

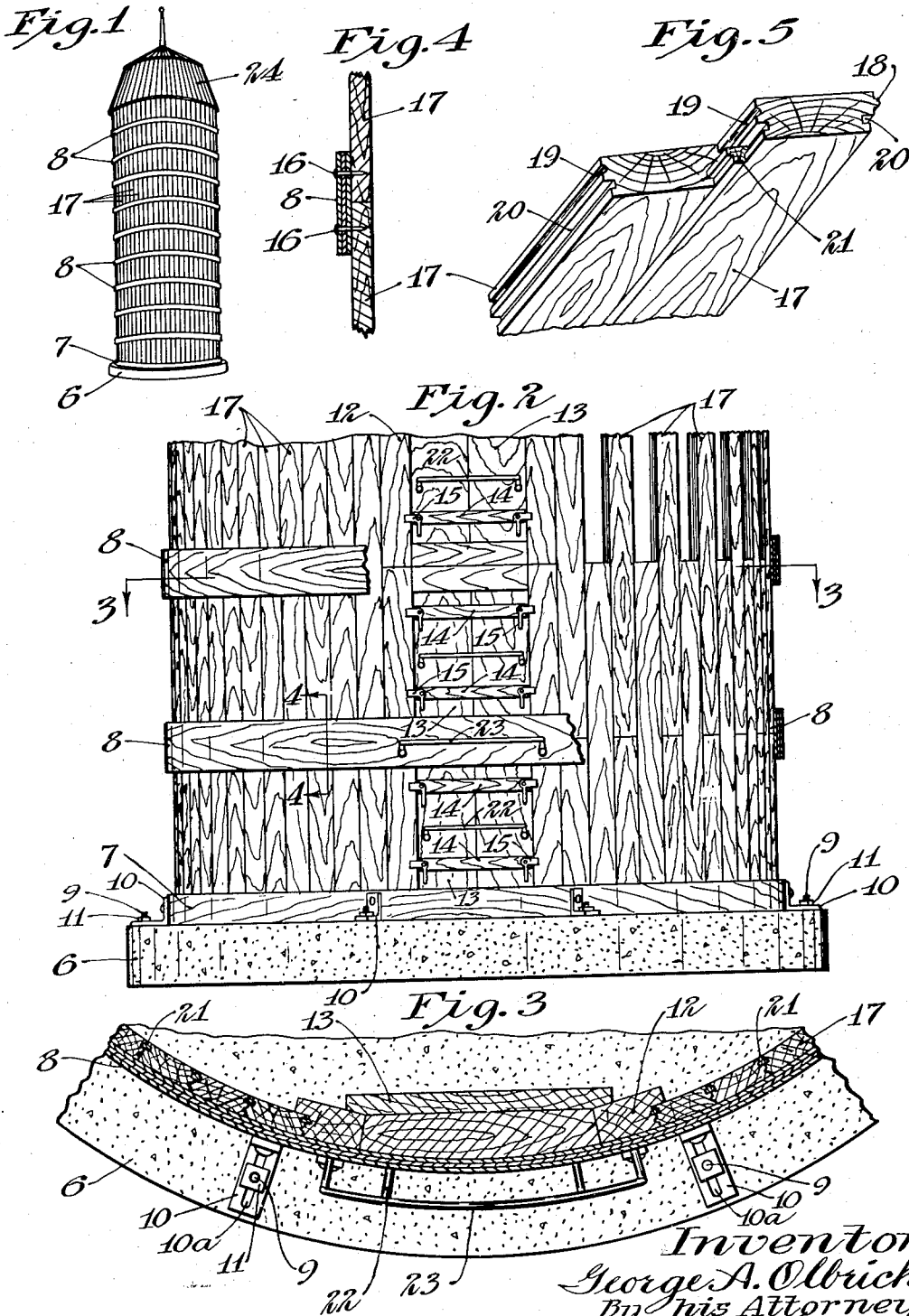
Jan. 8, 1935.

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1,987,155

SILLO

Filed Jan. 10, 1934



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Patented Jan. 8, 1935

1,987,155

UNITED STATES PATENT OFFICE

1,987,155

SILO

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Application January 10, 1934, Serial No. 706,052

4 Claims. (Cl. 20-1.4)

This invention relates to silos, tanks, and the like.

It is one of the objects of the invention to provide a novel and improved all wooden silo of cheap and simple construction which can be readily erected with a minimum of labor and wherein wooden staves and hoops are used, the hoops having the same coefficient of expansion as the staves and the same moisture absorption qualities so that the hoops will expand and contract as do the staves.

It is another object to provide a novel and improved silo including a wall made up chiefly from a plurality of staves, the adjacent staves being joined together by spaced double joints of novel and improved construction to equalize all contraction and expansion of the staves and produce a tight wall structure.

To these ends, generally stated, the invention consists in the novel parts and novel combinations of parts hereinafter defined in the claims and described in the following specification, made in connection with the accompanying drawing, wherein like reference characters refer to the same or similar parts throughout the various views, and in which,

Fig. 1 is a perspective view illustrating on a small scale a complete silo embodying the invention;

Fig. 2 is a view taken chiefly in front elevation of the lower portion of the silo, certain parts being broken away and shown in section and certain portions of the silo being shown in the course of erection;

Fig. 3 is a horizontal section taken on the line 3-3 of Fig. 2 as indicated by the arrows;

Fig. 4 is a vertical section taken on the line 4-4 of Fig. 2, as indicated by the arrows; and

Fig. 5 is a perspective view illustrating the joints between staves and looking toward the inner sides of two of the staves.

Referring to the drawing, there is illustrated a base 6 made of concrete or the like, and upon which the silo rests. Resting on this base 6 is a large circular wooden bottom hoop 7 which although somewhat narrower than the other hoops 8 which are used, is constructed very similarly to these other hoops and may be described more in detail later. Anchored within the concrete base 6 in outwardly spaced relation from the bottom hoop 7 are a plurality of vertical bolts 9, the upper ends of which are received within slots 10a in horizontal flanges of angular brackets 10. These brackets have vertical flanges which are secured as by means of screws or the like to the

outer side of the bottom hoop 7. Nuts 11 are carried by the upper ends of the bolts 9 and these nuts tightly clamp the brackets in place against the base 6.

There are provided a number of door frames 12 made of wood and each frame includes jambs and an upper, a lower and an intermediate sill. This door frame is preferably of arcuate-shape in horizontal cross section and closing the openings of the same are removable panels or doors 13 carrying cross bars 14 on which are mounted latches 15 engageable with the forward sides of the jambs of the door frame. There is one door 13 closing the opening above the intermediate sill and one door closing the opening below the intermediate sill in each door frame. These door frames from bottom to top of the silo are located so that one door frame rests upon another, the door frames being disposed in a vertical column.

There are provided a multiplicity of wooden staves 17 and all of these staves are of the same length as the height of the door frames 12 with the exception of certain of the lowermost staves and certain of the uppermost staves which are of half the length of the other staves. Each stave has a longitudinal tongue 18 formed at one edge thereof and it has a longitudinal tongue receiving groove 19 formed at its other edge for cooperation with the tongue of an adjacent stave. The tongues and grooves of the staves are located more closely toward the outer sides of the staves than toward the inner sides thereof. The edges of each stave are rabbeted contiguous with the inner side of the stave to form longitudinal rabbets 20 of angular shape in transverse cross section. The staves are assembled in circumferential relation and the edges of adjacent staves are brought into abutment with the tongue 18 of one stave fitting into the cooperating groove 19 of the adjacent stave. When so assembled, the two rabbets 20 formed in the adjacent edges of adjacent staves, face each other and together they form a slot of T-shape in horizontal cross section and this slot is open at the inner side of the silo. Received within these T-shaped slots are strips 21, also of T-shape in cross section, and these strips completely fill the rabbets 20. The strips 21 during the course of erection of the silo are slid in place within the rabbets 20, these strips being of a length corresponding to the length of most of the staves 17. The outer edges of the jambs of the door frames 12 are grooved to receive adjacent staves 17 and the outer edges of the grooved portions are provided with tongues

or grooves similar to the tongues and grooves 18 and 19 and they are also provided with rabbets corresponding to the rabbets 20 so that the adjacent staves may be connected to the jambs of the door frames in the same manner that adjacent staves are joined together.

From bottom to top of the silo, the staves 17 are placed in vertical columns with lower staves supporting the staves immediately above the same. The abutting ends of the staves form horizontal joints at intervals from bottom to top of the silo and these horizontal joints are staggered so that the horizontal joints between the staves in one vertical column of staves are located midway between the horizontal joints of the next adjacent vertical columns of staves. The horizontal joints between staves are thus located from bottom to top of the silo at intervals equal to half the length of the longest staves used.

The lowermost hoop 7 encompasses the lower ends of the lowermost staves. Hoops 8 are provided which encircle the staves of the silo at vertical intervals corresponding to the spacing between different horizontal joints between the staves. In other words, the center of the lowest hoop 8 is spaced from the lower edge of the hoop 7 a distance corresponding to one half the length of the longest staves 17 used and the remainder of the hoops 8 are spaced center to center a distance corresponding to one half the length of the longest staves. An upper hoop 7, exactly similar to the bottom hoop 7, is also provided and the upper edge of this upper hoop is spaced from the center of the uppermost hoop 8 a distance corresponding to one half the length of the longest staves 17. The hoops 7 and 8 serve in the place of joists or studs to a building or ribs to a ship and the staves 17 are secured at their ends and at their medial portions to these hoops as by means of nails or screws 16, preferably of copper construction. Each stave is thus secured at its two ends and at its middle portion to three of the hoops 7 and 8.

Each hoop 7 and 8 is made of wood and of several laminations. In the illustrated embodiment, each hoop is shown as having three laminations and each lamination consists of three pieces of wood so that each lamination forms a complete circle. The joints between the different pieces forming the different laminations of each hoop are circumferentially spaced from each other so as to give the hoop the utmost strength. These hoops in addition to acting to secure, reinforce and brace the staves and form structure to which the staves may be nailed as do the joists or studs of a building or the ribs of a ship, also compress the staves so as to cause them to retain their circular arrangement and the hoops extend across the door frames 12 over the sills thereof and the hoops are secured as by nailing to these door frames.

Suitable ladder rungs 22 and 23 are attached respectively to the doors 13 and to the hoops 8 so that these rungs form a continuous ladder. A suitable roof structure 24 is also provided to close the top of the silo.

A silo section may be considered to be that portion of the silo having an upper edge lying in the same plane as the upper edge of one of the door frames 12 and having a lower edge lying in the same plane as the lower edge of one of the door frames. The silo may be built up of as many silo sections as desired until the silo is of the desired height, whereupon the roof 24 will be erected upon the uppermost section. In setting up the silo, the

lower hoop 7 is first located in place on the base 6, whereupon the door frame 12 of the lowermost section is put in position. Short and long staves 17 circumferentially alternated are then assembled within the hoop 7 about the door frame and as the adjacent staves are brought with their edges into abutment, the strips 21 are slid in place. Eventually the lowermost section will take circular form, whereupon a circular draw rod may be placed about the section and drawn up to tighten all the joints between the staves. This draw rod can also be used for tightening the hoop 7 whereupon the nuts 11 may be screwed home to hold the parts of the lowermost section in proper position. The lower hoop 8 may then be applied, whereupon the staves 17 forming certain of the upper staves of the lowermost section and certain of the lower staves of the next upper section may be secured in place and the upper hoop of the lowermost section may then be applied.

In this manner the silo may be continuously built up with great ease.

As the hoops 7 and 8 of the silo are made of wood, the grain of which extends circumferentially of the hoops or transversely of the staves 17, these hoops will expand and contract very little circumferentially as temperature conditions vary or as they swell through moisture absorption or shrink as they dry out. The expansion and contraction of wood parallel to the grain of the wood through change in temperature or through swelling or shrinking by reasons of moisture conditions is but slight. The hoops 7 and 8, therefore, instead of loosening and tightening materially about the staves, as do metal hoops on metal hoop silos as temperature changes take place, will tightly embrace the staves. Although the staves 17 contract and expand through temperature change and shrink and swell through moisture content change, and this contraction and expansion and shrinking and swelling takes place chiefly transversely of the grain of these staves, i. e. circumferentially of the silo, the nails 16 securing the staves to the hoops hold the staves in place relative to each other and to the hoops so as to prevent the silo from being tumbled down as by wind storms when the silo is empty and dried out. When the silo is filled with silage, the inner surfaces of the walls become moist causing the staves to expand transversely of their grain to force them tightly against the confining hoops, thereby tightening the joints between the staves. The strips 21 are effective to take up for discrepancies between unequal expansion and swelling between the inner and outer portions of the staves through heat and moisture action. The strips serve to equalize all contraction and expansion of the staves preventing openings at joints between adjacent staves from extending through the inside wall of the silo. The walls of the silo at the joints between staves are double sealed by use of these strips.

It will be seen that an exceedingly simple and efficient silo structure has been provided, which can be erected with great ease.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the various parts without departing from the scope of the present invention.

What is claimed is:—

1. A wooden silo comprising a multiplicity of wooden staves arranged in vertical relation and joined together to form a substantially circular wall and wooden hoops encircling said wall at vertically spaced intervals, said staves being se-

cured to said hoops and said hoops confining the staves and forming the sole means securing, bracing and reinforcing said staves.

5 2. A wooden silo comprising a multiplicity of wooden staves arranged in vertical relation and joined together to form a substantially circular wall and wooden hoops encircling said wall at vertically spaced intervals, each stave being nailed at each end to certain of said hoops and certain of
10 said staves resting at their lower ends on the upper ends of other of said staves, said hoops being the sole means confining the staves and securing, bracing and reinforcing the same.

15 3. A wooden silo comprising a multiplicity of wooden staves arranged in vertical relation and joined together to form a substantially circular wall and laminated wooden hoops encircling said wall at vertically spaced intervals, each stave being nailed at each end to certain of said hoops,

each lamination of each hoop comprising several individual pieces of wood, said hoops confining the staves and securing, bracing and reinforcing said wall.

4. A silo section comprising a vertical substantially circular wall, said wall consisting chiefly 5 of a multiplicity of staves, said staves having tongue and groove connections connecting adjacent edges of adjacent staves, said adjacent edges having oppositely opposed longitudinal rabbets of
10 angular-shape in cross section cut therein and spaced from the tongue and groove connections, strips of T-shape in cross section received within and filling the opposing rabbets cut in adjacent
15 edges of said staves, and hoops encircling said wall whereby double joints are formed from the outer to the inner side of said wall between adjacent staves.

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