2 Sheets—Sheet 1.

F. A. LUCKENBACH.

Pneumatic Grain-Conveyer.

No. 228,206. **Patented June 1, 1880.**

Fig. 1.

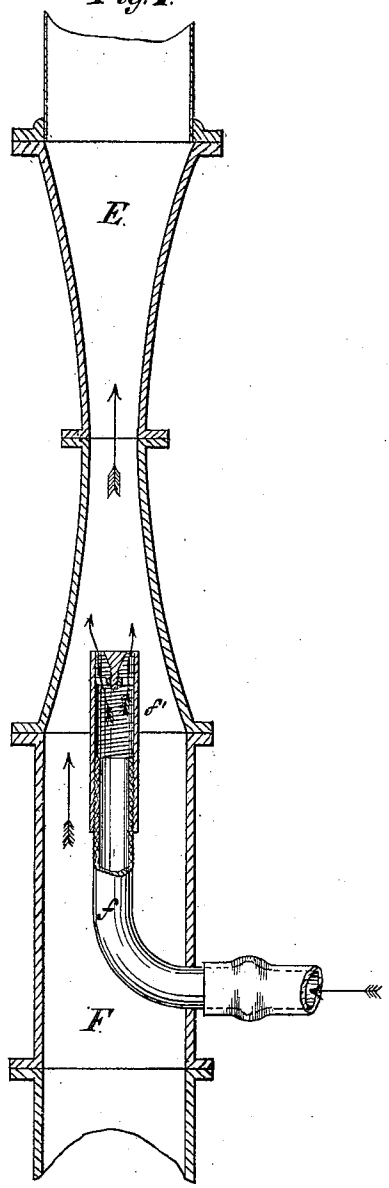


Fig. 2.

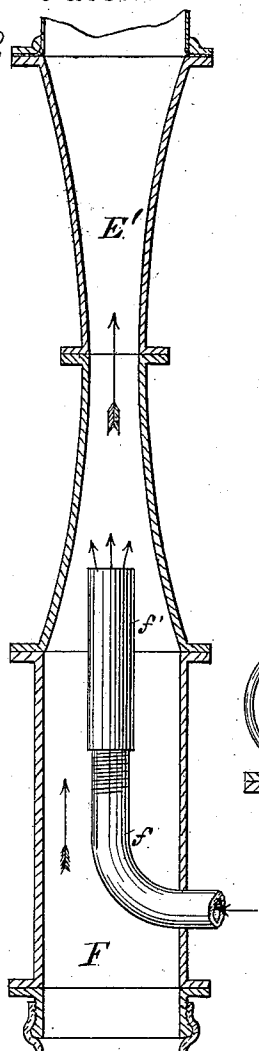
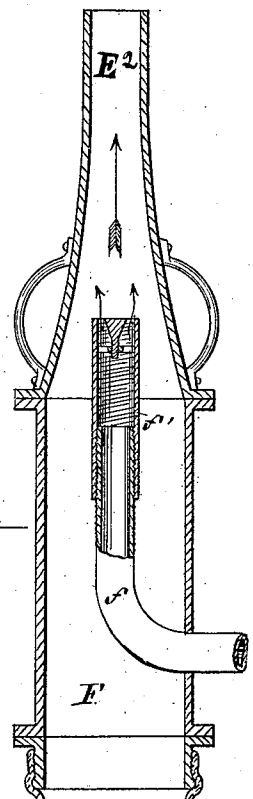
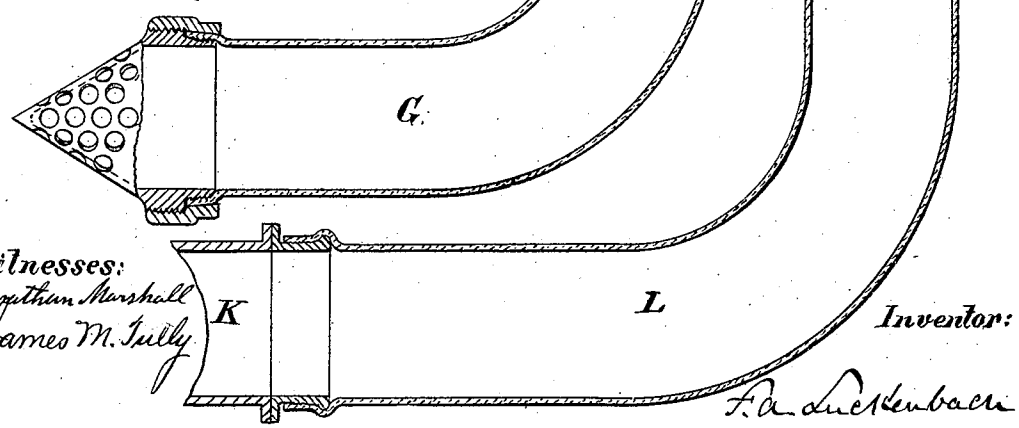


Fig. 3.





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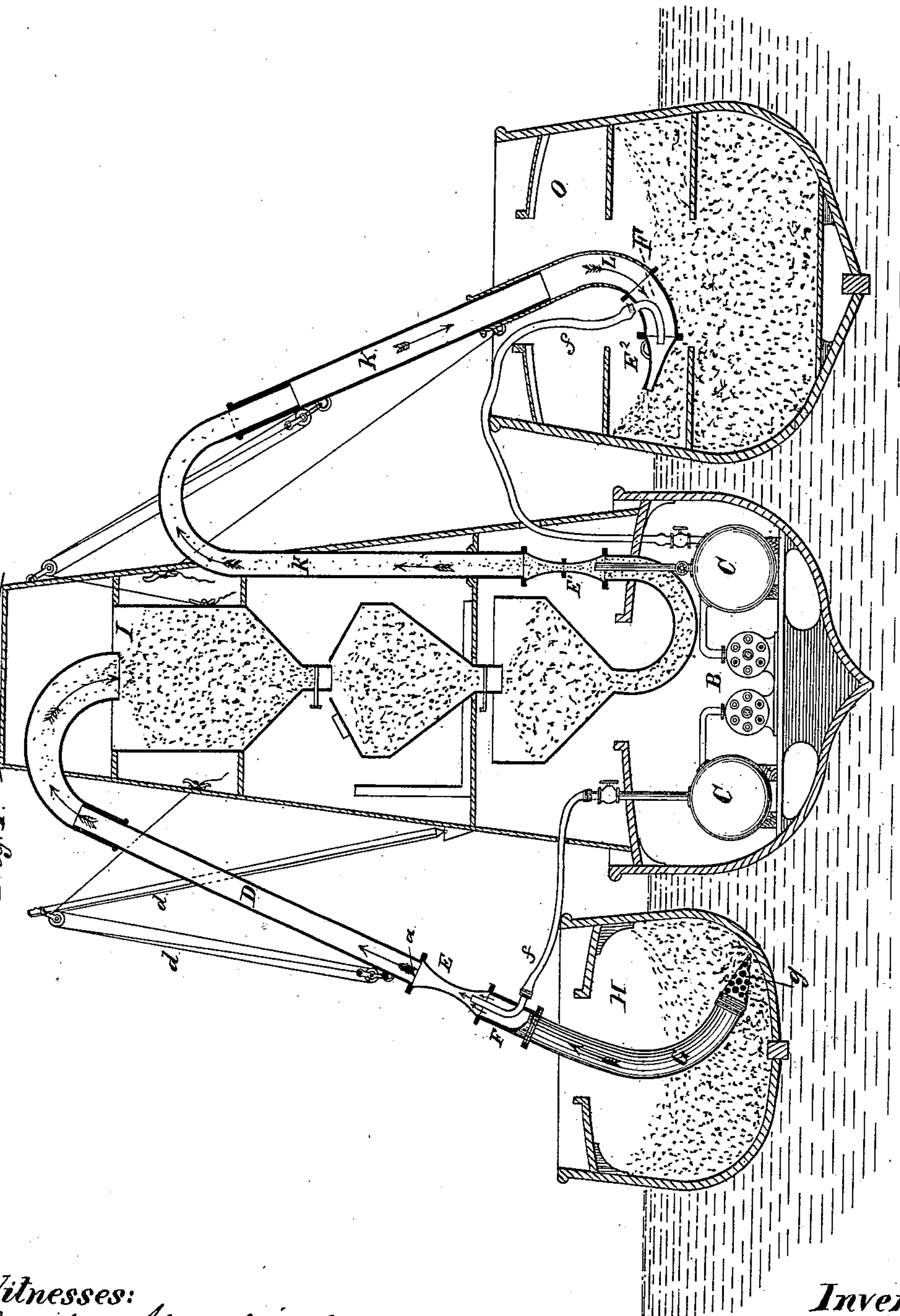
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Fig. 4.



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UNITED STATES PATENT OFFICE.

FREDERIC A. LUCKENBACH, OF NEW YORK, N. Y.

PNEUMATIC GRAIN-CONVEYER.

SPECIFICATION forming part of Letters Patent No. 228,206, dated June 1, 1880.

Application filed January 22, 1880.

To all whom it may concern:

Be it known that I, FREDERIC A. LUCKENBACH, of the city, county, and State of New York, have invented a new and useful Pneumatic Grain Apparatus for Elevating, Transferring, and Trimming Grain, of which the following is a specification.

This invention relates to that class of apparatus employed in elevating and transferring grain from one vessel to another or from a vessel to a store-house.

The objects of my invention are to provide an apparatus which in its construction and application is both simple and effective, and which will greatly reduce the time and expense in transferring grain, and to improve the condition of the grain during the time of transfer by causing its contact with currents of cold dry air.

The nature of my invention consists in the combination of a gradually contracting and expanding chamber or section of a grain-elevating tube with an injecting air-tube; also a gradually-contracting chamber of a discharging-tube with an injecting air-tube, for the purpose of transferring grain.

By forcing air through the contracted section of the elevating-tube a suction-current is produced in the lower end of said tube, and when this end is brought in contact with grain lying in bulk the grain will be drawn into and carried upward until its contact with the stronger current of compressed air introduced into the contracted chamber or section of the grain-tube, when the grain will be forced with great velocity through the upper section of said tube.

I attain those objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 represents a longitudinal section of the contracted chamber of the tube, in connection with a section of plain straight tube, in the center of which is placed an injecting air-pipe with an adjustable annular nozzle attached thereto by means of a long screw-connection. Fig. 2 represents the same with the addition of a flexible suction-tube attached, and showing a perforated tapering cap at its lower end. Fig. 3 represents a contracted chamber attached to a discharging-tube and forming a nozzle for the purpose of distributing or trimming grain. Fig. 4 represents a longitudinal sectional view of a floating grain-elevator in working position between a barge and a vessel, showing the several positions in which my invention may be applied.

Similar letters refer to similar parts throughout the several views.

The grain is drawn from the barge through the tube by suction until it reaches and mingles with the compressed-air jet within the contracted section of the elevating-tube, and by the power of the air thus contracted the grain is forced through said tube and discharged into a receiver in the upper part of the central vessel, through which the grain is allowed to fall in the usual manner, when it is again elevated into a tube leading to and terminating in the hold of the vessel. The trimming apparatus then forces the grain into and fills up all space between decks. The floating elevator is suitably constructed for the purpose.

An air-compressor or blowing-engine, B, with suitable air-receivers C C, is placed in proper position in the hold of the elevator, the air-compressor being driven by steam from a generator in another part of the hold. The pressure of air in the air-receivers C C should be kept at about forty pounds per square inch.

Air-conducting pipes or hose are connected with the air-receivers C C, which lead to and are connected with the several apparatus E E′ E². Suitable gate-valves placed in their proper positions supply or shut off the air through the pipe or hose. A conducting or elevating tube, D, is attached to the contracted section E, leading into a curved section at the top of the elevator. A flexible tube, G, is attached to the lower end of tube-section F, which is attached to the contracted section E, and thus the several sections form a continuous tube, which, when properly suspended in position, reaches from the hold of the barge H to the upper part of the elevator A. The tube D should be made telescopic, to allow its length or height to be changed as required.

At the lower end of section G is a pointed or tapering cap, *g*, which enables the tube to be easily forced into the grain. The cap *g* is suitably perforated to allow the inflow of air

and grain into the tube G. The sections of tube E and F, when in proper position, should not exceed fifteen feet in height from the lower end of tube G.

The section E is constructed in the form represented for the purpose of securing a more concentrated power of the jet or current of compressed air passing through it than could otherwise be obtained from a similar jet or current of air when passing through a plain straight tube. The inside diameter of the most contracted part should not exceed one-half of the diameter of the largest part. Its length should be four times its largest diameter.

Section of tube F is made plain for the purpose of holding or sustaining an air-injecting pipe, *f*, which terminates in the lower contracting part of section E.

Upon the end of the pipe *f* is an adjustable nozzle, made annular in form, which should be adjustable according to the pressure of air employed, so that the jet of air, on its exit from the nozzle, will impinge with greatest power against the inner contracting walls of the section E below the center or most contracted part. This point can easily be ascertained by proving the most perfect vacuum, indicated by a suitable gage attached for the purpose.

The jet or current of air, in its passage through the contracted tube E, also compels the surrounding air within the sections F and G to be drawn into and mingle with its current, thereby increasing the volume in section D, and also causing a great inflow or suction of air through the perforations of cap *g*, which, when placed into a body of grain, will cause the same to be drawn into section G and elevated until it meets and is mingled with the jet or current of air injected into section E, by which the grain is forced upward and through section D into the receiver I, from which it is passed into weighing apparatus, and then falls into suitable receivers with pipe or tube attachments connected with another elevating-section, E′, which again forces the grain upward and through the tube K into section L, to the end of which is attached an air-jet apparatus, E^2, as shown enlarged in Fig. 3.

The sections L and E^2 are constructed so that they are easily movable upon the lower end of tube K, to allow the jet apparatus E^2 to be moved and directed to various points required for distributing or trimming the grain in the vessel O. The air forces the grain through the apparatus E^2 in a more or less horizontal stream or current, filling up spaces at various distances from the point of exit. The air is supplied through suitable hose attached to the air-receivers C C.

The grain-trimming apparatus E^2 may be controlled in its various positions by the aid of one or two men with the employment of small suspending-ropes to relieve its weight.

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

1. The concavo-convex section E, having its inner walls either curved or straight to and from the smallest diameter thereof, in combination with an air-injecting pipe, *f*, the exit end of which terminates in a central position near to or within the section E, whereby the expanding volume or current of air, in its exit from pipe *f*, is concentrated in its force directly against the contracting walls to and through the throat or smallest part of section E, the whole being in combination with a tube for elevating grain, substantially as set forth.

2. In combination with the discharging-tube of a grain-transferring apparatus, a nozzle provided with an injecting-pipe for forcing air and grain from said discharging-tube, for the purpose of distributing or trimming grain, in the manner described.

3. In an apparatus for transferring grain, the injector E′, for exhausting grain from its receiver and forcing said grain through said injector into a transfer-pipe, in combination with an ejecting-nozzle upon the discharge end of said transfer-pipe, as and for the purpose herein set forth.

4. In combination with air-pump B, receiver C, and air-conducting pipe, the contracted and expanded section of pipe E, with flexible induction-pipe G thereto and eduction-pipe D leading therefrom, as arranged, and for the purpose set forth.

5. In combination with a floating grain-transferring apparatus provided with an air pump or pumps, B, air receiver or receivers C, and grain-receivers I, pneumatic transfer-tubes G and D, provided with the ejecting apparatus E, for drawing and forcing grain to receiver I, pneumatic tube leading from said receiver or receivers to injector E′, and pipe K, provided with ejecting-nozzle leading therefrom, for conducting and distributing grain, as described.

FREDERIC A. LUCKENBACH.

Witnesses:
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JAMES M. TULLY.