F. TAGGART.

Pneumatic Grain-Elevator.

No. 213,709. Patented Mar. 25, 1879.

Fig. 1.

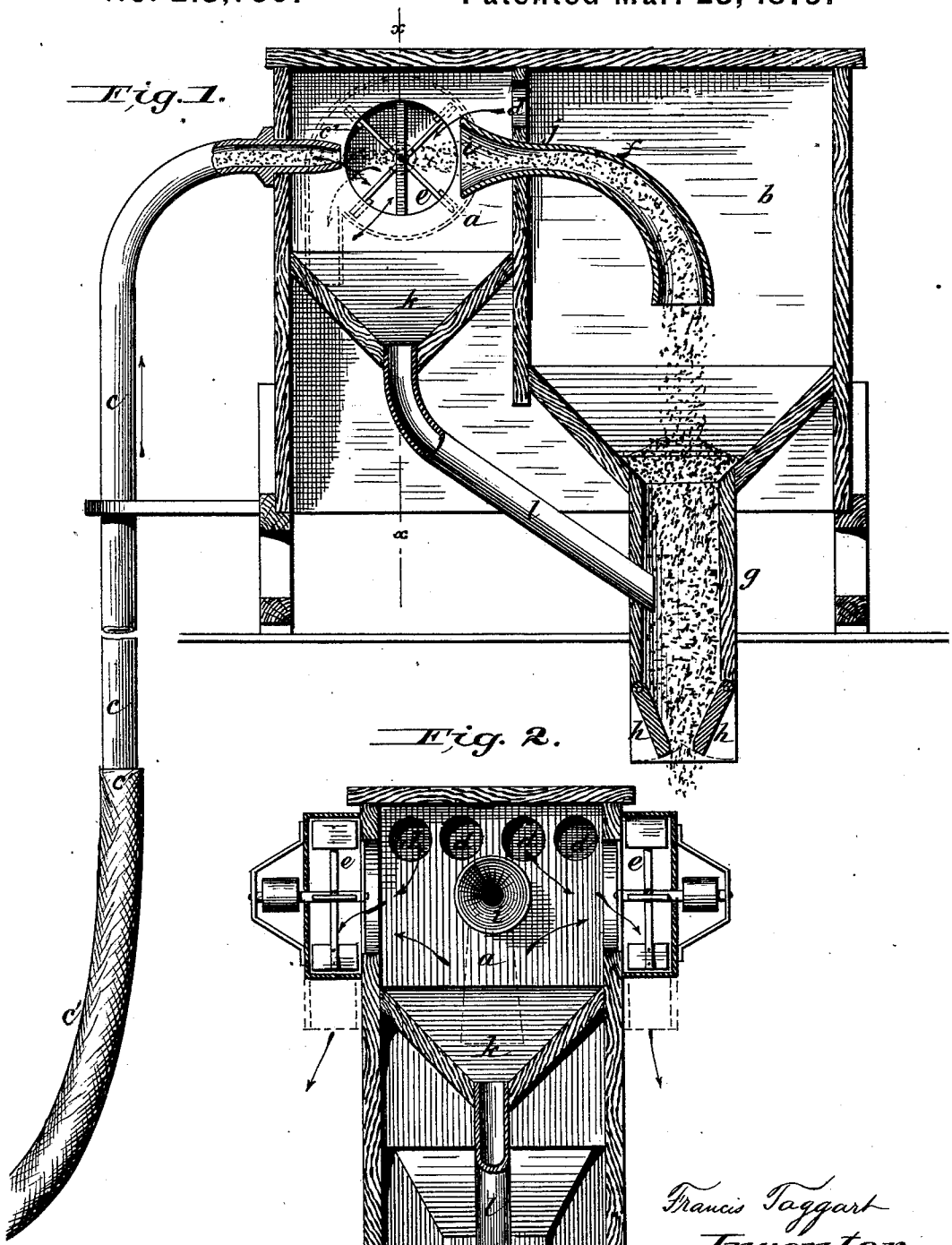


Fig. 2.

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UNITED STATES PATENT OFFICE.

FRANCIS TAGGART, OF BROOKLYN, N. Y., ASSIGNOR OF ONE-HALF HIS RIGHT TO LOUIS LANGEVIN, OF BUENOS AYRES, ARGENTINE CONFEDERATION.

IMPROVEMENT IN PNEUMATIC GRAIN-ELEVATORS.

Specification forming part of Letters Patent No. **213,709**, dated March 25, 1879; application filed January 23, 1879.

To all whom it may concern:

Be it known that I, FRANCIS TAGGART, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Pneumatic Grain-Elevators; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Grain has been elevated by a column of air drawn through a tube, and it is this kind of elevator which I have improved. The chamber into which the elevating-tube terminates is provided with exhausters, arranged directly or nearly opposite to each other, and the grain elevated by the vacuum created thereby is projected by its momentum across said chamber, beyond and out of the course and influence of the outward currents of said exhausters, into and through a receiving and conducting tube, arranged coincident with the horizontal discharging end of the elevating-tube, but separated a suitable distance from it, and by which the grain is delivered into a second contiguous vacuum-chamber, from which it is discharged to the place of storage. This second chamber communicates with the first, and the vacuum therein is created and equalized by the exhausters of the first chamber. It has a bottom discharging-spout, provided with pendent hinged meeting-valves, adapted to close by the pressure of the outside air until the grain has accummulated above them to seal the spout, and with sufficient weight to overcome the pressure of the outside air, when the discharge commences, and continues so long as the grain is presented to the receiving end of the elevating-tube.

The employment of two exhausters and the projection of the grain across the chamber-space centrally between them from one pipe into another serves to balance or neutralize the effects of the opposite outward currents upon the crossing column of grain.

The receiving section of the elevating-tube is of flexible hose, to allow it to be moved around and about as the grain is taken up, while the discharging end of said tube is straight, and contracted slightly to concentrate the column of grain and cause it to be projected more compactly across the vacuum-chamber, and to render it less liable to be influenced by the outward opposite currents of air in said chamber.

The end of the tube which receives the projected column of grain is straight, and made flaring or bell-shaped, the better to receive the projected column of grain in its passage from the elevating-tube, while its downward-curved discharging portion is of greater diameter than the neck of the flaring mouth, to compensate for the retardation of the grain caused by its downward bend. The diminished neck of the flaring mouth serves the important purpose of preventing, to a great extent, the passage of the air along with the projected column of grain through this conducting-tube.

The exhausting-chamber has a hopper, to receive the grain that may fall from the projected column at the beginning and ending of the operation, and this hopper connects by a spout with that of the discharging-chamber.

A great velocity of the grain and air is required to elevate a given quantity of grain in a given time; and in order to avoid an unnecessary expenditure of power for that purpose, the exhaust-openings are made comparatively large, so that the air is withdrawn from the contiguous chambers with the least possible velocity, and thereby render this method of elevating grain advantageous and economical as compared with the expensive machinery and apparatus now generally used for the purpose.

By using the momentum of the swift-rising column of grain to effect its projection in a body across a vacuum-chamber and across currents of air moving at right angles to that of the grain, and from the contracted outlet end of one tube into the enlarged inlet end of another tube, gives the advantage of delivering the grain outside of the exhausting-chamber and away from the direct influence of the exhausters, and of freeing the grain from the large volume of air with which it enters the exhausting-chamber by projection through a space or interruptions of tubes arranged in line

with each other, or through a succession of such interruptions.

Referring to the drawings, Figure 1 represents a vertical section of so much of a grain-elevator as embraces my invention, and Fig. 2 a cross-section through the exhausting-chamber of the same.

At a suitable place in the storage or elevator building I construct two or more contiguous air-tight chambers, *a* and *b*, one of which, *a*, forms the exhausting-chamber, with which the grain-elevating tube *c* connects, and from which it leads to the ship, boat, or car, or other place from which the grain is to be elevated, while the other chamber, *b*, receives the elevated grain and delivers it to the place of storage. These chambers communicate with each other by perforations *d* in their partition, so as to equalize the vacuum in both chambers.

An exhauster, *e*, is arranged at each side of the first chamber, *a*, in position opposite each other, or nearly so, so as to exhaust the air therefrom, preferably at right angles to the elevating-tube and by opposite currents—that is, each exhauster draws the air from this chamber in opposite directions, thereby creating a vacuum in both chambers, and, drawing the grain and air up the elevating-tube, projects it by its momentum in a column across said first chamber with sufficient force to carry it through a receiving and conducting tube, *f*, arranged in position coincident with the discharging end of the elevating-tube and into the second chamber. This second chamber has a hopper-bottom, from which leads a discharge-spout, *g*, provided at its lower end with pendent hinged valves *h h*, adapted to meet in closing, and which are closed by the outward pressure of the air when the exhausters are set in motion, will open to allow the grain to discharge only when the weight of the grain in the spout acts as a seal and exceeds the pressure of the outside air, and the grain will then pass out in a continuous stream during the operation of the elevating-tube.

The lower portion, c^1, of the elevating-tube is of flexible hose, to adapt it to be moved around and presented to the grain as it is taken up by the air drawn through said tube. The upper end, c^2, of this tube opens in a straight line into the exhausting-chamber *a*, and is contracted to concentrate the column of grain issuing therefrom, so as to cause it to be projected across the air-exhausting chamber as compactly as possible, and thereby, in connection with its high velocity, prevent it from scattering, and render it less liable to be influenced by the outward side-drawn currents of air, and thereby directed with the full force of the ascending column into the flaring end *i* of the receiving and conducting tube *f*, arranged with its flaring mouth in line with the discharge end of the elevating-tube, but separated from it a suitable distance to produce the best results, with exhausters arranged to draw the air from the projected column of grain in opposite directions to neutralize the effects of the outward currents upon the grain. The neck or point of least diameter of the bell-mouth acts to hinder the too free passage of the air along with the projected column of grain.

When the tube *f* is curved downward, as shown, it is gradually increased in diameter from the neck *j* of the bell-mouth, to compensate for any retardation of the grain which might be caused by such curve. When this tube is straight it need not be so enlarged.

The exhaust-openings are comparatively large, so that the air is drawn from the exhausting-chamber and from the projected column of grain across said chamber with the least possible velocity, while at the same time elevating the grain with a high velocity, and delivering it beyond the course and influence of the outward-drawn currents of air into a vacuum-chamber adjoining, but separated from the exhausting-chamber proper.

The exhausting-chamber has a hopper-bottom, *k*, to receive any grain that may fall from the column projected across the space from the end of the elevating-tube to the bell-mouth of the receiving and conducting tube, and deliver it by a spout, *l*, into the spout of the second chamber.

When more than two vacuum-chambers are used the intermediate receiving and conducting tube should be straight.

Any of the well-known devices for producing and maintaining a vacuum in the communicating chambers may be used, and I have shown fan-blowers; but pumps exhausting through valves of more than one-half the area of their cylinders are preferable.

The elevating and receiving tubes need not necessarily be horizontal at their interruption; but they must both project within the exhausting-chamber, and such projecting ends must be in such relation to each other that the grain projected from the one shall be received into the other.

I claim—

1. A pneumatic grain-elevator having a vacuum chamber or chambers and a pneumatic grain-projecting tube, in combination with a separate receiving-tube, or line of tubes, which receive the impelled grain from said elevator-tube and deliver it into store.

2. In a pneumatic grain-elevator, an elevating-tube and a receiving and discharging tube, the end of each projecting into an exhausting-chamber and separated from each other therein, in combination with exhausters adapted to draw the air from said chamber, whereby the grain is elevated and delivered at a point beyond the course and influence of the outwardly-drawn currents of air.

3. In a pneumatic grain-elevator, the combination, with the elevating-tube *c*, having a contracted discharging end, c^2, opening into an exhausting-chamber, *a*, of a receiving and discharging tube, *f*, having its receiving end *i*, flaring or bell-shaped, opening into said chamber.

4. In a pneumatic grain-elevator, in which the elevated grain is projected in a column by its momentum from the elevating-tube *c* across an exhausting-chamber, *a*, into the coincident end of a receiving and discharging tube, *f*, the latter having a flaring receiving end, *i*, in combination with an exhausting-chamber, *a*, and a contiguous communicating chamber, *b*, into which the elevated grain is discharged and delivered to the place of storage.

5. In a pneumatic grain-elevator, in which the elevated grain is projected by its momentum in a column across a vacuum-chamber from the end of the elevating-tube *c* into the coincident flaring end of a receiving and discharging tube, *f*, the contiguous communicating vacuum-chambers *a b*, each provided with a hopper, and in which the hopper of the exhausting-chamber communicates with the hopper-spout *g* of the grain-receiving chamber, above the automatic closing and opening valves *h h* in the delivering-spout *g*, substantially as herein set forth.

6. A pneumatic grain-elevator consisting of contiguous communicating vacuum-chambers *a b*, having their hopper-spouts also communicating, elevating, receiving, and discharging tubes *c* and *f*, communicating with said chambers, oppositely-arranged exhausters *e* in the exhausting-chamber *a*, flexible hose-sections c^1 at the lifting end of said elevating-tube, and automatic closing and opening valves *h h* in the delivering-spout *g*, all adapted for operation substantially as herein set forth.

In testimony that I claim the foregoing I have affixed my signature in the presence of two witnesses.

FRANCIS TAGGART.

Witnesses:
A. E. H. JOHNSON,
J. W. HAMILTON JOHNSON.