(No Model.) 2 Sheets—Sheet 1.

E. H. FARRAR.

DEVICE FOR SECURING GRAIN, GUANO, COAL, &c., FROM SHIFTING IN VESSELS.

No. 254,630. Patented Mar. 7, 1882.

Fig. 1.

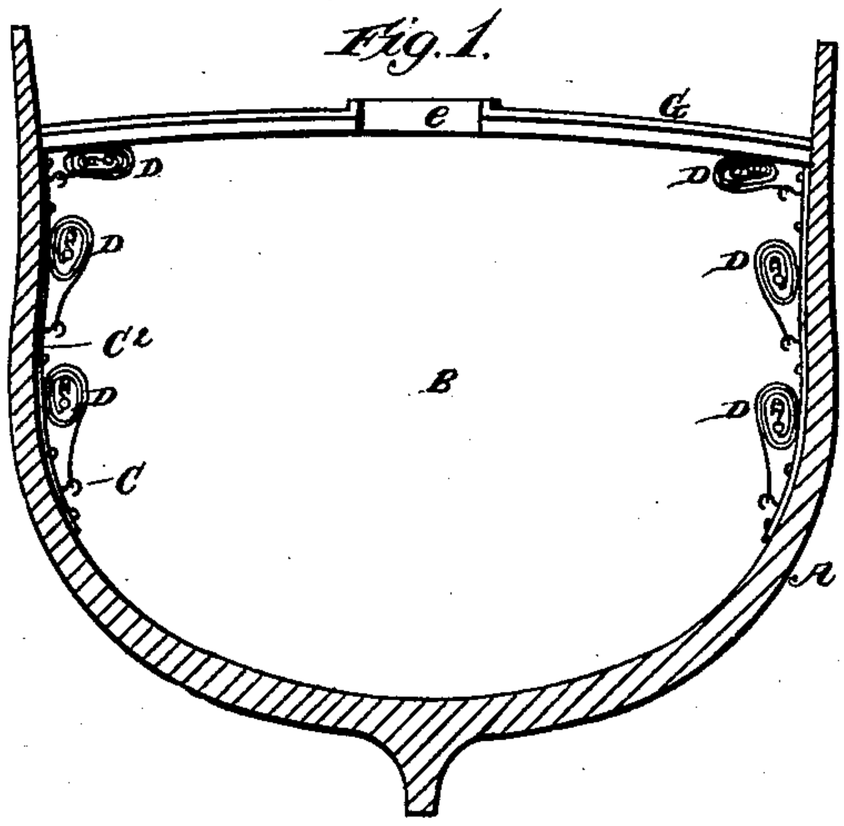


Fig. 2.

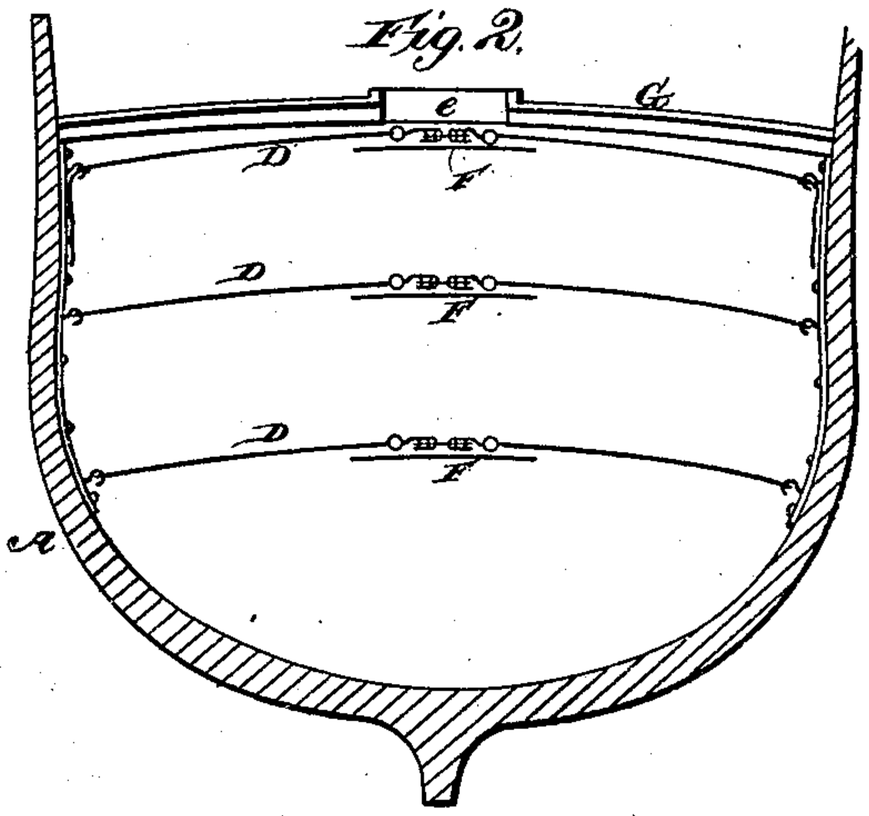


Fig. 3.

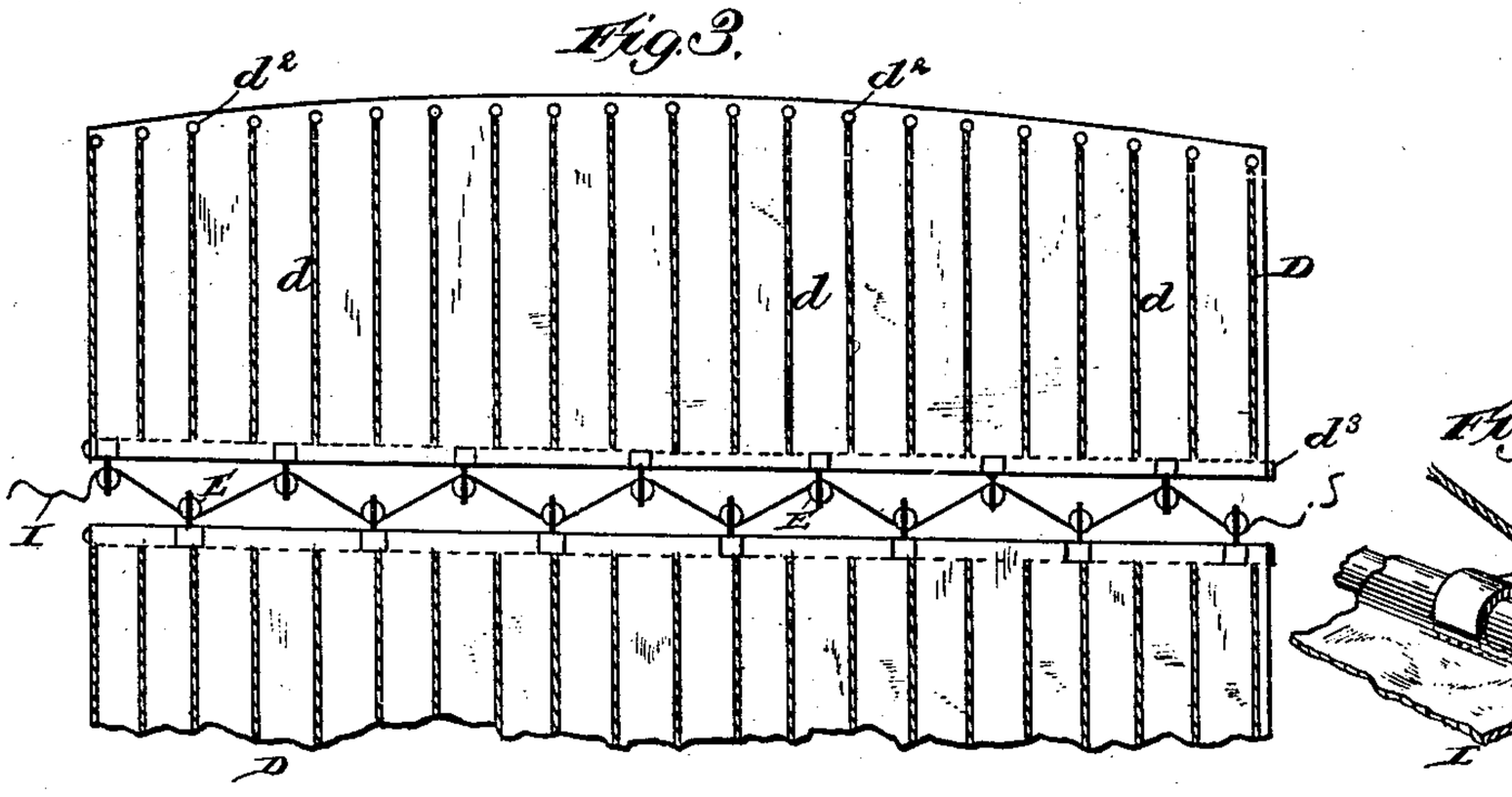


Fig. 6.

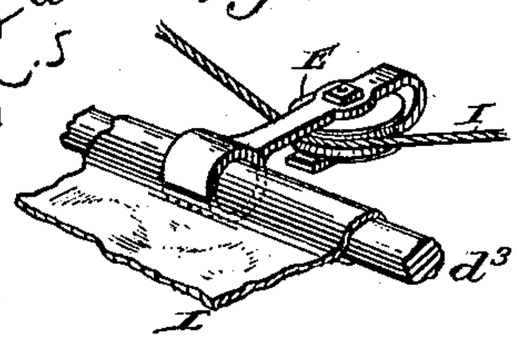


Fig. 4.

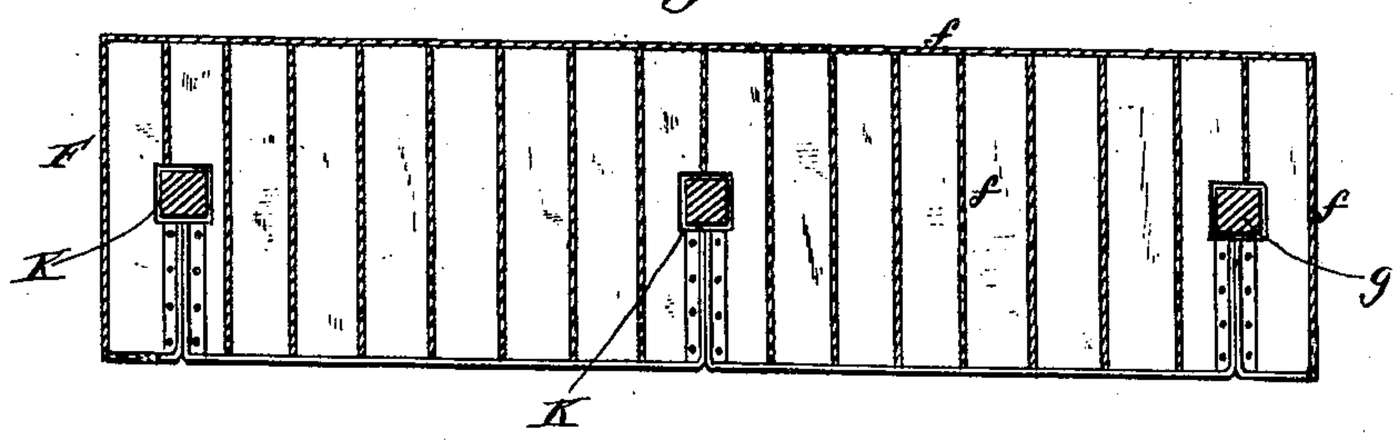
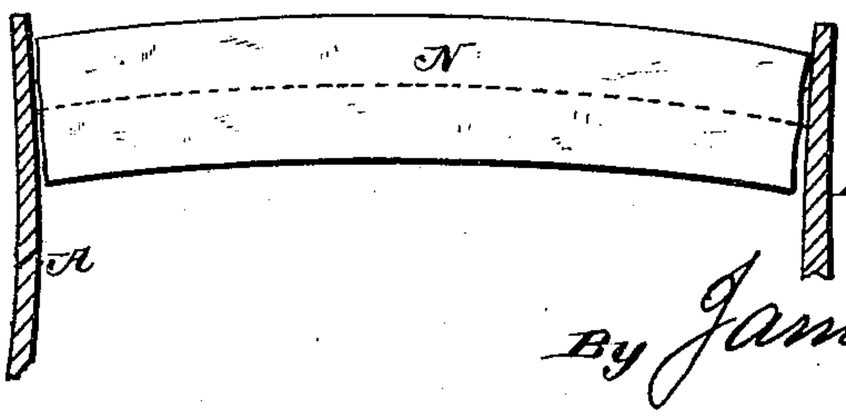


Fig. 5.



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(No Model.) 2 Sheets—Sheet 2.

E. H. FARRAR.

DEVICE FOR SECURING GRAIN, GUANO, COAL, &c., FROM SHIFTING IN VESSELS.

No. 254,630. Patented Mar. 7, 1882.

Fig. 7.

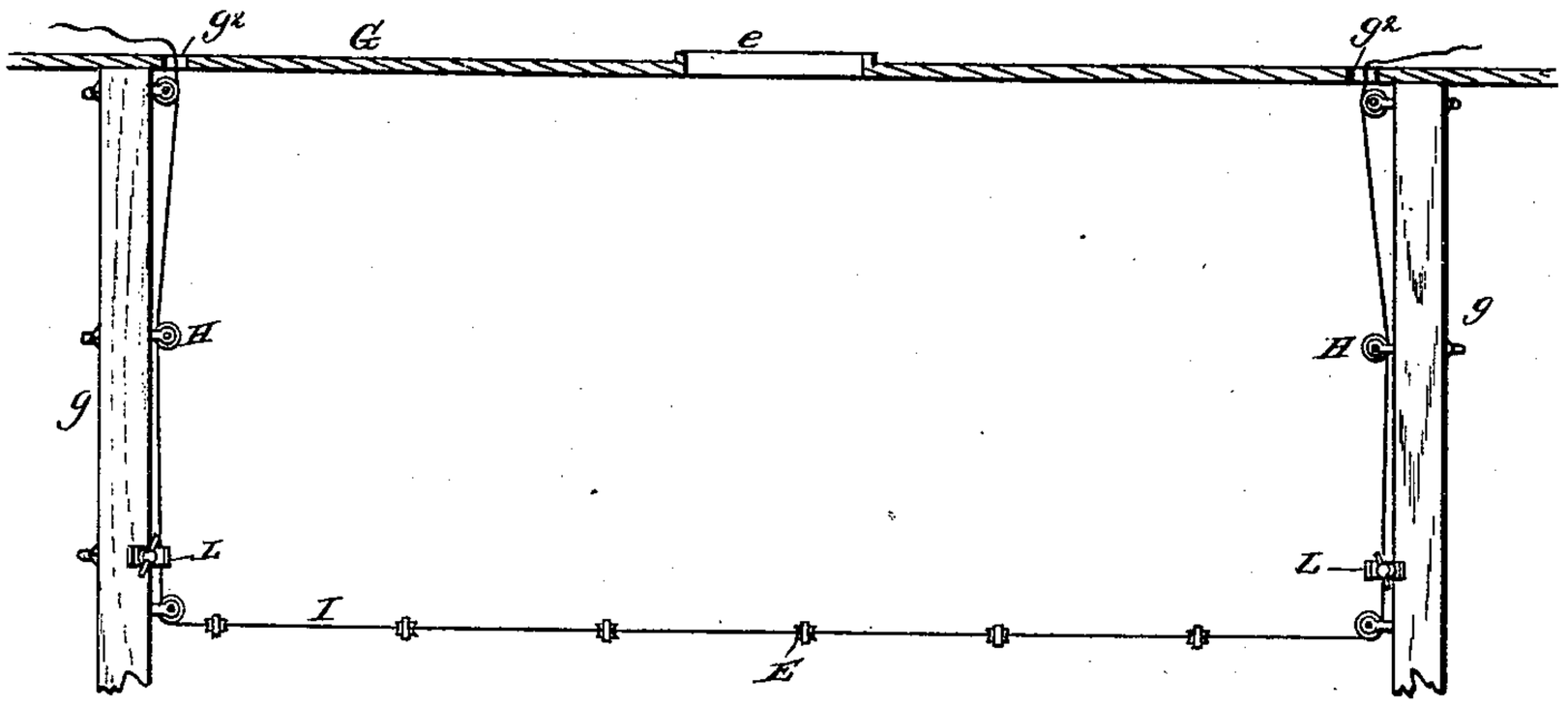


Fig. 8.

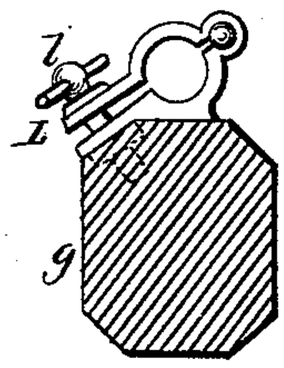


Fig. 9.

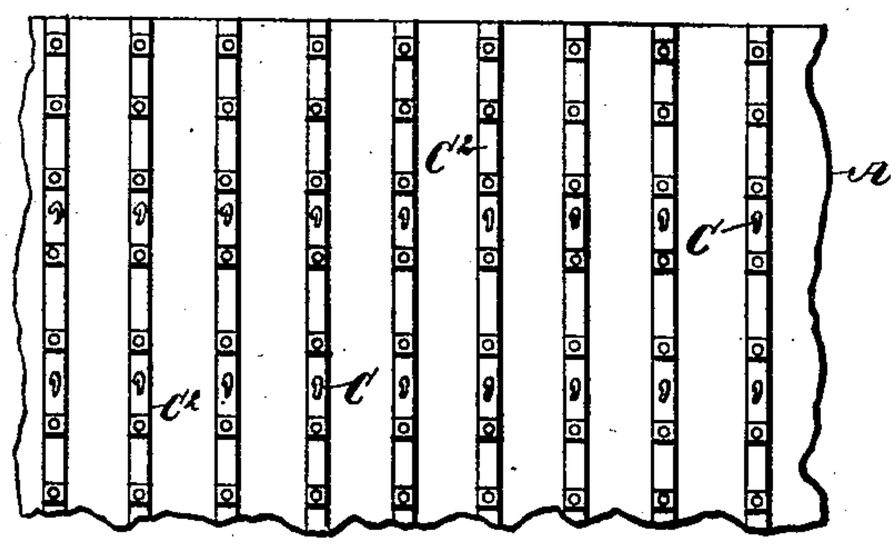


Fig. 10.

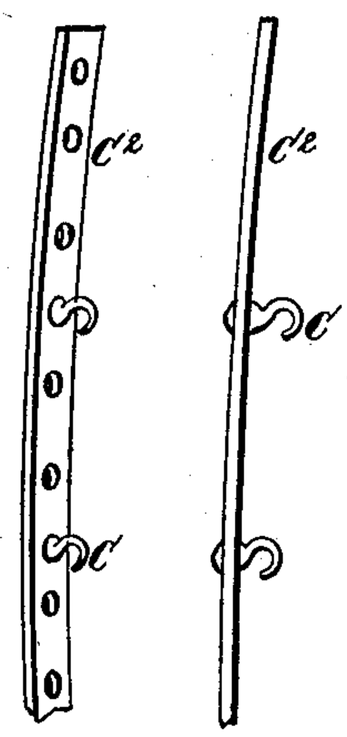
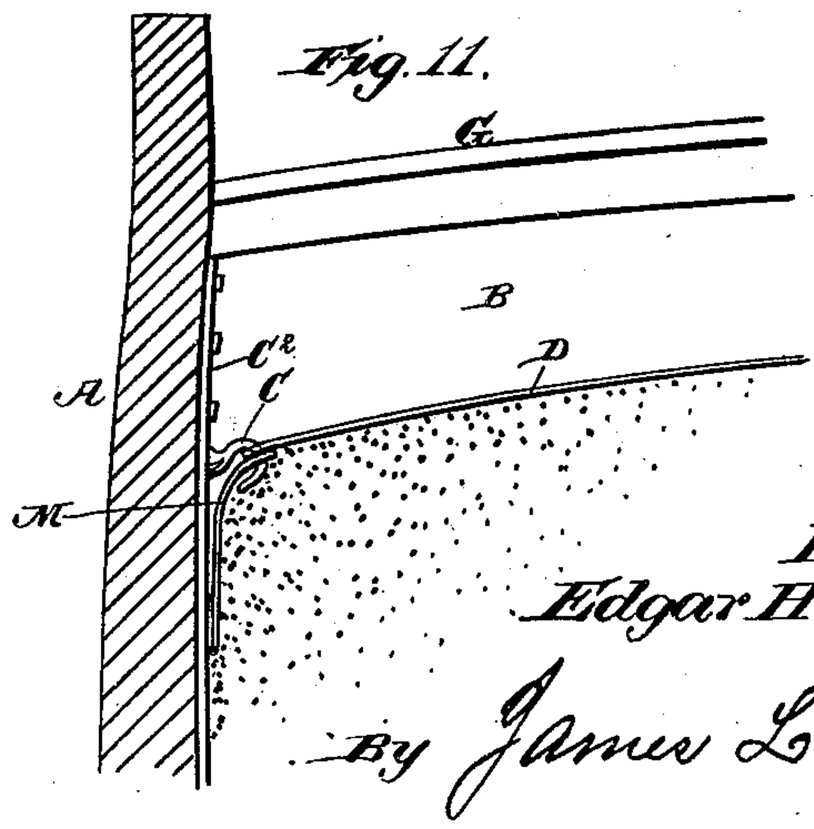


Fig. 11.



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Atty.

UNITED STATES PATENT OFFICE.

EDGAR H. FARRAR, OF NEW ORLEANS, LOUISIANA.

DEVICE FOR SECURING GRAIN, GUANO, COAL, &c., FROM SHIFTING IN VESSELS.

SPECIFICATION forming part of Letters Patent No. 254,630, dated March 7, 1882.

Application filed November 28, 1881. (No model.)

To all whom it may concern:

Be it known that I, EDGAR HOWARD FARRAR, of New Orleans, in the parish of Orleans and State of Louisiana, have invented a new and improved mode of securing grain, guano, coal, or any other similar mass of material from shifting when carried in bulk in sea-going vessels; and I do hereby declare that the following is a full and exact description of the same, to wit:

This invention relates to a novel method of and means for securing grain, guano, coal, or any other similar mass of material from shifting when carried in bulk in sea-going vessels. The hold in which said articles are stored will be, as usual, divided into several compartments, one of which is illustrated in the drawings, said compartments being made in the holds of vessels by means of transverse bulk-heads.

The object of my invention is to provide pressure for compacting and keeping stable bulks of grain or other articles by means of flexible diaphragms or flaps appropriately fastened to the containing-vessels, and tightened upon the mass, whose surface has been topped off to a semi-cylindrical shape. This object I attain by means of the devices illustrated in the annexed drawings, in which—

Figure 1 is a transverse section of the hull of a vessel with the flexible flaps or semi-diaphragms rolled up. Fig. 2 is a like view with the flexible flaps unrolled, and having their inner edges drawn toward each other. Fig. 3 is a plan view of one of the flexible flaps and portion of the opposite flap, and illustrates the manner in which the flaps are drawn together. Fig. 4 represents the tongue or strip that is to be placed under the space between the inner edges of the flaps. Fig. 5 illustrates one of the foot or head curtains or pieces for preventiug the escape of grain between the bulk-head and the end edges of the flaps. Fig. 6 is a perspective view of one of the sheaves connected with the stiffening-bar of a flap or semi-diaphragm. Fig. 7 is a longitudinal section through the deck, and shows in elevation two stancheons and the tightening-rope. Fig. 8 represents one of the clamps for securing the tightening-rope. Fig. 9 is a side view of a part of the inner side of the vessel, and shows the metal strips with the rows of hooks. Fig. 10 is an edge view and a perspective view of one of said metal strips with its hooks. Fig. 11 is a transverse section of a portion of the vessel, a flexible flap or diaphragm, and illustrates one of the curtains that are employed for preventing the escape of grain through the space between the outer edges of the flaps and the sides of the vessel.

Referring by letter to the drawings, A indicates the hull of a vessel, and B one of the compartments of its hold. It will be understood that each compartment will be provided with the same devices for holding down the grain, and hence a description of said devices in connection with one compartment will serve for all.

Along each vertical side of the compartment, running fore and aft in horizontal rows about five feet apart, are arranged the series of stout metal hooks C, about four inches apart. These hooks turn downward, as indicated, and may project about two and a half inches from the side of the vessel, and the number of rows of these hooks will depend entirely upon the depth of the compartment in which they are located. Where the depth of the hold is even as great as eighteen feet, two rows of hooks on each side will usually be sufficient. The strain upon these hooks will be considerable, as will hereinafter appear, and hence I find it preferable to employ metal straps C^2, which are fastened to the sides of the vessel and extend from the top to, or nearly to, the bottom of the compartment, each strap forming a bed for the shank of one hook of each row on the side where said strap is arranged. These metal straps not only serve to secure the hooks, but also strengthen the sides of the vessel. It will be obvious, however, that the hooks can be secured to the sides of the vessel in a variety of ways, either permanently or temporarily, although that found herein will be exceedingly effective. D indicates a flexible flap or semi-diaphragm having an area about equal to half the horizontal area of the compartment. This flap or semi-diaphragm will be composed of canvas or any material whatsoever, and if necessary can be strengthened by iron ribs, chains, or hempen or other cords *d*.

The semi-diaphragm has along one edge a row of metal eyes, d^2, adapted to receive the

hooks just described when hooks and eyes are employed as a means for connecting the semi-diaphragms to the sides of the vessel, for in carrying out my invention the object can be attained by employing other fastening devices for either permanently or temporarily connecting the semi-diaphragms to the sides of the vessel. At the edge of the flap or semi-diaphragm opposite to the edge along which the row of metal eyes is located is secured a cylindrical beam or pole, d^3, of about four inches in diameter, for stiffening the semi-diaphragm at such edge; or other means which will suitably stiffen the same can be employed. At intervals along this rod or beam are secured strong blocks or casings, of wood, or metal sheaves E, said sheaves being arranged horizontally and in the same plane as the semi-diaphragm or flap. Each semi-diaphragm or flap is formed so as to form a horizontal partition for one-half of the compartment, so that when two of these semi-diaphragms are connected with the hooks and their inner stiffened edges brought toward each other over the tongue or center piece a complete horizontal partition or diaphragm will be formed. If the inner edge of the diaphragm is stiffened by a beam, the same can be made in several pieces for convenience in handling, and secured in any suitable manner, iron or wooden bolts or keys being employed for rendering the entire length of the stiffened edge rigid when required.

If found necessary, the outer edge of each flap, where it is connected with the hooks, can be stiffened in any appropriate manner—as, for instance, by having the eyes made in a bar composed of sections hinged together so as to fold upward or downward, but to be rigid laterally. When the vessel is to be loaded with grain, for example, these semi-diaphragms or flaps will be connected with the hooks or otherwise appropriately fastened to the sides of the vessel and rolled up to within a short distance of the side—say two and one-half feet—as shown in Fig. 1, and then reefed, as is usual in reefing sails. The grain is then poured into the compartment through the hatchway *e* and piles up on the bottom of the compartment in a conical-shaped heap. When the edge of the body of the grain on each side is about one foot above the first row of hooks it is topped off to a cylindrical shape, and a tongue or strip, F, of canvas or other material, stiffened with marginal and transverse ribs *f*, or other equivalent means, is laid upon the center of the body of the grain. The first or lower flaps or semi-diaphragms are then unreefed and brought down upon the grain and upon said tongue or strip, which, being located centrally upon the mass of grain, will close such space as will exist between the stiffeners and opposing edges of the flaps. This tongue or center piece, as well as the curtains, hereinafter described, may, however, be dispensed with in the lower and middle diaphragms, and be used only in connection with the top diaphragm. The two flaps are drawn toward each other as tightly as possible by the application of force in a plane tangential to the cylindrical surface of the mass of grain along the line of contact of the inner edge of each flap—as, for example, I form through the deck G, in front and rear of the center stanchion *g* of the rear and front bulk-head of each compartment, a round hole, g^2, for the tightening-rope to pass through.

Corresponding with each set of flaps and on each stanchion on a level with the top of each topped section of grain are arranged the pulleys H, and around these pulleys the tightening-rope I is passed. Said rope is also passed around the sheaves at the inner edges of the flaps or semi-diaphragms, and carried up through the holes in the deck to a capstan or other device for tightening up the rope, and thereby drawing the inner edges of the flaps together, and thereby compressing the grain.

In case there are center stanchions K within the compartment, as indicated in Fig. 4, two ropes can be used in a similar manner in lieu of one. In such case the number of holes through the deck, and of blocks and sheaves on the end stanchions would be doubled, while similar blocks and sheaves would be placed on each side of the center stanchions.

It will be understood that a variety of devices could be employed for the purpose of drawing these semi-diaphragms taut upon the grain; but if those herein illustrated are used the rope can be fastened at the point of greatest strain by a pair of jaws, L, (see Fig. 8,) connected with the stanchion just above each block or sheave. The rope passes between these jaws and can be secured by clamping the hinged jaw to the jaw that is rigid with the stanchion by means of a set-screw, *l*. Any other form of clamp or fastening device can, however, be employed for such purpose. When the rope is thus fastened the ends above deck can be released and allowed to drop down through the holes in the same, so as to leave said holes free for the ropes of the next upper flaps or semi-diaphragms, where two or more sets of such flaps are used. To prevent the compressed grain from escaping up between the outer side edges of the flaps and the sides of the vessel, I provide curtains M, which are fastened to the diaphragm a few inches on either the inside or outside of the eyes, and which constitute vertical flaps at the sides of said semi-diaphragms, as shown in Fig. 11. The mass of grain within the compartment presses these curtains tightly against the side of the vessel, and hence holds the same in place. In addition to these side curtains I provide end curtains, N, each composed of a strip of canvas or other material, of proper size and shape for closing up the spaces between the end edges of the semi-diaphragms and the bulk-heads. These pieces of canvas, which can be designated as the "head" and "foot" pieces, will be placed over each bulk-head, their lower edges being about one and one-half foot below the surface

of the mass of grain, and their upper edges extending about the same distance above. When the grain is topped off preparatory to bringing over the top flaps these upper projecting edges of the head and foot pieces will be turned down over the grain, so that they will be covered by the main flaps or semi-diaphragms, and thus a tight joint made. The center tongue or strip shown in Fig. 4 will have openings for the center stanchions when center stanchions are employed in the construction of the vessel, the tongue being formed with slits *m*, leading from one edge to said openings, so that it can be adjusted in place by spreading the edges of the slits apart for the passage of the stanchions. After the first or lower set of flaps have been drawn over the grain and secured, grain can be again poured down through the hatchway, and after a sufficient quantity has accumulated upon the said flaps the grain can be topped off and the next upper set of flaps drawn over the grain and secured.

The ropes by means of which the top semi-diaphragms are tightened can be kept on deck around a capstan or a drum or other device arranged for that purpose, so that if the cargo shakes down any farther a constant strain may be put upon the ropes and the top diaphragm kept always perfectly rigid.

To obviate the difficulty of the cargo's shaking down so much that the top flaps would meet or be drawn up against the center stanchions, and thereby prevent any further and desired strain from being placed upon them, the flaps should be provided with means for taking a reef in them.

In Fig. 2 the position of the flaps after the ship is loaded is illustrated.

One set of flaps might be used; but a number of sets are desirable, so as to effectively hold down the mass of grain and prevent it from shifting. It will be seen that the compartment is thus divided into a number of large bags, so to speak, the bottom one having for five of its sides the rigid bottom and sides of the ship and the bulk-heads, and for its last and upper side a tightly-drawn diaphragm. The mathematical figure of this upper side is such that its shape cannot be changed except by a further compression of the mass or a lengthening of the perimeter. In addition to this the strain of the tightly-drawn diaphragm is re-enforced by the superincumbent weight and pressure of the two upper divisions. The same remarks will apply to the middle and to the upper division, the only difference as to the upper division being that the constant strain that can be put upon the latter, as before described, takes the place of the weight and pressure of a superincumbent mass.

By making the flexible diaphragms of sufficient strength (and they can be made like a piece of chain-mail, if necessary) coal can be securely held down in the hold of a vessel.

What I claim is—

1. The method of packing and preventing the shifting of bulks of grain, guano, or other substances in a ship, consisting in pressing and holding down the grain or other article in successive layers by stretching flexible diaphragms upon the layers as they are formed.

2. The combination, with a ship, of the flexible flaps or semi-diaphragms connected with the sides of the ship's hold, and means for drawing said diaphragms together so as to form a series of horizontal partitions for pressing upon and holding down the grain or other articles to be transported, substantially as described.

3. The combination of the horizontal rows of hooks secured to the inner side of the vessel with the flexible diaphragms adapted to be connected with said hooks, substantially as described.

4. The combination, with the flaps arranged for forming horizontal partitions in the ship's hold, of the side curtains adapted to prevent the passage of grain between the outer edges of the flaps and the sides of the vessel, substantially as described.

5. The combination, with the flaps or semi-diaphragms arranged for forming horizontal partitions in the ship's hold, of the strip F, adapted to close the space between the inner opposing edges of the semi-diaphragms, substantially as described.

6. The combination, with the semi-diaphragms arranged for forming horizontal partitions in a ship's hold, of the head and foot strips N, substantially as described.

7. The combination, with the flaps or semi-diaphragms D, adapted to be connected to the sides of the ship's hold, and having the stiffening-rod d^3, of the sheave E, the pulleys upon the stanchions, and the tightening-rope passing over the sheaves and pulleys and up through the decks, substantially as described.

8. The combination, with the flexible flaps and the tightening-rope arranged to tighten the flaps within a ship's hold, of the clamp for securing the rope after it has been tightened, substantially as described.

9. The combination, with the metal strips secured to the sides of the hold of a vessel and provided with hooks, of the flexible semi-diaphragms adapted to engage with said hooks, and devices for drawing the inner edges of said diaphragm together, substantially as described.

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Witnesses:

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FRED. D. KING.