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AIR LIFTING AND CLEANING SYSTEM

Filed Aug. 7, 1918

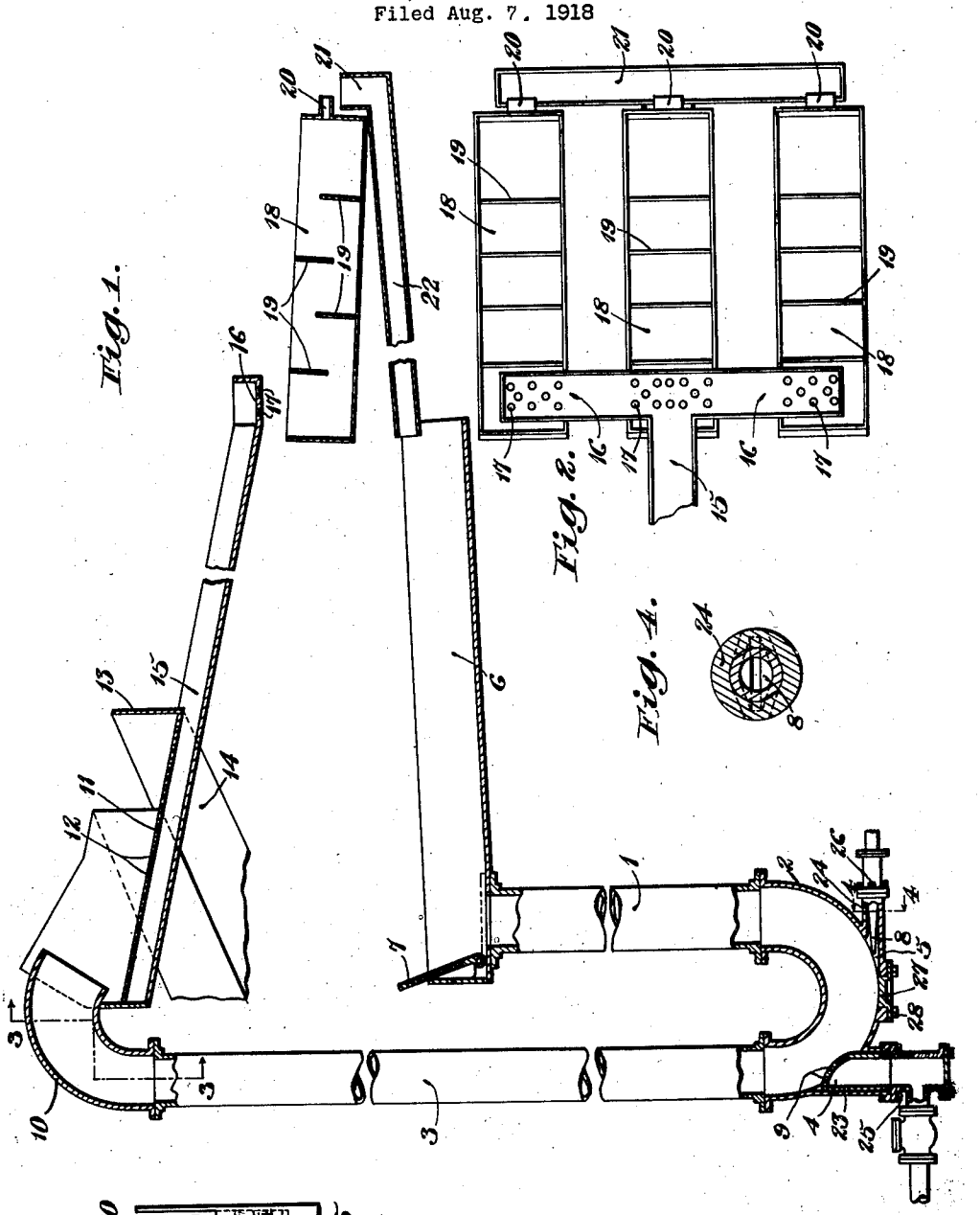


Fig. 1.

Fig. 2.

Fig. 4.

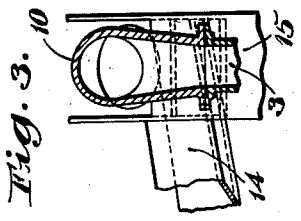


Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## AIR LIFTING AND CLEANING SYSTEM.

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*To all whom it may concern:*

Be it known that I, JOHN OLIPHANT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Air Lifting and Cleaning Systems, of which the following is a full, clear, and exact specification.

My invention relates to air operated lifting and cleaning systems.

It has for its object to provide an improved air operated lifting and cleaning mechanism adapted to use in the lifting and cleaning of granular objects, and one especially adapted to use in connection with cleaning sugar beets prior to the delivery of the same to the crushing machines utilized in the conversion of the same into sugar. More particularly, my invention has for its object to provide improved means whereby the objects to be treated are cleaned in an improved manner, improved means whereby the cleansing fluid may flow in a circuit, improved means whereby the dirt removed from the objects is separated from the water so that the latter may be used over again, and improved means whereby the system may be cleaned of granular objects before shutting down and started with only a fluid flow until the desired fluid velocity is obtained. These and other objects and advantages of my improved construction will, however, hereinafter more fully appear.

In the accompanying drawings I have shown for purposes of illustration one embodiment which my invention may assume in practice.

In these drawings,—

Fig. 1 is a side elevation, partially in section, showing my improved mechanism.

Fig. 2 is a detail plan view showing the separating tanks for the cleansing fluid.

Fig. 3 is a detail view taken substantially one line 3—3 of Fig. 1 showing the outlet for the granular objects.

Fig. 4 is a detail sectional view showing the nozzle of the auxiliary air jet taken on line 4—4 of Fig. 1.

In this illustrative construction it will be noted that I have shown an air lift including a downwardly disposed pipe section 1 having a U-section or elbow 2 at its base communicating with an upwardly disposed elongated pipe section 3, air supplying means in the form of a main vertically disposed nozzle 4 and an auxiliary horizontally disposed nozzle 5 being provided to provide a motive force for the fluid and to cleanse the granular objects immersed therein and flowing therewith through the several pipes.

In my improved construction it will be observed that an inclined receiving pan or slide 6 is disposed over the mouth of the pipe 1 so that this member 6 is adapted to receive the mixture of objects to be cleaned and the water, and direct the same into the pipe 1 when an apertured valve or gate member 7 for the latter is in open position. It will also be observed that as the water and granular objects pass down through the pipe 1 opposite the small auxiliary horizontally disposed air inlet 5, they are initially acted upon by the air from this jet in such a manner as to remove some of the dirt or sediment therefrom. Here it will be noted that as in my improved construction this member 5 is provided with a relatively wide or fan-shaped nozzle 8 of such form that it extends substantially across the lowest point of the pipe 2, the air flowing from the member 5 is thereby caused to act more effectually, not only to agitate the water and thereby initially cleanse the objects, but also to prevent any settling of sediment which might otherwise occur in the bottom of the pipe 2. After the granular objects and water have passed this auxiliary jet 5, it will be noted that they are next acted upon by the main vertically disposed jet 4, which, as shown, is larger than the jet 5 and vertically disposed, so that the air therefrom may perform the heavy duty of lifting the granular objects in the pipe 3 and thoroughly washing the same. As shown herein, this jet 4 is provided with a series of perforations 9 in its end in such a manner as to enable the air to be broken up into small jets and be thereby formed into an effective emulsion with the water, of such a character as thoroughly to perform its lifting and cleansing functions. After the granular objects and water have been lifted into the pipe 3 by the action of the air, it will be noted that the mixture is next deflected laterally, as through an expanding elbow 10 on the upper end of the pipe 3, in such a manner as to deliver the mixture upon an in-

clined grating 11 having a series of perforations 12 in its bottom. Here it will be noted, as the granular objects roll out they strike a transverse board or obstruction 13 disposed at the lower end of the grating 11, and are deflected thereby laterally into a laterally disposed inclined outlet 14, while the water passes through the openings 12 onto a lower sloping pan or trough 15 and flows therein to laterally branching pans 16 perforated at 17 and disposed over a series of slightly inclined sediment settling tanks 18 preferably having therein oppositely disposed transverse baffle plates 19. It will also be noted that each of these tanks 18 is provided, herein at its rear end, with an outlet 20, preferably disposed above the level of the lower baffles 19 and extending over a transversely disposed trough 21 which in turn discharges into a centrally located trough discharging into the rear end of the member 6.

In the operation of my improved construction, it will be observed that when the water and granular objects are flowing over the member 6 and down through the pipe 1, the auxiliary jet 5 will supply a small quantity of air into the elbow 2 in such a manner as initially to cleanse the granular objects and to distribute the air so thoroughly across the bottom of the member 2 as to keep the latter clear of sediment. It will also be noted that after the mixture has been thus acted upon by the jet 5, the same will next be acted upon by the air from the jet 4, which will then not only thoroughly cleanse the granular objects, but lift them to the expanding elbow 10, through which they are delivered upon the sloping grating 11. From this grating the granular objects will automatically pass by gravity into the trough 14, which in a beet handling mechanism may lead to the crushing mechanism. The water, on the other hand, will pass through the perforations 12 in the grating 11 and flow down over a member 15 into the members 16, which are disposed over the tanks 18, and through the perforations 17 in these members 16, into the tanks. These tanks, being disposed at an angle, will obviously permit of the free passage of the water through the same, so that while the sediment will settle and be retained in the tanks by the baffles 19, the water will flow out through the outlets 20 into the trough 21 and be delivered thereby through the trough 22 onto the member 6. Obviously, in the use of my improved construction when it is desired to finish up a given lot of granular objects or beets, this may be readily accomplished by dropping the members 7 into position over the mouth of the pipe 1 at any time. When this occurs, obviously, the further flow of objects to be cleansed will be prevented, while at the same time the flow of water may continue, thus enabling the pump to be cleared entirely of granular objects before the operation of the same is discontinued. It will also be noted that due to the provision of this member 7, it is possible to cut off the supply of granular objects during the starting of the system by simply closing the member 7, and thus, by enabling the desired velocity of liquid flow to be secured before the granular objects are supplied thereto, insure the most efficient operation of the system. If desired, by lifting the member 7 gradually relative to the mouth of the pipe 1, it will also be observed that the quantity of granular objects admitted to the pipe 1 may be further graduated as desired, in order to obtain a further increased efficiency in starting.

By the use of my improved construction, it will be observed that the liquid is pumped in circuit and used over and over again to cleanse successive lots of granular objects, the latter being automatically separated and the dirt also being automatically separated from the liquid by settling tanks while the liquid is returned to the receiving member 6 after it has been cleaned. It will also be observed that in the use of this system it is only necessary for the granular objects to be cleaned to be delivered either by hand or automatically to the receiving member 6, the flow of water acting automatically with the other elements of my improved system to carry the granular objects through the system and to clean and separate them, and cleanse the water and return it. In connection with my improved means for delivering the air to the pump, it will be noted that the clogging of the latter is efficiently prevented by the provision of the auxiliary jet 5 and the valve 7, and that the jet 5 and its fellow 4 cooperate effectually to clean the objects passing through the pump.

In connection with each of the jets 4 and 5, it will be noted that the same may be readily withdrawn when desired, as for instance by simply disconnecting them from the elbow 4 and withdrawing them from sleeves 23 and 24, preferably formed on the elbow, to which the jets are preferably removably attached by bolts 25 and 26. It will also be noted that access may also be had when desired to the elbow 2 through a suitable man-hole 27 located in the bottom of the elbow and likewise preferably removably attached thereto, as by means of bolts 28. These and other advantages of my improved construction will, however, be clearly apparent to those skilled in the art.

While I have in this application specifically described one embodiment which my invention may assume in practice, it will be understood that this form is used for purposes of illustration only, and that the invention may be modified and embodied

in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a cleansing system, air lift means for maintaining a continuous liquid cleansing circuit, and means for separating the cleaned objects and sediment therefrom.

2. In a cleansing system, air lift operated means for maintaining a liquid cleansing circuit, and constantly operative means for removing cleaned objects and sediment from the circuit whereby the operation of the cleaning system may be maintained continuous.

3. In a cleansing system, air lift means for maintaining a constantly moving liquid cleansing circuit and means for discontinuing at will the flow of objects to be cleaned through said circuit without interrupting the latter comprising means interposable in the circuit.

4. In an air operated lifting and cleaning system, means for maintaining a lifting and cleansing liquid circuit, and automatically acting means for separating the cleansed objects from the liquid and the sediment from the latter.

5. In a cleansing system, means including an air lift pump for maintaining a liquid cleansing circuit, means for separating the cleansed objects therefrom, and means for controlling the flow of objects to be cleansed therethrough, comprising means interposable in the circuit.

6. In an air lift system, downwardly and upwardly disposed pipes, an elbow operatively connecting the lower ends of the same, and an air jet communicating with said pipes, said jet having a fan-shaped nozzle playing across the bottom of said elbow.

7. In an air lift system, a cleansing fluid circulating system comprising upwardly and downwardly disposed pipes operatively connected, an air jet opening into one of said pipes, a receiving member communicating with one of said pipes, and an apertured valve controlling the connection of said receiving member and pipe.

8. In an air lifting and cleaning system, upwardly and downwardly disposed pipes, an air jet opening into one of the same, a receiving member communicating with one of said pipes, and means for interrupting the flow of objects to be cleansed through said pipe while permitting the flow of liquid therethrough.

9. In an air lifting and cleaning system, a continuous cleansing circuit comprising air lifting and cleaning mechanism, a settling tank receiving the sediment laden liquid therefrom, and means for returning the cleansed liquid from said tank to said mechanism.

10. In an air lifting and cleaning system, air lifting and cleaning mechanism, a liquid receiving trough having a lateral branch, a plurality of settling tanks receiving the liquid therefrom, and means for returning the liquid to said mechanism.

11. In an air lifting and cleaning system, upwardly and downwardly disposed pipes, an elbow operatively connecting the same, a plurality of air jets opening into said elbow and disposed substantially at right angles to one another, and means for removing said jets from said elbow at will.

12. In an air lifting and cleaning system, upwardly and dowwardly disposed pipes, an elbow operatively connecting the same, a plurality of air jets opening into said elbow and disposed substantially at right angles to one another, means for removing said jets from said elbow at will, and supplementary means for providing access to said elbow.

13. In a cleaning system, means including an air lift pump for maintaining a liquid cleansing circuit, and automatically acting sediment removing means included therein between the point of discharge therefrom of the objects cleaned and the point of delivery thereto of the objects to be cleaned.

14. In an air operated lifting and cleaning system, upwardly and downwardly disposed pipes, a U-bend connecting the same, an air nozzle in alinement with and discharging into said upwardly extending pipe and a second nozzle arranged tangential to the U-bend and adapted to discharge transverse to the end of said first named jet.

In testimony whereof I affix my signature.

JOHN OLIPHANT.