June 10, 1924. 1,497,142

F. S. HART

BUILDING STAVE

Filed April 2, 1921 2 Sheets-Sheet 1

Fig. 1.

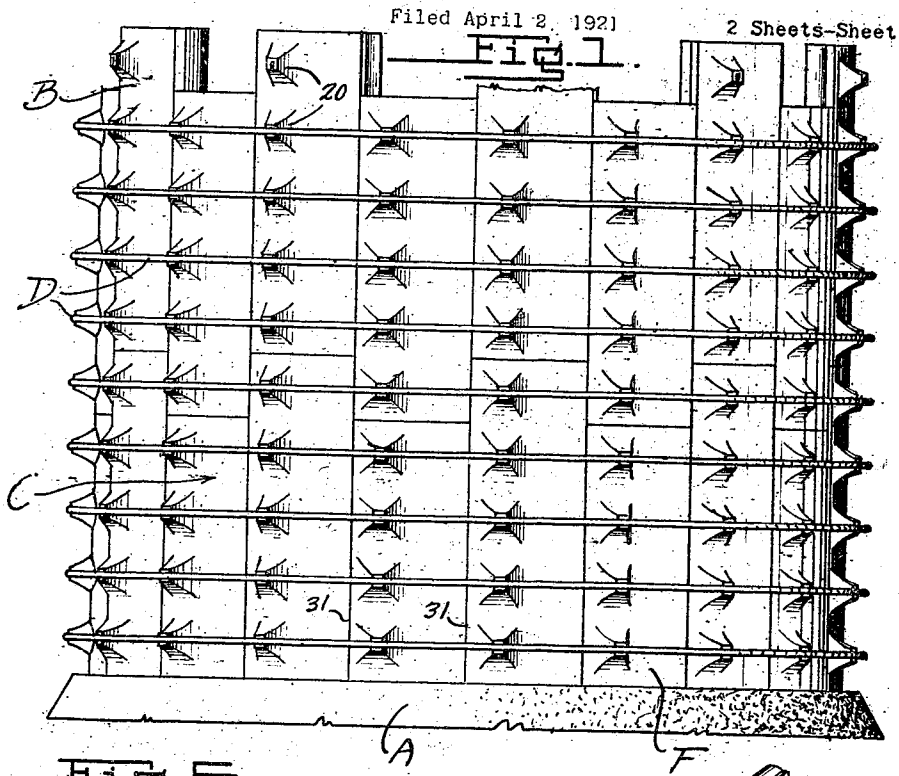

Fig. 5.

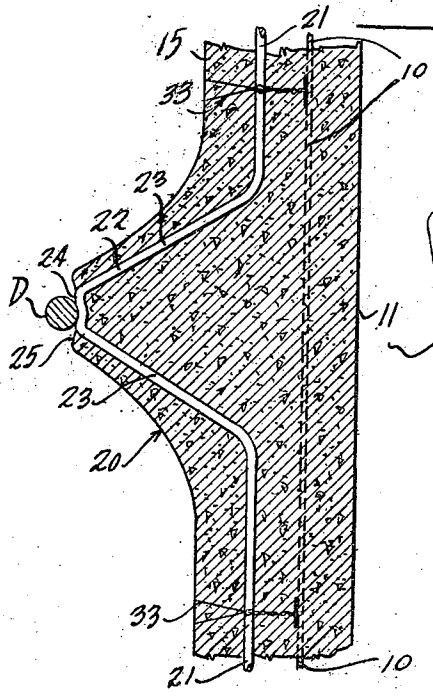

Fig. 6.

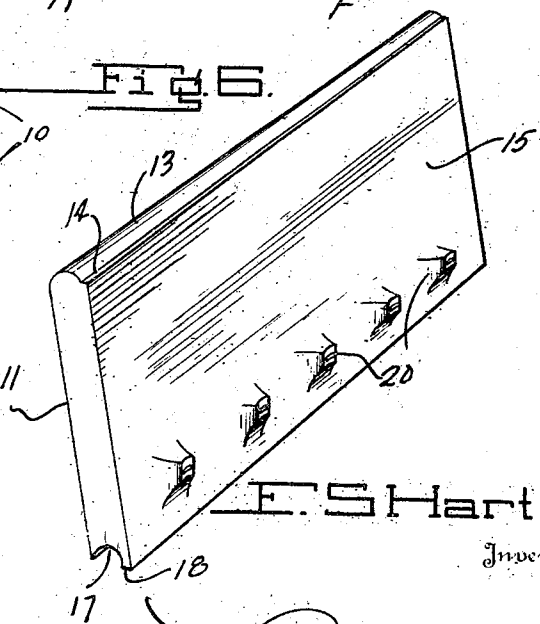

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Fig. 2.

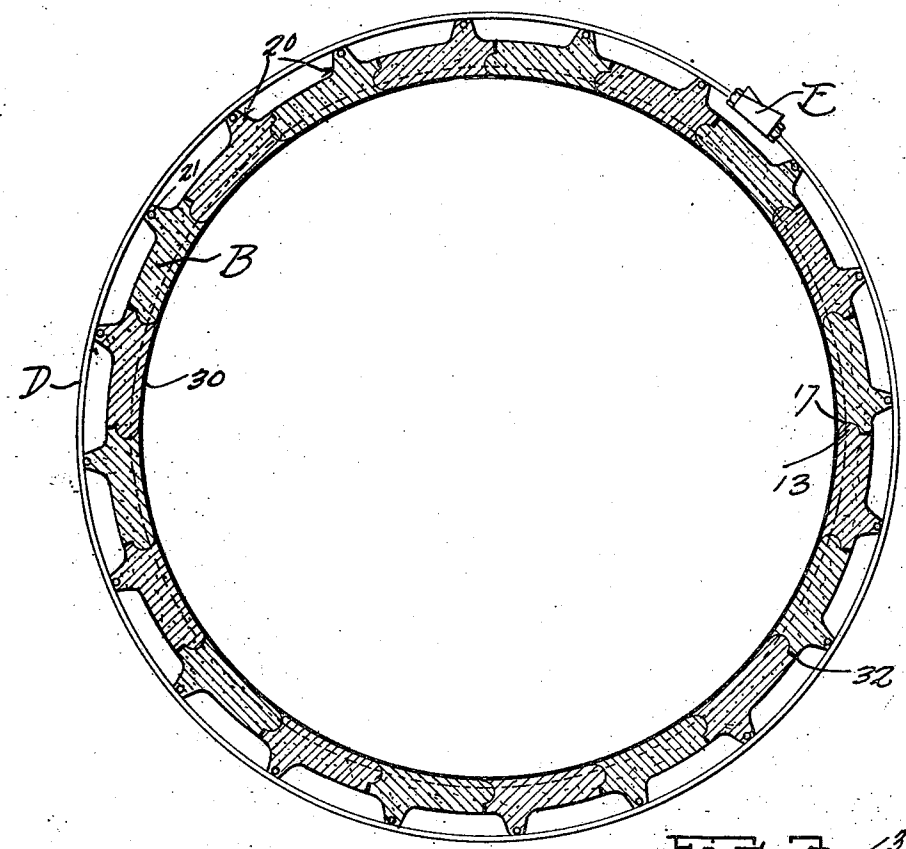


Fig. 4.

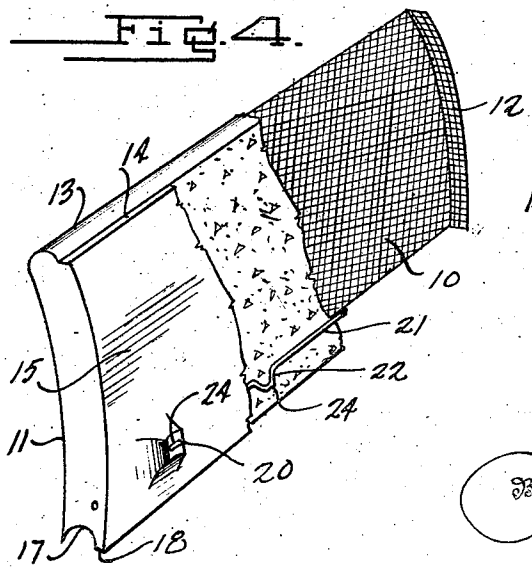
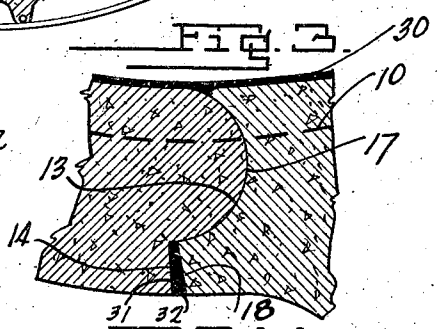


Fig. 3.



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Patented June 10, 1924. 1,497,142

UNITED STATES PATENT OFFICE.

FORREST S. HART, OF BATAVIA, NEW YORK.

BUILDING STAVE.

Application filed April 2, 1921. Serial No. 458,143.

To all whom it may concern:

Be it known that I, FORREST S. HART, a citizen of the United States, residing at Batavia, in the county of Genesee and State of New York, have invented certain new and useful Improvements in Building Staves, of which the following is a specification.

This invention relates to improvements in building staves for use in building construction.

The primary object of the invention is the provision of a building stave of reinforced concrete, so designed as to formation and reinforcement as to be capable of withstanding extreme pressures.

A further object of the invention is the provision of reinforced building staves adapted for specific use in silo construction, and when so used forming a structure capable of withstanding great internal pressure.

A further object of the invention is the provision of a building stave of the above described character, which is so designed that the steel reinforcement therein directly receives all clamping strains incident thereon, and which reinforcement transmits said strain equally throughout the building stave, to prevent rupture or cracking of the stave at any point.

Other objects and advantages will be apparent during the course of the following detailed description:

In the accompanying drawings forming a part of this specification, and in which similar reference characters designate corresponding parts throughout the several views,

Figure 1 is a fragmentary side elevation of a silo formed of the improved building staves.

Figure 2 is a horizontal cross section taken through the silo construction, and showing the assembled relation of building staves.

Figure 3 is a fragmentary enlarged cross section of the jointed connection of adjacent staves.

Figure 4 is a fragmentary perspective showing the constituent parts of each building stave.

Figure 5 is an enlarged longitudinal and fragmentary section of a building stave, showing the assembled relation of constituent parts.

Figure 6 is a perspective view of an individual building stave.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of my invention, the letter A designates a foundation of any approved type, upon which the concrete staves B are erected in circular formation to form a silo C; said staves B being maintained in circular relation by wire clamping means D, the free ends of which are adjustably clamped by the means E.

The improved building staves can be made in a variety of shapes and designs, however, for use in silo construction, it is preferred that the individual staves be substantially flat and rectangular as illustrated in Figure 6 of the drawings. In some instances it may be desirable to use an arcuate stave, and which type of stave has been partly illustrated in Figure 4 of the drawings.

The staves are preferably of some cementitious material, such as poured concrete, and the strength of which poured concrete can be varied to suit the mechanical analyses of the various ingredients therein. Expanded steel reinforcement 10 is provided in close proximity to the inside surface 11 of the staves, the same being cast or embedded in the concrete a sufficient distance to receive strain incident to any part of the internal surface 11. This expanded steel reinforcement may be of any preferred type, and the same is preferably reticulate in formation. It extends from side to side and end to end of the stave B, thus reinforcing the same throughout its length and width. The ends 12 of reinforcement 10 are preferably upturned and anchored inwardly into the top and bottom edges of the stave B.

The longitudinal edge 13 of the building stave B is convex and projects outwardly to form a tongue 13 throughout the length of the stave. It is preferred that this tongue be disposed immediately adjacent the inside surface 11, substantially as illustrated in the drawings. The tongue 13 is preferably less in width than the thickness of the stave B and thus providing a substantially flat surface 14 extending parallel and longitudinally of the tongue 13, the same being immediately adjacent the external surface 15 of the block B, the same being provided for a purpose

which will be subsequently set forth. The opposite longitudinal edge 16 of the block B is provided with a concaved pocket 17, immediately adjacent the external surface 11 of the arcuate stave B; and which pocket 17 is less in width than the thickness of the stave, leaving a projecting end portion 18 adapted for cooperation with the flat surface 14 of an adjacent stave B.

In order to provide bearing surfaces for the wire clamping hoops D, it has been found necessary to provide the hoop bearing offsets 20 which may be in the form of projections from the external face 15 of the stave B and which are preferably in longitudinal alignment of the staves B. Since great strain is invariably placed upon the staves B, due to the clamping action of the hoops D, and which is necessitated by internal pressure within the silo structure C, it is preferred to place steel reinforcing means within the offsets 20 for the purpose of equally transmitting strains incident upon the stave to all parts thereof. This necessary steel reinforcement is secured by crimping the longitudinal reinforcing rods 21 to provide substantially V-shaped crimps 22 for projection into the various offsets 20. The legs 23 of the V-shaped reinforcement converge from the longitudinal run of the reinforcement 21 to an arcuate peak 24, and which peak 24 projects from the extreme face 25 of the offset 20. The V-shaped reinforcement 22 is of course embedded within the offset 20, so that as the wire clamping hoops D are positioned to engage the arcuate peak 24 and securely clamped the strain as provided by the clamping action of the hoops D will be directly transmitted through the legs 23 of the V-shaped reinforcement 22, and into the longitudinal bar reinforcement 21. It is preferred that the offsets 20 be arranged in longitudinal alignment adjacent the pocket end 17 of the stave.

In constructing a silo, the staves are preferably staggered with respect to each other, in order to prevent a continuous joint circumferentially around the silo D. This is preferably accomplished by using a special stave F shorter in length than the stave B. Due to the circular formation of silos as ordinarily constructed, adjacent blocks B and F are positioned with a tongue 13 of one stave fitting into a pocket 17 of an adjacent stave. In this manner, the staves are placed side by side, until a silo of the desired diameter has been constructed. The wire bands or hoops D will of course, have to be placed upon the offset 20 and the arcuate peak 24 as the various tiers of staves are built; and the clamping means E properly adjusted, so that the various tongues 13 are tightly positioned within their pockets 17. This arrangement is continued throughout the height of the silo until the top is reached, where the proper design or arrangement is effected in any special manner according to the particular requirements of any special silo or building construction.

In practical construction, it will be necessary to tighten up the joints of the structure and it is preferred that a coating or layer of plastic material 30 be placed circumferentially within the silo or building C, thus presenting a uniform inside surface to the silo, to render the same moisture proof, and providing a finished appearance. When assembled, the adjacent surfaces 14 and 18 of the staves will be spaced to provide a recess 31 extending longitudinally of the silo. This recess 31 is provided to receive a plastic filling 32, to unite adjacent blocks to each other and to insure a permanent bond vertically of the silo construction.

In casting the concrete staves B and F, it is preferred that some means, such as stirrups 33 be used, in order to accurately space the bar reinforcements 21 and expanded reinforcement 10 in the body of the stave. This can, of course, be accomplished in a variety of ways, even dispensing with the stirrups 33, the same having been shown to demonstrate the accuracy with which the building stave is constructed.

From the foregoing, it can be seen that a building stave has been provided, which is particularly designed to stand huge internal and external pressures. This will prevent liability of rupture of the staves due to the fact that the places of greatest strain are places of greatest reinforcement, and will equally transmit the strain throughout the individual staves. The reticulate reinforcement 10 directly receives the internal pressure due to weight of any material positioned within the silo C, while the longitudinal bar reinforcement 21, while receiving some internal strain, is primarily provided to directly receive clamping or binding strains incident to locking of the hoops D upon the offsets 20.

Various changes in the shape, size and arrangement of parts, may be made in the form of the invention herein shown and described, without departing from the spirit of the invention or the scope of the claims.

I claim:

1. A building stave comprising in combination a cementitious body provided with spaced offsets upon the outer face thereof, bar reinforcement extending through said body angularly bent to project into said offsets, and expansion reinforcement throughout said body adjacent the inside surface thereof.

2. A building stave comprising in combination a substantially rectangular cementitious body provided with a series of aligning offsets upon the outer surface thereof, and bar reinforcement extending longitudi-

nally of said body and bent to project from the peak of said offsets.

3. A building stave, comprising in combination a cementitious body provided with an offset extending from the other face thereof, and reinforcement in said body and bent to project from the peak of said offset, said projecting portion of said reinforcement being concavely arcuate.

4. In a building construction, the combination of cementitious staves, each of said staves having offsets projecting from the outer faces thereof, reinforcing means cast in said staves, and extending from said offsets, and clamping means for engaging said reinforcing means at the offsets to hold said staves in fixed relation.

5. In a building construction, the combination of a plurality of cementitious staves each provided with a plurality of reinforced bearing peaks upon its outer face, and external clamping means bearing on said projections for holding said staves in assembled relation.

6. A building construction, comprising in combination a plurality of cementitious staves, reinforcement in said staves extending to the outer surfaces thereof at spaced intervals, and external clamping means to engage said reinforcement at the outer surface of the staves to hold said staves in assembled relation.

7. As an article of manufacture, a building stave comprising a body portion provided with outwardly extending bearing offsets thereon, and reinforcement extending through the body portion of said stave being bent intermediate its ends to extend into said bearing offsets.

8. As an article of manufacture, a building stave comprising a cementitious body having a series of longitudinally aligning offsets extending from the outer surface thereof, and bar reinforcement extending longitudinally through said body portion being angularly crimped intermediate the ends thereof to extend laterally into said offsets for reinforcing said body and offsets.

9. As an article of manufacture, a building stave including a cementitious body portion having a peaked offset upon the outer surface thereof, and bar reinforcement extending through said body portion crimped in V-shaped manner intermediate its ends to extend into said offset, the apex of said V-shaped crimp being arcuate and having the concave surface thereof exposed from the top of said offset.

10. As an article of manufacture, a building stave formed of cementitious material having a plurality of bearing offsets on the outer surface thereof, and rod reinforcement extending through said body in substantial alignment with said offsets and adjacent said offsets being laterally crimped to extend into said offsets for reinforcing the same.

11. As an article of manufacture, a building stave of substantially rectangular formation having a series of aligning peaked offsets extending from the outer surface thereof, and a rod extending longitudinally through said stave and adjacent each of said offsets being crimped in the form of a V to extend into said offsets.

12. As an article of manufacture, a building stave comprising a body portion, and reinforcement extending longitudinally through said body portion being crimped at intervals to extend laterally beyond the normal outer surface of said body portion to provide bearing extensions.

FORREST S. HART.