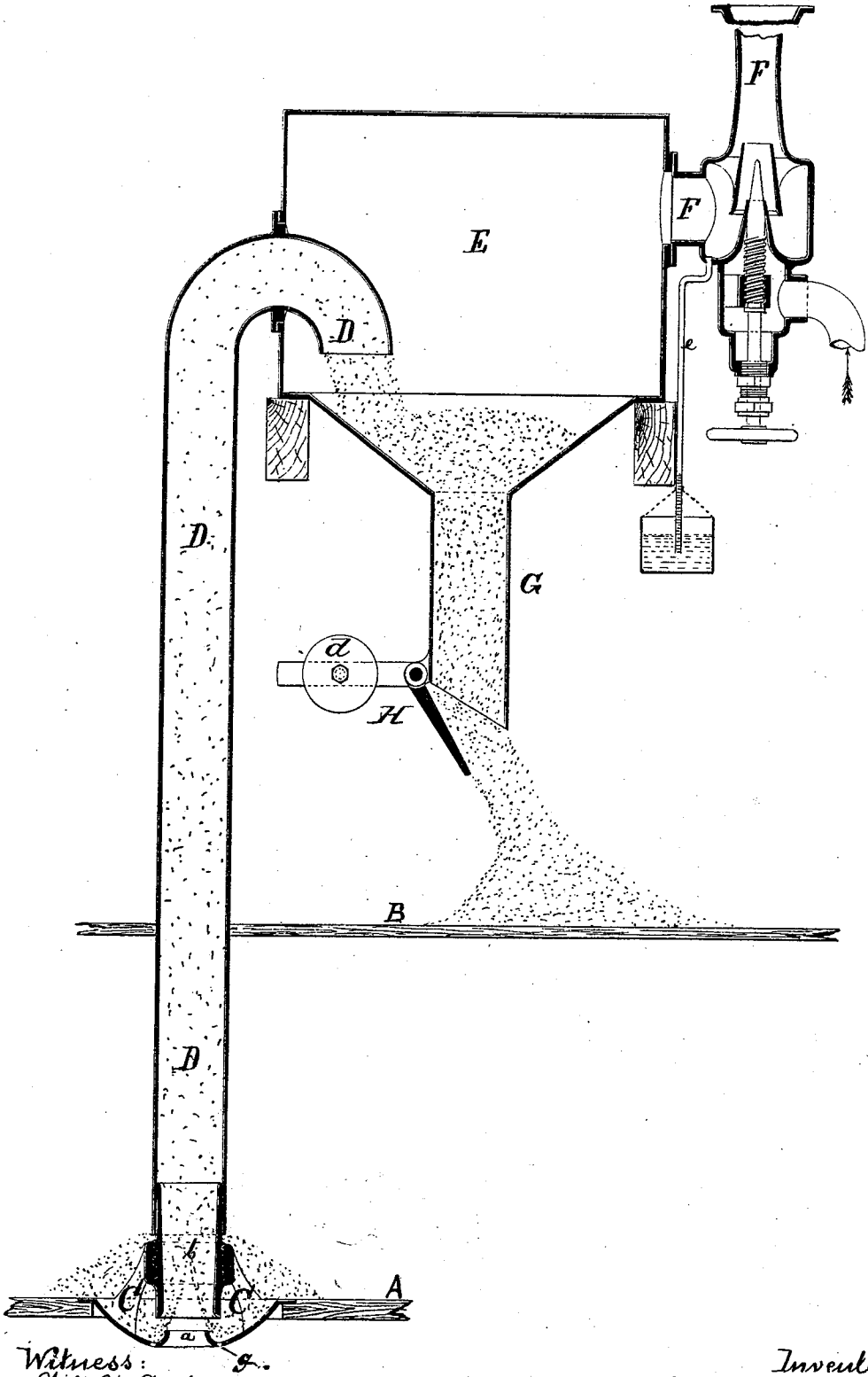
E. KÖRTING.

Grain-Elevator.

No. 168,029. Patented Sept. 21, 1875.



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UNITED STATES PATENT OFFICE.

ERNST KÖRTING, OF MANCHESTER, ENGLAND.

IMPROVEMENT IN GRAIN-ELEVATORS.

Specification forming part of Letters Patent No. **168,029**, dated September 21, 1875; application filed June 17, 1875.

To all whom it may concern:

Be it known that I, ERNST KÖRTING, of Manchester, England, have invented certain Improvements in Grain-Elevators, of which the following is a specification:

My invention relates to that class of grain-elevators in which the grain is carried by a column of air drawn through a conducting-tube; and it consists in a special construction and arrangement of parts for controlling the admission of the air and grain to the tube.

My invention is intended mainly as a substitute for the expensive and cumbersome apparatus now employed for elevating grain. It depends for its operation upon the employment of a conducting-tube, an exhausting apparatus communicating with the upper end of said tube, and devices at the foot of the tube for regulating the admission of the air and the grain thereto.

By maintaining a proper velocity of the ascending air, and admitting the air and grain in properly-graduated proportions and amounts, I find that I can cheaply and rapidly elevate grain to any distance required. In order to produce and maintain the necessary high and uniform velocity of the air, I find that it is necessary to employ a suction apparatus communicating with the upper end of the conducting-tube.

I am aware that various attempts have been made to elevate granular matter by means of a jet or blast introduced at the bottom of the conducting-tube, and also that fluids have been raised by means of a pipe communicating with a vacuum-chamber, but in practice it has been found impossible to elevate grain in a practical manner by either of said methods, and they have consequently failed to come into use for such purpose.

By practical tests I have discovered that in order to elevate the grain successfully it is necessary to employ a continuously-ascending column of air moving at a very high velocity, and to admit the air thereto gradually and in limited amounts, and that in order to produce the uniform velocity the entire length of the tube, and cause an even uninterrupted flow of grain, the only successful plan is to connect the exhauster to the upper end of the tube, as stated, it being demonstrated by actual test that the action of an exhauster at the top, and of a blower at the bottom, are very different. In order to attain the best results I find it advisable to employ a steam-jet exhauster, but an exhauster of any other character may be substituted. The jet-exhauster, being applied at the top, will discharge all chaff, dirt, and impurities contained in the grain, and will not subject the grain to either the action of the moist steam, or to the injurious action of air charged with grease and oil, as would be the case with a blower at the foot of the tube. I find that the action of the apparatus is the most efficient when the conducting-tube discharges into a large receiving-chamber having the exhauster applied thereto. The receiving-chamber should be provided at the bottom with a discharge-tube having a weighted valve arranged in such manner as to open under the weight of the grain and clog under the action of the weight of the grain, so as to permit the escape of the latter, and at the same time prevent the vacuum from falling too low. A drip-pipe is also connected to the chamber to carry off the water resulting from condensation, so as to prevent the same from coming in contact with the grain. At the foot of the conducting-pipe I provide a bowl to receive the grain, having a central hole and a surrounding row of small holes, *g*, through which air ascends to enter the tube, and on the foot of the pipe I arrange a vertically-adjustable sleeve to vary the size of the inlet for the grain, which latter passes with the air into the tube. The arrangement may, however, be reversed, and the bowl made adjustable.

The drawing represents a vertical central section of my apparatus.

A represents a floor, on which the grain is located; B, the floor to which is to be elevated; C, a bowl or feed-cup mounted in the floor, and provided with a central air-hole, *a*, and a row or series of small holes, *g*; D, the upright conducting-tube, provided at its lower end with a vertically-adjustable mouth-piece, *b*, entering the bowl C directly over the opening *a*, as shown; E, a large air-tight receiving-chamber, into which, at or near the top, the upper curved end of the pipe D enters, as shown; F, the steam-jet exhauster,

communicating with the chamber E; G, a discharge-tube attached to the bottom of chamber E; and H, a valve hinged to the lower end of the tube G, and provided with an arm having an adjustable weight, *d*, mounted thereon to hold the valve shut. A pipe, *e*, extends downward from the exhauster to carry off the water resulting from condensation, the end dipping in water or being provided with a check-valve to prevent the entrance of air. The mouth-piece, which fits closely within the lower end of the pipe D, is provided with an encircling screw-thread, and is supported in a ring sustained by arms on the bowl or feed-cup, as shown, so that by simply giving the mouth-piece a rotary motion it may be adjusted with great nicety. Around the air-inlet *a* a flange is turned up, as shown, forming a nozzle to direct the air in a central jet into the mouth of the tube, and also serving to prevent the escape of grain through the opening, and to admit the grain to the tube in a thin annular stream around the air-jet.

The operation of the apparatus is as follows: As soon as the suction apparatus commences to operate, the valve in the lower end of the discharge-tube of the chamber closes, and an upward current of air is induced through the nozzle *a* and the space under the mouth, and thence through the pipe, into the chamber, the velocity of the current depending upon the amount of the vacuum in the chamber and being increased or diminished according to the specific gravity of the material and the distance which it is to be raised. When the current attains the proper velocity through the tube and inlets, the grain being admitted from the bowl through the annular space into the mouth-piece *b* of the tube D, comes in contact with the surface of the central jet and is carried up in the tube therewith into the receiving-chamber. The air passing from the pipe into the large chamber has its velocity diminished to such an extent that it will no longer sustain the grain which falls, by reason of its gravity and is deposited in the receiver, while the air continues its course out through the exhauster. The discharge-pipe is made of such length that, when filled, the weight of the column therein is in excess of the vacuum, so that it holds the valve open and permits a gradual discharge of the grain from the receiver.

I am aware that attempts have hitherto been made to elevate grain by means of a column of air drawn through a conducting-tube, and I therefore make no claim thereto; but I am not aware that any one has hitherto used, in an apparatus of this character, a feed-hopper through which air is admitted, nor that any one has hitherto made provision for controlling the relative admission of air and grain, and at the same time permitting them to enter the mouth of the tube together. By my combination and arrangement of the feeding devices I am enabled to render the action of the apparatus perfect and economical under all circumstances, overcoming all difficulty from variations in the quality or character of the grain, the strength of the air-current, and the height to which the grain is to be carried.

Having thus described my invention, what I claim is—

1. A pneumatic grain-elevator, consisting of a conducting-tube, an exhausting apparatus communicating with the upper end of said tube, and a foot or hopper to receive the grain, arranged opposite the lower end of the tube and provided with a central air-passage, substantially as shown and described.

2. The combination of the tube D, communicating at its upper end with an exhauster, and the hopper C, provided with the central hole *a* and surrounding holes *g*.

3. In a pneumatic grain-elevator, the combination of a conducting-tube and a feed-hopper, provided with a central air-passage, substantially as shown, so that the distance between the hopper and the end of the tube may be increased or diminished at will, whereby the admission of grain may be varied, and at the same time the grain and air permitted to enter the mouth of the tube together.

4. In combination with the fixed tube D and fixed hopper C, provided with the central air-passage *a*, the movable mouth-piece *b*, provided with the external screw-thread and arranged as shown.

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