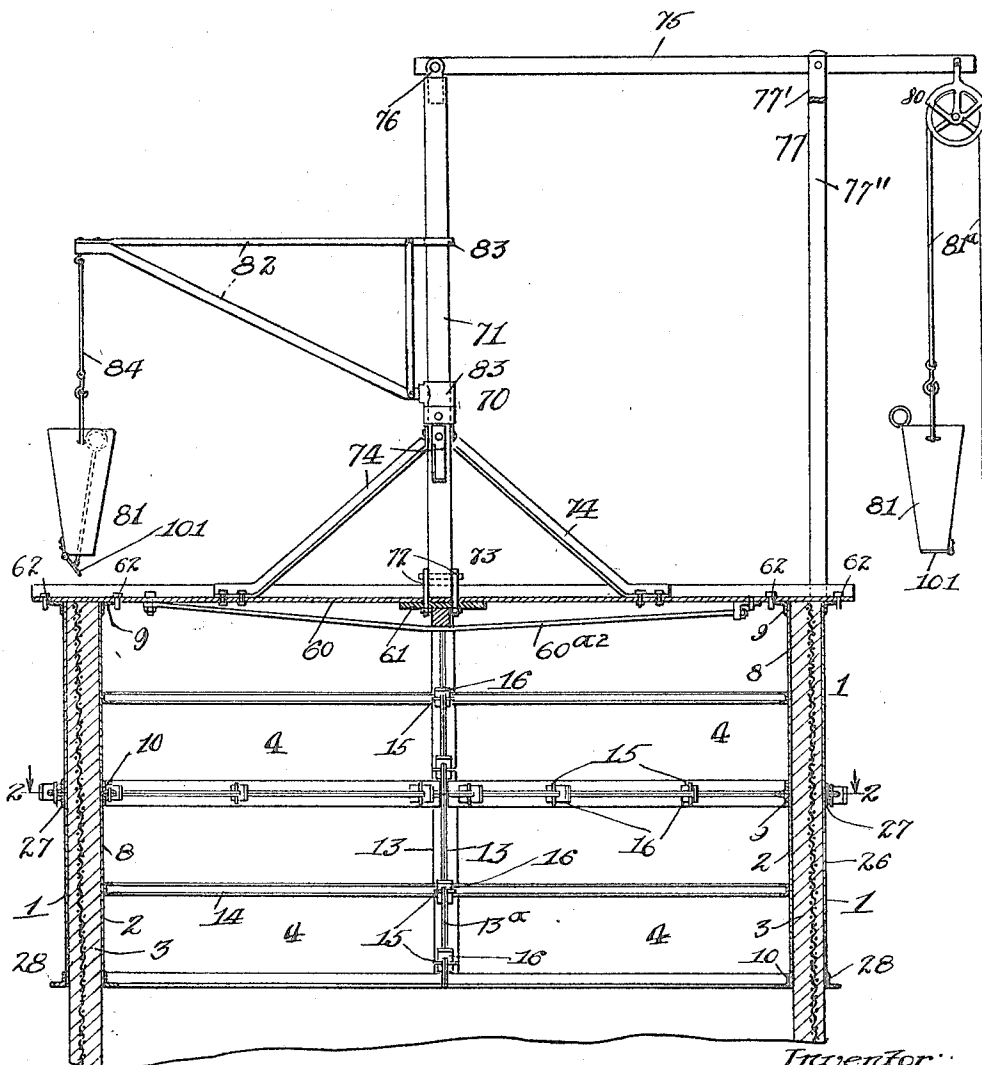


Fig. 1



Witnesses:
Arthur Wilson
John P. Severe

Inventor:
Alexander J. Stoesser
by Hawley & Shellman

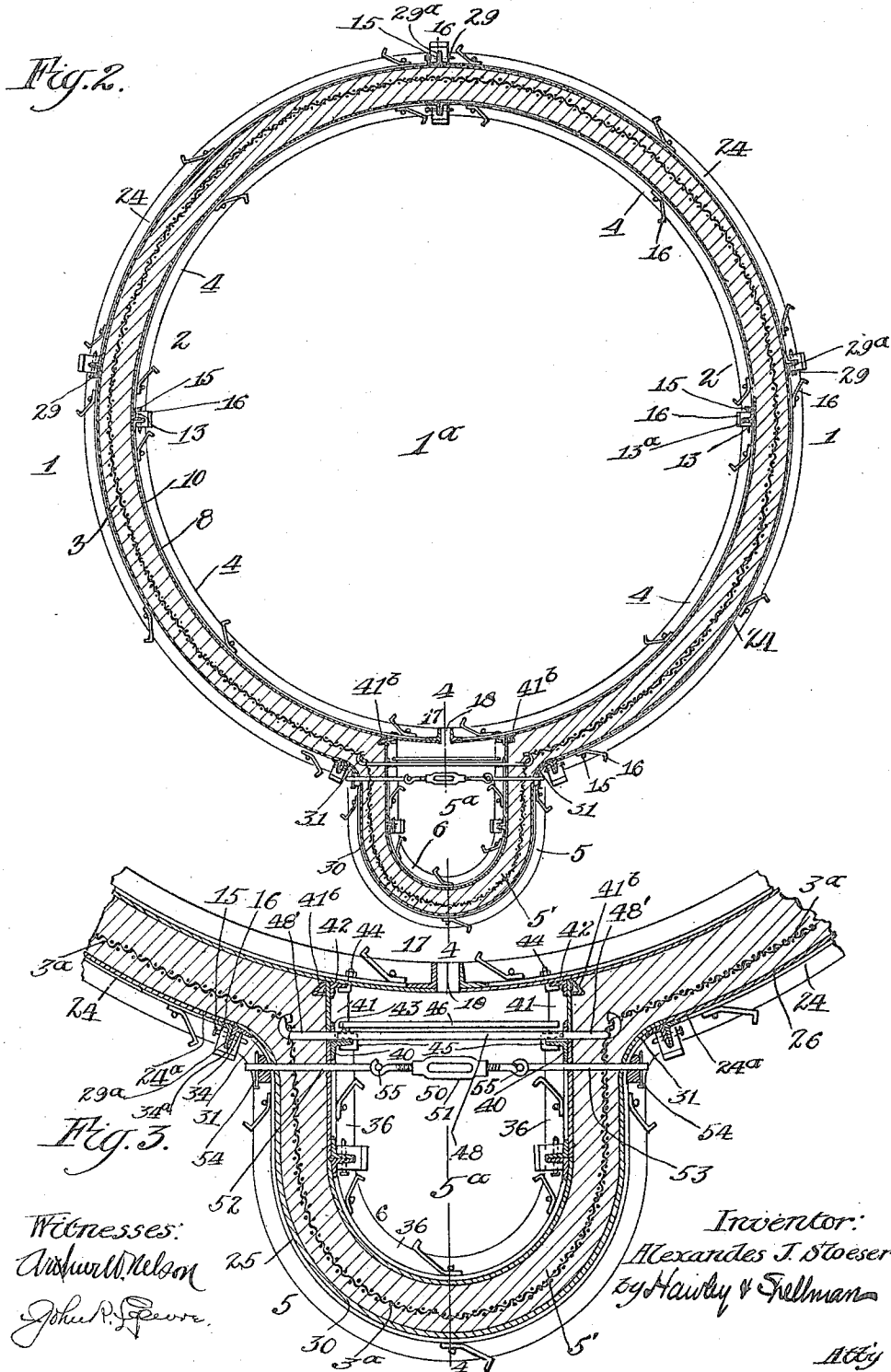
Atty's.

A. J. STOESER.
 PROCESS AND APPARATUS FOR ERECTING CONCRETE STRUCTURES.
 APPLICATION FILED DEC. 22, 1911.

1,208,398.

Patented Dec. 12, 1916.

5 SHEETS—SHEET 2.

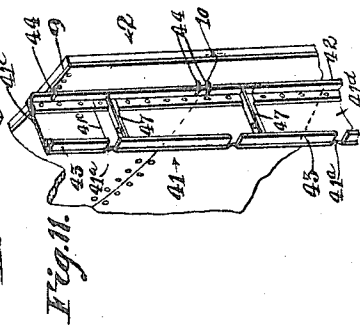
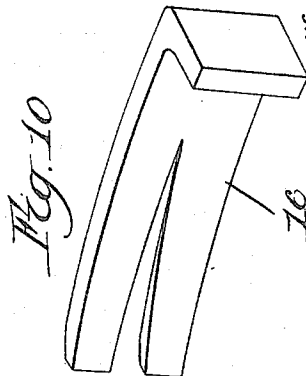
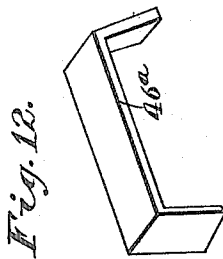
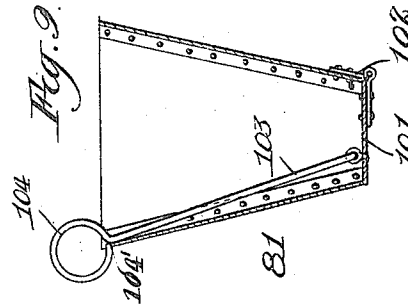
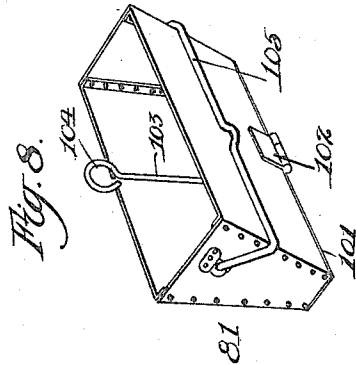
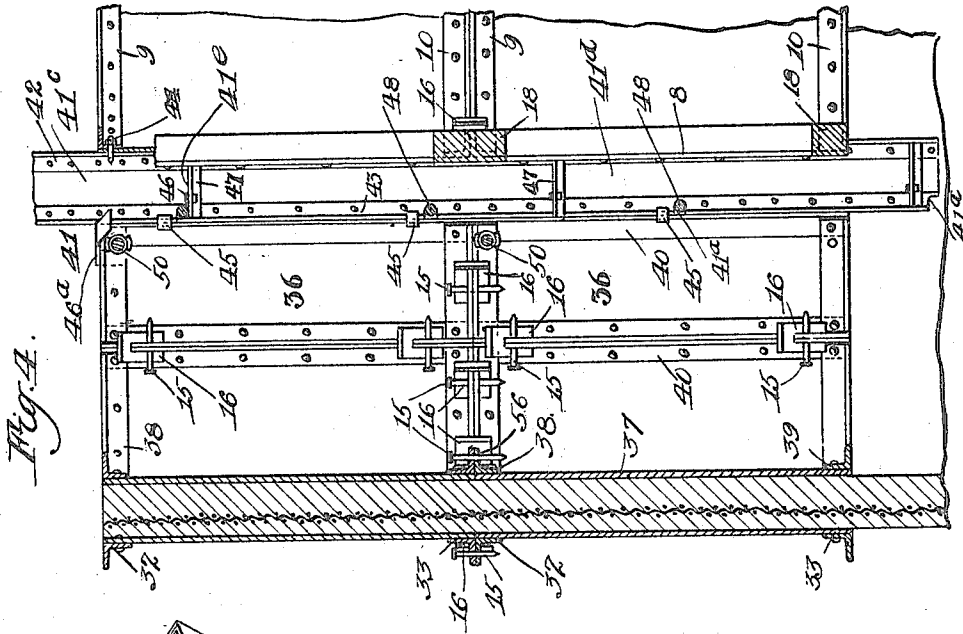


A. J. STOESER.
 PROCESS AND APPARATUS FOR ERECTING CONCRETE STRUCTURES.
 APPLICATION FILED DEC. 22, 1911.

1,208,398.

Patented Dec. 12, 1916.

5 SHEETS—SHEET 3.



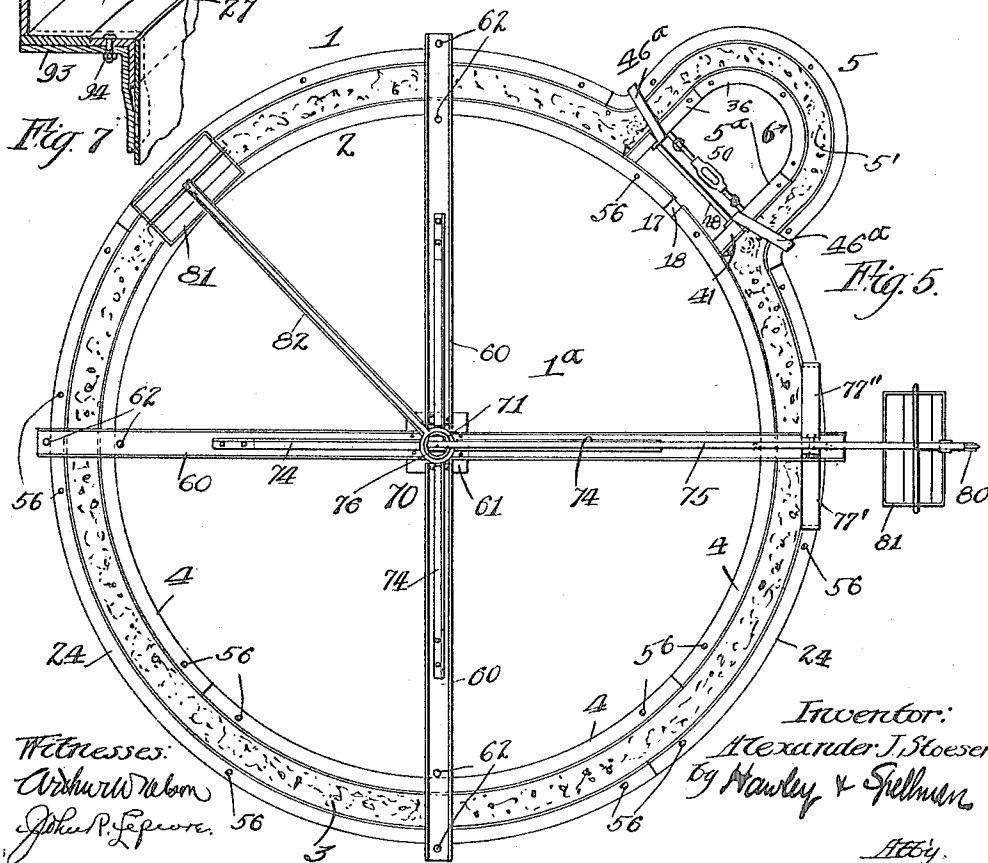
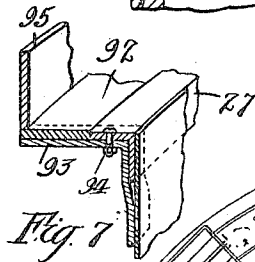
Witnesses:
 Andrew Nelson
 John P. Lewis.

Inventor:
 Alexander J. Stoesser;
 by Hawley & Shellman
 Attys:

PROCESS AND APPARATUS FOR ERECTING CONCRETE STRUCTURES.

Patented Dec. 12, 1916.

1,208,398.



Witnesses:

Arthur Nelson

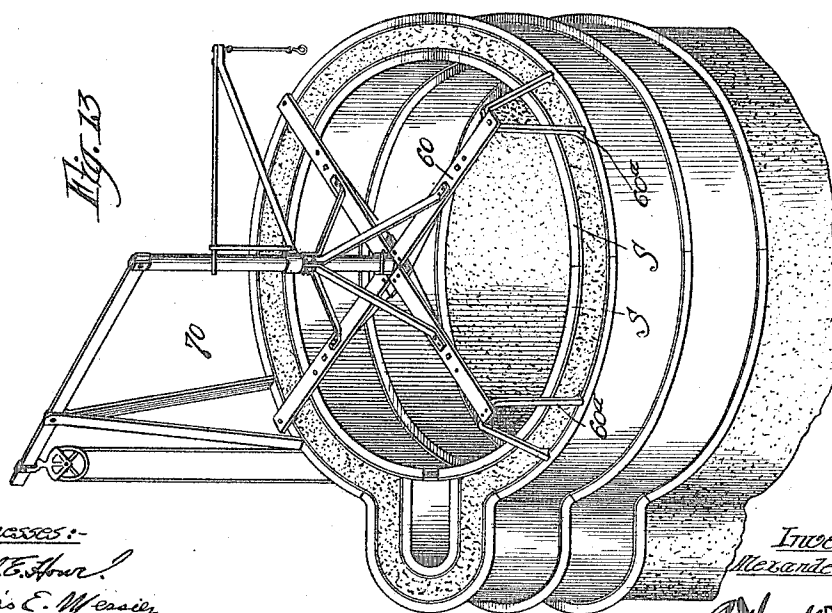
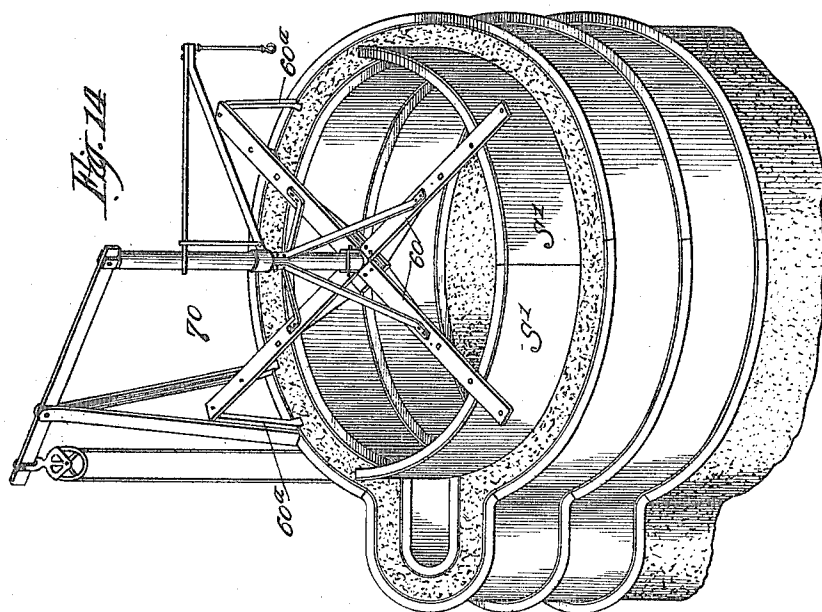
Robert P. Fernald.

Inventor:

Alexander J. Stoesser

By Hawley & Spelman

Abbey



Witnesses:
 Earl E. Hume
 Valis E. Messier

Inventor:
 Alexander J. Stoesser
 By: *Michael Wilson*
 Atty.

UNITED STATES PATENT OFFICE.

ALEXANDER J. STOESER, OF CHICAGO, ILLINOIS.

PROCESS AND APPARATUS FOR ERECTING CONCRETE STRUCTURES.

1,208,398.

Specification of Letters Patent.

Patented Dec. 12, 1916.

Application filed December 22, 1911. Serial No. 667,345.

To all whom it may concern:

Be it known that I, ALEXANDER J. STOESER, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Processes and Apparatus for Erecting Concrete Structures, of which the following is a specification.

The invention relates generally to apparatus for erecting structures from cement, concrete and other plastic materials and has for its object to provide apparatus where-with the process of construction thereof can be simplified and wherewith a more substantial structure can be obtained than is possible with apparatus hitherto devised.

A further object of my invention is to provide apparatus which will be comparatively simple and inexpensive as to construction and maintenance and which can be successfully used by unskilled laborers; and a special object is to provide apparatus for building a protrusion in the form of a chute or the like upon the body proper of the structure simultaneously with the forming thereof in such manner that the structure will be of uniform strength and rigidity throughout.

My invention consists generally in apparatus wherewith the above named objects and several other objects, which shall hereafter appear, are attained as will be more fully disclosed in the following specification and appended claims.

My invention will be more readily understood by reference to the accompanying drawings which illustrate apparatus particularly designed for the erection of silos.

Figure 1 is substantially a vertical central section illustrating a silo in course of construction with apparatus embodying my invention; Fig. 2 is a transverse section substantially on the line 2—2 of Fig. 1; Fig. 3 is an enlarged transverse section of the protruding or chute portion of the silo; Fig. 4 is a vertical section substantially on the line 4—4 of Figs. 2 and 3; Fig. 5 is a top plan view of the silo and apparatus shown in Fig. 1; Fig. 6 is a view partly in central section and partly in elevation of the upper and roof portion of the silo illustrating particularly means for forming the cornice; Fig. 7 is a detail perspective view showing one of the brackets for supporting the cornice forms; Fig. 8 is a perspective view of the novel form of bucket used for placing the

concrete in the form; Fig. 9 is a transverse central section thereof illustrating the handle control for the bottom; Fig. 10 is a perspective view of one of the wedges used to secure the segments of the molds removably together; Fig. 11 is a perspective view of the ladder member showing its relation to the main wall of the mold; and Fig. 12 is a perspective view of a clip used to hold the outer and inner chute forms in proper spaced relation; Figs. 13 and 14 are perspective and somewhat diagrammatic views showing the mode of raising the derrick and the concrete molds for forming a new course of wall.

While the apparatus here shown is particularly designed and adapted for silos of circular cross section, it will, of course be understood that silos of different forms as well as other structures can be erected with apparatus embodying my invention by adapting same to the particular shape of such other structure. A desirable silo comprises a main body portion of circular cross section which is of considerable height and in which silage is stored. For convenience in removing the silage a vertical slot is made in the structure, preferably the entire height, and at this place a chute is provided through which the silage can be thrown to the ground. The silo should be so nearly air tight as to prevent excessive fermentation of the silage. With apparatus hitherto devised it has been difficult, if not impracticable, to build the chute simultaneously with the main body of the structure, and hence in erecting a concrete silo the body portion has often been erected first and then a chute of wood or other material added later. This is not only a laborious and expensive manner of constructing a silo, but the resulting structure is one which is not of uniform strength and which is not substantially air tight.

By use of apparatus embodying my invention the silo body portion and chute can be constructed simultaneously in an easy and inexpensive manner and a substantially air tight structure of uniform strength can be secured. Referring now to the drawings, I shall describe same in detail.

I usually provide two complete forms which are alternately placed one upon the other for forming successive courses of wall. As these are identical in construction, a description of one will serve for both, and

for sake of convenience I shall refer to them as "upper" and "lower" forms. The lower form comprises an outer wall 1 and an inner wall 2 which are spaced apart to receive concrete, forming the wall 3. The inner wall 2 of the mold is cylindrical in form comprising a plurality of segments 4, while the outer wall 1 is substantially cylindrical with a protruding substantially semi-cylindrical portion 5 which in conjunction with the supplemental wall 6 serves to form the chute portion 5' of the silo. The segments 4 of the inner wall 2 consist of sheet metal 8 braced above and below by angle irons 9 and 10 respectively and at either end by vertical angle irons 13. The sheets 8 are braced further by intermediate channel irons 14. The segments 4 are removably secured together by pins 15 passing through the flanges 13^a, which serve properly to aline the forms, and by wedges 16 which straddle the adjacent flanges 13^a. Two of the segments 4 are slightly spaced apart at 17 by blocks 18 which may be knocked out to permit easy removal of the various segments 4 from the wall. The outer wall 1 comprises a plurality of segments 24 for the main body portion of the wall and a member 25 for the chute portion. The segments 24 are similar in construction to the segments 4 of the inner wall, comprising a sheet member 26 braced above and below by angle irons 27 and 28 respectively and at the ends by vertical angles 29. The flanges 29^a of the angles 29 are provided with registering holes through which pins 15 pass to aline the segments, and wedges 16 straddling the adjacent flanges 29^a serve to hold the segments removably together in same manner as the segments of the inner wall. The chute member 5 comprises a substantially semi-cylindrical sheet 30 having outwardly curved end portions 31 which meet the ends 24^a of the segments 24 of the main form. The sheet 30 is braced at the top and bottom by angle irons 32 and 33 respectively and at the ends by vertical angle irons 34. The flanges 34^a of the vertical angles 34 have holes which register with holes in the flanges 29^a and through which pins 15 pass to aline and hold the member 5 in proper position. Wedges 16 straddle the adjacent flanges 29^a and 34^a for holding the parts removably together against the pressure of the concrete in the same manner as described with reference to other parts of the form.

The inner wall 6 of the chute form comprises a plurality of segments 36 each of which consists of a sheet 37 strengthened at the top and bottom by angle irons 38 and 39 respectively and at the ends by vertical angles 40, the adjacent flanges of which are provided with registering holes and are held removably together by pins 15 and wedges 16. The members 36 end a short distance

from the inner wall 2 and the space therebetween is occupied by ladder members 41 which are properly not a part of either the upper or lower form but act in conjunction with both to complete the form as will be described more fully hereinafter. The ladder members 41 are braced by vertical angles 42 and 43, the angles 42 contacting the inner wall 2 of the main form and the angles 43 contacting and alining with the angles 40 of the adjacent segments 36. L bolts 44 passing through the wall 2 and engaging the angles 42 serve to hold one edge of the ladder section 41 in position. The other edge is held properly in position by a plurality of U-clips 45 which are riveted to the angle 43 and which straddle the flanges of the adjacent angle irons 40. The ladder members 41 are further strengthened against collapse by cross bars 46 which have turned down end portions for engaging flanges 47 on members 41. Over the top form I place U-shaped clips 46^a (see Figs. 4 and 5) which serve further to position and hold the members 41.

It is desirable to have a ladder in the chute and so I arrange cross rods 48 properly placed which have their ends 48' embedded in the concrete, as is well shown in Figs. 2 and 3. The members 41 are cut away at 41^a to accommodate the ladder rods 48. When the silo is filled it is necessary to close the continuous opening or slot formed at 17 between the main silo chamber 1^a and the chute chamber 5^a. This is done by placing a plurality of door sections across the opening 17. I provide the ladder members 41 with projecting portions 41^b which form substantially V-shaped recesses in the inner sides of the chute. The ends of the door sections enter these recesses and the doors are thereby held in position against the pressure of the silage. The door sections may be raised and lowered in the V-recesses to permit easy removal of the silage. The outer chute wall 5 is braced temporarily by turnbuckle braces 50 comprising the turnbuckle portion 51 and the end links 52 and 53. The links 52 and 53 extend through the outer wall 5 and through the ends thereof stop pins 54 are placed. To permit easy removal of the turnbuckle braces when taking the form apart, I provide hook-and-eye connections 55 between the parts, one connection being formed to permit entire separation of the parts. It will thus be seen that the form for making the main wall of the silo and that for making the chute portion are connected to constitute a single form or mold whereby an integral wall can be made. Reinforcing material 3^a continues from the main wall 3 through the chute wall 5' and back, binding the chute portion firmly to the main wall.

The upper form is vertically alined with and placed upon the lower form with the

holes 56 of adjacent angle irons registering. Pins 15 passing through these holes and wedges 16 straddling the angle iron flanges serve removably to secure the upper and lower forms together. The two walls of the forms are properly spaced apart and braced by channel irons 60 which are radially arranged being secured at the center to a plate 61. Limit pins or bolts 62 spaced apart the desired distance extend through the channel 60 and engage the angle irons of the walls 1 and 2 (see Figs. 1 and 5) and thereby prevent same from spreading apart by pressure of concrete. By varying the distance between the bolts 62 the spaced relation of the walls 1 and 2 can be controlled. The channels or cross braces 60 serve to support a derrick 70, the mast 71 of which rests upon the channels 60 over the center plate 61, being removably secured thereto by eye bolts 72. The eye bolts 72 engage a cross pin 73 in the mast 71 and extend through plate 61 under which nuts are provided for binding the mast to the center plate. The mast 71 is further braced by angles 74 which are bolted to the channel irons 60. Mounted at the top of the mast is a horizontal boom 75 which is supported at the inner end by a plug 76, which is inserted in the mast and to which the boom is pivotally secured. The boom is supported at the outer end by a horse 77 comprising legs 77' and 77'', the lower ends of which rest upon the outer wall 1 of the form. The form is pivotally secured between the upper ends of the legs 77' and 77''. Thus the boom, while it is stationary in the sense that it cannot be swung around the mast, may be swung vertically by virtue of the pivotal connections. A pulley 80 is provided at the outer end of the boom whereby material may be raised from the ground by means of buckets 81 and tackle 81^a. The bucket 81 is of unique construction and will be described in detail hereinafter. The material being raised by means of the pulley, tackle and bucket is to be distributed throughout the form and for doing this conveniently I provide an arm 82 which is swingably mounted on the mast 71 by means of bearings 83. The arm 82 may be swung around so that the link 84 thereof can be attached to the bucket and it can then easily be moved about to deposit the concrete in the desired place in the mold. The braces supporting the derrick structure are made rigid by a suitable truss 60^{a2}.

The method of raising the elevating and concrete distributing mechanism in the course of the work will best be understood by reference to Figs. 13 and 14. The concrete material is raised by the derrick 70, and deposited in the form until both forms are full. When the concrete in the lower course has set sufficiently I raise two of the angle irons 60, of the derrick base, and un-

der each of these I place a prop or horse 60^a. The props 60^a are preferably placed upon the outer mold form for the sake of convenience. This having been done, I loosen several of the segments of the lower inner mold form, and place them in position upon the inner upper segments marked "S" in Fig. 13. Because the derrick is suitably spaced above the top mold by means of the horses, 60^a the mold forms can be freely placed in position. So soon as the inner mold forms are placed on the forms "S" I secure them by means of the wedges 16, hitherto described. The props 60^a may then be removed whereupon the angle irons, 60, of the base rest upon the newly positioned inner upper mold segments S¹, as is well shown in Fig. 14. By propping up the other side of the derrick, as is well shown in Fig. 14, the remainder of the lower inner form can be raised to complete a new upper inner wall. This having been done, the props 60^a may be removed as the newly positioned inner wall is now in place and serves to support all the legs of the derrick. The outer lower mold segments are now loosened and secured to the present upper mold segments to form the new outer wall. This having been accomplished, it is obvious that a new mold cavity is provided. In like manner as many courses of wall as desired may be simply and easily built. It is just as easy to construct a silo one hundred fifty feet high as one fifty feet high. Most of the form raising operation can be conveniently accomplished by means of the block and tackle on the boom. The derrick lends itself admirably to this alternate raising of first one side and then the other, because of its jointed construction.

As before stated, the members 41 are not properly a part of either form and I arrange a plurality of same so that they overlap, *i. e.*, extend above the uppermost form so that there will always be a portion thereof to which the empty form or mold can be attached. I have here shown the ladders 41 as composed of two members 41^c and 41^d parted at 41^e (see Fig. 4) but if found desirable a greater number of parts may be provided. They are, therefore, in a sense ladders to which the empty forms are secured and wall sections serving to complete the inner supplemental wall 6 of the chute. When the structure has reached the desired height, the derrick is used to raise the roof material and is then dismembered and lowered to the ground. The form used for the last or highest course of wall is kept in place and serves to support the roof form as well as the cornice form. The roof form comprises suitable braces 90 which rest upon the inner wall of the form and which support a covering 91 on which the concrete may be placed.

The cornice form comprises a bottom or floor portion 92 which is supported by a plurality of brackets 93 secured to the outer wall of the form. As the brackets 93 are used only when constructing the cornice, I secure same removably to the angle irons 27 of the outer form by bolts 94. An upright wall 95 is arranged on the member 92 which serves as the outer wall of the cornice. It will thus be seen that the parts constituting the cornice form or mold are all easily secured to and removed from the regular wall mold. After the roof and cornice have set sufficiently, the cornice form and supporting mold are dismembered.

In Figs. 8 and 9 I have illustrated a bucket 81 particularly adapted for use in placing concrete in molds. It is substantially an inverted rectangular pyramid open at the top and closed at the bottom. The bottom is closed by a door 101 which is secured by a hinge 102 to one side of the bucket. An up-standing rod 103 is secured at the bottom to the door, and has a hand ring 104 at its upper end which can be placed in a recess 104' of the bucket side, thus making the rod 103 a latch to hold the door bottom closed. The bottom can be manually opened and closed to deposit the concrete just where needed and in the quantity desired by removing the hand ring from engagement with the bucket. The bottom is preferably about the width of the wall to be made so that the concrete can be easily deposited in such quantity as to fill the mold form evenly. A bucket of the size used for constructing silo with my apparatus contains more concrete than can be lifted by a man and so the same is supported by the handle 105 on the swingable arm 82 of the derrick. The operator is thus free to control the deposit of material by means of the hand rod 103.

As various modifications will suggest themselves to those skilled in the art to which this appertains, I do not wish to be limited to the specific construction, arrangement and use herein shown and described.

I claim as new:

1. In an apparatus for erecting concrete structures, the combination of concrete elevating and distributing mechanism with upper and lower mold forms constructed for interchange of position, said upper and lower forms comprising outer and inner walls, each composed of a plurality of sections removably secured together, and said concrete elevating and distributing mechanism being formed for continuous support solely upon the forms as they are raised to provide mold cavities for successive courses of wall.

2. In apparatus for erecting concrete structures, the combination of segmental upper and lower forms comprising outer and inner walls, means removably securing the

upper and lower forms together adapting same for interchange of position, with concrete elevating and distributing mechanism supported upon the upper form and spacing the walls apart, said concrete elevating and distributing mechanism adapted to be continuously supported solely by the forms as they are raised to form mold cavities for successive courses of wall.

3. In apparatus for erecting concrete structures, the combination of a segmental mold comprising upper and lower forms removably secured together and adapted to be segmentally removed and alternately secured one above the other, concrete elevating and distributing mechanism supported upon the forms and comprising a base portion engaging the outer and inner walls of the form and spacing them apart, a centrally arranged vertical mast secured to the base, a horizontal member pivotally attached to the upper part of the mast and extending beyond the outer mold wall, and means supporting the outer end of the horizontal member from the mold form.

4. Apparatus for erecting concrete structures, comprising in combination, forms for molding concrete consisting of outer and inner walls, comprising upper and lower plural member forms removably secured together and adapted for interchange of position, combined mast supporting and form-wall spacing means comprising centrally connected cross beams resting upon and engaging the walls of said form, a mast centrally arranged on said combined mast support and spacer, a boom pivotally connected at the inner end to the mast, a depending member pivoted at the outer end of the boom and resting upon the forms, and concrete elevating and form-raising means on said boom.

5. Apparatus for erecting concrete structures, comprising in combination forms for molding concrete consisting of outer and inner walls, comprising upper and lower plural member forms removably secured together and adapted for interchange of position, combined mast supporting and form-wall spacing means comprising centrally connected cross beams resting upon and engaging the walls of said form, a mast centrally arranged on said combined mast support and spacer, a boom detachably and pivotally connected at its inner end to the upper part of the mast, a depending member pivoted to the outer end of the boom and supporting the boom by engagement with the outer wall of the form, substantially as described.

6. In apparatus for building concrete structures, the combination of concrete forms consisting of outer and inner walls comprising upper and lower forms, each consisting of a plurality of segments re-

movably secured together, a mast, a combined mast support and form-wall spacer on said forms, a concrete elevating and form-raising arm pivotally and detachably connected at its inner end to said mast, saw-horse-like legs pivotally secured to the boom near its outer end and depending therefrom into engagement with said forms, and an arm swingably mounted on the mast for distributing concrete.

7. In apparatus for erecting concrete structures, the combination of a concrete mold comprising outer and inner walls and upper and lower forms, each composed of a plurality of members removably secured together, a mast having a web base supported upon the upper forms, means thereon holding the outer and inner walls in proper spaced relation, a jointed boom and supporting horse, the inner end of the boom being supported upon the mast and the outer end supported by said horse-engaging the mold form, the said mast and base adapted to be raised upon one side for the placement of

the lower forms thereon, while the boom and supporting horse continue to be supported respectively by the mast and mold form, substantially as described.

8. The process of erecting concrete structures which consists in employing a first and a second mold, each comprising outer and inner walls which are respectively substantially inexpandible and non-compressible, filling the space between the outer and inner walls with concrete, whereby the mold walls are held in place, free from mechanically connecting devices and continuously supporting concrete elevating and distributing mechanism upon the concrete mold walls and thus step by step forming so many courses of wall as may be desired.

In testimony whereof, I have hereunto set my hand this 14th day of December, 1911, in the presence of two subscribing witnesses.

ALEXANDER J. STOESER.

Witnesses:

L. B. SPRINGER,
ARTHUR W. NELSON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."