

(No Model.)

5 Sheets—Sheet 1.

J. WILSON.

CONSTRUCTION OF WALLS FOR BINS, &c.

No. 459,806.

Patented Sept. 22, 1891.

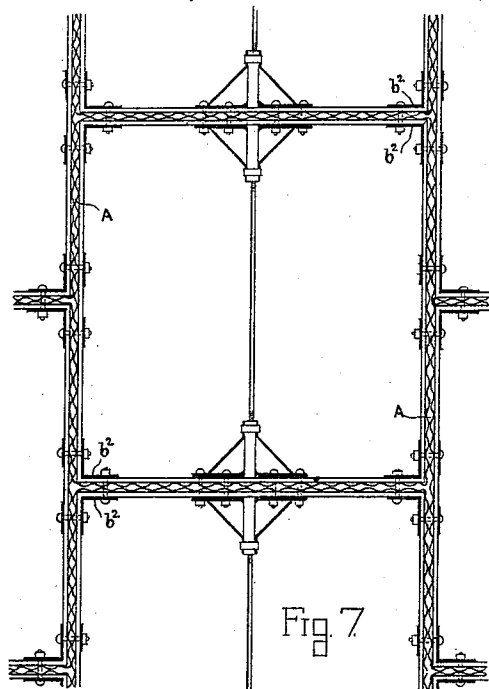


Fig. 7

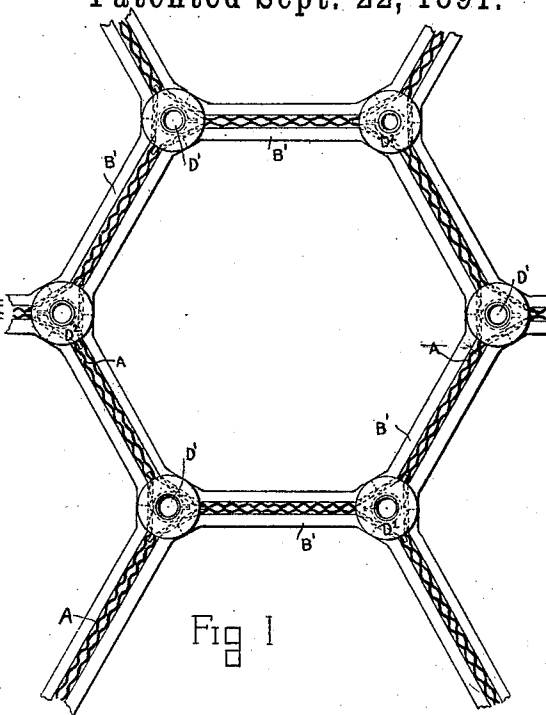


Fig. 1

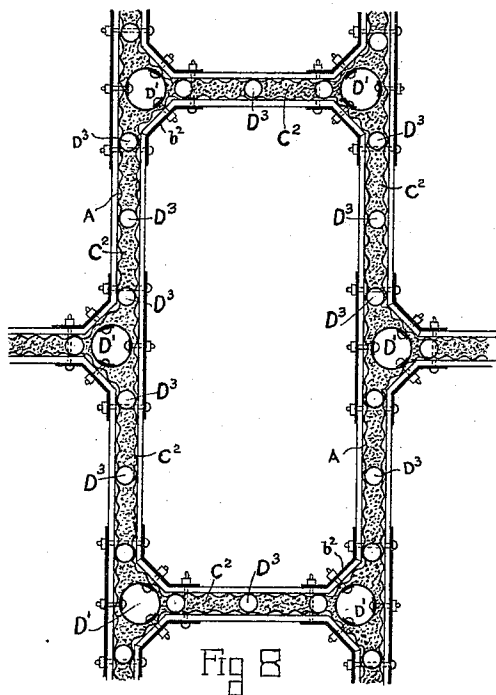


Fig. 8

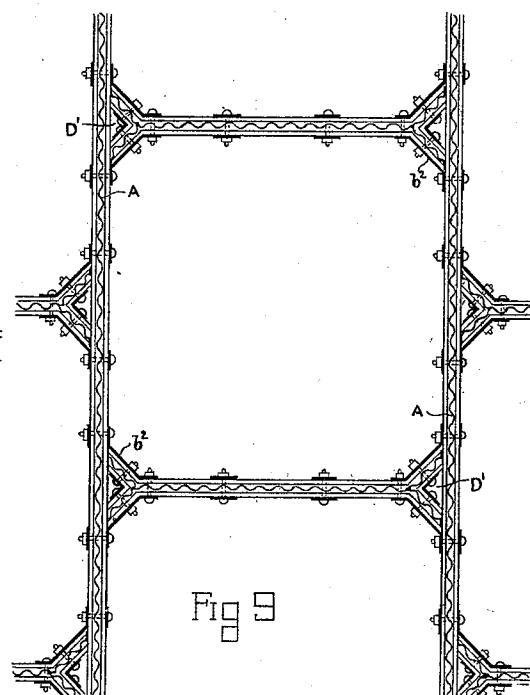


Fig. 9

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(No Model.)

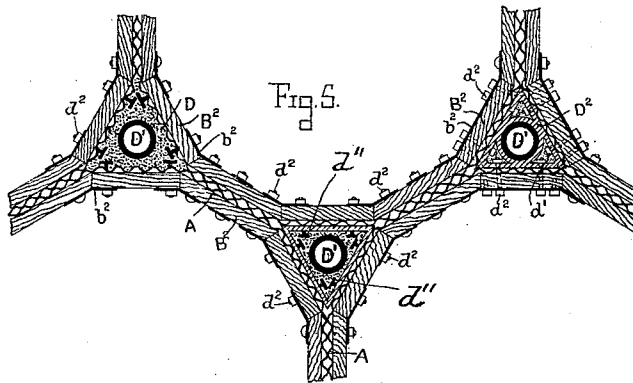
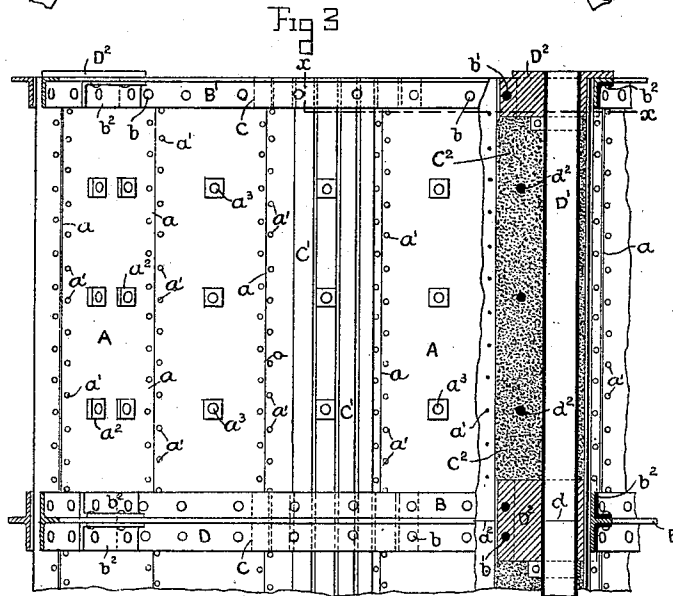
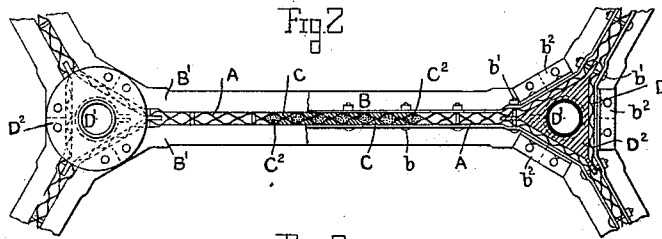
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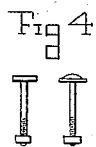
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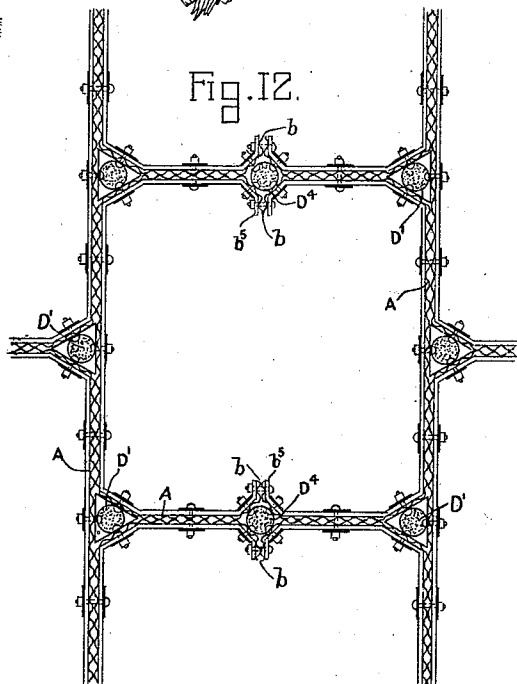
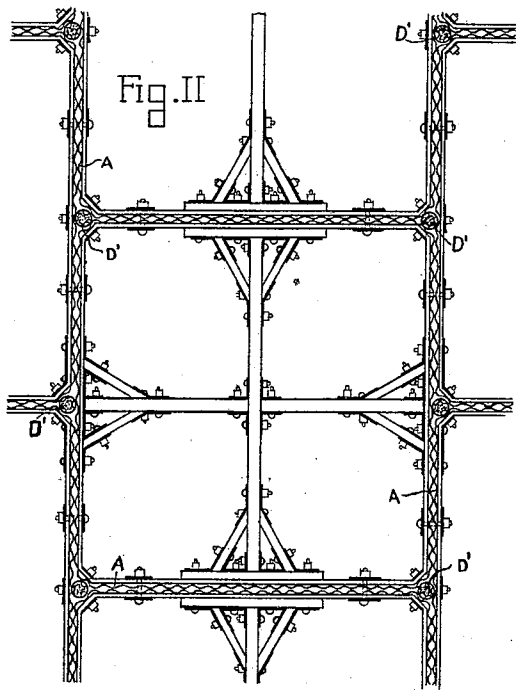
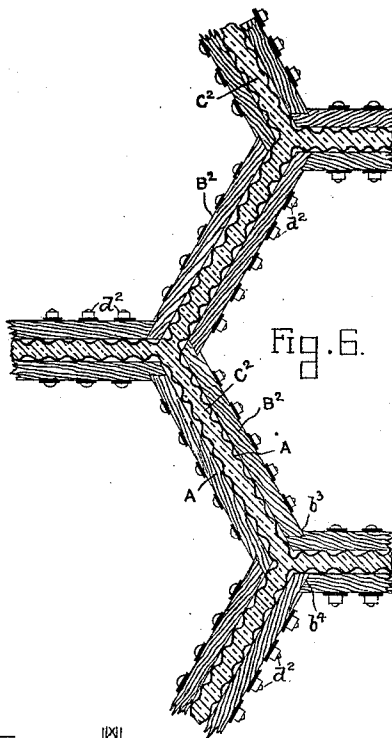
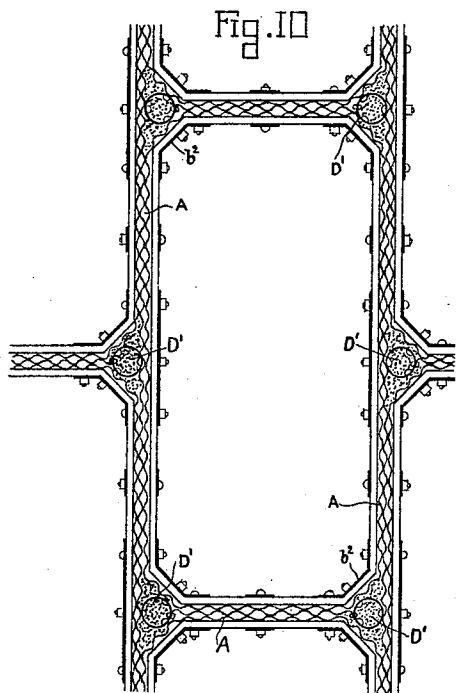
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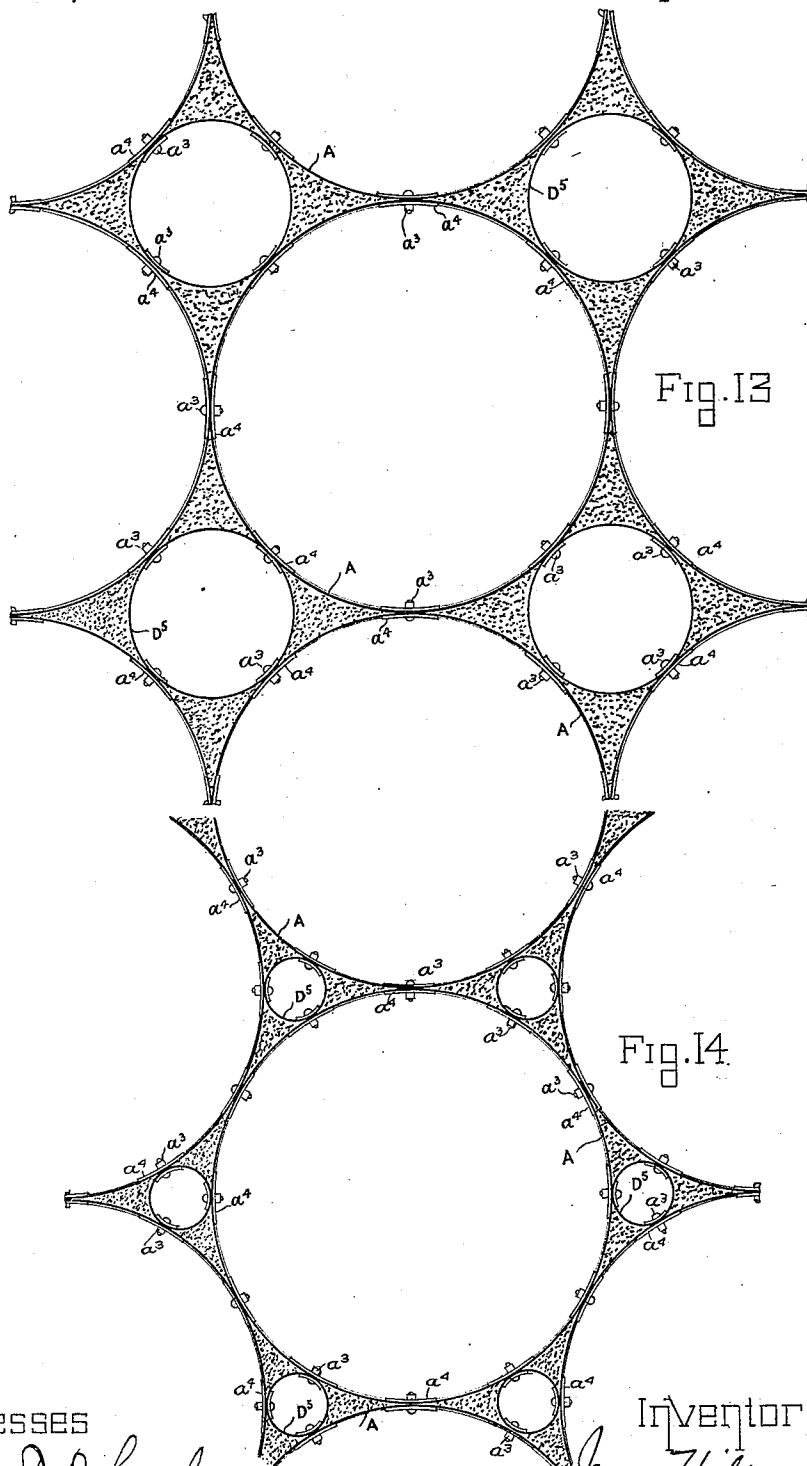
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5 Sheets—Sheet 5.

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Fig 15.

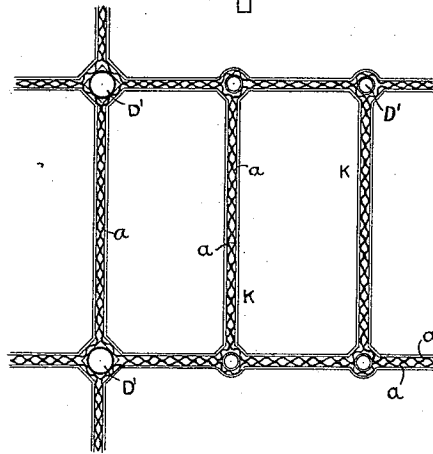
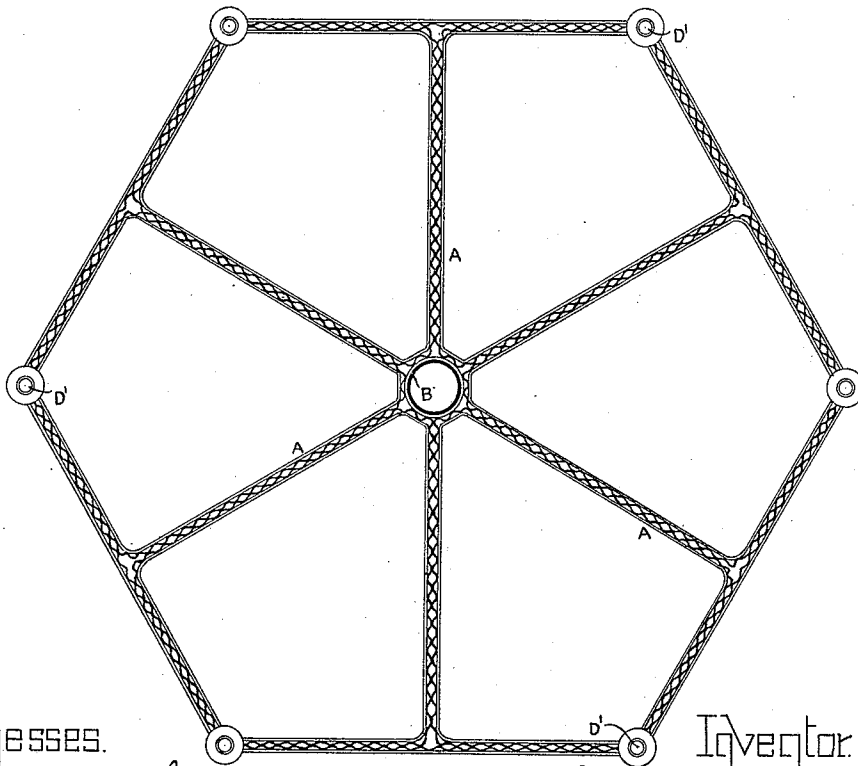


Fig 16



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UNITED STATES PATENT OFFICE.

JAMES WILSON, OF LISCARD, ENGLAND.

CONSTRUCTION OF WALLS FOR BINS, &c.

SPECIFICATION forming part of Letters Patent No. 459,806, dated September 22, 1891.

Application filed December 27, 1888. Serial No. 294,744. (No model.) Patented in England April 3, 1888, No. 5,074, and October 4, 1888, No. 14,269.

To all whom it may concern:

Be it known that I, JAMES WILSON, a subject of the Queen of Great Britain, residing at Liscard, in the county of Chester, in the Kingdom of England, have invented certain new and useful Improvements in the Method of Constructing Walls, Vessels, and Structures, (for which I have obtained Provisional Protection in England, dated April 3, 1888, No. 5,074, and No. 14,269, dated October 4, 1888,) of which the following is a specification.

The invention has for its object an improved method of constructing vessels or structures which shall have comparatively lighter and cheaper walls than those hitherto generally employed, but shall be of sufficient strength to resist the strains, lateral or otherwise, which are brought upon them.

The invention is applicable to structures of various kinds, such as grain silos and bins, hereinafter called "bins," warehouses, forts, shields, batteries, theaters, and similar structures, ships, barges, and other vessels, bulk-heads, partitions, safes, strong-rooms, and the like, refrigerating-safes, houses, and compartments, vats, tanks, and similar structures, vehicles, and the like.

My improved method of construction consists, essentially, in using two or more layers of corrugated metal placed with their respective concavities opposite each other, whereby great strength and stiffening is obtained.

The way in which I carry out the invention may be understood by reference to the accompanying drawings, in which—

Figure 1 is a sectional plan of a silo or bin for storing grain, with portions of other similar bins adjacent thereto. Figs. 2, 3, and 4 show details of construction, Fig. 2 being a plan of one side of a bin, shown partly in section, as on line $x x$, Fig. 3, an elevation of the top portion of same, partly in section, and Fig. 4 various forms of bolts used in construction. Fig. 5 is a sectional plan showing modifications in the details of constructing the walls of the bins. Fig. 6 is a similar view showing other modifications. Figs. 7 to 14 show in plan view various ways of staying and grouping the bins. Fig. 15 is

a sectional plan of a bin divided into compartments for heating, cooling, or drying the produce. Fig. 16 is a sectional plan of a bin divided into compartments by radial stays or walls.

It will be unnecessary to further illustrate my invention as applied to other structures, because the above will sufficiently illustrate the method of carrying it out.

Referring first to Figs. 1 to 4, the walls of the bins, which can be circular, polygonal, rectangular, or other shape, are made of comparatively light plates of corrugated metal A. The plates A overlap each other at their vertical edges a and are secured by rivets, screws, bolts a' or other suitable fasteners. The horizontal ends of the plates preferably abut against each other, as shown at a^2 , Fig. 3; but, if desired, they may overlap each other. In the latter case they are secured to each other by screws, rivets, bolts, or other suitable fasteners.

Along each horizontal joint a^2 , whether butt or lap, and on each side of the sheets is secured, preferably by bolts b , a T-iron B. These T-irons extend right round the bin, forming a rigid frame, to which the metal wall-plates are secured. At the extreme top and bottom of the bin the plates A are secured by similar bolts b to angle-irons B' in preference to T-irons. Both T and angle iron frames may be made either in a piece or in sections. If in sections, their joints may be stiffened by cover-plates. The sides of the bin are made vertical, as shown in the drawings; also, the T or angle iron frames are preferably of lighter cross-section as they approach the top of the bin. If found necessary, other frames may be introduced at intervals between those which cover the horizontal joints a^2 . I preferably fill up the concavities of the corrugations between the plates A and the horizontal frames B or B' with blocks of wood C or with other suitable material. These act as wedges against the adjoining convexities and are secured in position by any suitable fastenings. The corrugations are thus maintained in position and are prevented from being elongated or flattened. This materially increases the strength and rigidity of the structure. Holes are made

at intervals in the flanges of the horizontal T-bars, to which rings or hooks can be fixed for fastening scaffolding in case of repairs or other requirements.

5 Where the condensation of vapors upon the metal plates is considered to be deleterious to the produce, the bin can be lined with wood, in which case the blocks C can be lengthened, so as to form strips, as shown at C', Fig. 3, 10 which extend the entire distance between the horizontal frames. These may be covered, if necessary, by light boards, lath, and plaster or other suitable material.

The plates A may be placed two or more 15 deep, as desired. They are arranged back to back, with their convexities touching, or nearly so, as shown in Figs. 1 and 2. By this arrangement I obtain a structure composed of a series of tubes or cylinders which is able 20 to resist every kind of strain likely to be brought upon it. I can therefore use a comparatively much lighter metal than has been hitherto employed in any other method of construction. Where two or more sheets are 25 arranged as above described, the spaces between the sheets may be filled up with concrete, asphalt, cork-shavings, sawdust, sand cement, or other suitable packing, as shown at c², Fig. 2. In this case the blocks C may, 30 if desired, be dispensed with. The angles of the bins are by preference rounded or flattened, as shown in Fig. 2, instead of being sharp, as in Fig. 1. The angles being made round or flattened, a triangular space D is formed 35 at the junction of the walls of adjacent bins. This space may be filled with material similar to what is hereinbefore described for filling in the spaces between the corrugated sheets. I prefer, however, to place vertical cylindrical 40 pipes D' in these triangular spaces. The pipes may be of iron or other material and may be either plain or corrugated, the spaces round the pipe being filled in with suitable packing C², as shown in Fig. 3. The pipes D' 45 are preferably made in lengths, as shown in Fig. 3, and are united at their joints d by sockets D², to which they may be secured by bolts, rivets, or their equivalent. The sockets D² extend outward from the pipes D' and 50 form a solid abutment for the plates A. The joints d are preferably so located that each socket D² shall come opposite T or angle iron frame, as shown in Fig. 3. Bolts b' are passed through the T-iron of one bin, through the corrugated plates A and socket D², and 55 through the T-iron of the adjacent bins, so that the whole is bound firmly together. Bolts d² are also embedded at intervals in the packing C² and pass through intermediate T or angle iron frames or simply through the 60 plates A. (See Fig. 2 and also Fig. 5, hereinafter to be described.)

The bodies of the plates A are united by bolts a³. By means of this method of bolting 65 the plates and frames of adjacent bins are all firmly united. Various kinds of bolts are used, such, for example, as shown in Fig. 4,

according to the position in which they are required and the object they have to fulfill. The spaces between the plates A may be filled 70 with circulating freezing-mixture, cold water, or cold air for the purpose of keeping the bins cool, or steam, hot air, or hot water may be similarly applied to heat the bins. In the case of steam or liquids being used the joints 75 of the plates or the bolt-holes are made watertight, the former being preferably overlapped, or by perforating the plates and passing air along the spaces between them a ready means of aerating the contents of the bin is obtained, 80 or some or all of these spaces may be used as extra means of discharging the bins or as passages for lines, wires, gas or water pipes, &c., or for other requirements. In case of fire or 85 other emergency the pipes D' can be employed as reservoirs for water or as an extra means for discharging the bins or for other purposes, or as passages for elevators, hoists, gas or water pipes, &c. Their chief use is to 90 bind together and materially strengthen the structure.

In Fig. 5 a portion of a bin is shown, in which wooden frames are used instead of the T or angle bars B B', the frames being made 95 in sections, the joints being in each case secured by cover-plates b². A modified form of socket is also shown having bolts d'' cored in the angles. Bolts d² are passed through the plates b², sections B², and socket D² into nuts placed in the holes d''. Moreover, some- 100 times bolts are passed at intervals through the spaces or pipes D', plates A, and bin-frames, as in Figs. 8, 9, 10, and 11.

In Fig. 6 another way is shown of arranging the sections B² of the wooden frames, the 105 end b³ of one section being placed opposite a joint b⁴ between two adjacent sections in the adjoining bin. This arrangement of sections is most suitable for bins without rounded or 110 flattened corners.

The plates A in Fig. 6 are shown placed a short distance apart and filled in between with concrete C² or other suitable packing. In this packing, as shown in Fig. 8, there may 115 also be placed at intervals vertical pipes D³, preferably of smaller diameter than the corner pipes D', which give additional strength and rigidity to the walls. Similar pipes D⁴ may also be placed in the walls at intervals, 120 even when the plates A touch each other, the latter being turned outward and flanged for the purpose, as shown at b, Fig. 12.

In Figs. 5 to 12 the wall-frames are shown built up of flat bars or wooden battens instead of T or angle bars, as in Figs. 1, 2, and 125 3, the particular shape of these frames in cross-section being capable of variation.

In Fig. 9 a bin is shown in which only one thickness of plate A is used for the walls. In such a case the blocks C, referred to in refer- 130 ence to Figs. 2 and 3, are most essential to keep the corrugations from being flattened.

In Figs. 1, 2, 3, 5, 7, 11, and 12 two sheets A and in Fig. 10 three sheets A are shown

placed back to back. The bins may be of any convenient shape in plan, either rectangular, polygonal, or circular, and may be grouped in many different ways, the main object being to make them and to group them in such a manner that they shall mutually support each other to the best advantage, while leaving a maximum amount of storage space on a given area. When groups of bins of a square or rectangular shape are required, instead of employing the method heretofore adopted of placing the walls or divisions of each in direct lines, I construct them so as to "break joint"—that is, I place the end wall of each bin so that it will meet the center of the side wall of the adjacent bin, as shown in Figs. 7 to 12. By this arrangement I reduce by one-half the unsupported surface of the walls which are presented to the pressure of the contained produce. When the bins are constructed of a cylindrical shape, it is preferable to group them as shown in Figs. 13 and 14, each bin forming the center of a group of five, as in Fig. 13, or of seven, as in Fig. 14. The bins are secured together by bolts a^3 and curved plates a^4 , placed at intervals in a vertical direction. The corrugations of the sheets A are by preference placed horizontally in cylindrical-shaped bins, as greater rigidity and strength to resist the strains upon it are thereby obtained. In the trefoils or spaces between the bins vertical cylinders or pipes D⁵ are placed of such a diameter as to touch each of the surrounding bins, and fastened thereto by plates a^4 and bolts a^3 in the manner hereinbefore described for fastening the bins together. When desired, the aforesaid trefoils may be filled up with concrete or its equivalent. In this case I substitute for the bolts and inner plates a^4 flat-headed bolts, or bolts with large plates, such as shown in Fig. 4, which are embedded in the concrete, &c., and pass through the plates A into the bins. The aforesaid pipes D⁵ or the unoccupied trefoils without the pipes may be filled up or used for storing produce or for any of the purposes herein described with reference to the pipes D' of Figs. 2 and 3.

When bins are required for heating or cooling or drying produce, I may subdivide them by partition-walls K (see Fig. 15) and follow the same construction as heretofore described. This subdivision brings the bulk of the produce into closer proximity with the cooling, heating, or drying element and enables it to be drawn off and refilled into an adjoining compartment, if required. Air, steam, or liquid is forced between the sheets a^1 and is kept in circulation by escape-valves. The produce can be kept in motion by screws, rotating arms, or other appliances.

Fig. 16 is a sectional plan of a hexagonal bin divided into compartments either for the purpose of storing smaller quantities of produce than in the large bins and facilitating the mixing of the produce which is being drawn off from these several compartments

through the central pipe or for the purpose of strengthening the structure or for sampling or aerating the produce. A are the radial arms for strengthening or dividing the structure; B, a vertical tube or pipe from which the said arms radiate and which can be used for the purposes of sampling, aerating, or mixing the produce, as hereinbefore mentioned.

In the case of tanks, vats, or similar receptacles the sides, bottoms, and covers may be of two or more sheets of corrugated metal placed together, as hereinbefore described, and hot or cold air, steam, or liquid, as may be required, caused to circulate and flow off, so as to maintain a uniform temperature of any desired degree.

When great strength is required, as in the case of forts, shields and the like, and vessels, more than two sheets of the metal may be bound together in the manner described to form a plate and the tubes between the sheets packed with any good resisting material or liquid. The plates so constructed may be used in the same manner and for the same purposes as plates made of plain metal.

I claim as my invention—

1. The combination, in bins, of the corrugated-metal walls and the blocks of wood filling up the corrugations, whereby a smooth surface to the wall is obtained and on which moisture will not easily condense, and whereby the strength is increased.

2. A bin composed of two or more corrugated plates with the corrugations back to back and the tubular spaces formed by their concavities filled with solid matter, such as concrete, whereby great rigidity is obtained.

3. In combination with bins having rounded corners, the space D, filled with packing, and the pipe D', for the purposes described.

4. The combination of the space D, formed by plates A, with the pipe D', formed in lengths, and sockets D², extending out and forming a solid abutment for plates A at their joints.

5. The combination of the T-iron of one cell, the two corrugated-metal sheets ending about the center of the said T-iron, and the T-iron of the other cell, with the bolts b' , passing through the whole and binding them tight, substantially as described.

6. The arrangement of groups of rectangular bins with their lengths about twice their breadth and ending and beginning opposite the centers of the contiguous bins, so as to break joint, substantially as set forth in Fig. 10, whereby each bin end is a lateral support to the contiguous ones.

7. The combination, with the walls of a bin formed of corrugated metal, of a vertical pipe in the center of the side, around which the corrugated plates and strengthening-frames are bent or pass, substantially as described, and shown in Fig. 12.

8. In combination with bins grouped together, a series of vertical pipes inclosed in

the walls of the bins at their junctions, substantially as and for the purposes described, and shown in Figs. 8, 10, and 12.

9. In combination with the walls of bins
5 formed mainly of two platings of corrugated metal and horizontal framings, a series of vertical pipes at short distances between the platings of corrugated metal, and the part between the platings not occupied by pipes filled
10 with a composition.

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

JAMES WILSON.

Witnesses:

GEO. C. DYMOND,
H. P. SHOOBRIDGE.