3 Sheets—Sheet 1.

C. B. STACY.

GRAIN-DRIER.

No. 173,078. Patented Feb. 1, 1876.

Fig. 1.

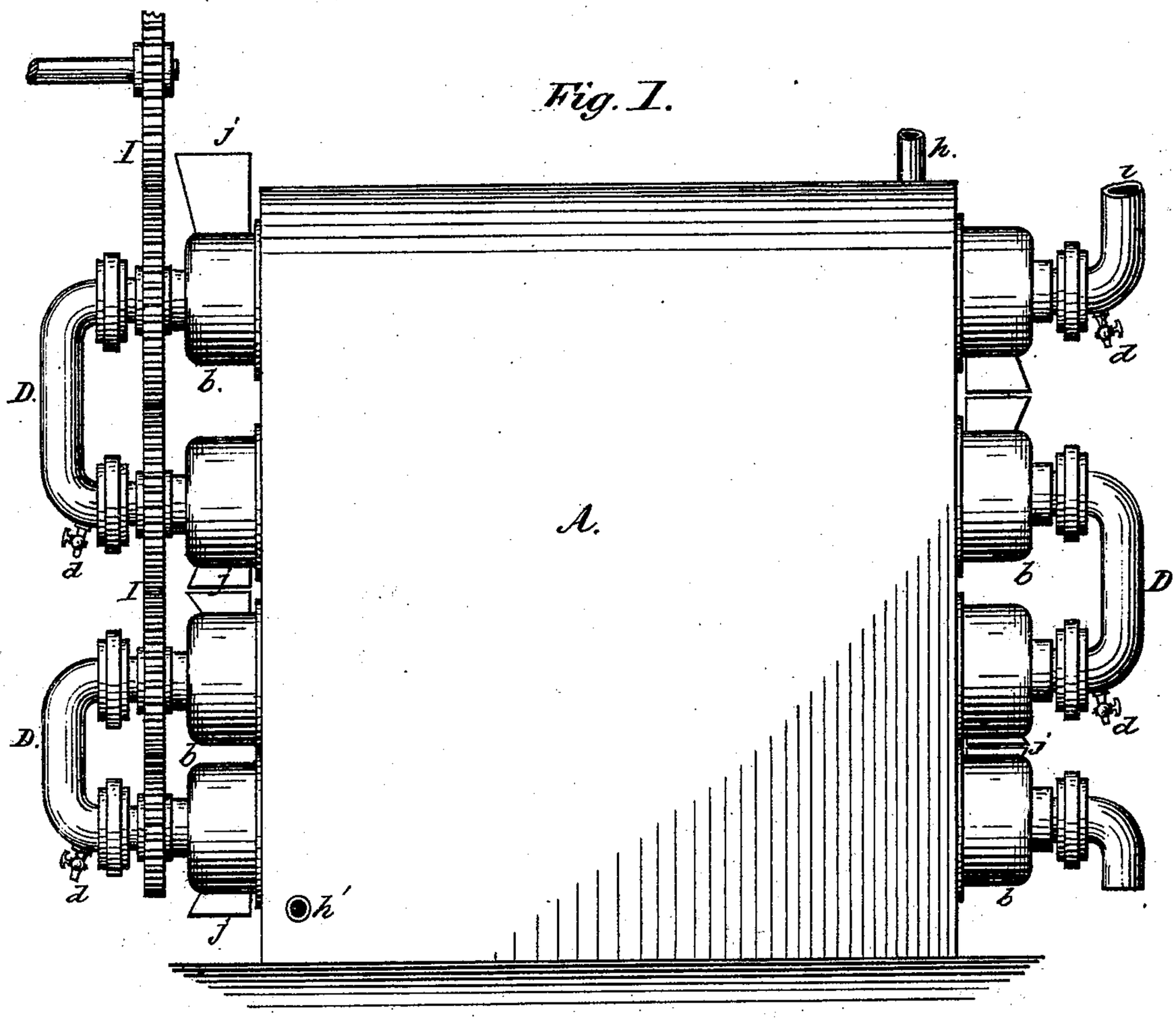
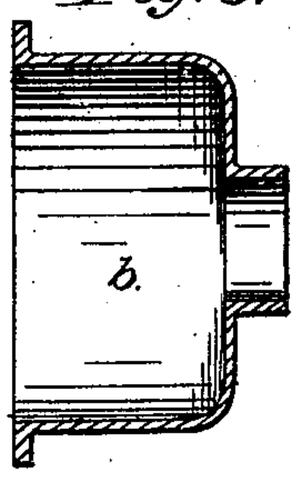


Fig. 5.



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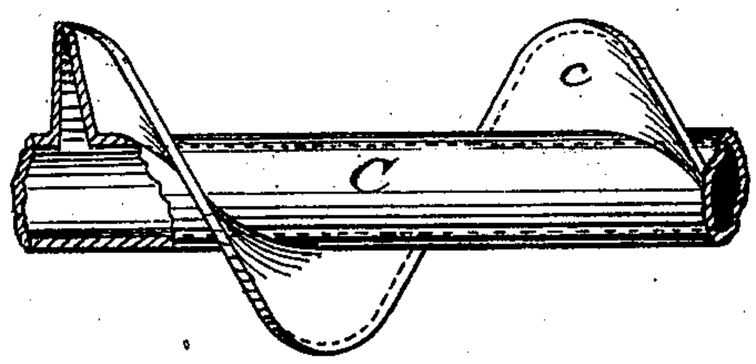
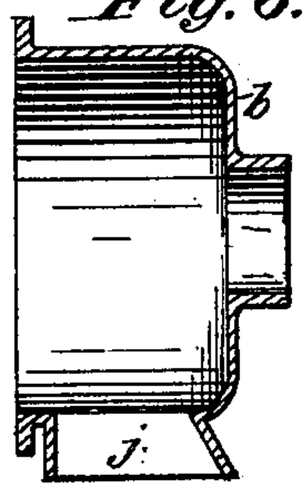


Fig. 6.



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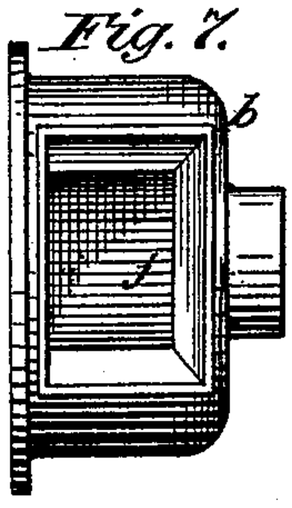
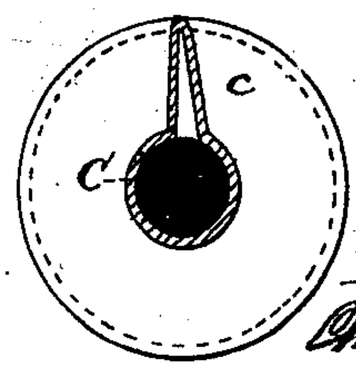


Fig. 9.



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Wm. G. Henderson

3 Sheets—Sheet 2.

C. B. STACY.

GRAIN-DRIER.

No. 173,078. Patented Feb. 1, 1876.

Fig. 2.

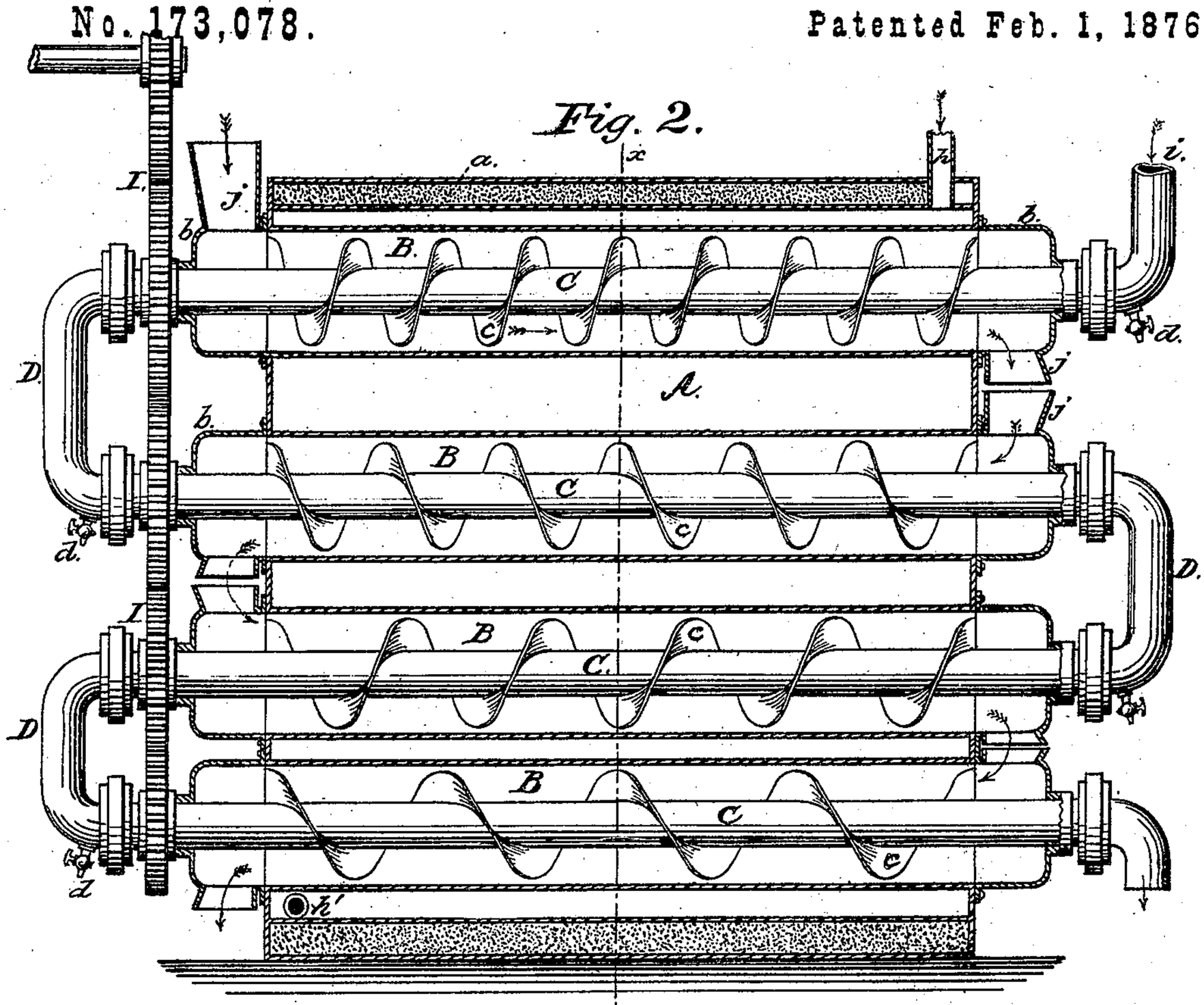


Fig. 3.

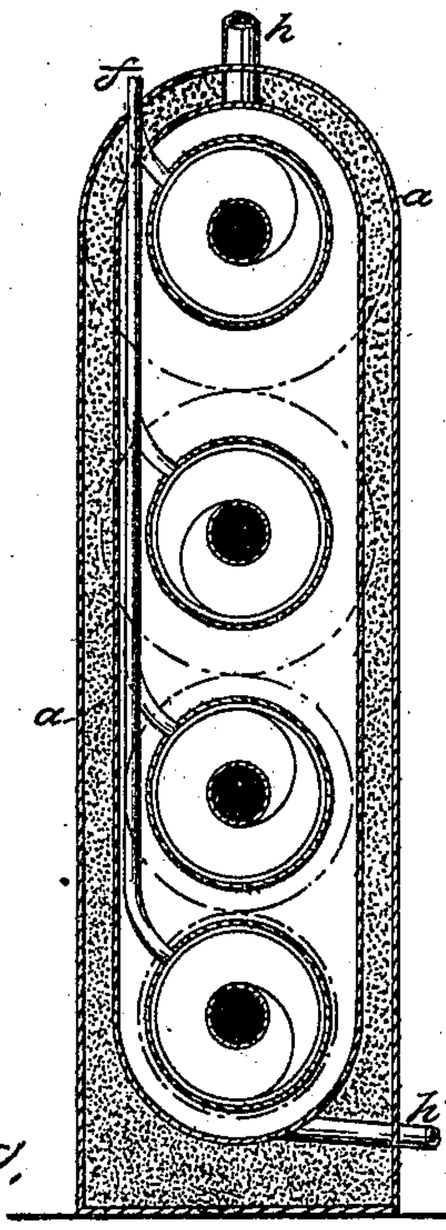
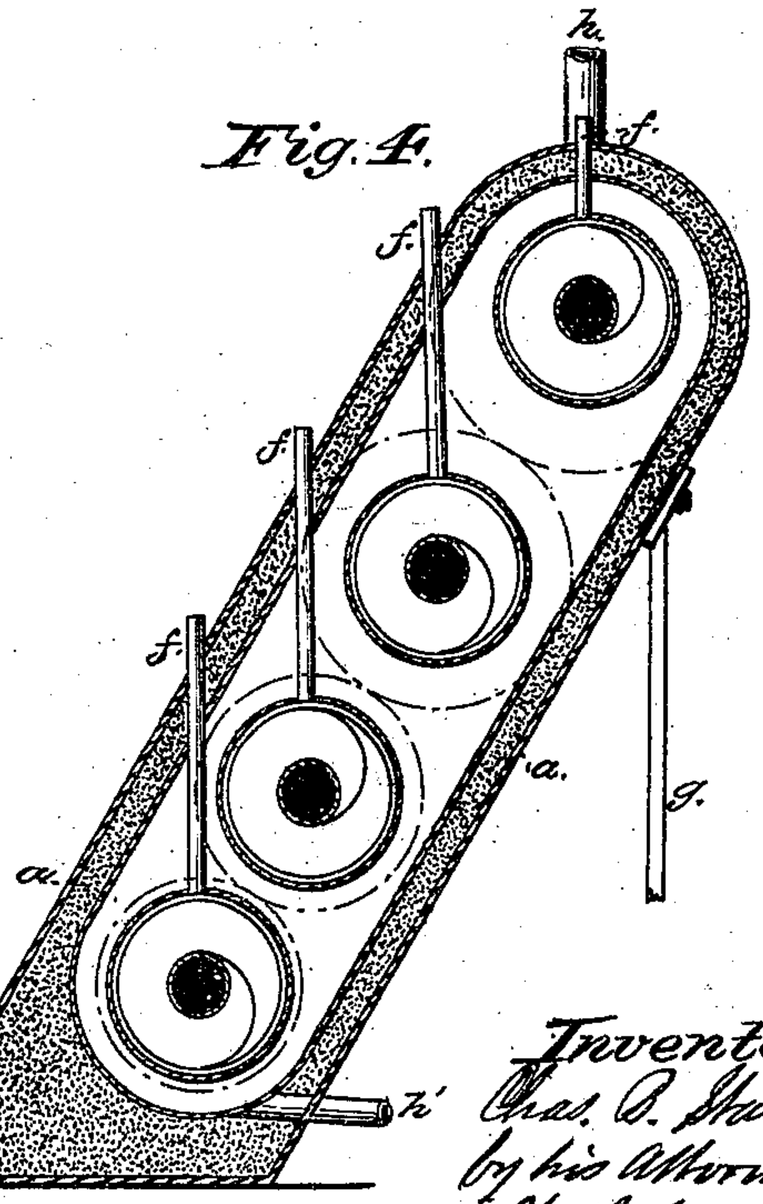


Fig. 4.



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3 Sheets—Sheet 3.

C. B. STACY.

GRAIN-DRIER.

No. 173,078. Patented Feb. 1, 1876.

Fig. 10.

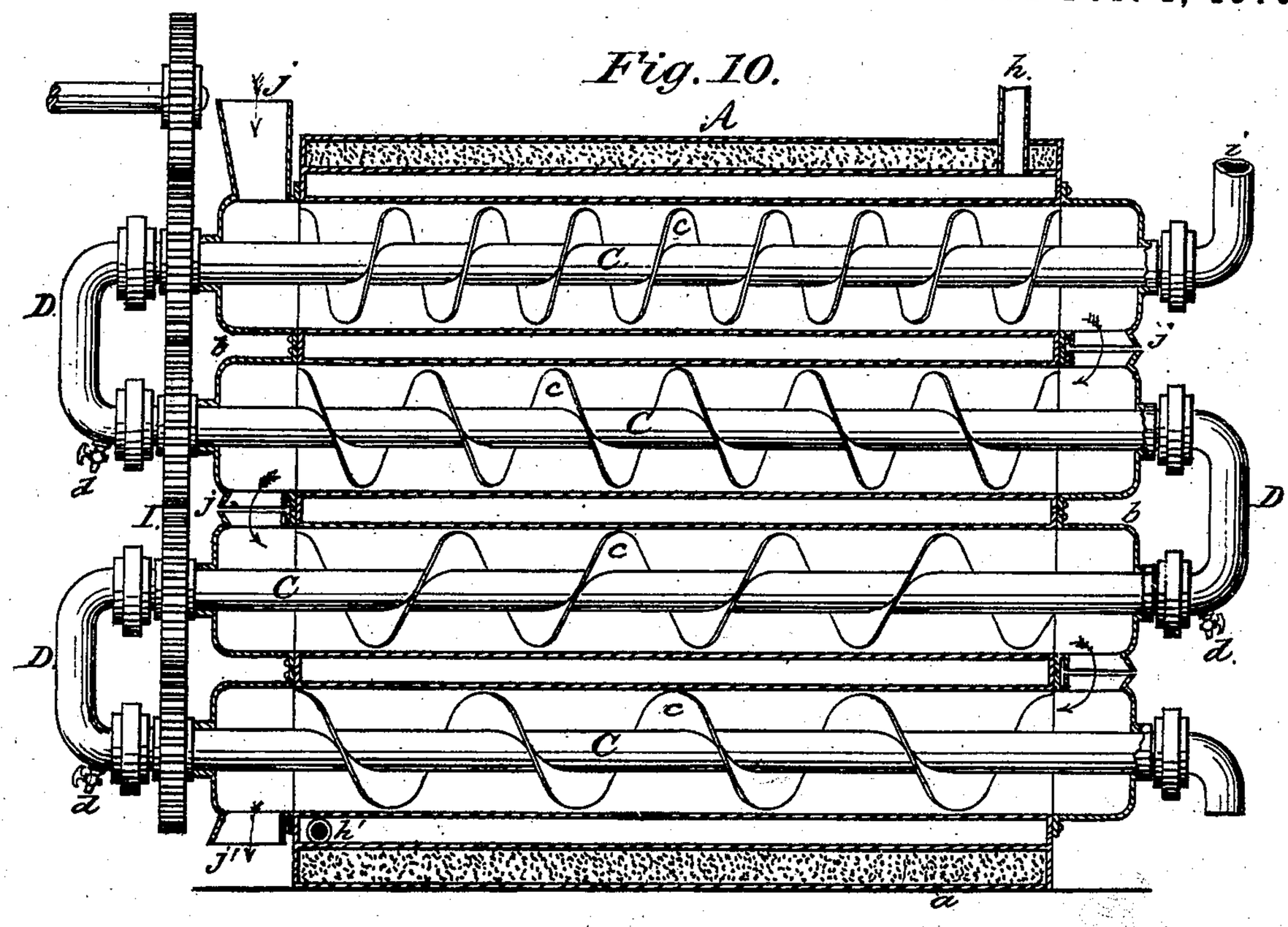
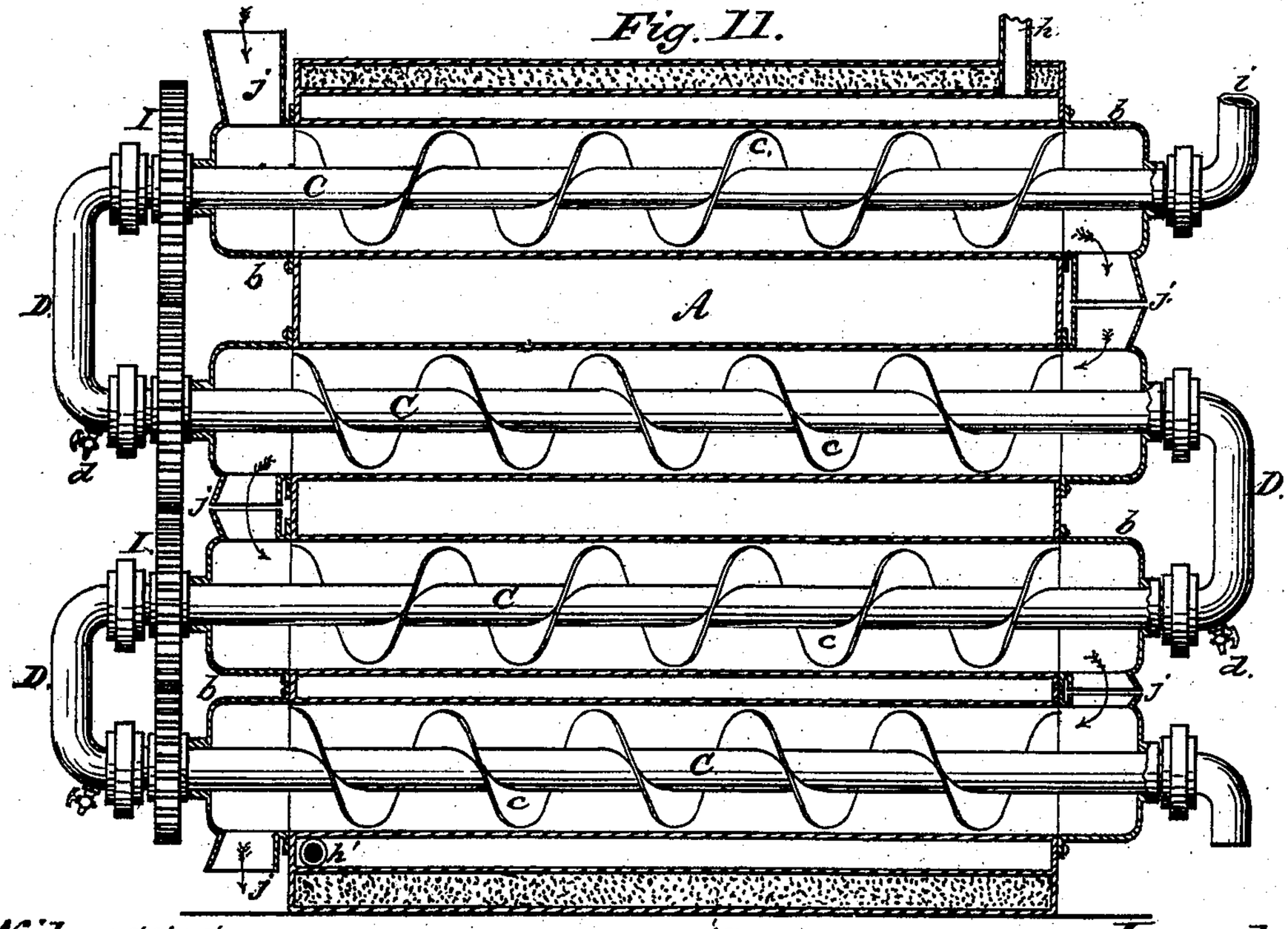


Fig. 11.



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Inventor:
Chas. B. Stacy
by his attorney
Wm. G. Henderson

UNITED STATES PATENT OFFICE

CHARLES B. STACY, OF RICHMOND, VIRGINIA, ASSIGNOR OF ONE-HALF HIS RIGHT TO GUSTAVUS A. WALLACE, OF SAME PLACE.

IMPROVEMENT IN GRAIN-DRIERS.

Specification forming part of Letters Patent No. **173,078**, dated February 1, 1876; application filed December 10, 1875.

To all whom it may concern:

Be it known that I, CHARLES B. STACY, of Richmond, in the county of Henrico and State of Virginia, have invented certain new and useful Improvements in Apparatus for Drying Grain, Meal, Nuts, Tobacco, &c.; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification, and in which—

Figure 1 is a side elevation of the apparatus; Fig. 2, a longitudinal section of the same; Figs. 3 and 4, transverse sections of the same; Figs. 5 and 6, sections of detachable caps; Fig. 7, a top view of same; Fig. 8, a longitudinal view of hollow shaft and spiral post in section; Fig. 9, a transverse section of same; and Figs. 10 and 11, modifications of the apparatus.

The invention consists in an apparatus constructed substantially as hereinafter described, by means whereof the material to be dried, as it passes through two or more successive cylinders, is carried along at a higher rate of speed than that at which it passed through the first cylinder, and in the construction of other parts of the apparatus, all of which will be herein fully explained.

In the accompanying drawing, the letter A represents a steam-chest, provided at the top with a pipe, *h*, for admission of steam into the chest, and with a pipe, *h'*, at the bottom for drawing condensed steam from the same.

The steam-chest may have a non-conducting covering, *a*, and a steam-escape valve.

A series of cylinders, B, pass longitudinally through the chest A, and each of these cylinders is provided at one or both ends with a detachable cap, *b*.

If a cap is used at one end only, the other end of the cylinder extends outside of the steam-chest, and its mouth contracted to a shape similar to the cap at the other end. There is an opening in each of the caps, or at both ends of the cylinders B, for charging them with and emptying them of the material to be dried.

A hollow shaft, C, passes through each cylinder B, and has its journals in the detachable caps, and on its circumference is a spiral flight or conveyer, *c*.

These flights or conveyers, instead of being solid, may be hollow, and communicate with the interior of the hollow shafts.

If, from any cause, it becomes necessary to remove the shafts from the cylinders, it can be readily done by unscrewing the nuts of the bolts that attach the caps to the cylinders or steam-chest, and lifting off the caps.

It is generally found desirable to use a series of cylinders, two or more, one above the other, and when two or more of them are used, the hollow shafts C, which pass through them, are connected by necks D, so that steam can traverse the whole series. The connection between the shafts and necks is made by a swivel-joint, or in any other suitable manner that will permit the shafts to revolve within the necks; but in whatever manner the connection is made it should be steam-tight.

To avoid any possibility of the material which is being dried choking the cylinders, I make the pitch of the flight or conveyer in each succeeding cylinder greater than the pitch of the flight in the preceding cylinder; and I also reduce the size of the gear-wheels I affixed to the hollow shafts from top to bottom, as indicated in Figs. 2 and 11.

The neck which connects the two lowest shafts is provided with a valve, *d*, for drawing off condensed steam. Each of the other necks may be provided with a similar valve, though generally a valve in the lowest neck or shaft will answer all purposes.

Each of the cylinders B is provided with a vent-tube, *f*, which may pass up through the steam-chest and out at its top, as shown in Fig. 3.

Fig. 4 shows the steam-chest made so as to be supported in an inclined position, the upright *g* helping to support it, and when thus made the vent-tubes can be run through the sides of the chest, instead of through the top. The purpose of the vent-tubes is to allow any foul air or vapor that may rise from the material being dried to escape.

Fig. 10 shows a modification of the apparatus, and in which the gear-wheels are of a

uniform size, but the pitch of each succeeding flight increased.

Fig. 11 is another modification of the apparatus, in which the pitch of all the flights is the same, but the size of the gear-wheels reduced from top to bottom. In all other respects these modifications are constructed like the apparatus hereinbefore first described.

The operation is as follows: The chest A is filled with steam direct from a boiler through pipe *h*. Steam is also admitted from the same source into the hollow shaft C at the point *i*, and passes to the far end of the shaft, and thence through neck D into the next lower shaft, and in like manner it passes through the whole series of shafts. Condensed steam is drawn from the lowest shaft by means of the valve *d*. The shafts are next caused to revolve by power applied to the gear-wheels, and the material to be dried introduced into the top cylinder B through hopper *j*, and as it is carried through the said cylinder by the flight or conveyer *c* it is subjected to heat from the steam in chest A, and also, at the same time, to heat within from the steam passing through the hollow shaft C in a direction opposite to the advancement of the grain or other material being dried, and so the same process continues through the series of cylinders. When the material being dried reaches the end of the first cylinder it falls through spout *j* into the next lower cylinder, and is carried to the far end of that cylinder at a higher rate of speed than that at which it was carried through the first cylinder, and so the operation is continued until the grain is passed through as many cylinders as it is found necessary to employ for drying the material.

As hereinbefore stated, the material may be carried through each succeeding cylinder faster than it was carried through the preceding one; or, after it has passed through the second cylinder with the increased speed, it may be carried at the same speed through the succeeding cylinder, the flights in the succeeding cylinders being of the same pitch as the flight of the second cylinder, and the gear-wheels being of the same size as that attached to the second hollow shaft.

If the material to be dried be passed into the cylinder to its full capacity and be delivered with the speed at which it is introduced into and carried through the first cylinder, and from any cause be not removed as fast as it passes out at the final delivery, it will back up in the cylinders and overflow at one or more of the hoppers or spouts; but if it be delivered from the second cylinder, and at the final delivery, at a higher rate of speed than it passes through the first cylinder, the second and succeeding cylinders must of necessity be at no time filled to its or their capacity, and a failure to remove the material at the final delivery immediately upon its passage therefrom will not cause it to overflow at the hoppers or spouts for the reason that the space in the cylinders must be filled by the backing material before it can overflow.

A second object that induces me to construct the parts as I have described is to hasten the delivery of the material from the drying apparatus without detracting from its thorough drying.

As the same degree of heat will in the same time more thoroughly dry a small bulk of material than it will a large bulk, so, also, will the same degree of heat in a shorter time as thoroughly dry a small bulk as it will in a longer time a large bulk, and therefore it must follow that a given quantity of material passed through my apparatus in a given time will be as thoroughly dried as would be the same quantity of material in a greater bulk passed through an ordinary apparatus in a longer time.

When grain, nuts, or the like is to be dried, a sieve may be placed in the hopper of the first cylinder, so as to prevent sticks, nails, or cobs entering the cylinders.

The material after passing through my apparatus is in condition to be run direct into bags for storage or transportation.

Having described my invention, what I claim is—

1. An apparatus, substantially as described, consisting of two or more cylinders and provided with means for carrying material to be dried through a succeeding cylinder at a higher rate of speed than it was carried through a preceding cylinder, substantially as and for the purpose set forth.

2. The combination of steam-chest A and two or more cylinders, B, with two or more hollow shafts, C, connected by a neck, D, and provided with flights *c* and with gear-wheels I of varying size, substantially as described.

3. The combination of steam-chest A and two or more cylinders, B, with two or more hollow shafts, C, connected by a neck, D, and provided with flights *c* of varying pitch, and with suitable gearing, substantially as described.

4. The cylinder B, provided at one or both ends with a detachable cap or caps, *b*, having an opening, *j*, for charging or discharging the cylinder of the material to be dried, and another opening to form a bearing for the shaft C, substantially as and for the purpose set forth.

5. The combination of steam-chest A, two or more cylinders, B, provided with detachable caps *b* and vent-tubes *f*, two or more hollow shafts, C, connected by a neck, D, and provided with flights *c* and gear-wheels I, substantially as and for the purpose described.

In testimony that I claim the foregoing as my own invention I affix my signature in presence of two witnesses.

CHARLES BUCKNOCK STACY.

Witnesses:

NATHL. WOODSON BOWE,

ROBERT HENRY MOSBY.