the ash intake openings for controlling the supply of motive fluid to said conduit.

In testimony that I claim the foregoing as my invention, I affix my signature in the presence of two witnesses, this 9th day of March, A. D. 1917.

ARTHUR P. STRONG.

Witnesses:

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