(No Model.)

8 Sheets—Sheet 1.

L. SMITH.

STORAGE OF COTTON.

No. 446,028. Patented Feb. 10, 1891.

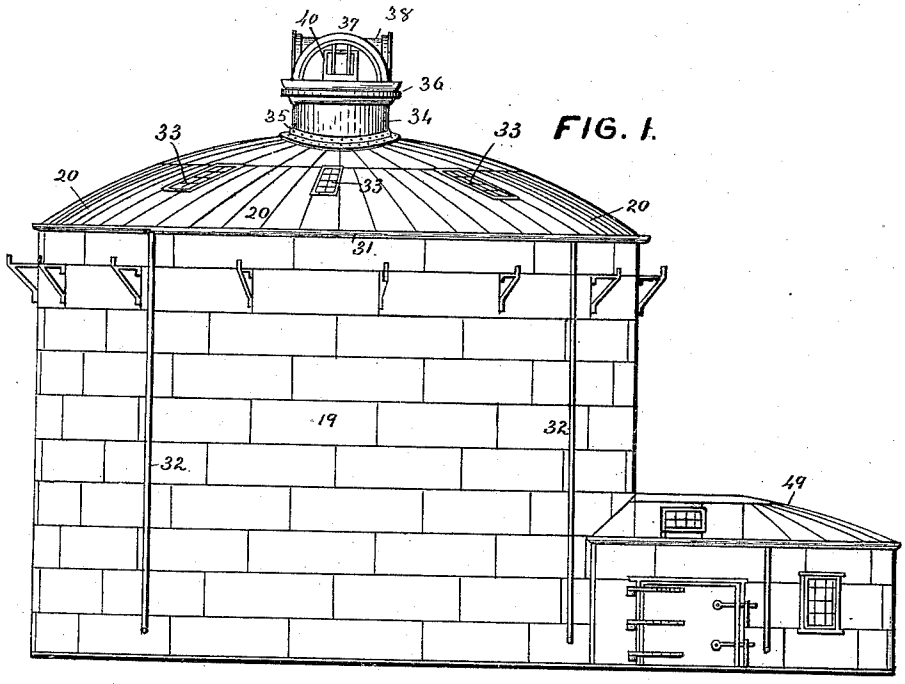


FIG. 1.

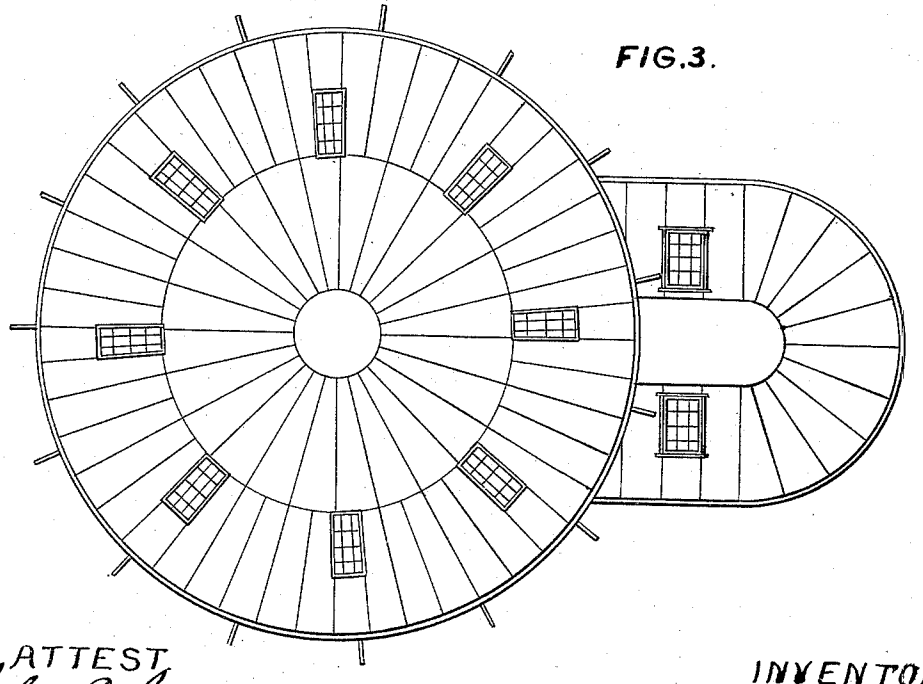


FIG. 3.

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(No Model.) 8 Sheets—Sheet 2.

L. SMITH.

STORAGE OF COTTON.

No. 446,028. Patented Feb. 10, 1891.

FIG. 2.

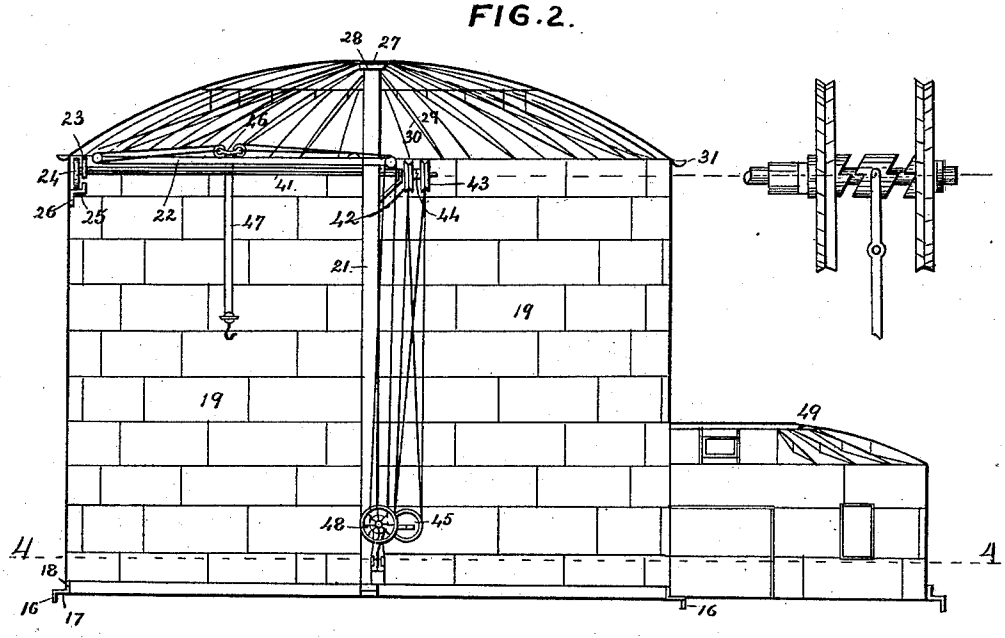
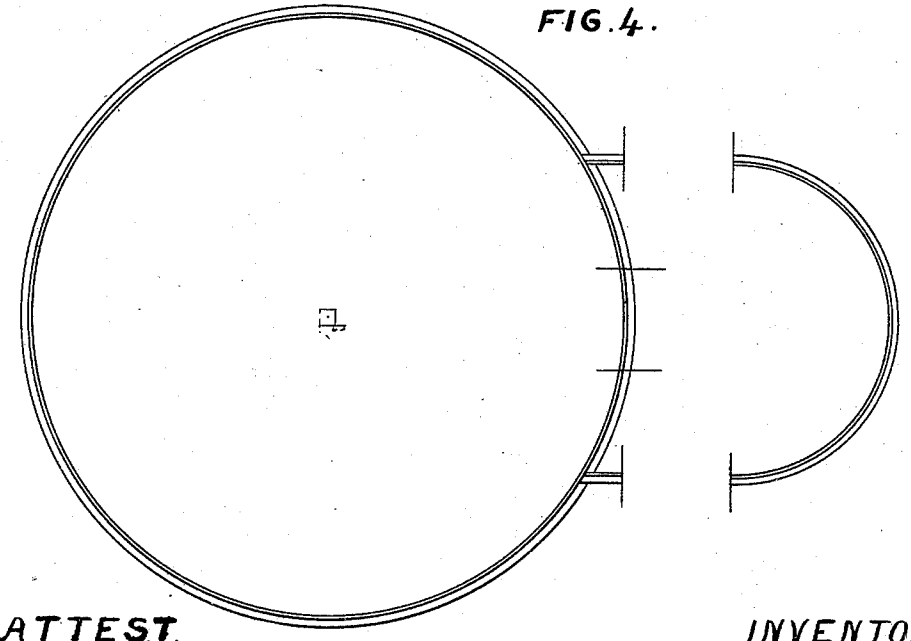


FIG. 4.



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FIG. 5.

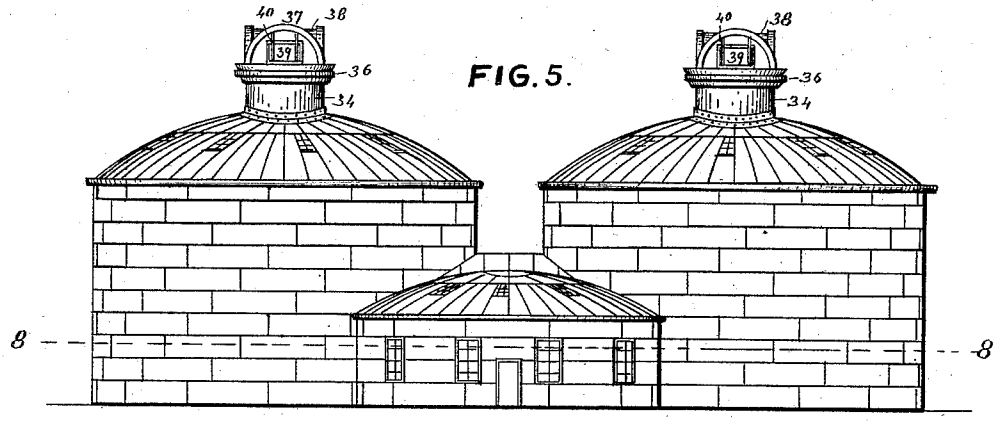


FIG. 6.

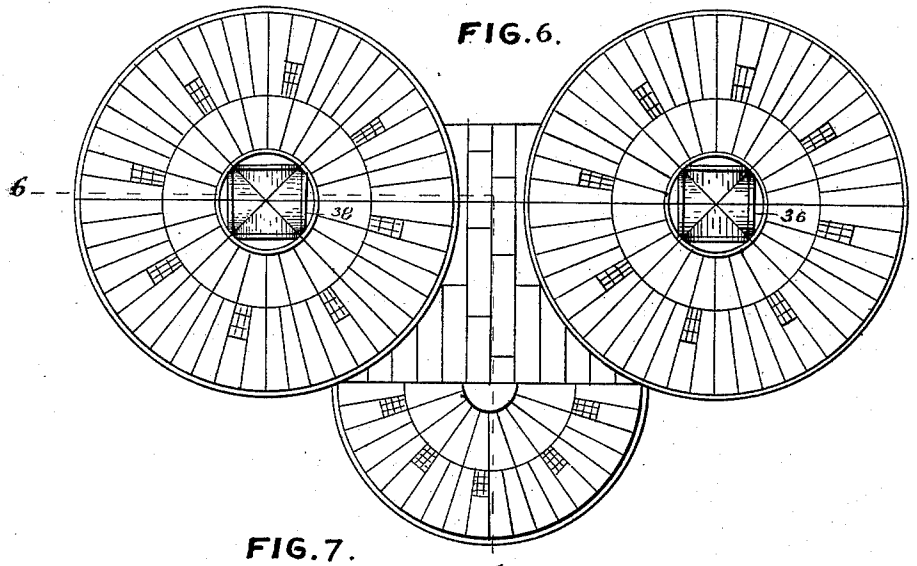
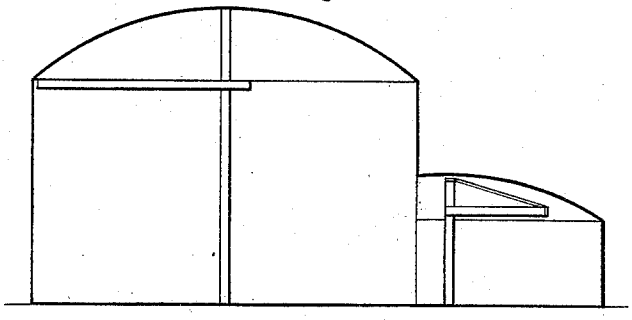


FIG. 7.



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FIG. 8.

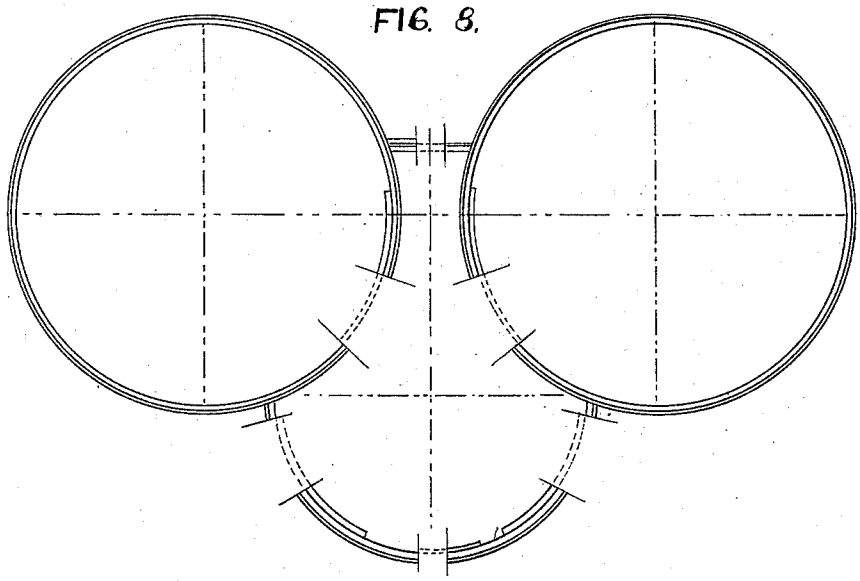
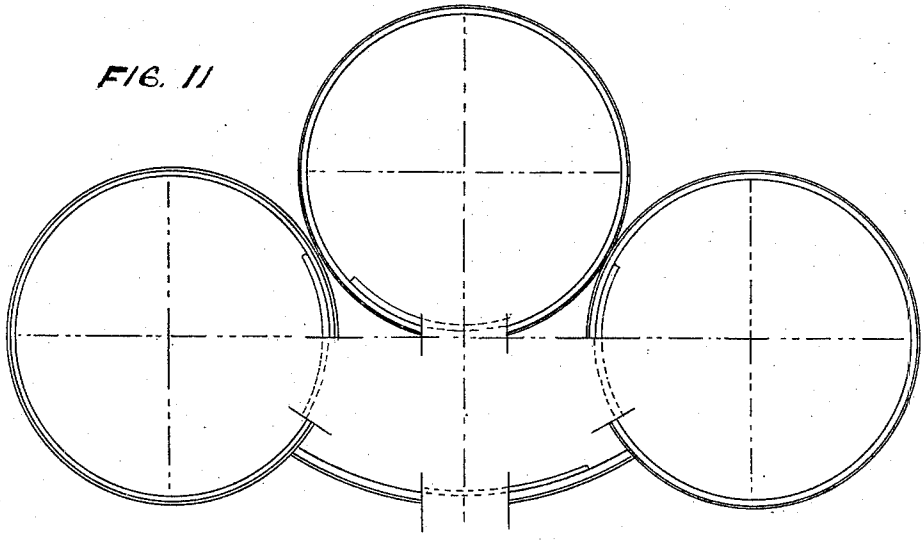


FIG. 11



Witnesses

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FIG. 9.

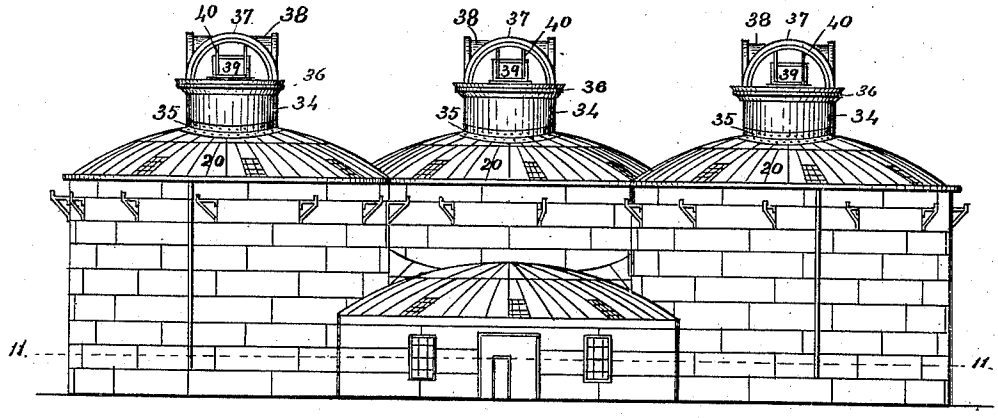
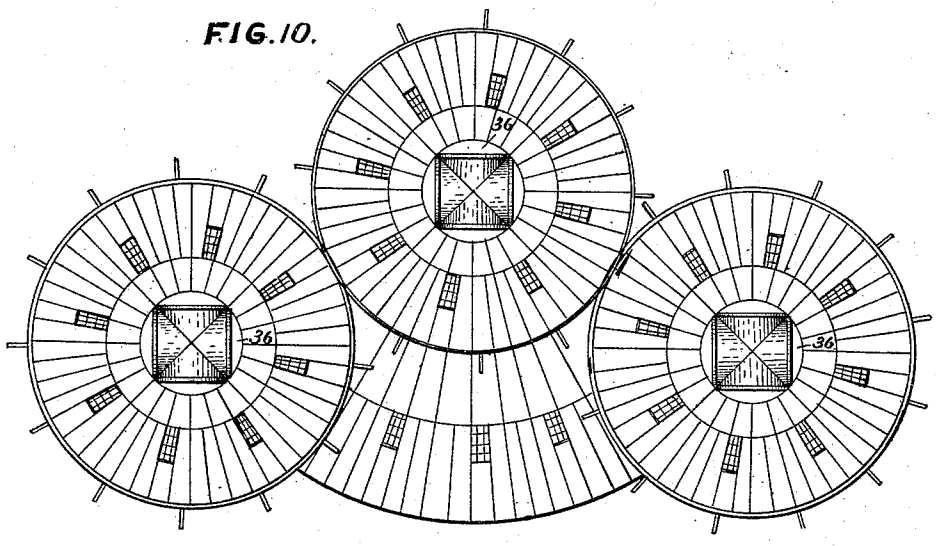


FIG. 10.



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L. SMITH.

STORAGE OF COTTON.

No. 446,028. Patented Feb. 10, 1891.

FIG. 12.

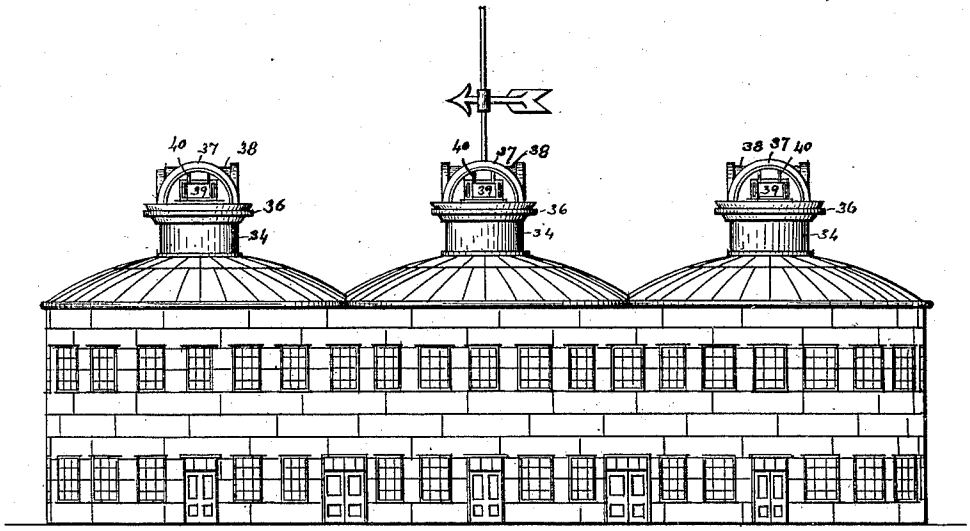
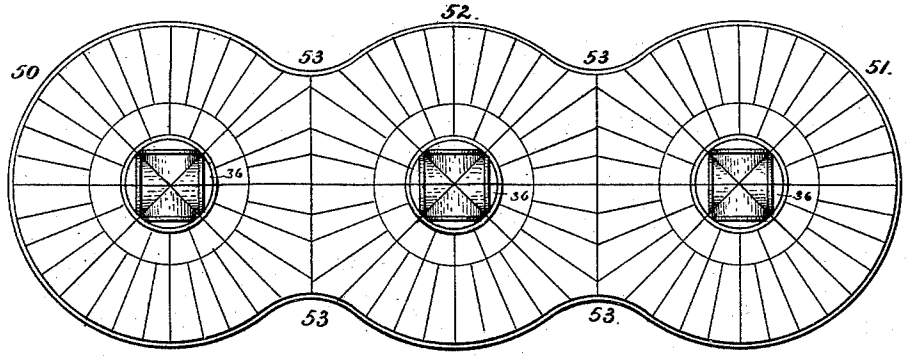


FIG. 14.



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L. SMITH.

STORAGE OF COTTON.

No. 446,028. Patented Feb. 10, 1891.

FIG. 13.

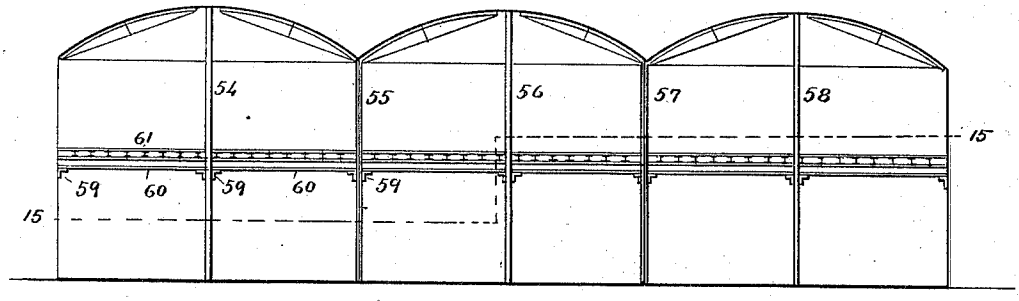
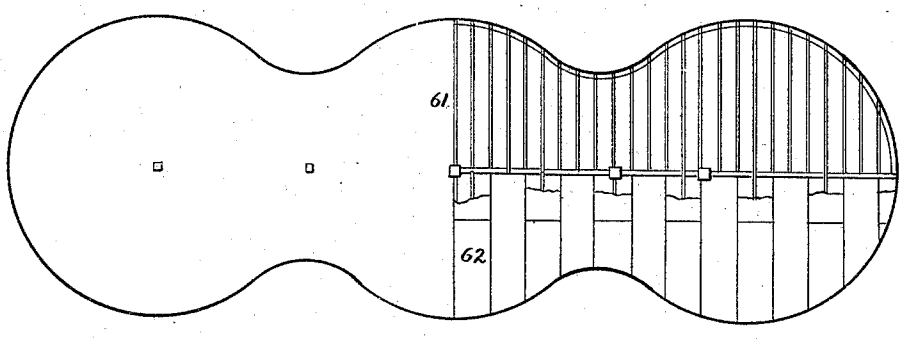


FIG. 15.



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(No Model.) 8 Sheets—Sheet 8.

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STORAGE OF COTTON.

No. 446,028. Patented Feb. 10, 1891.

FIG. 16

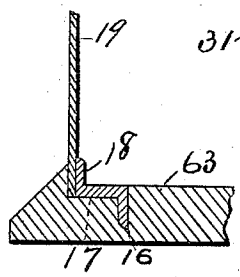


FIG. 17

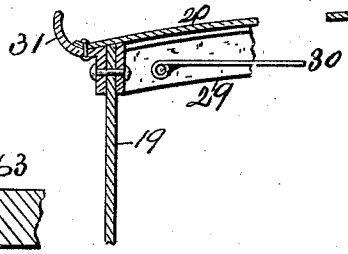


FIG. 18

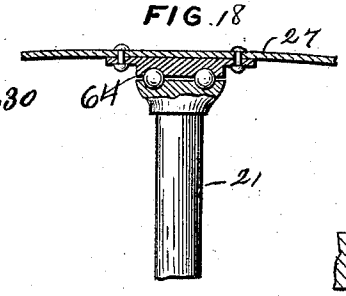


FIG. 19

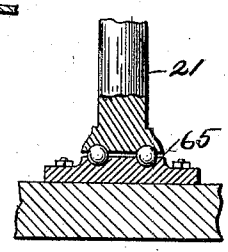


FIG. 20

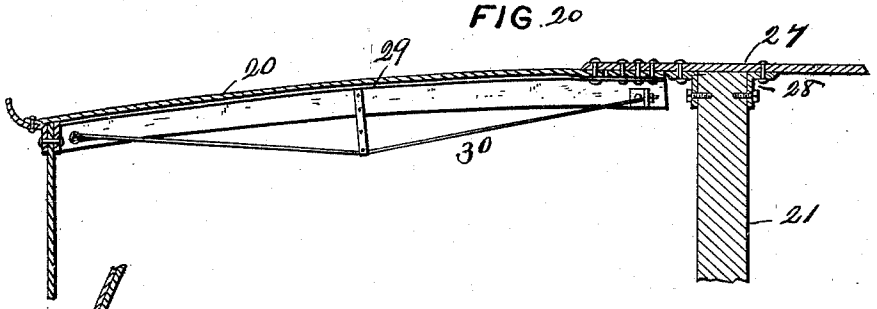


FIG. 21

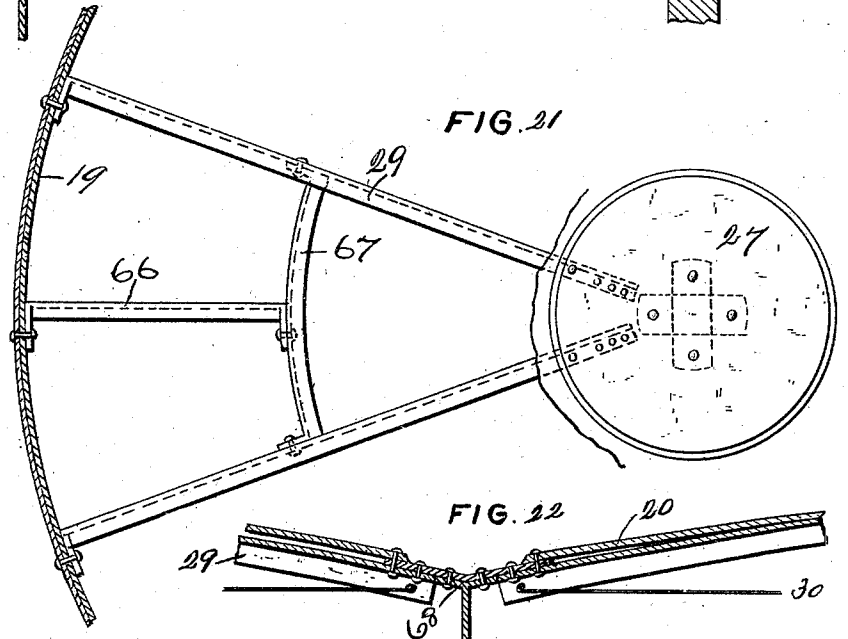
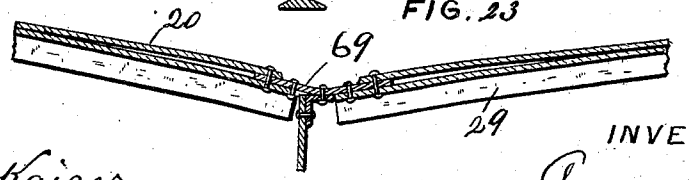


FIG. 22

FIG. 23



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UNITED STATES PATENT OFFICE.

LYMAN SMITH, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE SMITH PNEUMATIC TRANSFER AND STORAGE COMPANY, OF WEST VIRGINIA.

STORAGE OF COTTON.

SPECIFICATION forming part of Letters Patent No. 446,028, dated February 10, 1891.

Application filed June 5, 1890. Serial No. 354,416. (No model.)

To all whom it may concern:

Be it known that I, LYMAN SMITH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Storage of Cotton; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain new and useful improvements in the storage and preservation of cotton and the like; and it consists in the novel construction and arrangement of parts hereinafter described, and particularly pointed out in the claims.

My invention is designed to provide at small expense a storage plant with the necessary adjuncts for baling and pressing cotton, and which shall be of such construction as to exclude the entrance of moisture from the ground and shall be protected at all times from the inclemency of the elements, while adapted to be constantly and thoroughly ventilated. Provision is also made to close the ventilating-openings, so as to exclude rain, or in the event of fire within the store-houses, and in order to insure that the external walls of the store-houses shall be thoroughly air-tight, the construction of parts is such that the skylights, door-frames, and doors when in place shall fit accurately their respective openings. The store-houses are of general cylindrical contour and are surmounted by domes of spherical form strongly braced and joined by metallic rafters and stringers and covered externally with lapped and riveted plates of homogeneous steel, the entire structure thus combining the maximum amount of strength and solidity and fire-proof and water-proof qualities with economy and durability of materials. A convenient means of handling or manipulating the cotton-bales, so as to pack them expeditiously and securely in place, is provided within each of the store-houses, the arrangement being such that from a central point within the store-house the machinery for such purpose may be under convenient control.

In the accompanying drawings illustrative of my invention, Figure 1 represents in side elevation a single store-house embodying my improvements in connection with an auxiliary baling and pressing chamber. Fig. 2 represents a central vertical section of the same, the mechanism for handling the cotton-bales being shown in elevation. Fig. 3 represents a top plan view. Fig. 4 represents a diagrammatic section on a plane indicated by the line 4 4 of Fig. 2. Fig. 5 represents in front elevation two store-houses embodying my improvements and connected together by a baling or pressing chamber common to both. Fig. 7 represents a diagrammatic section taken on a plane indicated by the line 6 6 of Fig. 6. Fig. 6 represents a top plan view of Fig. 5. Fig. 8 represents a diagrammatic section taken on the line 8 8 of Fig. 5. Fig. 9 represents in front elevation three store-houses embodying my improvements and connected together by a baling or pressing chamber common to all. Fig. 10 represents a top plan view thereof. Fig. 11 represents a diagrammatic view taken on a line indicated by the line 11 11 of Fig. 9. Fig. 12 represents in front elevation a further modification of my invention, illustrating three store-houses arranged in series with common dividing-walls. Fig. 13 represents a vertical longitudinal central section of the same. Fig. 14 represents a top plan view of same; and Fig. 15 represents a section taken on a line indicated by the line 15 15 of Fig. 13, certain parts of the flooring being shown as broken away to more clearly illustrate the supporting-beams beneath. Fig. 16 is a vertical section of a portion of the lower part of a tank, showing the concrete bottom and the mode of connecting the shell of tank and the bottom by means of a Z-bar. Fig. 17 is a vertical section at top of the shell of the tank, showing gutter-angle, with its connection to top of shell and roof-plating, also mode of connecting heel of rafter to shell and connection of truss-rod. Fig. 18 is a vertical central section through apex of dome, showing mode of connecting the central mast to the cap-plate, so as to allow the mast to be rotated. Fig. 19 is a vertical central section of the mast at the lower end, showing its connection to the foundation. Fig. 20 is a vertical central section of the top portion of one-half of a tank, showing the connections at

top of shell and at the apex of the dome. Fig. 21 is a plan of a portion of the top of a tank, showing the connections of the rafters to the shell, to the cap-plate, and to the circular trimmers. Fig. 22 is a section showing the method of forming the gutter and making the connection of the domes of the partly-cylindrical tanks forming the storage-warehouses. Fig. 23 is a section at top of adjoining tanks, showing manner of connecting the two domes to the top of the shell forming the walls of two adjacent tanks, as in the clusters of two or more tanks.

Similar numerals of reference indicate similar parts throughout the several views.

It will be noted as characteristic of the several forms of my invention illustrated in the drawings that the general contour of the external walls of the store-houses is cylindrical and that the roofs thereof are dome-shaped or of the form of a segment of a sphere. This construction combines in the highest degree lightness with strength and enables the parts constituting the outer walls to be made symmetrical or homologous, so as to be interchangeable, whereby they may be manufactured in quantity with much economy of labor and material and may be readily restored by workmen of ordinary skill. The foundation upon which the structures rest is of concrete of sufficient thickness to support them rigidly and of water-proof qualities, so as to prevent the access of moisture from the surrounding earth. Within the concrete is embedded one of the vertical flanges 16 of a Z-bar bent into circular form to correspond to the contour of the store-house. The horizontal flange 17 of this Z-bar rests upon the concrete foundation, and the vertical flange 18 is connected to the base of the vertical shell or exterior walls of the store-house. The shell-walls are formed of steel plates 19 of uniform size, the various courses breaking joints with each other, and both the longitudinal and vertical seams being lapped and double-riveted in such manner as to render the shells water-tight and air-tight. The plates, together with the door-frames, doors, window-frames, and sashes, are formed of homogeneous steel.

To the top of the vertical shell is connected by its vertical flange a steel angle-bar 31, the horizontal web projecting outwardly to form the eave of the store-house, to which the roof-plating 20 is riveted. Within the store-house is erected at its central portion a vertical post 21, of white pine or other wood, of a height sufficient to reach to the apex of the dome, said post constituting the central mast or support of a swinging-crane arm 22, bearing at its outer end in a bracket 23 and supporting roller 24, which travels in a runway formed by the Z-bar 25, whose lower vertical flange 26 is secured to the upper interior portion of the shell-wall.

Upon the summit of the post or mast 21, when the mast is not required to rotate, is secured a circular cap-plate 27, of steel, the mode of attachment consisting of angle-clips 28, riveted to said cap-plate and attached to the mast by means of wood-screws. An "angle-clip" among manufacturers and builders is understood to be a short piece clipped from the end of a bar of angle iron or steel with shears. These "clips," so called, are from two to eleven inches long.

In the construction shown in Figs. 18 and 19 the connections between the top of post 21, Fig. 18, and the cap-plate and the bottom of the post 21, Fig. 19, and the foundation are each made of two castings. The casting that is shown as connected to the cap-plate of the dome is provided with a flange for the purpose of securing it to said cap-plate. The lower end of the casting is formed with a semicircular groove extending around it, which is suited to rest on steel balls, as shown. The top portion of the lower casting is made of similar form and supports in its groove the said balls upon which the upper casting rests. The lower portion of this casting is in the form of a socket or sleeve, into which the top of the post is fitted and secured. It is evident that if the balls are free to roll in the circular grooves the post may be rotated, while the upper casing remains fixed. The bottom connection is the same, except that the castings are reversed in position. The dome-rafters 29 are formed of angle-steel shaped to conform to the curvature of the dome and provided with truss-rods 30, secured at the lower end to the top of the shell-wall by an angle-clip or by a flange turned on the vertical web of the rafter, as shown in Fig. 21, and at the upper end directly to the circular cap-plate. The short rafters 66, Fig. 21, are secured to the shell in like manner at their lower ends and at their upper ends to circular trimmers 67, of angle-steel, which in turn are secured to the long rafters 29 by turning the web of the trimmers to the required angle. The long rafters run from the inside of the top of the tank to the cap-plate at the apex of the dome, while the short rafters extend from the inside of the top of the tank to and are secured to circular trimmers about half-way up the dome. These short rafters alternate with the long rafters. The roof-plating 20 is lapped and double-riveted, the center of each plate resting upon a rafter, to which it is riveted at suitable intervals. A grooved steel angle or an angle having a straight flange and a grooved or semicircular web, as shown in Fig. 22 as forming the gutter 31, is riveted to the shell-wall near the top thereof and forms a cornice and collecting-trough, from which conductors 32 lead to the ground.

33 indicates skylights for the purpose of giving light to the interior of the tank. The frames and sashes are made of steel shaped suitable for the purpose, and the glass is cemented in the frames, so as to render the structure air-tight. On reference to the sectional views it will be noted that the shell-

walls are provided with doors for ingress and egress, as shown at 32½, Figs. 8 and 11. These doors are adapted to slide or roll on friction-wheels and are so arranged as to close air-tight by jamming into an angle-groove.

Each of the store-houses is surmounted by a ventilator device consisting, primarily, of a cylindrical steel-plate shell 34, secured to the roof-plating by an angle-bar 35, of steel, one of the flanges of said angle-bar being riveted to the shell 34 and the other flange being riveted to the roof-plating. The top of the shell 34 supports a plate 36, upon which are supported the intersecting semi-cylinders 37 38, located at right angles to each other and having closed ends provided with ventilating-openings controlled by the swinging ventilating-doors 39, pivoted at 40, as shown. The intersecting semi-cylinders 37 38, as viewed from below, have the appearance of a groined arch—that is, the construction is such that free circulation can be had through the semi-circular gables of the ventilator. It will be evident that the hinged doors may be dropped or lowered in the event of rain or in case of fire, so as to close their openings air-tight.

The apparatus for handling or manipulating the cotton bales within the store-houses has already been partially described. It will be noted, however, that the boom 22 of the crane, instead of being supported entirely from the mast 21, is sustained in part at its outer end by the wheel 24, which travels within the runway 25. The wheel 24 is mounted upon a shaft 41, supported at one end in the hanger 23 and at the other end from the mast 21, through which said shaft 41 passes directly and is held in position in the most suitable way. This shaft carries the pulleys 42 43, which are normally loose upon the shaft, but either of which may be connected therewith by the intermediate clutch 44. One of these pulleys is connected by a straight belt and the other by a cross-belt to the power or driving pulley 45, which may be operated in any suitable manner, so that by the aid of the clutch the boom 22 may be driven in one direction or the other.

The trolley 46, carrying the chain 47, is operated by two pulleys revolving in opposite directions, as is also the barrel 48, carrying the hoisting-chain, so that the boom may be caused to travel in either direction, the trolley caused to move outwardly or inwardly with respect to the mast or the chain be raised or lowered without reversing the motive engine. The baling or press rooms 49 are of similar general construction to the store-houses, and are constructed of steel of lighter gage, but on the same uniform plan. In case of fire they can be closed air-tight by shutting the doors and windows.

In the form of my invention shown in Figs. 12 to 15, inclusive, wherein the store-houses are arranged in series, the outer walls of the end store-houses 50 51 consist of about seven-eighths of a complete cylinder. The central store-house 52 is inclosed by a partial shell-wall, which is joined or connected to the shell-walls 50 51 by the reverse cylindrical portions 53. Posts 54 55 56 57 58 at the center of each store-house and at each of the planes of meeting thereof are employed for the double purpose of supporting the roofs of the several store-houses and supporting a second-story floor, as indicated in Figs. 13 and 15 of the drawings. I-beams 60, of steel, are secured to the posts by means of steel angle-clips 59, so as to form a longitudinal girder throughout the entire length of the three store-houses. Upon this girder are supported at their central portions joists 61, said joists being secured at their outer ends to angle-clips of steel, riveted to the inner wall of the shell, said joists being also formed of I-beams of steel. Upon the joists 61 are riveted the floor-plates 62, said plates being butted and riveted down to the flanges of the I-beam joists, so that the floor will be even and smooth.

Having described my invention, what I claim is—

1. A cotton store-house consisting of a vertical shell of general cylindrical contour and provided with a dome or roof of spherical contour, in combination with a central supporting post or mast extending from the foundation to the roof, said mast forming one member of a suitable elevating apparatus, substantially as described.

2. A cotton store-house consisting of a vertical shell having at its bottom portion a Z-bar and a concrete foundation in which said Z-bar is embedded, substantially as described.

3. A cotton store-house consisting of a vertical shell of general cylindrical contour and a dome or roof of spherical contour, in combination with a central mast reaching to the apex of the roof, said mast forming one member of a suitable elevating apparatus and having a cap-piece, the roof-rafters being connected at one end to the cap-piece and at the other end to the upper edge of the shell, substantially as described.

4. A cotton store-house consisting of a vertical cylindrical shell, a spherical dome or roof surmounting said shell, a central mast supporting the roof-rafters, and a ventilator device mounted upon said roof, said ventilator device consisting of a vertical shell supporting two intersecting cylindrical shells, said cylindrical shells having ventilating-openings provided with closing doors, substantially as described.

5. A cotton-storage plant consisting of a plurality of store-houses having a baling and pressing chamber common to all, each store-house having independent entrances and doors, whereby the separate chambers may be completely isolated from each other, substantially as described.

6. A cotton store-house consisting of a vertical shell and a roof surmounting said shell, a central mast carrying a boom, and a runway connected to the interior of the vertical

shell and supporting the outer end of the boom, substantially as described.

7. A cotton store-house consisting of a vertical shell and a roof surmounting said shell, a central mast carrying a boom, a runway connected to the interior of the vertical shell and supporting the outer end of the boom, a shaft parallel to the boom and bearing at its outer end a wheel and at its inner end a pulley, and means for operating said pulley, substantially as described.

8. A cotton store-house consisting of a vertical shell and a roof surmounting said shell, a central mast carrying a boom, a runway connected to the interior of the vertical shell and supporting the outer end of the boom, a shaft parallel to the boom and bearing at its outer end a wheel and provided at its inner end with two pulleys loose upon the shaft, a friction-clutch for connecting either pulley to the shaft, and a driving-pulley geared to drive one of said pulleys in one direction and the other in an opposite direction, substantially as described.

9. A cotton-storage plant consisting of a series of store-houses whose vertical walls are of general circular contour, said store-houses being connected by walls of reverse curvature, substantially as described.

10. A cotton-storage plant consisting of a series of store-houses whose vertical walls are of general circular contour, said store-houses being connected by walls of reverse curvature, and posts or masts for supporting the roofs of said store-houses at their apexes and at their planes of intersection, substantially as described.

11. A cotton-storage plant consisting of a series of store-houses whose vertical walls are of general circular contour, said store-houses being connected by walls of reverse curvature, posts or masts for supporting the roofs of said store-houses at their apexes and at their planes of intersection, and a second floor or story supported by said posts or masts, substantially as described.

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

LYMAN SMITH.

Witnesses:
JOHN C. PENNIE,
U. G. M. PERRIN.