

UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN GRAIN-CONVEYERS.

Specification forming part of Letters Patent No. **211,351**, dated January 14, 1879; application filed May 23, 1878.

To all whom it may concern:

Be it known that we, WILLIAM THOMAS SMITH and ERNEST ABSHAGEN, both of the village of East New York, town of New Lots, county of Kings, State of New York, have invented certain new and useful Improvements in Grain-Conveyers; and we hereby declare that the following is a full, clear, and exact description thereof.

The nature of our invention, in the first part, consists in an air-tight vessel or chamber, having on its upper portion a supply-valve for the admission of grain conveyed thereto by means of exhausting the air conveyed in said air vessel or chamber, and suction pipe or hose connected therewith, and a number of exhausts on the lower portion of the chamber, in order to discharge the grain which has been formerly admitted to the same; and, in the second part, of a series of pneumatic valves attached to diaphragms, and operated by compressed air, for the purpose of regulating one and the other; and, in the third part, to register the quantity and weight of the grain which has been elevated and transferred from one place to the other through the air-chamber.

Figure 1 in drawing represents a longitudinal vertical section of our invention. Fig. 2 is a cross-section of the diaphragm and valve. Figs. 3 and 4 show in detail the parts A A and B B of Fig. 1. Fig. 5 represents the external and sectional view of suction-pipe. Fig. 6 illustrates the exhaust-valves at the lower portion of the air-vessel. Fig. 7 represents a modification of the mode of opening and closing the valves at the upper and lower portion of the air-chamber.

A is an upright engine, to which the air-cylinder B is attached, and operated by the crank-connection C. On the fly-wheel D' is also a crank, E, attached, which operates the up-and-down movement of the piston-rod *a* of the second cylinder, F.

The cylinder B is for the purpose of exhausting, through the upward movement of its piston, the air-chamber G and the herewith-connected suction-pipes *b b*, and through the downward movement of its piston to increase the discharge of the grain in the air-chamber G and the herewith-connected suction-pipes *b b*, through the series of exhaust-valves *c c* into the funnel *d*, from which place the grain

may be transferred to any point of the vessel or warehouse, as the case may be.

The cylinder F is so arranged as to produce by the downward movement of its piston, first, to close the supply-valves *f f*, and, second, to open the exhaust-valves *c c* of the chamber G.

The pipe H forms the connection between the cylinder B and the chamber G.

The air-chamber G consists of two vessels—one outer casing, G', and the inner casing, G. The latter is suspended by means of strong elastic springs I from the top of the outer casing, G', and is properly guided through the rollers *y y*, attached to the inner casing, G.

In order to produce an effective air-tight chamber formed by the sidings of the inner casing, G, the exhaust-valves *c c*, when closed, and the inner side of the upper portion of the outer casing, G', and yet to give a swinging motion to the inner chamber, G, the upper portion of the said air-chamber G is lined with a rubber cloth, *g g*, (see Figs. 3 and 4,) in such a manner as to serve at the same time to keep suspended the inner casing, G, in common with the elastic spring I.

At that part where the air-pipe H enters the outer casing, G', a connection is made of rubber hose or other suitable yielding material, which passes through the rubber cloth *g* into the air-chamber G, thus effecting an air-tight compartment from the air-cylinder B through pipe H to air-chamber G.

On the one side of the suspended chamber G is attached the pointer or indicator J, which follows the upward and downward motions of the casing G, and indents or registers on the horizontal lines of the unwinding paper of the register K the weight of each unit of quantity transferred into the air-chamber whenever a vacuum has been created and a quantity of grain has been admitted to the same.

The oscillator L, being an extension of the flap-like valve *c c* and gearing on the cog-wheel Z, causes to partly revolve the same for the space of one unit at each discharge of the grain. This revolving motion is transferred to the unwinding paper of the register K, thus causing the pointer or indicator to indent or register at the same time the quantity and weight of the transferred grain which passes through the air-chamber.

h is a deflector, protecting the mouth of the air-pipe H.

The supply or suction pipes *b* are opened and closed by the valves *ff* in such a way as when compressed air has been admitted from the second air-cylinder, F, into the upper part of the diaphragm M, the same will be brought downward, and the thereto-attached rod *l*, operating on the two-arm lever *i*, will shift the valve-stem K in the direction of arrow, as shown in the drawing, Fig. 1, in which case communication will be shut off between air-chamber G and suction-hose *b b*.

In the upward motion of the piston of cylinder F, air is admitted to the lower portion of the diaphragm M, the rod *l* is pushed upward, the valve-stem K shifted in the opposite direction, and the valves *ff* opened.

Whenever the piston of cylinder B has performed its upward motion, and a vacuum created in the air-chamber G, and a unit of quantity of grain transferred into the same, the next downstroke of both pistons of cylinder B and F will operate to discharge the grain in such a manner that, compressed air from cylinder F entering through pipe *m*, the diaphragm M shall close valves *ff*, as described above, and open diaphragm-valve *o*, passing through the same into pipe *p*, and entering the lower part of diaphragm N, exhausting through vents *v v* to push upward the rod *r*, and, by means of the two-arm lever S and circular connecting-rod *t*, opens the exhaust-valve *c c*, through which operation the grain in the chamber G accumulated will, by its own gravity, discharge into funnel *d*.

The compressed air, which enters from cylinder B through pipe H into chamber G, will assist to more rapidly discharge the grain.

Whenever the pistons of both cylinders B and F have performed their downstrokes, at the first upward stroke compressed air from cylinder F will enter, through pipe *n*, the upper portion of diaphragm N, push rod *r* downward, and consequently close valves *c c*. It will open diaphragm-valve *o*, and enter, through pipe *p*, the lower part of diaphragm M, open the supply-valves *f f*, and exhaust through vents *v v*.

The position of cranks C and E is such a one that crank E shall be slightly in advance of crank C, in order that the compressed air admitted from cylinder F, either through pipe *m* or *n*, shall have performed the duty of opening and closing valves *ff* and *c c*, as the case may be, before a vacuum is performed through the upward stroke of piston of cylinder B.

The suction-hose *b b*, leading from the top of air-chamber G to the place from where the grain or corn shall be elevated, is provided on its lower portion with a nozzle, *w*, as shown in Fig. 5, having a number of openings to admit the easy entrance of the grain into the pipe *b b*.

Instead of operating the valves *c c* and *ff* by means of diaphragms, actuated upon through compressed air from cylinders, a direct action from the up and downward movement of pis-

ton-rod C', as illustrated in Fig. 7, may be used in such a manner as that a guide, *a a*, being firmly connected to C', will operate the continuation of valve-stems *f'* and *t'*. This guide *a a* has three vertical and two inclined sections, all connected with each other, forming one uninterrupted line, but broken in the direction of its section.

The ends of valve-stems *f'* and *t'* have an opening of slightly larger dimensions than the diameter of said guide *a a*, which is allowed to pass through the same. A downward movement of piston-rod C' will slide sidewise both valve-stems and open and close the valves whenever the inclined section of *a a* passes through their end openings. During the time that the vertical section of *a a* passes through ends of *f'* and *t'* the valves are kept at rest—that is, they remain open or closed, as the case may be.

In the upward movement of rod C' a reverse of the above-described operation takes place.

We also contemplate using this device for elevating corn or grain, and for such other purposes as it may be adapted for, such as elevating quicksand, or mud, or other substances.

We claim—

1. The arrangement of the apparatus for the elevation, measuring, and weighing of grain, or other similar substances, by the creation of a vacuum, as herein set forth.

2. The arrangement for the automatically opening and closing of valves *ff* and *c c* by means of diaphragms actuated upon by compressed air, as and for the purpose herein described.

3. In combination, with each other, the diaphragm M, diaphragm N, cylinder F, valves *ff* and *c c*, and service-pipes *m* and *n*, operated by compressed air, as shown and described.

4. The arrangement of the registering apparatus K, for the purpose of weighing and measuring the elevated material, as herein set forth.

5. The inner air-chamber, G, the outer, G', the spring I, rubber cloth *g g*, and suction-hose *b b*, in combination with registering apparatus K, as and for the purpose herein set forth.

6. The arrangement of cylinder B, pipe H, and air-chamber G, and suction-hose *b b*, for the purpose of alternating, receiving, and discharging the elevated material, as herein set forth.

7. The guide *a a*, valve-stems *t'* and *f'*, and air-chamber G, in connection with piston-rod C', as and for the purpose herein described.

In witness whereof we have hereunto set our names in the presence of two witnesses.

WM. THOMAS SMITH.
ERNEST ABSHAGEN.

Witnesses:

MATTHEW COOPER,
I. G. BAINBRIDGE.