No. 627,732. Patented June 27, 1899.

G. D. HARDER.

SILO.

(Application filed Feb. 4, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

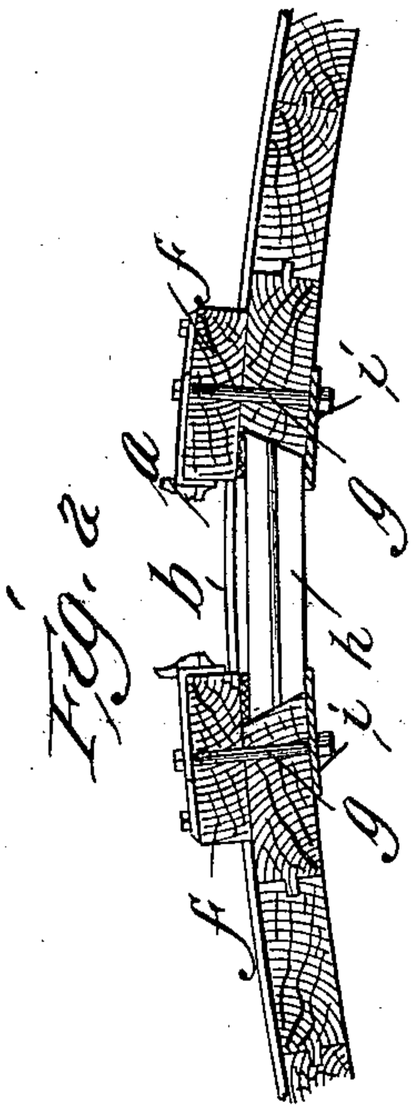


Fig. 6.

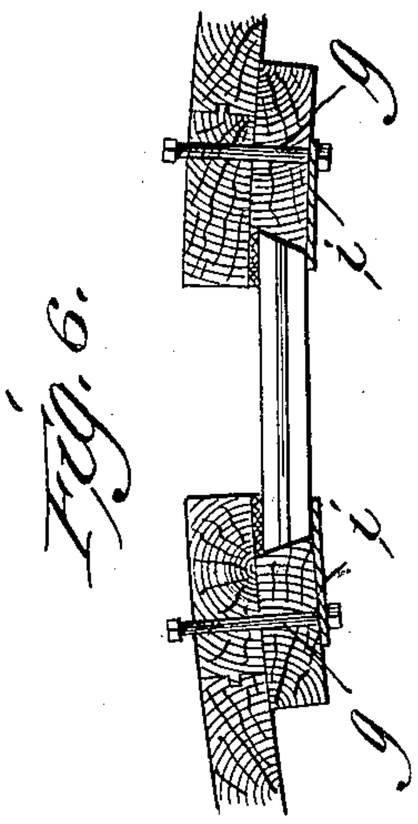
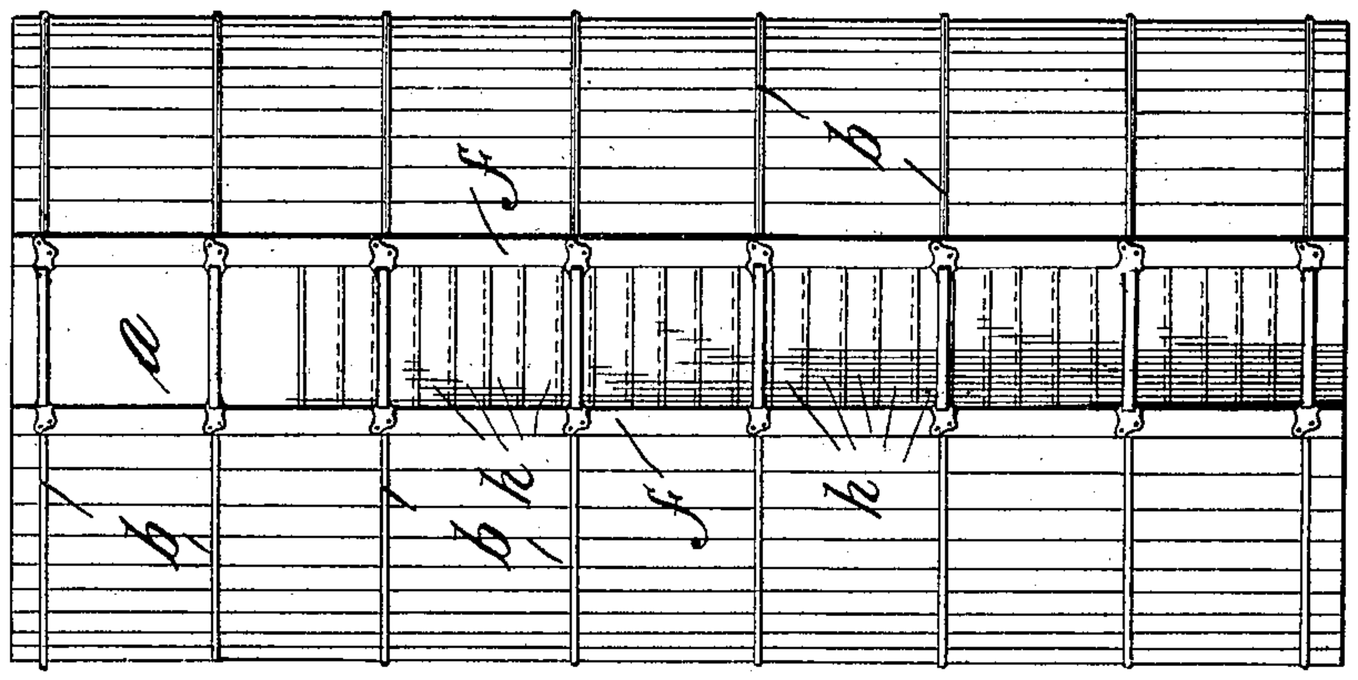


Fig. 1.



Witnesses:
F. L. Winchester
W. F. Staats.

Inventor:
Geo. D. Harder
by Wm Lyon
Atty.

No. 627,732. Patented June 27, 1899.

G. D. HARDER.

SILO.

(Application filed Feb. 4, 1899.)

(No Model.) 2 Sheets—Sheet 2.

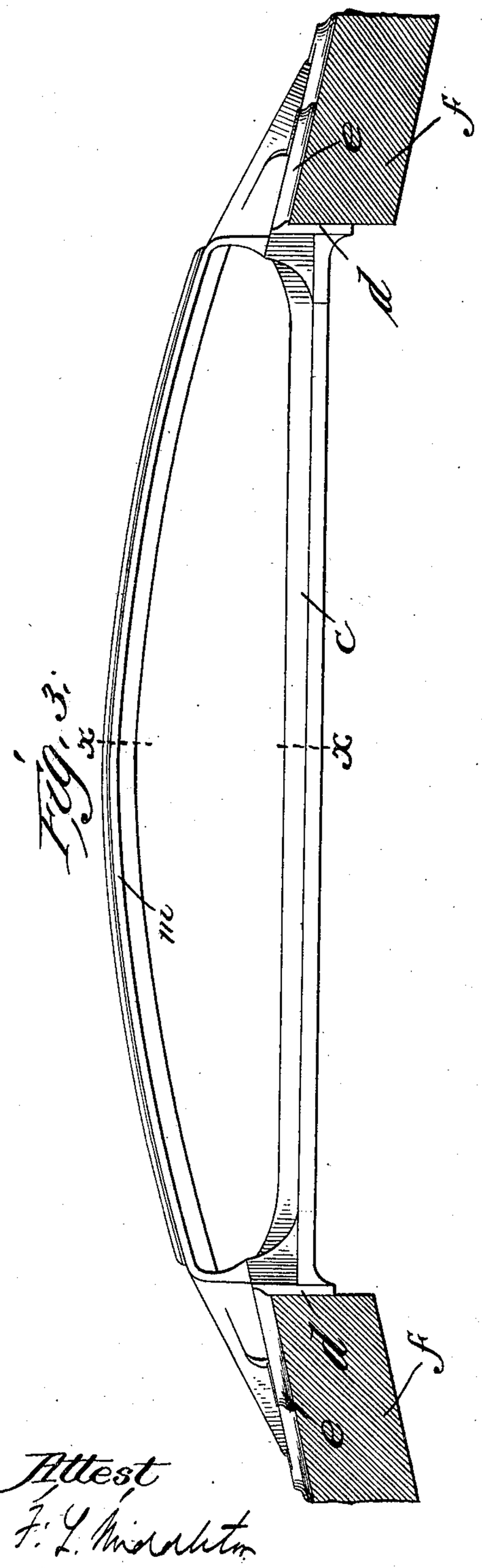


Fig. 3.

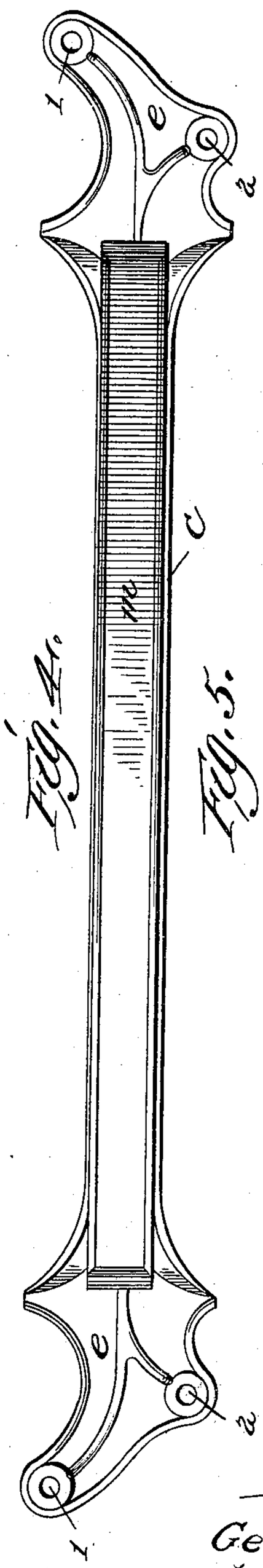


Fig. 4.

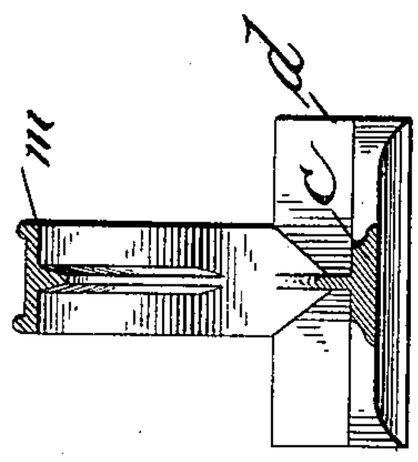


Fig. 5.

Attest,
F. L. Middleton.
W. F. Hall.

Inventor
Geo. D. Harder.
by Ellis Spear
Atty.

UNITED STATES PATENT OFFICE.

GEORGE D. HARDER, OF COBLESKILL, NEW YORK.

SILO.

SPECIFICATION forming part of Letters Patent No. 627,732, dated June 27, 1899.

Application filed February 4, 1899. Serial No. 704,539. (No model.)

To all whom it may concern:

Be it known that I, GEORGE D. HARDER, a citizen of the United States, residing at Cobleskill, Schoharie county, State of New York, have invented certain new and useful Improvements in Silos, of which the following is a specification.

My invention relates to silos or tanks of that class in which a continuous opening is made from top to bottom, through which the contents are removed at intervals. It is particularly designed for tanks used for holding ensilage.

I have shown the invention as applied to a round silo composed of various staves and hoops made on the same general principle as a barrel, except that the staves are straight. The vertical opening in this silo is made from top to bottom and practically continuous, and the opening is closed by a succession of boards or sections of doors inserted and removable from the top downward like the opening and sectional closing of an ice-house. I do not herein claim, therefore, the vertical opening from top to bottom, nor the round construction of the tank or silo, nor the means for closing formed in sections and inserted so as to be removable from the top downward and arranged to be pressed against the wall or any part of the wall in an outward direction, as I am aware that these devices and elements are very old in the same or analogous structures.

My invention relates particularly to the special form of brace or stay-piece for holding the edges of the opening at the proper distance from each other to prevent collapse, and, further, in the special means for holding the sections of the door firmly in place.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 shows a front elevation of the silo. Fig. 2 shows a cross-section, on an enlarged scale, of a part only of the silo around the opening, the base being broken away. Fig. 3 shows, on a still larger scale, a plan view of the brace; and Fig. 4 shows a front view of the same. Fig. 5 is a section on line $x\ x$ of Fig. 3. Fig. 6 shows a modification of the reinforce.

In the drawings, Fig. 1 shows a general form of a silo constructed of staves and hoops. It has an opening from top to bottom, as shown at *a*, and is bound together by hoops *b*, extending completely around the silo. As a matter of course the edges of this opening must be braced by cross-pieces inserted between the edges to prevent the structure from collapsing. These braces are made in special form, as I now proceed to explain.

The form shown in Fig. 3 consists of a straight bar *c*, having at each end a flange or bearing *d* at right angles, substantially, to the bar *c*. These bearings or flanges are adapted to bear against the edge of one thickness of the wall of the silo, but not to overlap, so as to interfere with the door-sections. Outside of this bearing *d* is an inclined extension *e* of the brace, which is fitted to bear on the outside of the silo-wall, and this is provided with holes 1 and 2.

Referring now to Fig. 2, it will be observed that a casing or reinforce *f* is provided on each side of the opening and fixed upon the edge of the wall, so as to overlap said edge and afford a bearing for the flange *d* and extension *e*, the first bearing against the edge of the reinforce and the second on the outside thereof. The brace is held by bolts *g*, which pass through the reinforce and through a stave and so bind the whole together. The door is composed of sections *h*, which may be simply cross-staves dovetailed and made so as to be placed one on the top of the other with the ends bearing on the outside against the reinforce *f*. That part of the reinforce against which the ends of the pieces *h* bear is provided with rubber or other suitable lining to form an air-tight packing. The pressure of the contents of the silo may be relied upon to press outwardly the pieces *h* to form an air-tight joint, if constant care be used to press the material down in filling the silo, so as to create a sufficient pressure; but this constant care on the part of the workman cannot be relied upon, and I have therefore provided a metallic strip or plate *i*, extending from top to bottom and arranged to overlap the edge of the stave at the margin of the opening on the inside. The bolts *g* pass through this plate and are held in any suitable manner. Preferably the bolts are headed on the inside and are provided with nuts on the outside, so that they may be turned up

to draw the flange in closely after the pieces *h* are inserted, or the bolts may be riveted or otherwise set in fixed position, the parts being adjusted so that the pieces *h* may be crowded down one after the other firmly in place and so closely fitting as to bear tightly against the packing. The reinforce may be on the inside instead of the outside, as shown in Fig. 6, in which case the brace will bear against the outer edge of the staves and the sections *h* will bear against the inner surface of the staves and abut against the edge of the reinforce. This construction I regard as equivalent.

In order to obviate the necessity of a separate ladder or ladders, brackets are fixed upon the outside of the silo, and to further strengthen the brace I have provided an additional outside bar on the brace, (shown at *m*.) If the brace be made of cast-iron, this additional bar may be cast in one piece therewith, and if of wrought-iron it may be made separate and the parts riveted together. Preferably I curve the bar outward slightly, as shown in Fig. 3, and proportion the metal in the parts so that the strain at the ends may be provided for. This construction brings the ladder at the point where the door-sections are to be inserted and removed, and it is convenient and saves the expense of a separate ladder.

The cross pieces or sections *h* in practice are of the same material as the staves and are simply narrow strips of board with dovetails, the boards being set with the ribs presented upward and the grooves downward to prevent water accumulating in the grooves. They may be taken out in discharging the silo one by one, so that no lifting of the material is required. It may then be simply raked out.

I claim—

1. In a silo or tank having a continuous opening from top to bottom and a reinforcing-strip at the edges of the opening arranged to form an overlap, a packing on the inner face of the overlapping part, a brace having shoulders bearing against the overlapping edges and an extension bearing against the outer face of the overlapping part, in combination with cross-pieces or door-sections *h* arranged to bear at their ends against the packing and bolts for holding the parts together, substantially as described.

2. In a silo or tank having a continuous opening from top to bottom and a reinforcing-strip on each side arranged to form an overlap, said overlap having a packing on its inner face, a brace having shoulders arranged to bear against the edges of the overlapping part and extensions bearing upon the outer face of said part, in combination with the sections *h* arranged as described and with a plate *i* and suitable bolts holding the parts together.

3. In a silo or tank having a continuous opening from top to bottom, and door-sections arranged across the opening, an overlapping part against which the said sections bear and a bracket composed of a straight bar having shoulders adapted to bear against the overlapping part and an additional bearing *m* forming at the same time an additional brace and serving as the bar of a ladder, substantially as described.

4. In a silo or tank having a continuous opening from top to bottom, braces between the edges of the walls forming the opening door-sections for closing the opening and reinforcing-strips for the door-sections, substantially as described.

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

GEORGE D. HARDER.

Witnesses:

SANFORD S. MYERS,

ESTELLE M. TIDD.