No. 611,569. Patented Sept. 27, 1898.

F. E. DUCKHAM.

METHOD OF AND MEANS FOR DELIVERING PNEUMATICALLY CONVEYED GRAIN, &c.

(Application filed May 11, 1897.)

(No Model.)

FIG. 1

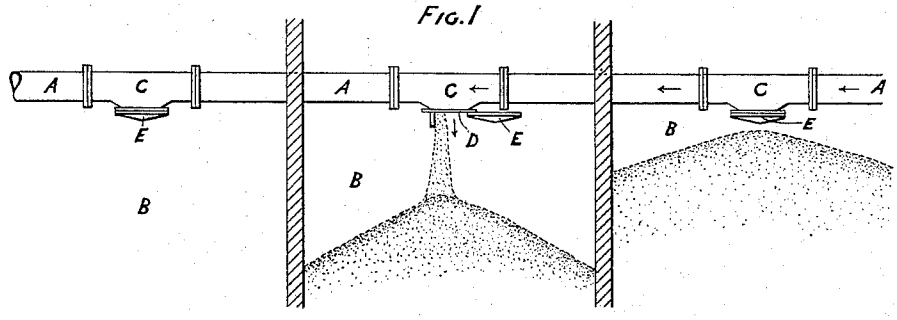


FIG. 2

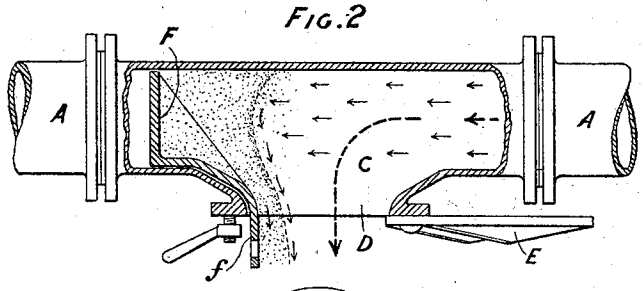
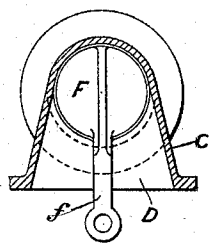


FIG. 4



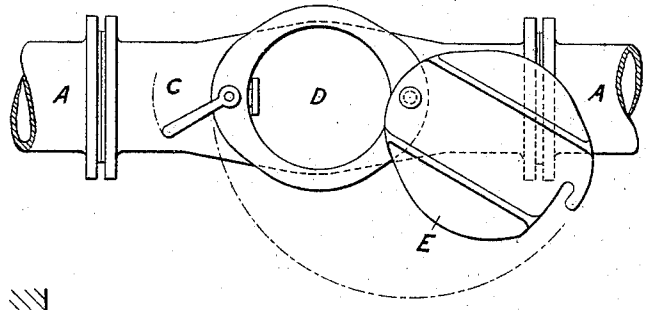
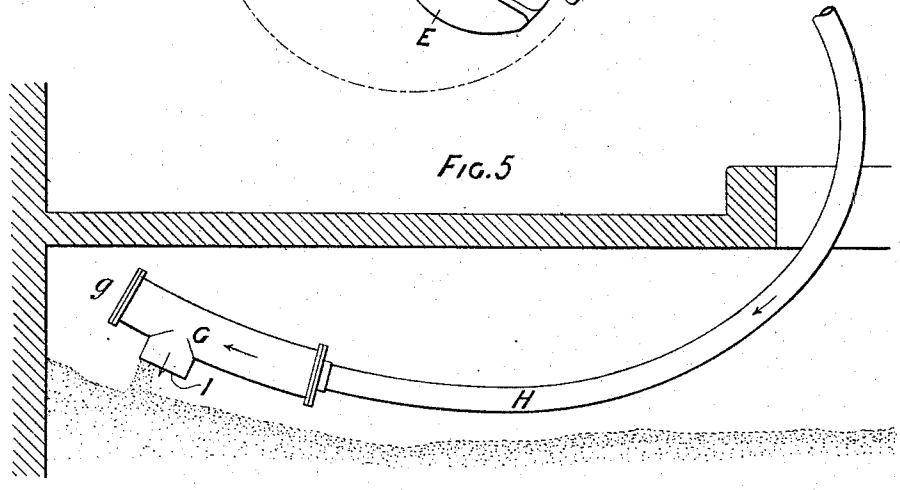


FIG. 3

FIG. 5



WITNESSES:

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BY

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UNITED STATES PATENT OFFICE.

FREDERIC ELIOT DUCKHAM, OF LONDON, ENGLAND.

METHOD OF AND MEANS FOR DELIVERING PNEUMATICALLY-CONVEYED GRAIN, &c.

SPECIFICATION forming part of Letters Patent No. 611,569, dated September 27, 1898.

Application filed May 11, 1897. Serial No. 636,035. (No model.) Patented in England July 27, 1896, No. 14,283.

To all whom it may concern:

Be it known that I, FREDERIC ELIOT DUCKHAM, civil engineer, of Millwall Docks, London, England, have invented a new and useful Method of and Means for Delivering Pneumatically-Conveyed Grain or other Granular or Pulverulent Matters, (for which I have obtained Letters Patent in Great Britain, No. 14,283, dated July 27, 1896,) of which the following is a full, clear, and exact description.

My invention relates to the deposit or delivery of pneumatically-conveyed grain or other granular or pulverulent matters conveyed by a current of air under pressure, and has for its object to enable the grain to be deposited gently wherever required.

In pneumatically conveying grain through long lengths of piping (as in loading or discharging ships' cargoes from or to barges or as in granaries) the grain flows in a somewhat attenuated stream suspended in a current of air, which is necessarily at such a high pressure that the air and grain travel at a very considerable velocity, the effect of which is that the grain rebounds and flies about in all directions, so that it is practically impossible to deposit it in any particular spot if it is projected from the discharge-aperture at the velocity with which it travels through the conveying-pipe, this difficulty occurring whether the place of deposit be an open bin, a barge, or a vessel's hold. The difficulty experienced in depositing the grain is aggravated when it is desired to completely fill up with grain the last spaces left vacant in a vessel's hold or beneath the deck or beneath the top or ceiling of a granary-bin after the bulk of the space has been filled.

According to my invention I provide means whereby the velocity acquired by the grain is destroyed and the direction in which the grain is propelled is suddenly changed just at the moment before it emerges at the point of discharge, so that before the air-current can overcome the inertia of the grain and again impart to the grain its own high velocity the air will have become dispersed in the surrounding atmosphere, while the grain, freed from the propulsive action of the air-current, masses in a thick stream, flowing out by gravity at a low velocity, so that it may be deposited quietly where required. The means employed for accomplishing this result are illustrated in the accompanying drawings, wherein—

Figure 1 is a side elevation of part of a line of pneumatic piping extending above a row of granary-bins. Fig. 2 is a longitudinal section, Fig. 3 an under side plan, and Fig. 4 a cross-section, of one of the discharge-outlets from the pneumatic pipe. Fig. 5 illustrates the invention as applied to the delivery-nozzle of a flexible hose delivering grain in the hold of a vessel.

The same letters of reference indicate the same parts in all the figures.

Referring to Figs. 1 to 4, A is a line of piping extending over the various bins B of a warehouse or granary. It is connected at one end with the conveying-pipe coming from the grain blowing and conveying appliances generally used for the pneumatic conveyance of grain by a forced current and is closed at the other end. At the under side of this line of piping and at intervals corresponding to the various bins B or places of deposit pipe enlargements C, having outlet-orifices D and removable covers E, are provided. The enlargement of the thoroughfare at the point of discharge has for effect to diminish the velocity of the air-current at this point, and in order that the grain traveling at a very high velocity through the pipe may be deposited gently the orifices are placed axially at right angles to the line of piping, so that the direction of motion of the grain must be abruptly changed in order that it shall pass out at the orifice which for the time being may be open. Now while the air flows directly to the outlet the momentum of the grain is so great at the high velocity at which it travels in the pipe that its inertia would cause it to overshoot or pass beyond the discharge-orifice, and means are therefore provided whereby the grain is brought to rest, so that its initial velocity being thus destroyed it will flow slowly in the new direction. The arrest of the grain and the change in the direction of its motion are produced by closing the bore of the pipe A at a point beyond the orifice at which the grain is required to be discharged, the effect being to cause the grain carried by its momentum over the opened aperture to bank up in and to choke the pipe just beyond the said

aperture, the grain thus banked up forming a self-constituted yielding but non-elastic and constantly-renewed buffer, against which the grain subsequently arriving may be projected without injury. In order to limit the length of the bank of grain by which the pipe thus becomes choked, so as to permit of the bank being easily removed when it is required to effect the discharge at an aperture farther along the pipe, it is generally most convenient to close the bore of the pipe A just beyond the aperture at which the discharge is to be effected, and for this purpose I provide a baffle-plate F, having a shank *f*, whereby it is adapted to be passed through the delivery-aperture D into the bore of the pipe A and to be there retained by the engagement of the shank with the lower side of the enlargement C, the baffle being situated so far beyond the aperture D as to leave room for a bank of grain to form for the purpose mentioned. To facilitate the dispersal of the air and permit of the quiet deposit of the grain, the sectional area of the orifice D is made considerably greater than that of the pipe A, the preferred form of the pipe-enlargement section C being clearly shown in Fig. 4. The covers E of the orifices D are preferably pivoted at one side and secured at the other by a locking-bolt, so that they may be readily opened and closed as required, all being usually closed except the one from which the grain is to be discharged.

Referring now to Fig. 5, which illustrates the invention applied to the terminal nozzle G of a flexible pipe H, adapted to be passed through the hatchway of a vessel or bin, the nozzle G is made about twice the diameter of the pipe H, is closed at the end *g* to form a baffle, and provided with an outlet I at the under side of about the same diameter as the nozzle. In this as in the other case the grain first projected banks up in the closed end of the nozzle and forms a cushion by which the motion of the subsequently-projected grain is arrested, so that it flows out quietly at the aperture I.

I claim—

1. A terminal nozzle, of a pneumatic grain-conveying pipe, for gently depositing the grain from the forced current of air by which it is conveyed, the said nozzle consisting of a length of tube of larger diameter than the conveying-pipe, closed at the end and provided with an outlet-aperture in its under side of about the same diameter as the nozzle itself, substantially as specified.

2. A pneumatic conveyer having a pipe provided with a discharge-orifice, and a baffle situated in the pipe at one side of the orifice and distant from the orifice, whereby to form a closure in the pipe at a point adjacent to or beyond the orifice, whereby material pneumatically conveyed through the pipe will be ejected through the discharge-orifice at approximately right angles to the pipe by the formation of a body of air and grain situate between the baffle and orifice and pressing against the baffle.

FREDERIC ELIOT DUCKHAM.

In presence of—
FRED C. HARUS,
WALTER J. SKERTEN.