No. 777,730. PATENTED DEC. 20, 1904.

J. A. JAMIESON.

ELEVATOR BIN.

APPLICATION FILED JAN. 2, 1903. RENEWED NOV. 18, 1904.

NO MODEL. 3 SHEETS—SHEET 1.

FIG. 1.

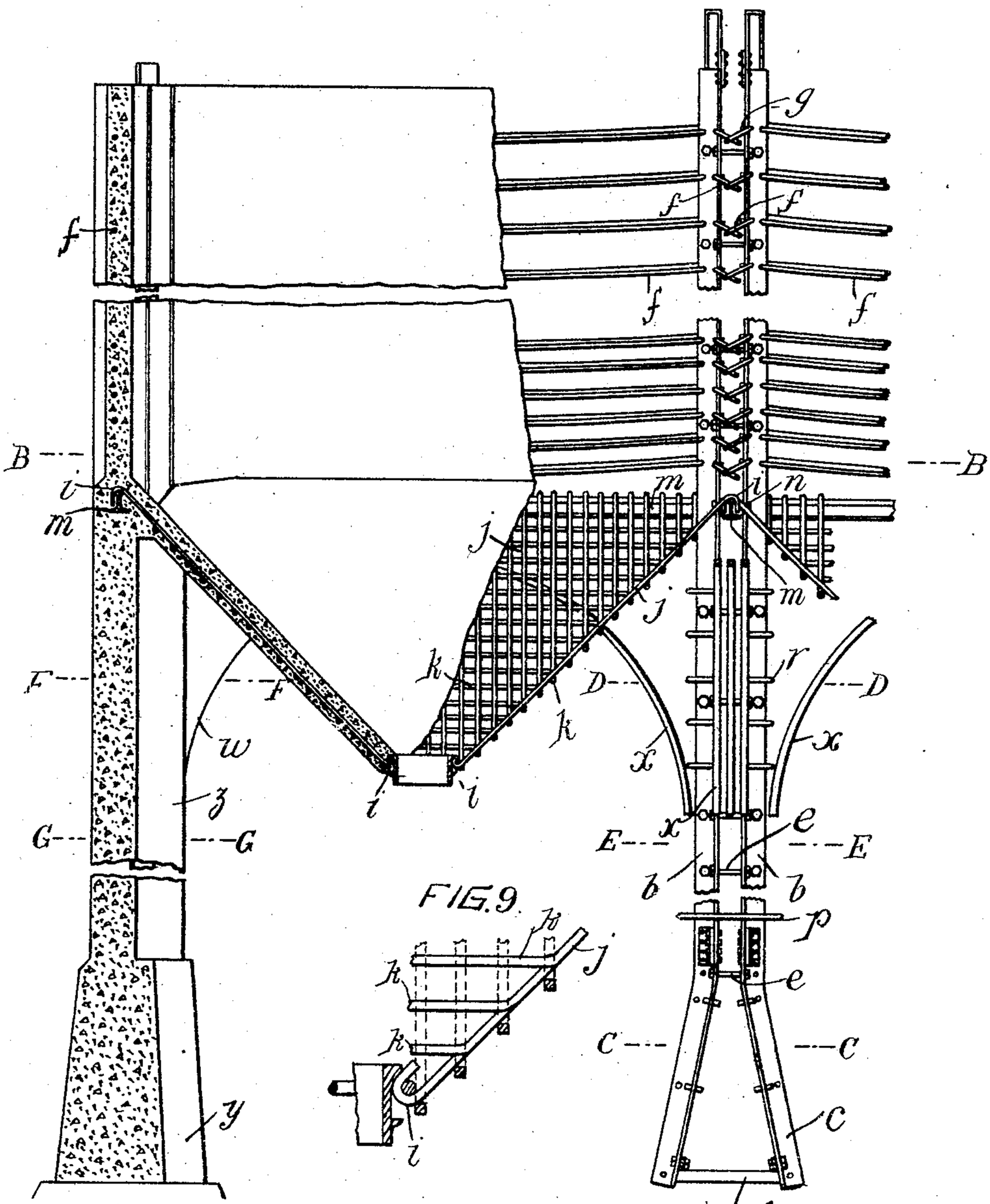

FIG. 9.

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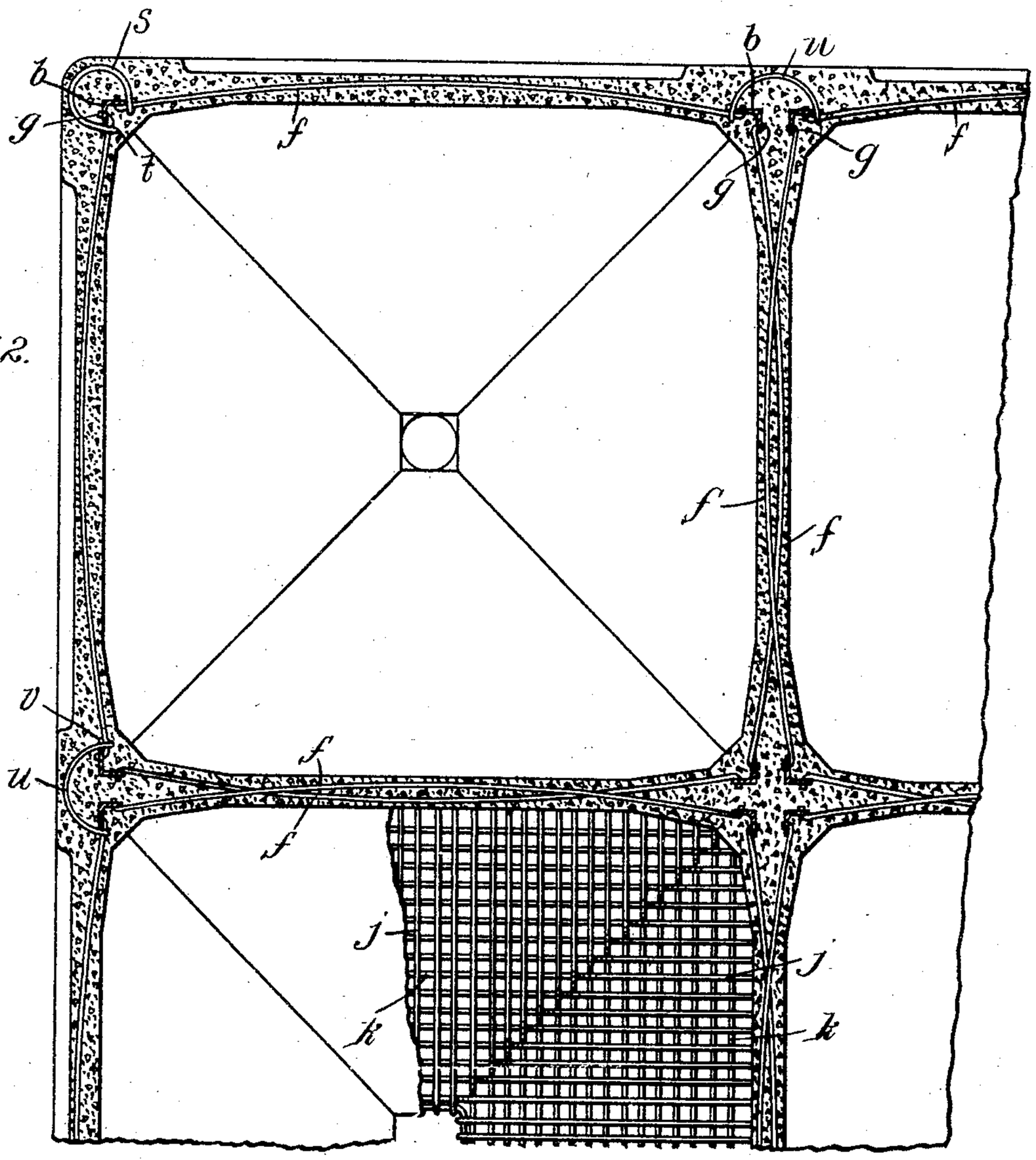
NO MODEL. 3 SHEETS—SHEET 2.

FIG. 2.



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NO MODEL. 3 SHEETS—SHEET 3.

FIG. 3.

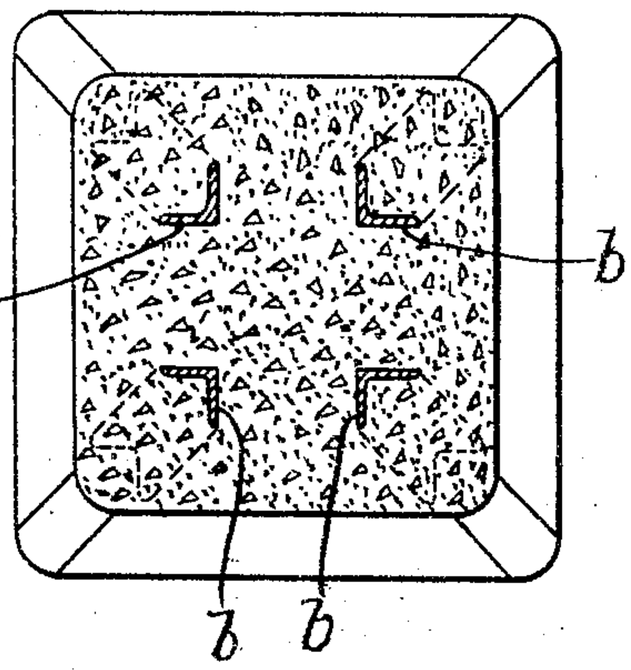


FIG. 4.

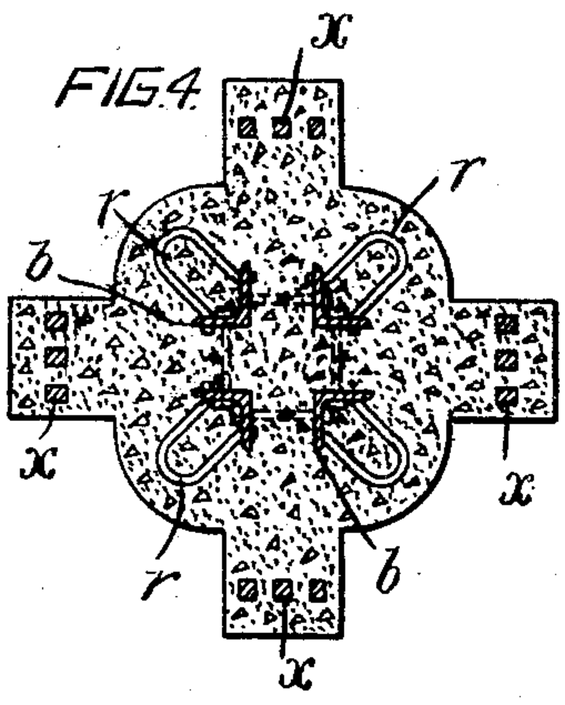


FIG. 5.

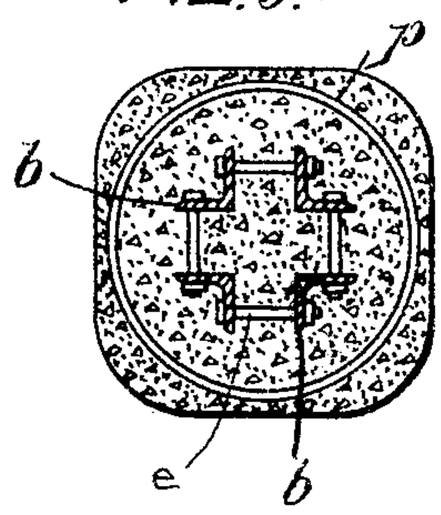


FIG. 6.

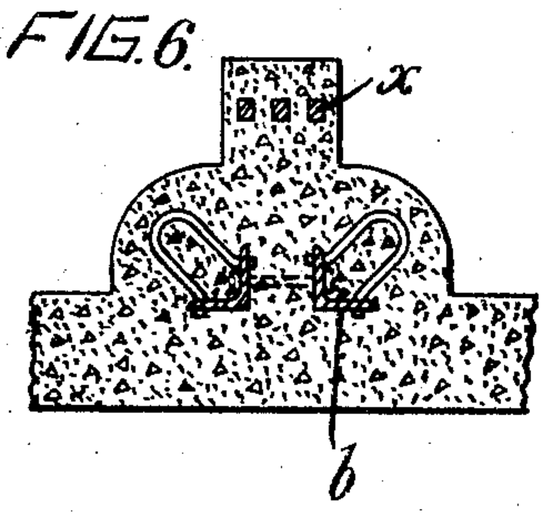


FIG. 7.

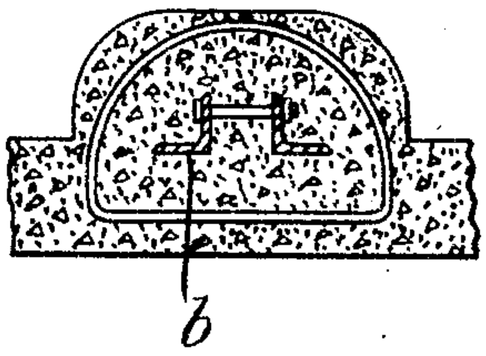
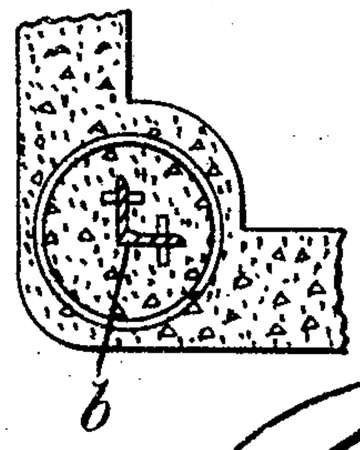


FIG. 8.



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No. 777,730. Patented December 20, 1904.

UNITED STATES PATENT OFFICE.

JAMES ALEXANDER JAMIESON, OF MONTREAL, CANADA.

ELEVATOR-BIN.

SPECIFICATION forming part of Letters Patent No. 777,730, dated December 20, 1904.

Application filed January 2, 1903. Renewed November 18, 1904. Serial No. 233,268.

To all whom it may concern:

Be it known that I, JAMES ALEXANDER JAMIESON, of the city of Montreal, Province of Quebec, Canada, have invented certain new and useful Improvements in Elevator-Bins; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates particularly to composite bins made up of metal and concrete combined; and it has for its object to provide an elevator-bin of greater strength at a lower cost than has been possible heretofore.

The invention may be said briefly to consist in providing a bin structure comprising columns, walls, and bin-bottom constructed entirely of concrete and metal combined, in each case the principle of construction involved including a novel structural feature whereby the concrete and metal are securely and permanently bound together and cause the load to impart to the structure as near as possible homogeneous stress.

More specifically speaking, the invention consists in binding concrete and metal members together by causing the metal member or a portion thereof to in itself be formed or by extraneous means in connection therewith to extend through the portion of the concrete member laterally of the plane between the ends of the member, thereby increasing the holding area.

For full comprehension, however, of my invention reference must be had to the accompanying drawings, forming a part of this specification, in which similar reference characters indicate the same parts, and wherein—

Figure 1 is a vertical sectional view of a bin structure constructed according to my invention, taken on line A A, Fig. 2. Fig. 2 is a horizontal sectional view thereof, taken on line B B, Fig. 1. Fig. 3 is a transverse sectional view of one of the piers of my improved structure, taken on line C C, Fig. 1. Figs. 4 and 5 are transverse sectional views of one of my improved middle columns, taken on lines D D and E E, Fig. 1, respectively. Figs. 6 and 7 are similar views of one of my improved side columns, taken on lines F F and G G, Fig. 1, respectively; and Fig. 8 is a similar view of one of my improved corner columns, taken on line H H, Fig. 1; Fig. 9, a detail sectional view illustrating the manner in which the suspensory bin-bottom rods are disposed.

My improved structure consists of columns, bin-walls, and bin-bottoms formed into an integral whole. Commencing at the base of the structure, I will describe the parts in the order in which they occur from the base up.

The metal portion of the columns consists of a series of vertical metal members *b*, preferably angle-irons and arranged parallel to one another throughout the major portion of their height and having their lower ends *c* spread apart to distribute the load more equally over the foundation. These members are spaced a short distance apart and secured to one another by strips or bars *d* at their lower extremities and by bolts *e* at intervals throughout the height of the members from their bent lower ends. Four angle-irons with their apices arranged toward a common center are utilized for the middle columns of a series, a pair for the outside columns between the corners of a series, and a single angle-iron for the outside corners of a series. These members *b* are of sufficient height to extend from the foundation to the roof (not shown) or other superstructure which it supports. The metal portions of the walls are suspended from these vertical members and consist of a series of curved metal rods *f*, having their ends hooked, as at *g*, and inserted into perforations in said vertical members. In order to cause these rods to act as girders and sustain a maximum proportion of the load, they are disposed to lie in planes at an angle to the vertical and toward the exterior of the bins, thus presenting supports in suspension from the vertical members of the columns for the load and lateral pressure of the walls of the bins and the contents thereof and for a large percentage of the stress of the latter.

In order that it may be thoroughly understood, it may be explained that if a curved bar were set in place with its ends hooked into holes opposite to one another in standards

and if loosely supported in this manner it would be caused by gravity to hang with its curve below a horizontal line drawn between such holes. I have, however, discovered that by adjusting each rod outwardly relatively to the bin it is intended to brace it will sustain a comparatively large proportion of the load within the bin and transmit it to the standards; hence the definition: "horizontally-arranged curved rods each disposed to have its curve lie in a plane at an angle to the vertical and toward the exterior of said structure."

The metal portions of the bin-bottoms consist of series of bars substantially rectangular or circular in cross-section and having their ends bent, as at *i*, and their main lengths bent to present inclined and horizontal portions (*j* and *k*, respectively) of varying relative proportions in order that said bars may constitute suspensory members collectively conforming to the shape of and supporting a bin-bottom. The upper ends of these members are hooked over a series of inverted-T irons *m*, with the top edges of their legs increased in thickness and of rounded cross-section, said T-irons being bolted at their ends, as at *n*, between the vertical members of the column, while said bars are so assembled as to have the bars of one series at right angles to the bars of the other series and the horizontal portions of the bars of one series extend beneath the inclined portions of the bars of the other series.

The metal structure as thus far described is supplemented with binding members adapted to augment the connection of the wall members and the bolts *e* in binding a concrete filling and facing to said structure. These binding members consist in the piers of dowel-pins set midway of their length in the flanges of the lower portions of the vertical members *b* of the columns and of sufficient length to project a short distance on either side thereof. In the columns between their lower spread ends and the bin-bottoms an annular member *p* encircles the lower end of the metal members and is of sufficiently large diameter to be near the outer surface of the column and leave a space therebetween and the members approximately equal to the cross-section of the space between said members. Above this annular member and with short intervals between them a series of staple-like binding members *r* are set at right angles to the column members and with their ends projecting through perforations in the flanges of the latter. The piers of the side columns have semi-annular instead of annular binding members. The portions of the columns constituting the outside corners of the outside bins of a series have binding members *s* of approximately annular form, with their ends bent, as at *t*, and hooked over the girder-rods *f* of the walls, and the outside bin-corners between the corners of the series have semi-annular members *u*, with their ends, like the ends of members *s*, bent, as at *v*, to hook over the girder-rods *f*,

An arch *w* acts supplementally to each side of each bin and the inverted-T beam forming the bottom thereof in supporting same and has a semicircular compression-bar *x* set therein near the inner edge of said arch, each of these arches being integral with the columns.

The division-walls between the bins have oppositely-inclined suspensory rods, thus enabling said walls to take the strain from either or both sides and transmit it to the columns.

This metal structure is incased in concrete of truncated conical form, as at *y*, to constitute piers and of straight cylindrical form, as *z*, to constitute columns proper, while the form imparted to the concrete inclosing the portions of the members from the bottoms to the tops of the bins is rectilateral.

In bins of this construction the metallic wall and bin-bottom members are inclosed in intact cement walls and sides, respectively, the metallic bin-bottom members being so embedded in their concrete sides as to be disposed near the lower or outer surface thereof. This disposal of the bin-bottom members with the metal members near the outside or bottom faces of the concrete sides has the effect of causing the metal to take the tensile strain and the cement the compression. Furthermore, the fact of the horizontal portions *k* of the suspensory bin members being beneath the members at right angles they have to carry only a small proportion of the vertical load, and consequently are better able to take the greater part of the tension due to the bending moment of the inclined portions of the said suspensory bin-bottom members.

This structure is in reality a concrete monolith strengthened by a metallic skeleton.

An important function of the vertical angle members of the columns is that they act as ties between the abutting walls of adjoining bins.

It is obvious that the bending of the metallic suspensory wall members and the dowel-pins, annular members *p*, staple-like members *r*, and open annular members *s* constitute auxiliary binding members.

What I claim is as follows:

1. In a composite elevator-bin made up of concrete and metal members and wherein the members extend one through the other, the combination with the members thereof, of an auxiliary annular binding member embedded in said concrete and independent of and encircling the metal member, said auxiliary member being of sufficiently large diameter to accommodate a portion of the concrete member therebetween and the metal member for the purpose of adding to the compressive strength of the concrete member, substantially as described.

2. An elevator-bin structure comprising bins of rectangular horizontal cross-section and consisting of a concrete monolith comprising columns, bin-walls, and bin-bottoms, and strengthened by a metallic skeleton.

3. In a bin structure a division-wall comprising vertical columns having integral flanges, two series of suspensory rods having their opposite ends hooked into perforations in the flanges of said columns the rods of each series being curved and the rods of each series being disposed to lie in corresponding angular planes relatively to the columns, and the plane in which the rods of one series lies being opposite to the other plane, and a concrete wall having said rods embedded therein and extending from column to column, substantially as described and for the purpose set forth.

4. In a composite elevator-bin made up of concrete and metal members and wherein the metal member extends through the concrete member, the combination with said members of an auxiliary binding member of staple form connected at its ends to said metal member and extending through said concrete member, substantially as described and for the purpose set forth.

5. In an elevator-bin structure, the combination with a series of wall members, of vertical corner members, a series of rods extending through said wall members and with their ends in contact with two of said corner members and means for securing such ends of the rods against vertical and horizontal displacement relatively to said corner members substantially as described and for the purpose set forth.

6. In a composite structure the combination with a pair of vertical members, of a vertical series of curved rods each disposed to have its curve lie in a plane at an angle to the vertical and toward the exterior of said structure, the ends of each rod being connected to said vertical members, and a filling for the space between said rods, substantially as described and for the purpose set forth.

7. In a composite structure the combination with a pair of vertical members, of a vertical series of horizontally-arranged curved rods each disposed to have its curve lie in a plane at an angle to the vertical and toward the exterior of said structure, the ends of each rod being in the same horizontal plane and connected to said vertical members, and a filling for the space between said rods, substantially as described and for the purpose set forth.

8. The combination with a bin structure of a bin-bottom comprising a series of metallic members arranged a short distance apart, a second series of metallic members arranged a short distance apart and disposed at right angles to said first-mentioned series, each of said members being bent to present two inclined and an intervening horizontal portion substantially as described and for the purpose set forth.

9. The combination with a bin structure of a bin-bottom comprising a series of metallic members, a second series of metallic members disposed at right angles to said first-mentioned series, each of said members being bent to present two inclined and an intervening horizontal portion with the horizontal portions of one series extending beneath the inclined portions of the other series, substantially as described and for the purpose set forth.

10. A composite column consisting of a series of vertical members disposed a short distance from one another, means for securing said members to one another, a concrete column having said separated members embedded therein, and an auxiliary binding member adapted to bind said concrete and metal members together.

11. The combination with a composite elevator-bin of composite columns for supporting said bin and consisting of a series of vertical metallic members disposed a short distance from one another, means securing said members to one another, a concrete column having said separated members embedded therein, and an auxiliary binding member adapted to bind said concrete and metal members together.

12. The combination with a composite elevator-bin of composite columns for supporting said bin and consisting of a series of vertical metallic members, means for securing said members to one another, a concrete column having said members embedded therein, and an auxiliary annular member embedded in said concrete and encircling said metallic members, substantially as described and for the purpose set forth.

13. The combination with a composite elevator-bin of composite columns for supporting said bin and consisting of a series of vertical metallic members, means for securing said members to one another, a concrete column having said members embedded therein, and an auxiliary binding member of semi-annular form embedded in said concrete and partially encircling said metallic members, substantially as described and for the purpose set forth.

14. The combination with a composite elevator-bin, of composite columns, for supporting said bin and consisting of a series of vertical metallic members of angle cross-section arranged with their angles toward a common point, means for securing said members to one another, a concrete column having said members embedded therein and a series of auxiliary binding members connected at their ends to said metallic members and extending through said concrete column, substantially as described and for the purpose set forth.

15. The combination with a composite elevator-bin, consisting of a series of walls com-

prising a series of horizontally-arranged curved rods, a series of vertical metallic members located at the corners of said bin, means connecting the ends of said rods to said vertical members and said rods being each disposed to lie in a plane at an angle to the vertical and toward the exterior of said structure, and arranged progressively-increasing distances apart from the bottom of said bin to the top thereof, and a filling for the spaces between said rod to form intact walls, substantially as described and for the purpose set forth.

16. A composite-elevator-bin structure comprising composite columns consisting of a series of vertical metallic members of angular cross-section arranged with their angles facing a common point and spread apart at their lower ends, said metallic members extending from the foundation to a point above the bins, a series of binding members binding said concrete and metallic members together, a series of horizontally-arranged curved rods extending between said vertical members of one column to the vertical members of the columns adjacent thereto, means connecting said curved rods to the columns, a concrete filling for the spaces between said rods and extending over both faces thereof to form intact walls, a series of horizontal inverted-T irons extending between said columns beneath said walls, means connecting said T-irons to said columns, a series of bin-bottoms suspended from said inverted-T irons and consisting of a series of metallic members of corresponding cross-section and arranged a short distance apart, a second series of metallic members arranged a short distance apart and at right angles to said first-mentioned series, each of said members being bent to present two inclined and an intervening horizontal portion with the horizontal portions of one series extending beneath and supporting the inclined portions of the other series, means connecting said bin-bottom members to said T-irons, and a concrete lining for each of said bin-bottoms enveloping said members and with a greater thickness above than beneath same, substantially as described and for the purpose set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

JAMES ALEXANDER JAMIESON.

Witnesses:

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FRED. J. SEARS.