

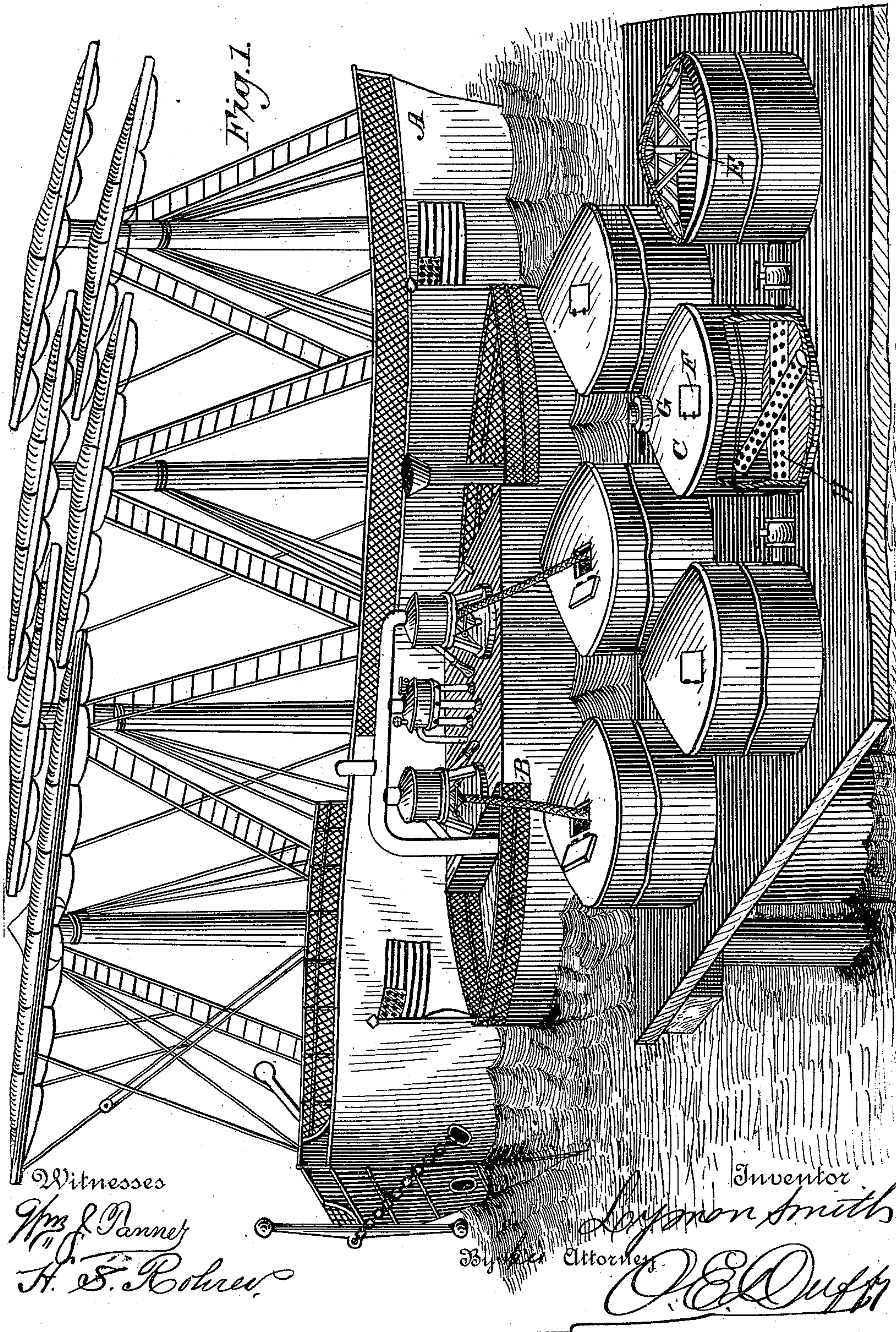
(No Model.)

2 Sheets—Sheet 1.

L. SMITH.  
GRAIN SILO.

No. 355,480.

Patented Jan. 4, 1887.





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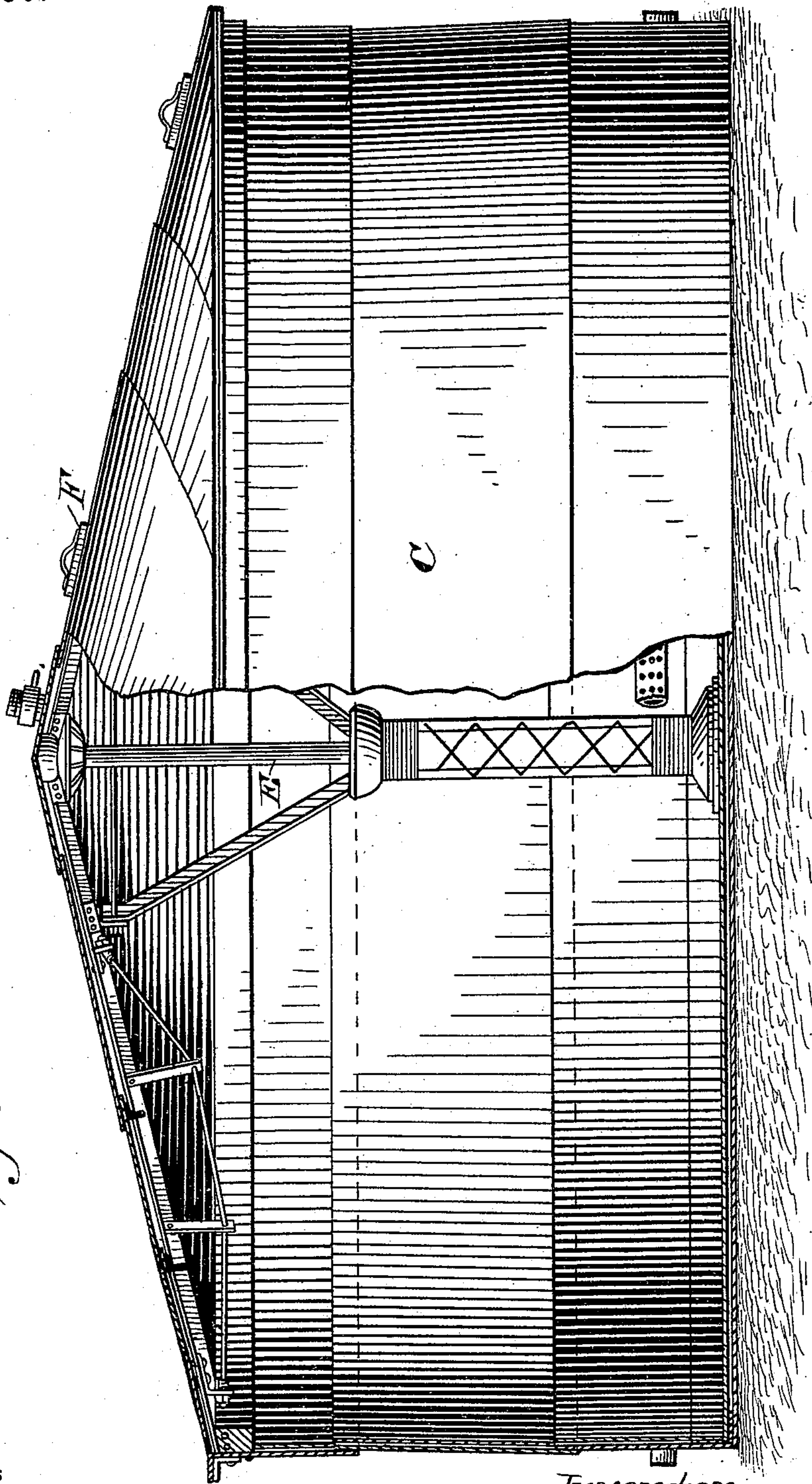
2 Sheets—Sheet 2.

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Fig. 2.



Witnesses  
*Wm. J. Danner*  
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# UNITED STATES PATENT OFFICE.

LYMAN SMITH, OF KANSAS CITY, MISSOURI.

## GRAIN-SILO.

SPECIFICATION forming part of Letters Patent No. 355,480, dated January 4, 1887.

Application filed May 27, 1886. Serial No. 203,453. (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 Grain-Silos; 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 the storage of grain in large quantities, and preserving it from fermentation or heating. The storage-tanks may be termed "silos," but ordinarily "grain-storage" will be better understood.

Grain is now stored in large quantities or in bulk in what are known as "grain-elevators," which are generally located on wharves on water-fronts, where ships have easy access, for loading cars, canal-boats, and the like. The wharves or ground upon which these elevators are erected are very costly, and the buildings themselves are expensive both in first cost and in repairs, running up into the hundreds of thousands, and add largely to the cost of storage. They are also hundreds of feet high in the air, which renders it expensive to elevate the grain to such a height; but the greatest cost is in the fact of the waste of grain in this mode of handling, and the unsatisfactory mixture of grain of different degrees of value and quality.

The object of my invention is, in a great measure, to do away with this expense and to facilitate the handling of grain, and to preserve it from heating, sweating, and consequent fermentations.

My present invention is an improvement on my Patent No. 305,976, which is mostly applicable to storage for railway-cars, in which the cars are run alongside the storage-bins, which bins are connected by conduits common to all tanks; but in this instance this tank is independent and complete in itself, although two or more may be connected at the bottom for a certain purpose, as will be more fully herein-after described.

Where very large tanks are used, they are divided into sections, either to store grain for

different persons or to store different qualities; but in floating hulls—say, two hundred feet long, twenty-five deep, and fifty feet wide—they are necessarily made in sections, the divisions forming brace-stays, which are predetermined to certain dimensions beforehand; but, preferably, I divide it into eight transverse sections. These in turn are centrally divided by a longitudinal division. These sections and divisions are properly supported by angle-irons. Each section is calculated to hold twelve thousand five hundred bushels of grain, or an aggregate of two hundred thousand bushels, in a condition safe and free from destructive and deteriorating influences. The hulls and tanks being wholly constructed of iron and non-combustible material in such a manner as to be air and water tight, the grain is thus safe from fire, heat, and water.

The importance of this invention cannot be too strongly stated, when it is known that piers have to be run out into the stream to a considerable distance at a very heavy expense and where they are generally in the way of navigation. The piles upon which the piers are built are also expensive to drive, and when driven are almost immovable, should that be desirable, and they are therefore generally abandoned, instead of being removed, and thus obstruct the passage of boats and the like.

Now, in addition to the cost of the piers, the cost of erecting elevators and places of storage on them make the total so great that a large percentage is added to the cost of the grain. Furthermore, there are numerous places where floating hulls may be located entirely out of the way, in which millions of bushels of grain may be stored. There is no expense of wharfage or repair attached to these places. Therefore the grain, being more economically handled and stored, can be sold much cheaper, and hence benefit the consumer as well as the producer.

It often happens that ships, to either load or unload a cargo of grain, have to wait a considerable time before they can reach the elevator, (old style,) on account of other ships being in their way, and this valuable time consumed in waiting is wasted. With my system of storage, hulls lying in the stream or in near prox-



imity to it, the ships can readily approach and load and unload without being in each other's way. This storage-hull can be floated into shallow water when the tide is high and anchored and left there any indefinite time. Thus positions otherwise useless are utilized to a valuable extent. Every one knows the cost and expense of wharfage, and also knows it is too expensive for storage, and when used for that purpose it greatly adds to the cost of the material to be stored; and when the storage is considered by the millions of bushels it will be readily seen that the aggregate cost is immense, and when this is considered and added to the cost of handling in the old way the advantage of my system is apparent.

Having given an outline of my system, I will proceed to describe it in detail, referring to the drawings.

Figure 1, Sheet 1, is a view in perspective of an ordinary wharf or platform with a series of grain tanks in position, also my transfer-barge and a ship in position to be loaded. Fig. 2 is a tank made with a view of holding one hundred thousand bushels of grain, and is intended to be set on the ground near the waterfront, where it is accessible by the transfer-barge. (Shown in Fig. 1.)

The same letters will indicate like parts throughout the figures of the drawings. A represents a ship in the act of being loaded; B, the loading, weighing, and transfer barge provided with my invention patented November 28, 1882, and July 28, 1885, for transferring grain.

C is a series of tanks arranged on a waterfront and resting on the ground and projecting through a platform, D. Their capacity may range from twenty-five thousand to one hundred thousand bushels of grain.

E is the roof or cover, which is properly braced and provided with man-holes F. At their apex I locate a cap or nozzle, G, for attachment of hose for drawing off the air after the tank is closed. The object of drawing off the air and producing a partial vacuum is fully set forth in my Patent No. 305,976, dated September 30, 1884, which contains, among others, the following sentence: "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 forming a vacuum in the bin or other place of storage, whereby the grain-insect is destroyed for want of air, which is essential to maintain animal life."

Now, this invention goes further, and, in ad-

dition to creating a partial vacuum, I introduce, preferably at the bottom, carbonic-acid gas, and this, together with withdrawing the air out of the silo or tank, forms the gist of my invention.

I have discovered that vegetable matter in bulk generates more or less carbonic-acid gas, and when supplied with oxygen creates fermentation, and in time this fermentation destroys the grain; but, on the other hand, if the air is withdrawn and prevented from entering the vessel, the gas generated will be beneficial, instead of, as formerly, an injury; but to be certain of having this gas in sufficient quantities, I draw out the air, as above described, and introduce at the bottom, through perforated pipe H or other approved means, carbonic-acid gas, which finds its way through the body of the grain and takes the place of the air which has been pumped out. The effect of this gas on the grain is to keep it dry and sweet, and prevent it from sweating or being musty. It will also destroy any insect that may find its way into the grain. Rats or mice would never enter such tank, and if so, they could not live therein.

The subject-matter embodied in the method of admitting carbonic-acid gas to the silo, with or without a vacuum, will be embodied in a separate application; also, the construction and arrangement of the hull or floating barge with certain compartments, for the purpose specified.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination of two or more tanks or silos, preferably made of steel plate, nozzles terminating inside their tops, whereby the air is exhausted from the tank or silo, pipe-connection at the bottom of the tanks or silos, and means for introducing carbonic-acid gas through said connections, for the purpose set forth.

2. In a grain-silo, substantially as described, the combination of a receptacle provided with a filling-orifice, an exhaust-port at or near its apex, pipes located at its base, and means for exhausting the air and supplying carbonic-acid gas, for the purpose 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,  
WILLIAM FITCH.