

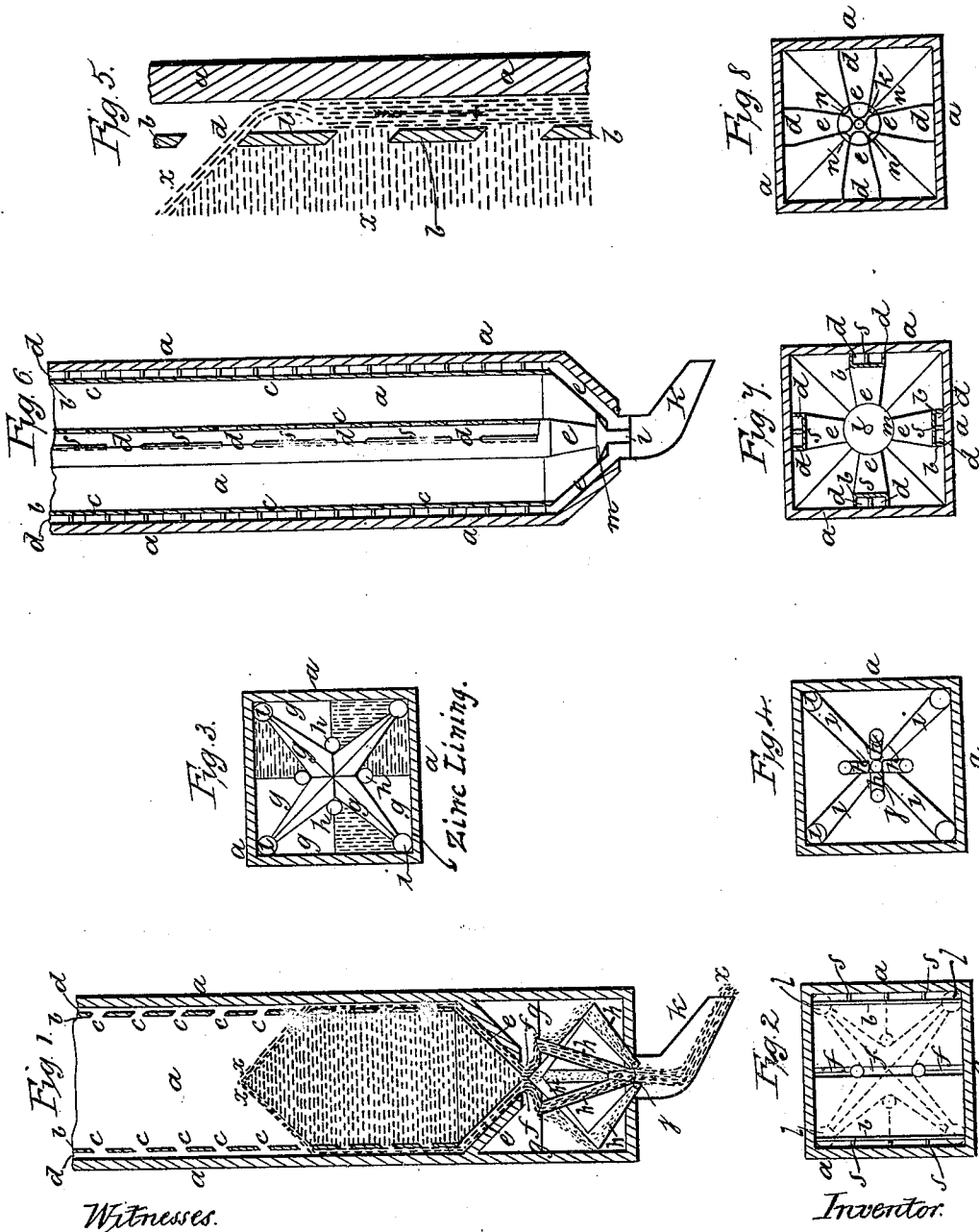
(No Model.)

W. H. SPRAGUE.

APPARATUS FOR DRAWING OFF AND MIXING THE GRAIN
FROM ELEVATORS.

No. 407,907.

Patented July 30, 1889.



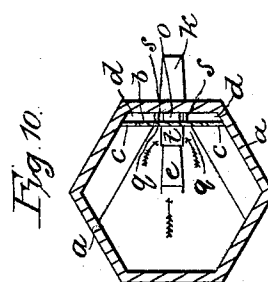
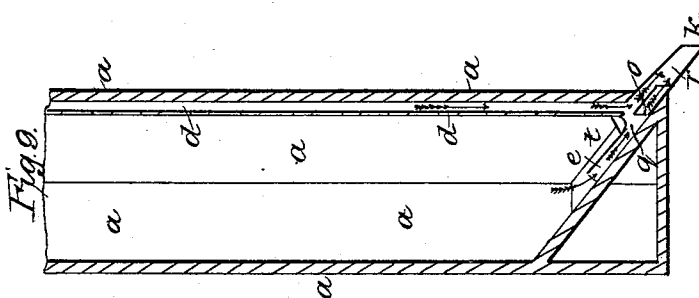
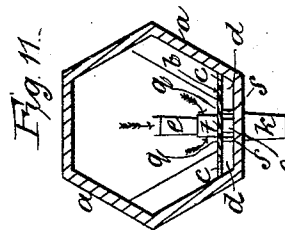
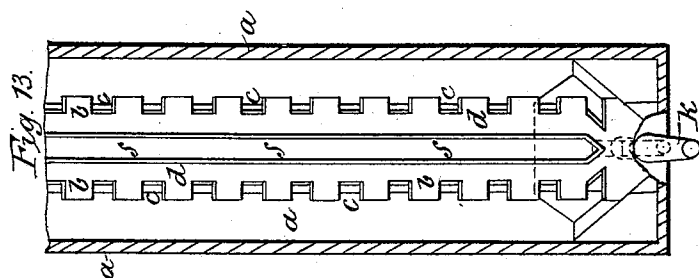
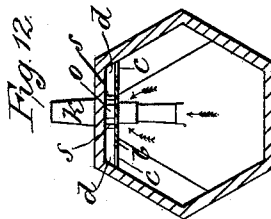
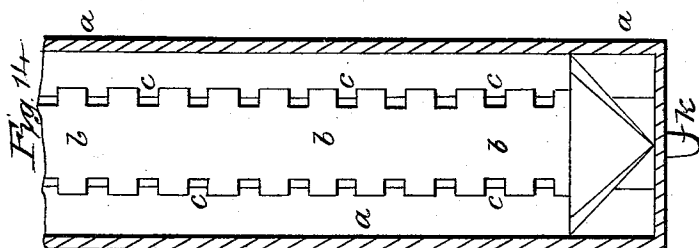
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Witnesses.

Wm. H. Sprague,
Gates W. Booth.

Inventor.

William Hollinshead Sprague

UNITED STATES PATENT OFFICE.

WILLIAM HOLLINSHEAD SPRAGUE, OF HORWICH, COUNTY OF LANCASTER,
ENGLAND.

APPARATUS FOR DRAWING OFF AND MIXING THE GRAIN FROM ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 407,907, dated July 30, 1889.

Application filed February 12, 1889. Serial No. 299,569. (No model.) Patented in England May 21, 1886, No. 6,840.

To all whom it may concern:

Be it known that I, WILLIAM HOLLINSHEAD SPRAGUE, a subject of the Queen of Great Britain and Ireland, residing at Horwich, in the county of Lancaster, Kingdom of Great Britain and Ireland, have invented Improvements in Arrangements or Apparatus for Drawing Off and Mixing the Grain from Elevator and other Vertical Silos and Store-Bins, (for which I have obtained a patent in Great Britain, No. 6,840, bearing date May 21, 1886,) of which the following is a specification.

This invention relates to arrangements or apparatus for drawing off and mixing the grain from elevator and other vertical silos and store-bins; and it consists in causing the grain to leave the bin from the top or upper end of the supply and also from the bottom end simultaneously, so that deliveries or streams of grain from the top may meet and mix with a central stream issuing from the bottom of the bin, whereupon the grain may in some cases be further mixed by being arranged to fall upon a pyramidal structure along whose sloping surfaces the grain passes to pipes or tubes converging toward the lower central aperture through which the grain is delivered. Near to each of two or more opposite sides of the bin, and extending from the top to the bottom thereof, I arrange a partition having vertical openings or ports at suitable distances apart and arranged alternately on the opposite sides of the bin, the interval or space behind the partitions forming vertical passages, through which the grain from the top of the supply, after passing through the vertical openings or ports, is conducted down to suitably-arranged passages pointing inwardly, so as to meet in two or more opposite streams a central stream of grain descending from the bottom of the supply through an opening at the bottom of the bin. The openings or ports and the side and underneath passages are of such a size relatively to each other that the vertical side passages become filled with the grain, which moves downwardly in a compact column, and thus cuts off and prevents the entry of grain from those ports which are below the two ports above, (one on each side of the bin,)

supplying for the time being the grain to the side passages. Thus chaff and extraneous light matter, which are apt to rise and accumulate upon the surface of the grain, are caused to be carried off as they rise and to be mixed with the better grain at the bottom of the bin, and so produce a uniform mixture or sample throughout the delivery of the entire contents of the bin.

In lieu of the arrangement of side passages as above described, a central tube may be employed having openings or apertures through which the grain may pass from the top of the supply, so as to fill the tube and descend in a compact column, as in the case of the side passages hereinabove referred to. When a central tube is employed, the grain may be arranged to leave the bottom of the bin and to mix with that issuing from the bottom of the tube by means of a suitably-sized annular aperture surrounding the tube.

When a pyramidal structure is employed upon which the grain falls after leaving the bin, it is so arranged as to carry an inner upper set and a lower outer set of tubes, (preferably four tubes in each set,) the top of the structure being formed with sloping surfaces in such manner that the grain may be guided in the required quantity to each of the several tubes, which may be provided with valves, so that the supply of grain from each tube may be regulated. The grain flows from the inner outlet ends of the tubes in eight streams, which meet each other, the grain thereby becoming thoroughly mixed at the point of delivery. The upper side of the structure, the interior of the tubes, and other surfaces along which the grain passes are preferably covered with sheet-zinc for the purpose of reducing friction.

In the accompanying drawings, Figure 1 is a vertical sectional view, and Fig. 2 a plan view, of a rectangular or four-sided silo or store-bin having my invention, as above described, applied thereto. Fig. 3 shows in plan view the arrangement of the sloping surfaces of the structure and the position of the two sets of tubes. Fig. 4 shows also in plan view the arrangement of the tubes through which the grain passes and by which the grain is

delivered in eight converging streams meeting at one central point, thereby becoming thoroughly mixed together on entering the chute or delivery-tube. Fig. 5 is a vertical section of part of the apparatus drawn to an enlarged scale. Fig. 6 is a vertical sectional view; Fig. 7, a plan view, and Fig. 8 a diagrammatic plan view showing a modification in which each of the four sides of the bin is provided with a vertical passage. Fig. 9 is a sectional side view. Figs. 10, 11, and 12 are plan views. Fig. 13 is a front view with the front sides of the bin partially removed, so as to show the construction of the partition and its openings or ports and attendant arrangements; and Fig. 14 is a sectional back view of a six-sided bin to which my invention is applied.

In Figs. 1 to 5, *aa* are the sides of the bin; *bb*, partitions with vertical openings or ports *cc*; *dd*, the spaces forming vertical side passages, through which the grain *x*, after leaving the top of the supply, as shown in Fig. 1, descends in a solid or compact column (shown more clearly in Fig. 5) to the sloping conducting-passages *ee*, so as to meet in two opposite streams and mix with a central stream descending through the groove or narrow opening *f*. The descending grain then falls upon the upper surface *g* of a pyramidal structure having an inner upper set of tubes *hh* *hh* and a lower set of tubes *iii* *iii*. *j* is the central point where the converging streams meet. *k* is the chute or delivery-tube.

In Figs. 6, 7, and 8 each of the four sides of the bin is provided with a vertical passage *d*, although each of the four passages is made to extend only partly across the side of the bin instead of entirely across, as in the previously-described arrangement. The vertical openings or ports *cc* are preferably at the sides of the tubes which form the vertical passages, the openings being shown more clearly in the center of Fig. 6, in which the back tube is shown partly in section. The grain descends through the vertical passages in a compact column, cutting off and preventing the entry of grain from the ports below those which, for the time being, are feeding or supplying the grain to the interior of the tubes from the top of the supply, and is then conducted inwardly through the sloping passages *ee* to meet a central stream from the bottom of the bin, which finds its way partly through the central tube *l* through the bottom of the funnel-shaped dish *m* and partly underneath the dish through the apertures between the ends of the converging sloping tubes *ee* into the vertical semicircular tubes *nn*. (See Fig. 8.) In Fig. 8 the dish *m* is removed to show more clearly the arrangement of the sloping converging tubes and the method whereby the grain is conducted in nine separate streams into the chute *k*, the mixing of the grain being thus effected without the employment of the pyramidal arrangements first

hereinabove described, and shown in Figs. 1, 2, 3, and 4 of the drawings.

In the form of apparatus shown in Figs. 9 to 14, inclusive, I prefer to provide only one side of the bin with a partition, and to form the lower part of the bin with a floor sloping down toward the chute. *aa* are the sides of the bin; *b*, the partition with the vertical openings or ports *cc*, and *dd* vertical passages. *ss* represent pieces of timber interposed between the partition *b* and the bin-side *a* to receive the pressure of the grain upon the partition, which, under ordinary circumstances, would be too weak and would therefore give way under the side pressure of the grain within the bin. Similar supporting-pieces *ss* are also shown in the figures illustrating the former arrangements hereinbefore described. The grain descending in a compact column through the vertical passages *d* finds its way, as shown by arrows, to the interior of the chute *k*, the grain from the vertical passages falling meanwhile upon the top side of a central inner conducting-tube *o*, which receives the grain supplied from the bottom of the bin through the central sloping tube *e* and the openings *q*, the upper and lower streams being mixed together at the point of delivery *r* in the chute *k*. *t* is a semicircular piece or saddle provided for the purpose of receiving the pressure of the grain above, and to prevent it from interfering with the passage of the moving grain underneath as it passes from the bottom of the bin to the inner tube *o*.

In all the arrangements above described it will be observed that a delivery from the top or inferior part of the grain-supply and a delivery from the bottom or superior part are simultaneously drawn off in such manner as to meet and mix with each other near the exit-point of delivery or chute.

I am aware that it has been sought to draw off the grain from the top of the supply in silos or bins by means of vertical tubes arranged centrally or otherwise, such tubes having openings fitted with doors or valves, to be opened in some cases automatically and in others by the aid of rods and levers and other appliances worked from the outside of the bin. When designed to be opened automatically, the tubes have, first of all, to be filled with grain to insure the doors or valves being securely closed from the inside by the pressure of the grain within the tubes, the doors being intended to open as the top of the column of grain lowers in the tube and the inside pressure of the grain without. As ordinarily constructed, such doors or valves cannot in practice be relied upon to open and close when wanted, and are, moreover, liable to get out of order. When the valves are operated from the outside of the bin, great difficulty is experienced, owing to the heavy pressure of the grain on the valve mechanism employed.

Now, the principal feature of my invention consists in adapting the principle that a com-

5 pact column of descending grain within a vertical tube or passage cuts off the entry of grain at those ports or apertures in the tube which the compact column is passing at the time, as shown at Fig. 5, and by reason of this discovery I am enabled to dispense with doors, valves, and external mechanism of every kind and to turn the grain-supply into the silo or bin at once in the ordinary way, the opening or closing of the ordinary chute or delivery-valve controlling the action of the entire apparatus. Another important feature of my invention consists in providing arrangements whereby the grain may be drawn off from the bottom of the supply as well as from the top simultaneously and as to effect such a mixture of the two as shall be practically uniform throughout the drawing off of the entire contents of the bin.

20 Although a vertical central tube or tubes may be employed having side openings or ports without any doors or valves and operating on the principle of my invention, (with a lower annular tube surrounding its lower extremity, so as to allow the grain to escape from the bottom of the bin simultaneously with that descending through the tube from the top of the supply,) I prefer in practice to arrange the vertical passages against the sides of the bin, as they may then be more firmly and compactly constructed and secured in place and without the obstructions caused by the numerous cross-stays which a tube arranged centrally requires in order to support it in position and to enable it to resist the varying strains caused by the shifting pressure of the grain in the bin.

What I claim is—

40 1. Apparatus for drawing off and mixing grain, comprising a bin or vessel with vertical passage or passages having free openings or ports in the wall or walls thereof adapted to establish communication between the interior of said bin or vessel and said vertical passage or passages, a chute or delivery-tube, and an inclined converging passage or passages arranged to deliver grain from said vertical passage or passages to said chute or delivery-tube, substantially as herein described, for the purposes specified.

55 2. Apparatus for drawing off and mixing grain, comprising a bin or vessel provided at or near its lower end with one or more openings, one or more passages having free openings or ports adapted to place the interior of

said bin in communication with said passages, one or more inclined passages arranged to converge toward the opening or openings in the lower part of said bin or vessel, and a delivery chute or tube in communication with said passages and with the interior of said bin at or near its lower end, substantially as herein described, for the purposes specified.

3. Apparatus for drawing off and mixing grain, comprising a bin, one or more passages having free openings or ports adapted to place the interior of said bin in communication with said passages, the bottom of said bin being formed with one or more openings and arranged to incline toward the delivery ends of said vertical passages, and a delivery chute or tube in communication with the outlets of said bin and passages, substantially as herein described, for the purpose specified.

4. Apparatus for drawing off and mixing grain, comprising a bin or vessel, one or more passages therein with free openings out of same into said bin, a delivery-tube, and one or more tubes between said passages and said tube, substantially as herein described, for the purposes specified.

5. Apparatus for drawing off and mixing grain, comprising a bin or vessel open at or near its lower end, one or more passages in said bin with free openings into the same, a delivery-tube, and a tube or tubes between said passages and said delivery-tube, substantially as herein described, for the purpose specified.

6. Apparatus for drawing off and mixing grain, comprising a bin or vessel *a*, open at its lower end, passages *d*, partly formed by partitions *b*, provided with free openings or ports *c*, converging tubes *e*, and chute or delivery-tube *k*, all substantially as described.

7. Apparatus for drawing off and mixing grain, comprising a bin or vessel *a*, open at its lower end, passages *d*, partly formed by partitions *b*, provided with free openings or ports *c*, converging tubes *e*, a pyramidal structure *g*, with converging tubes *h* and *i*, and chute or delivery-tube *k*, all substantially as described, for the purposes specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM HOLLINSHEAD SPRAGUE.

Witnesses:

WM. HY. THWAITES,
YATES W. BOOTH.