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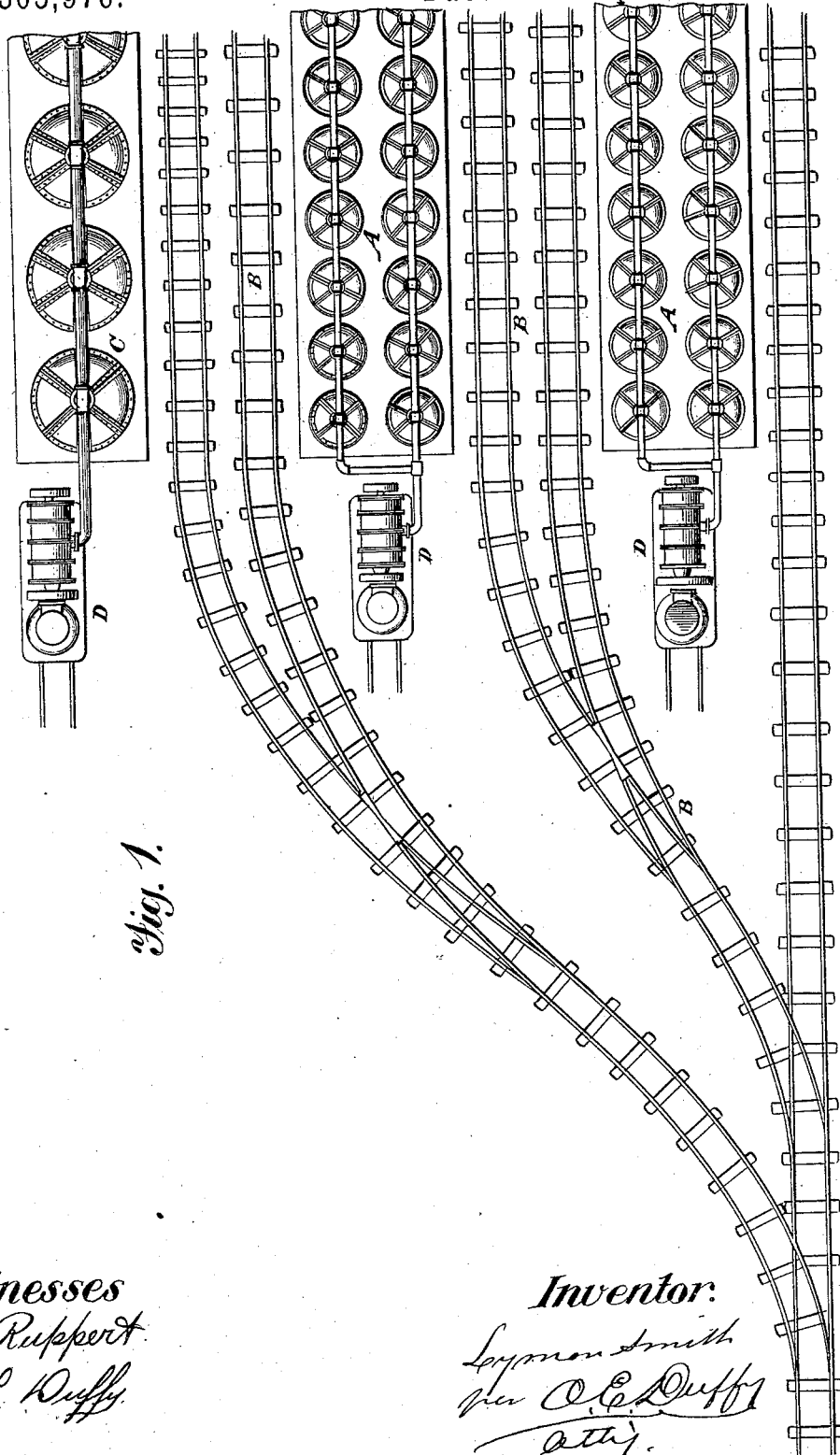
4 Sheets—Sheet 1.

L. SMITH.

PNEUMATIC GRAIN TRANSFER AND STORAGE SYSTEM.

No. 305,976.

Patented Sept. 30, 1884.



Witnesses  
A. Ruppert  
A. L. Ruffey

Inventor:  
Lyon Smith  
per O. E. Ruffey  
att'y.

(No Model.)

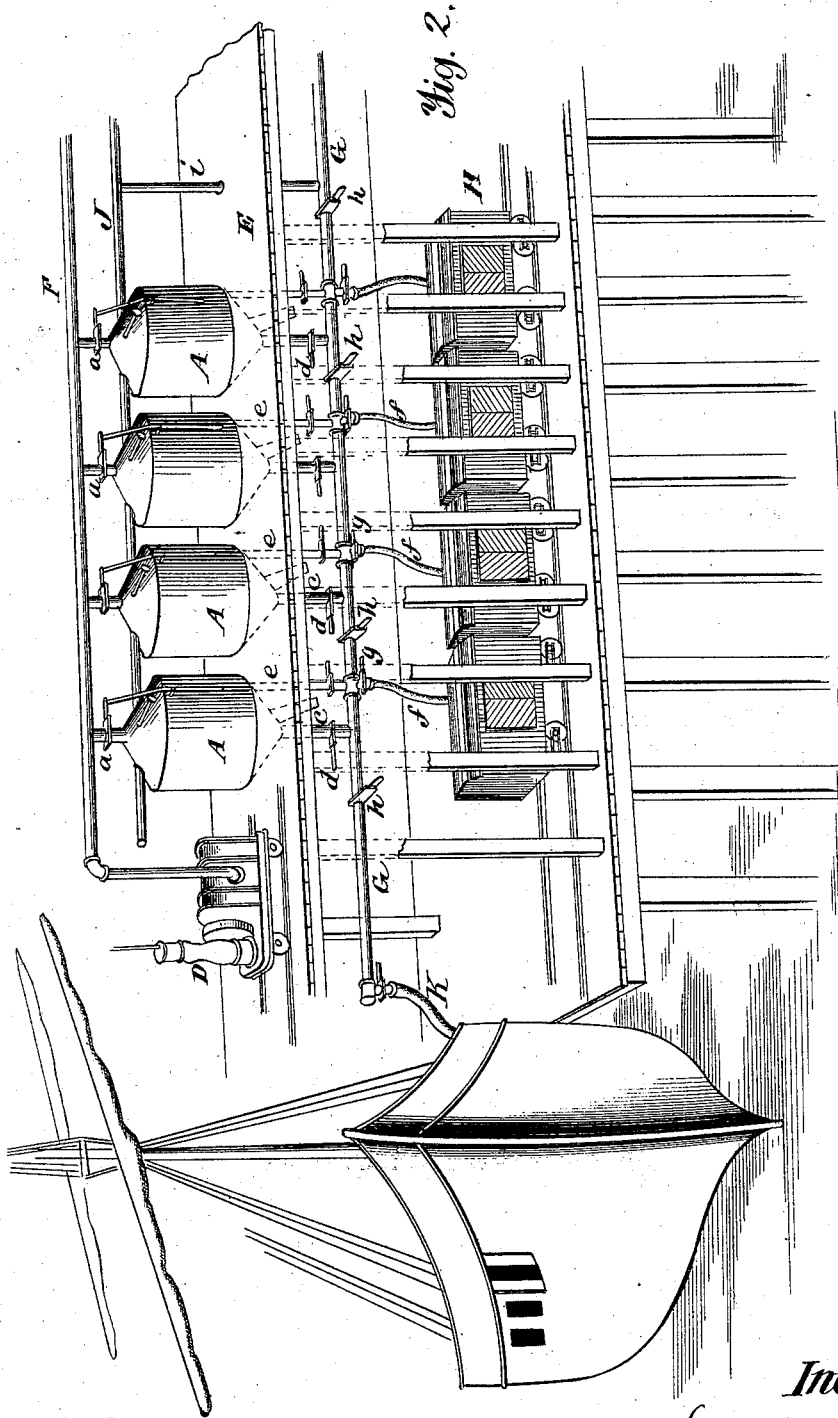
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PNEUMATIC GRAIN TRANSFER AND STORAGE SYSTEM.

No. 305,976.

Patented Sept. 30, 1884.



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(No Model.)

4 Sheets—Sheet 3.

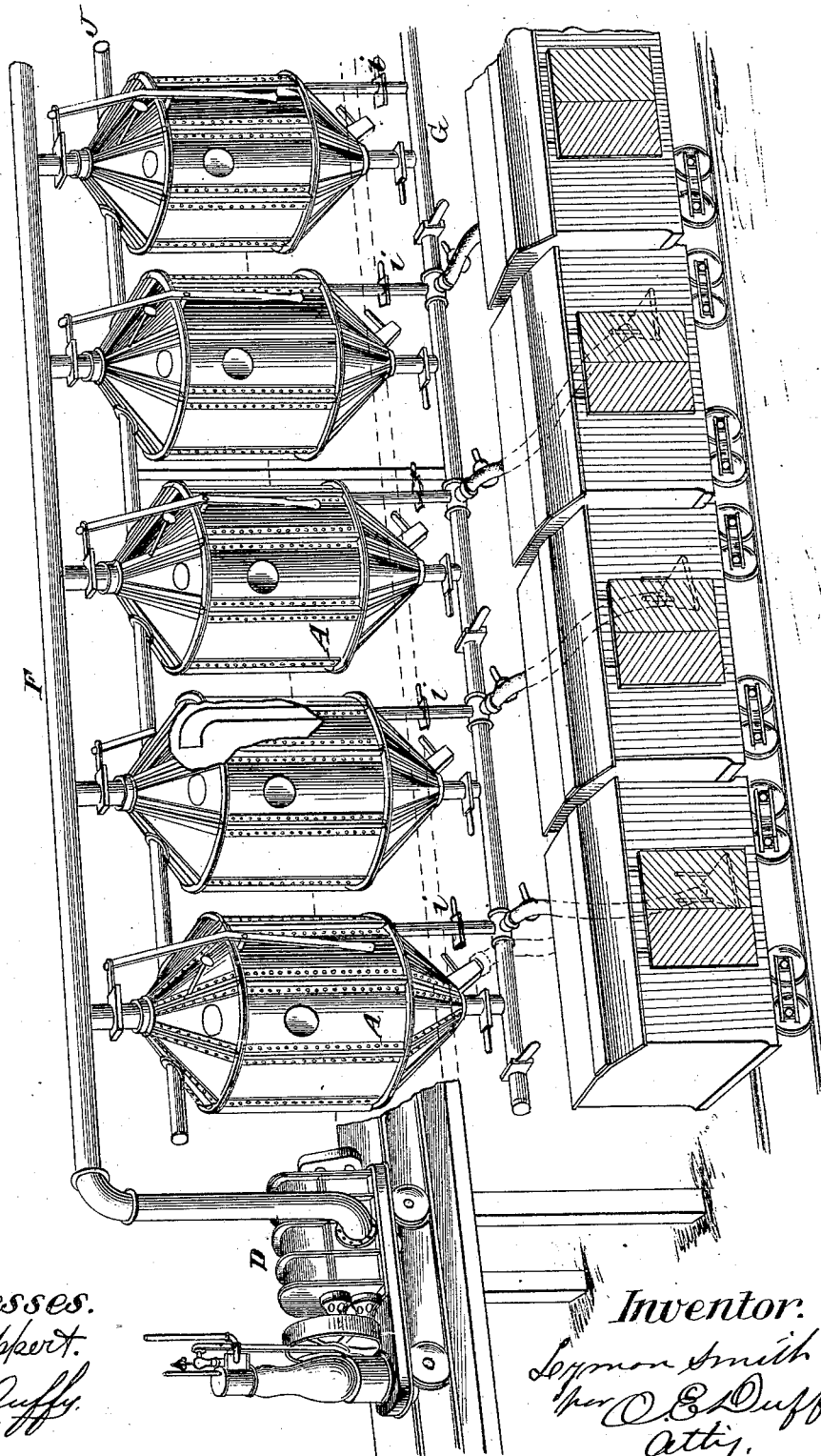
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Fig. 3.



Witnesses.  
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Leymon Smith  
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(No Model.)

4 Sheets—Sheet 4.

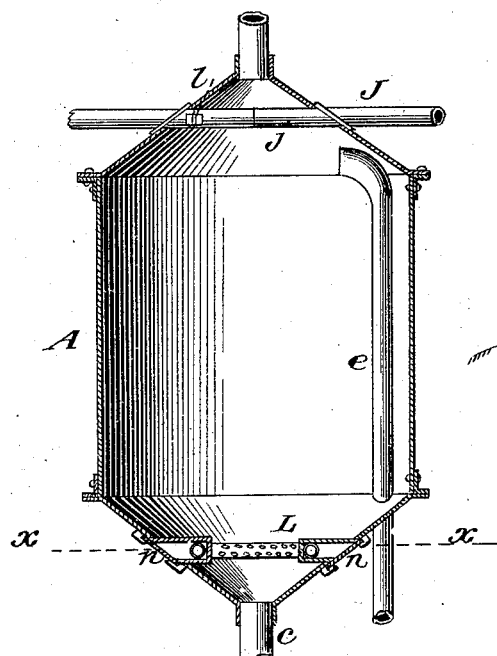
L. SMITH.

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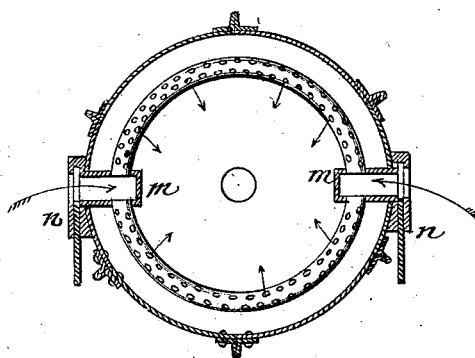
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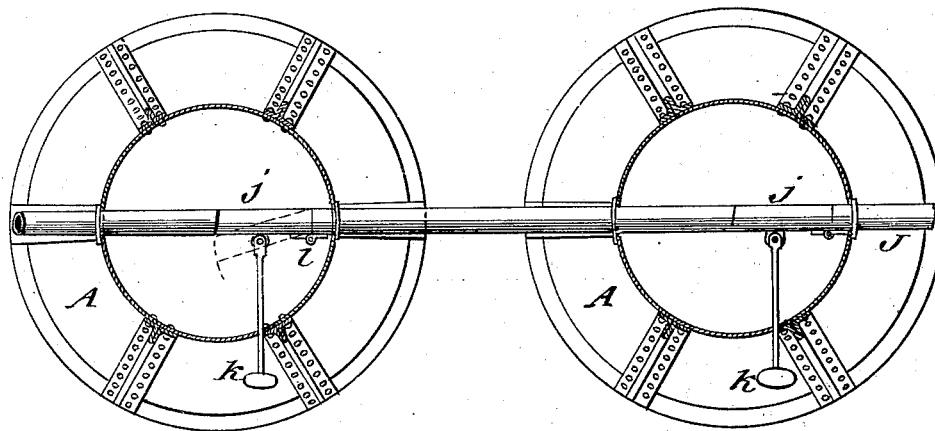
*Fig. 4.*



*Fig. 5.*



*Fig. 6.*



*Witnesses*  
*A. Ruppert*  
*A. L. Duffy*

*Inventor*  
*Lyman Smith*  
*per O. E. Duffy*  
*att.*

# UNITED STATES PATENT OFFICE.

LYMAN SMITH, OF KANSAS CITY, MISSOURI.

## PNEUMATIC GRAIN TRANSFER AND STORAGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 305,976, dated September 30, 1884.

Application filed March 3, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, LYMAN SMITH, of Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Pneumatic Grain Transfer and Storage Systems; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention has relation to a new and useful apparatus for the transfer of grain and other substances from one car to another, or to and from a series of cars simultaneously, and also to a new and improved system of transferring and storing grain, and to ventilating and drying the same, and by which animalcules and grain-destroying insects are exterminated.

This invention is an improvement upon patent granted to me, dated June 5, 1883, No. 279,034. In the patent just mentioned a series of bins are shown which are adapted to railroad-cars, to load and unload the same. The bins in said patent are independent of each other respecting each other as to grain-storage, and are only unloaded by the gravity of the grain, superinduced by an air force from the blower. The present invention goes much beyond the method set for it and claimed by said patent, while the general principles embraced therein will be more or less embodied in this.

The first object of this invention is to establish a system of storage of grain, whereby it may be readily discharged into storage bins or houses adapted for that purpose, and where it may remain on storage for a certain length of time, and where each consignor may with confidence consign his grain to his consignee without danger of having it mixed and mingled promiscuously with grain of other shippers.

The second object is to provide means of transferring this grain, when desired, or when sold to others, either to ships, boats, or barges, or to railroad-cars, without further handling

of the grain than to force it out of its storage-place to the place of transfer, or from one or more bins to other of like character. These objects may be carried out without wastage or damage.

The third object of this invention is to dry and improve the grain while in storage by exhausting from it all moisture, dust, and other foreign substances, and, further, by forcing a vacuum in the bin or other place of storage, whereby the grain-insect is destroyed for the want of atmospheric air, which is essential to maintain all animal life.

Fourth, the system comprises a peculiar arrangement or plant of the bins or storage-places for ready access for loading and unloading, and for distribution of the grain in certain quantities over a certain area of ground for the best utilization of the same, whereby hundreds of car-loads of grain may be loaded and unloaded simultaneously, and each car to its rightful destination, without danger, loss, or damage.

Referring more particularly to the drawings hereto annexed, Figure 1 illustrates a plan view of my plant or system of storage-bins, arranged in rows or groups, between which railroads are located for the cars to be loaded or unloaded. There may be any number of these bins, whose capacity may be from one thousand to five thousand bushels of grain, and may be operated by a series of engines and blowers, all of which may be varied according to necessity and location.

Fig. 2 represents a plan of the system as applied to docks and piers for loading and unloading vessels to and from railroad-cars and other places. This figure also shows in perspective the bins sufficiently elevated for the railroad-cars, vehicles, &c., to pass under them without interfering with the traveling public. In this case ships to be loaded or unloaded with grain, fine coal, sand, and other material of like character may be run in close proximity to the elevated bins for that purpose. The grain-carrying pipes which connect the bins may be utilized to load or unload an ordinary vessel in a very short space of time. Should there be different qualities of grain in the bins to be loaded each par-

particular quality may be taken from the bin before any other quality is touched. Thus grain of different kinds and qualities may be kept separated, as may be desired. The same may be said of unloading vessels. A whole series of bins or cars may be unloaded at once by adding the necessary connections. The bins are designed to be so arranged that the grain contained therein will be weighed before it is emptied to either car or vessel or elsewhere. This feature must not be omitted. The bin is first weighed and marked. The bin now being filled, it is at once weighed, having its load therein, which weighing only takes a few seconds of time. The unloading at once commences. One series of bins may be loaded while another series are being unloaded. It is evident that these bins may be made out of any suitable material.

Fig. 3 represents a perspective view in elevation, clearly showing my plan of elevated bins as applied to railroad-cars only. The bins are so arranged as to be used together or independently, as occasion may require. By the connection between the cars and bins, &c., the grain may be taken from one to the other, or any number of them, or any one or a number of them may be operated at the same time, precisely the same as that shown by Fig. 2.

Sheet 4 and the figures illustrated thereon represent a very important feature in this invention as applied to the transfer of grain, and also to the preservation of the same from dampness. It equally applies to grain that becomes wet in transit or from other cause. This feature supplies a long-felt want in handling grain, and is calculated to save untold millions of bushels of grain in a year.

It is well known that grain when wet is regarded as damaged, and is sold for little more than half its value, really, when the said grain is in a sound condition, only being wet. By my process I can in a very short space of time revivify and dry this wet grain and restore it to its original freshness and purity—just as much so as when it was standing in the ear when it got wet and was immediately dried by the blowing of the wind. My process is just as natural, and while I use artificial means for drying the same, as nature did in the field, I use pure atmospheric air, the said air surrounding every grain and permeating the entire mass.

Referring in detail to the drawings, A A, Fig. 1, show two groups or double rows of bins located between railroad-tracks B B B. These lines A A may be said to be of a capacity of from one to two thousand bushels each.

C shows a single row of storage-bins, which may be said to contain from five to ten thousand each, the object being to supply the demand of the shippers of grain, and to preserve their grain independent of others in separate bins, so that when a shipper has either from one thousand to ten thousand bushels he can be accommodated. In the meantime, should the grain become wet in shipment, the moist-

ure can be exhausted therefrom by causing atmospheric air to pass through it by means of my exhausting and drying process.

D D D show the blowers and engines for operating the various apparatuses.

Wagon-roads may be arranged between and alongside of the tracks and loaded the same as cars.

In Fig. 2 I show another very important element of this invention in transferring grain. A A show elevated bins. The platform E is built sufficiently high to permit railroad-cars or any ordinary travel to be carried on beneath them. These bins may be located along docks for loading and unloading vessels, their elevated position rendering them entirely out of the way. Should a vessel to be unloaded contain more grain than the bins would hold, or should it be essential to immediately unload the vessel, the grain can be carried off to any suitable location in the distance, where the grain may be stored until it is required. The conduits for conveying the grain may be of the usual character, but will of course be air-tight. Thus ground less valuable may be utilized for the storage of large quantities of grain or other material capable of being handled by my process. D is the blower shown in this figure. F is the exhausting-pipe from the blower, communicating to each one of the tanks or bins. Each of these bins is independently controlled by means of valves *a*, and the valves by lever *b*, so that all or any one of them may be operated at the same time. Just below the bins, and communicating with their bottom by suitable pipes, I locate a conduit, G, which is common to all the bins for loading and unloading. The unloading connections are marked *cc*, and are provided with slide-valves *d d*, which control their exit. The inlet-pipe shown by *c* also connects with pipe G, and extends up into or near the top of the bins A, where they discharge. Projecting downwardly from pipe G are another series of tubes, (marked F,) which lead into one or more cars, H. These tubes F may be used either for loading or unloading, as the case may be. Tubes F are also supplied with controlling-valves *g*. This pipe G is also provided with valves *h*, interposed between each of said bin-connections, the object being to control any of said bins, or to permit the pipe or conduit G to have a clear passage to other storage-places by closing all the connecting valves and passages and opening the straight-way valves *h*.

At *i*, I show another connection to the main conduit G. This pipe *i* connects a delivery-pipe, J, which runs through all of the tanks or bins. This pipe J has a hinged joint-piece, *j*, (clearly shown at Figs. 4 and 6,) and is adapted to carry grain in either direction and deliver it in the bin by means of the joint *j*. When all the joints *j* are closed, it is a straight-way conduit to any distance. The joint *j* is an important adjunct to the work of filling the bins, and is much better than valves. When the grain is to be delivered into either of the

bins, all there is to do is to pull the joint to one side, which destroys the connection and the grain falls into the bin. Just as soon as the joint is pushed back again the pipe is wholly without interruption from valve projections. These joints *j* may be operated from the outside by handles or lever *k*. At the end of the main pipe *G*, I also show a conduit, *K*, which leads into the hold of a ship. There may be several of these conduits, *K*, leading into a ship's hull. In the drawings the ship is shown at the end of the deck; but it is preferable that her broadside be brought to the sides of the bins, so that a conduit may enter each hatchway, so that she may be evenly loaded.

It is stated in a former patent that the discharge from the bins or elevators may be augmented by reversing the pressure from the same apparatus. It is evident that the same may be done in this case.

Too great a stress cannot be laid upon the importance of this invention, and I consider the above relating to the handling of grain sufficient to a clear understanding thereof.

Fig. 3 clearly shows the system of bins as applied to railroad-cars, the various parts of which are similar to that described for Fig. 2. The same letters will also designate the same parts as those designating the parts in descriptions of said figure, only that in the present instance the feed-nozzles within the cars are shown in dotted lines, and the filling-pipe *e* is shown in one of the bins, where the latter is broken away. In all other respects the construction and operation is the same. I may add, however, that the elevation of the bins as applied to railroads may not be so great or elaborate as when applied to dock or ship loading.

I will now proceed to describe the invention as it relates more particularly to the drying process of grain or other substances—such as fruit in bulk, or edibles in warehouses, &c.—as will be evident from the drawings and this specification.

Fig. 4 shows a sectional elevation of a grain-bin as applied to my system of grain-transfer. *A* is the bin. I prefer to make these bins of a conical shape at both ends when applied to grain, for the reason that when the bin is exposed to the weather the cone-shaped top sheds the rain or snow, and by having the bottom cone-shaped the grain or other granular substances will slide to the extreme outlet by its own gravity. However, when a tank is to be made for fruit or other substances, the bottom may be this or other form and hinged as occasion may require, and may be provided with internal arrangements to suit the material dried.

*e* is the inlet-pipe, which in this case enters the bottom and runs up within the vessel.

*L* shows a cross-section of an annular perforated pipe resting upon and secured within the bottom of the bin, and *o* the outlet.

*j* is the jointed inlet-piece of pipe *J*, and *i*

is the hinge. The piece *j* may be operated by any suitable device, as may be seen at *k*.

Fig. 5 shows a cross-section of the bin, taken on the line *x x*, Fig. 4, which shows one means of admitting air to the bin, which may be varied, as circumstances may require. *m m* are airways controlled by valves *n n*. The air is drawn through these valves by an exhausting mechanism, which has heretofore been fully described; and Fig. 6 shows a plan view of two of the bins connected with the grain-pipe *J* running through them.

While this drying process is very beneficial for grain generally, it cannot be surpassed for seed-grain.

It is well known to farmers and to persons generally handling seed-grain that a large percentage of it is attacked by insects—such as worms, insects, weevil, and the like—which unfits it for seed. Those insects get into the germ of the grain unbeknown to the farmer or merchant handling the grain, which destroys it for seed purposes, so that when grain of this character is sown it fails to come up, and at a time too late to plant other grain. Thus a large percentage of that year's crop is lost. Now, with my invention the said grain can be first dried, then all the air exhausted from the bin in which I create a vacuum. The grain may be left in this vacuum for a certain length of time, when in the absence of atmospheric air every atom of animal life is destroyed. The same may be said of meat. It may be dried and cured in the same way, and I might mention many other articles of food and other things to which my process could be applied with good results, and which are used as merchantable articles and commodities too numerous to mention.

It will be fully understood that only atmospheric air is used in my drying process, and therefore the material is not subjected to heated or vitiated air.

Having thus described my invention and the best means known to me at present for carrying the same into effect, what I claim as new, and desire to secure by Letters Patent, is—

1. The system of transferring and storing grain or other analogous substance, which consists in locating a series of storage or transfer bins, then connecting said bins by suitable conduits to each other, whereby one or more may be emptied or loaded independently or together by means of an exhausting apparatus, as set forth.

2. The system of transferring or storing grain, which consists of one or more series or groups of bins connected together by suitable conduits, said conduits having controlling-valves, whereby one or more of said series may be operated independently or together for the discharge or loading of grain, substantially as set forth.

3. The system herein described of transferring and storing grain, which consists of groups or series of bins or tanks connected together by suitable conduits, said conduits having

controlling-valves, and adapted to be connected to an exhausting or blowing apparatus, and valves for adapting the main conduit for conveying grain beyond the tanks shown by the system, for the purpose set forth.

4. The system herein described, which consists of two or more series or groups of tanks, each group being adapted to be connected to each other by suitable conduits, and the bins in said groups to be of variable sizes, for the purpose set forth, each series or group being adapted to be loaded or discharged from different points by exhausting mechanism.

5. The method of transferring grain, which consists of first elevating the bins to a suitable height, then connecting them together by suitable conduits, then loading or discharging the receptacle for said grain, substantially as described.

6. The method herein described of transferring grain, which consists, first, in exhausting the grain from conveying-vehicles through suitable conduits, then transferring it to grain-weighing bins, then exhausting or forcing it from said bins into ships or other vehicles, or to storage-places, as specified.

7. The combination, in a grain-transfer system, consisting of the sucking-nozzles, the intermediate conduit, and the discharge-conduit, with the elevated weighing-bin, substantially as described.

8. The combination, in a grain-transfer system, of the main conduit G, the conduit *ef*, having controlling-valves, with the bins, as set forth.

9. The combination, with an elevated system of storage and weighing bins, of the main

conduit and its connecting-pipes, with the tanks or bins and with the exhausting apparatus, as set forth and described.

10. The combination, with a system of grain-transfer consisting of the main conduit and its connecting-pipes and nozzles, of the intermediate pipe, *i*, and the tanks, substantially as set forth.

11. The combination, with the pneumatic grain and storage transfer-bins, and with the conduits thereof, of the main pipe J, having its jointed piece adapted to operate substantially as set forth.

12. The combination, in a grain-transfer system, of the main grain-transfer conduit G and exhaust-pipe F, with the interposing tanks or bins, the said bins having valves at both their ends, as set forth.

13. The combination, in a grain-transfer system, of the exhaust-pipe F, main conduit G, subsidiary conduit J, having a pivoted or hinged jointed piece, and the connection *i*, as set forth.

14. The combination, in a grain-transfer system, consisting of a grain-bin and its connecting conduits, whereby it may be loaded and discharged, and with its exhaust mechanism and air-supply device, substantially as set forth.

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

LYMAN SMITH.

Witnesses:

O. E. DUFFY,  
F. O. McCLEARY.