H. G. SELLMAN.

MACHINE FOR BUILDING CONCRETE STRUCTURES.

APPLICATION FILED DEC. 18, 1911.

1,062,040. Patented May 20, 1913.

3 SHEETS—SHEET 1.

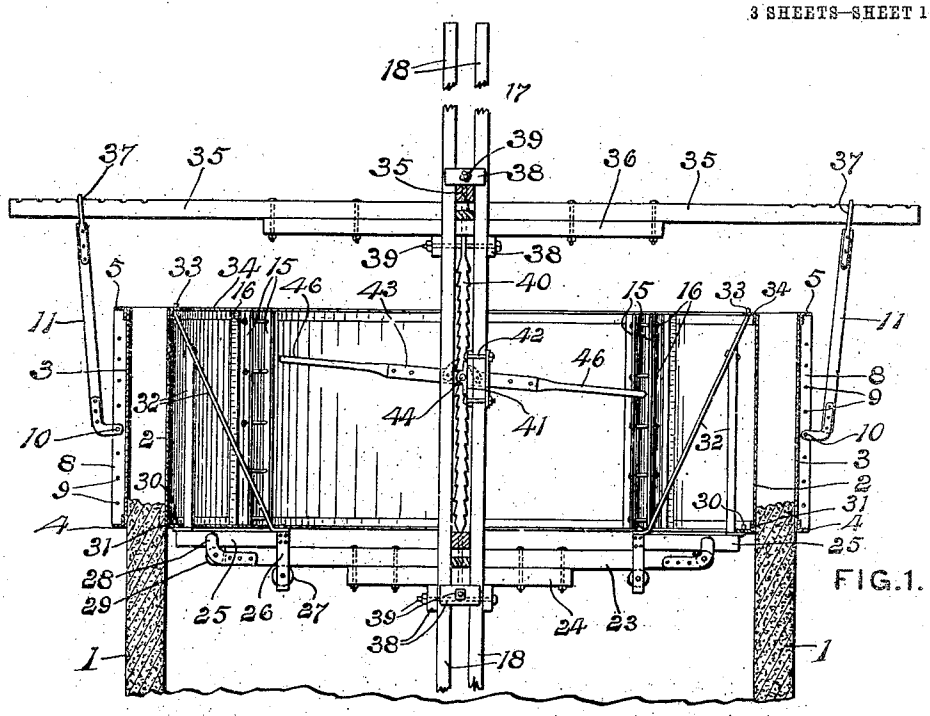
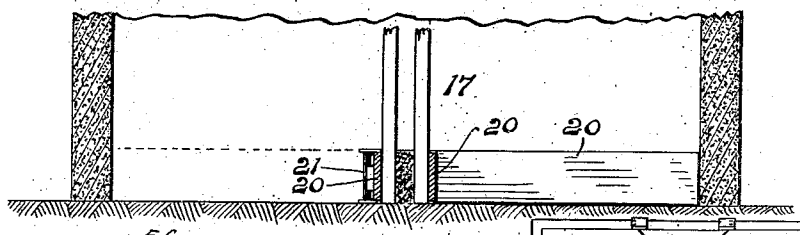


FIG.1.



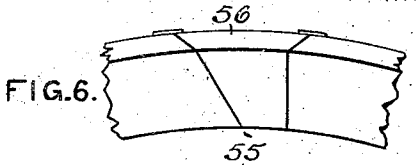


FIG.6.

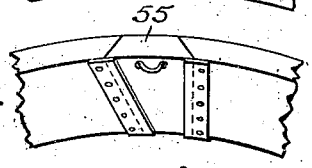


FIG.7.

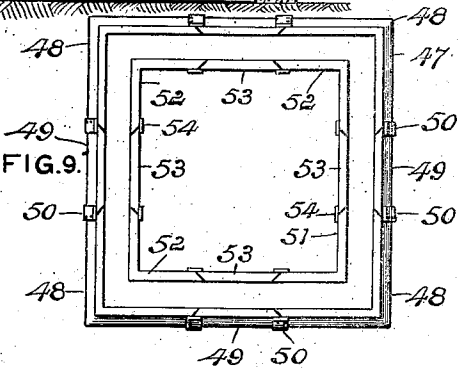


FIG.9.

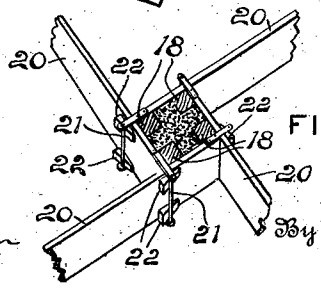


FIG.8.

Witnesses

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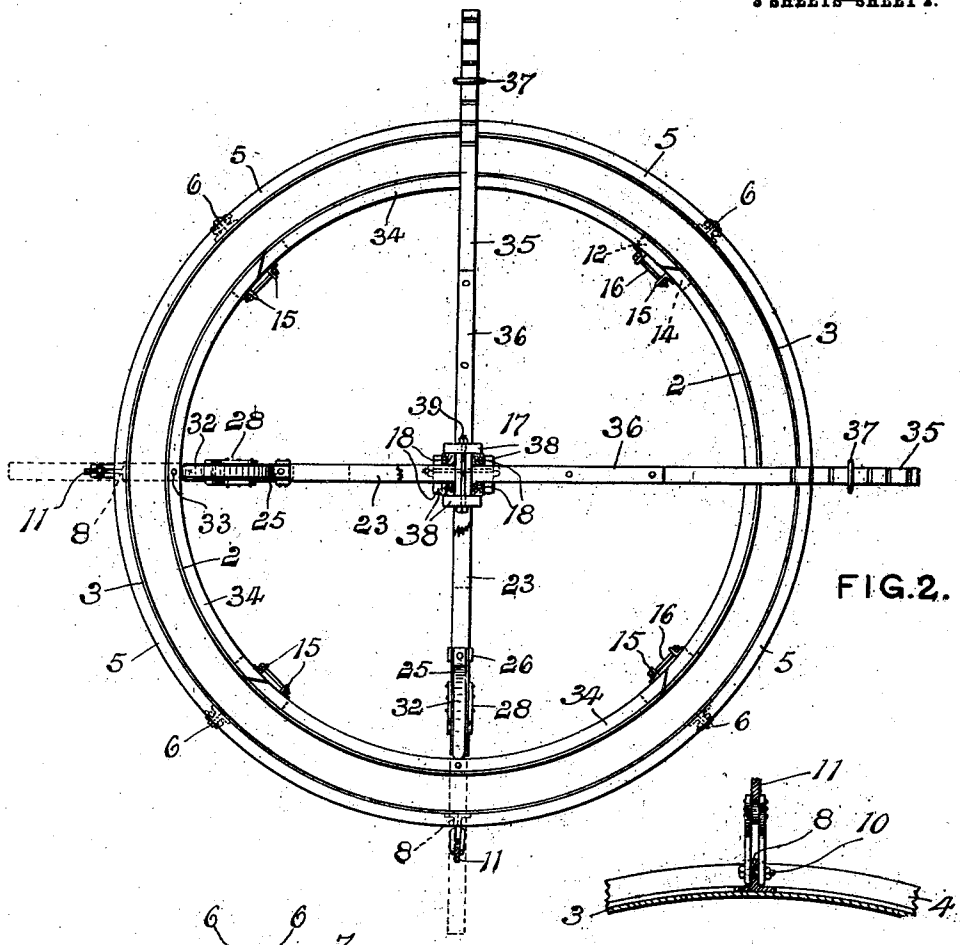
3 SHEETS—SHEET 2.



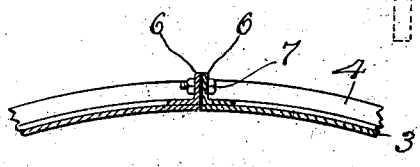
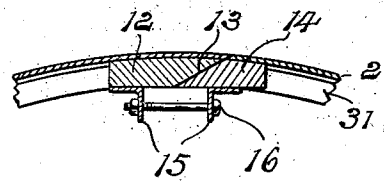


FIG.3.



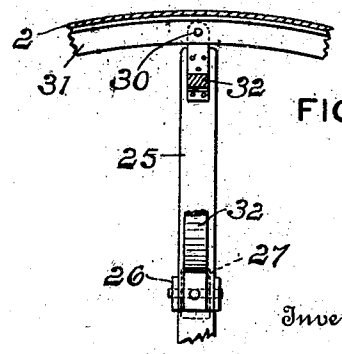


FIG.4.

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3 SHEETS—SHEET 3.

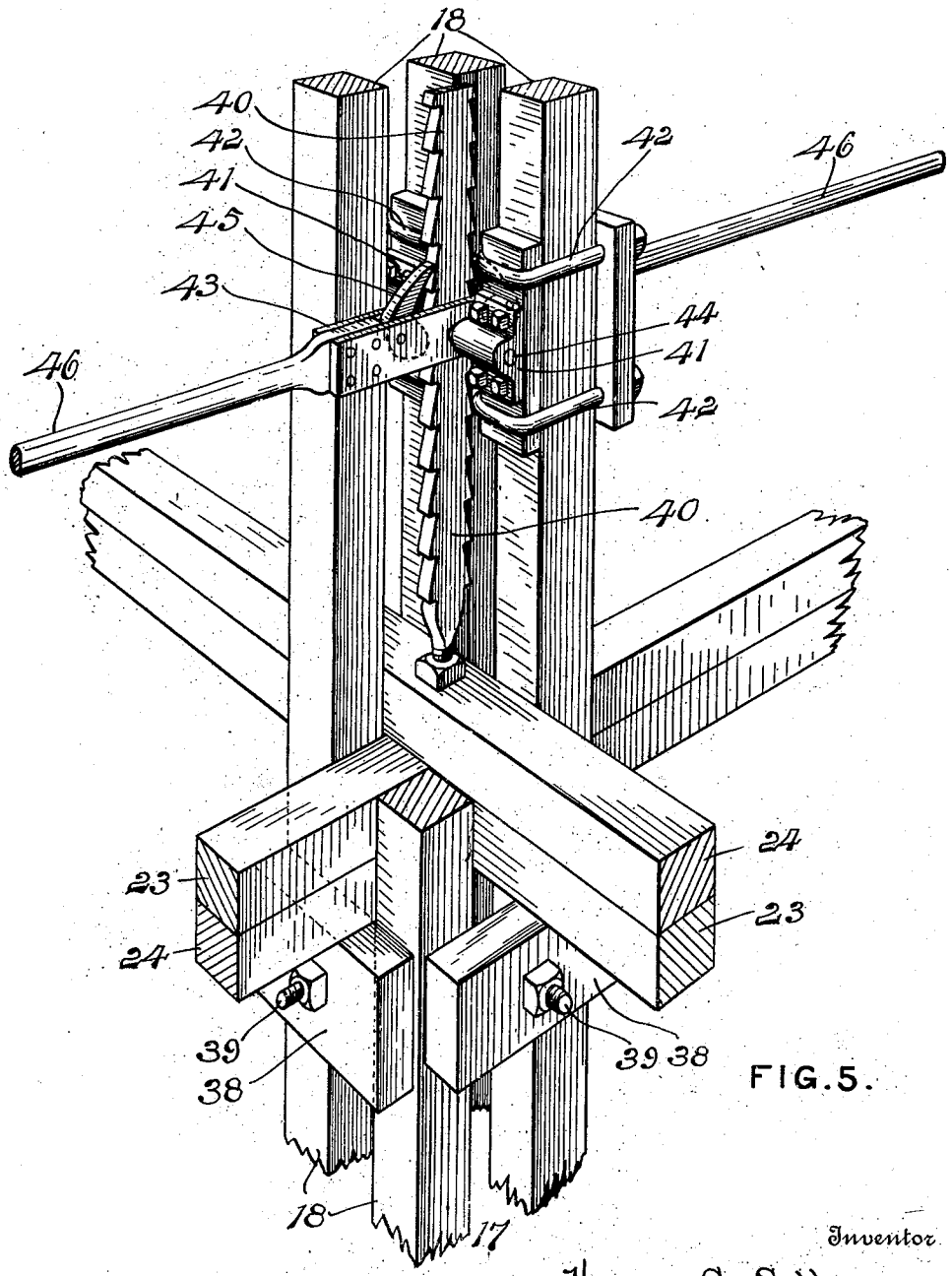

FIG. 5.

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UNITED STATES PATENT OFFICE.

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MACHINE FOR BUILDING CONCRETE STRUCTURES.

1,062,040. Specification of Letters Patent. Patented May 20, 1913.

Application filed December 18, 1911. Serial No. 666,462.

To all whom it may concern:

Be it known that I, HENRY G. SELLMAN, a citizen of the United States, residing at Ann Arbor, in the county of Washtenaw and State of Michigan, have invented certain new and useful Improvements in Machines for Building Concrete Structures, of which the following is a specification.

This invention relates to a device for use in building upright concrete structures such as silos, chimneys, water towers and similar hollow structures, and its object is to provide a suitable device for supporting a mold or form and facilitating the raising and lowering of the same to successively form superposed portions of the wall, and further to provide a suitable construction of mold or form for use in conjunction therewith.

To this end the invention consists in the matters hereinafter more fully set forth and particularly pointed out in the claims, references being had to the accompanying drawings, in which—

Figure 1 is a vertical section through the structure embodying the invention and showing the same in operative position; Fig. 2 is a plan view of the same with portions broken away to show the construction; Fig. 3 is an enlarged detail showing the manner of joining the mold sections; Fig. 4 is an enlarged sectional detail showing a portion of the mold supporting frame; Fig. 5 is an enlarged perspective detail of a portion of a central tower or mast and mechanism for raising the supporting arms and adjacent parts; Fig. 6 is a perspective detail of a portion of an outer mold; Fig. 7 is a similar detail of an inner wall of a mold; Fig. 8 is a perspective detail of a foot anchor for the lower end of the supporting frame column; and Fig. 9 is a diagrammatic view of a modified form of mold.

For convenience of illustration, the device embodying the invention is shown as including a mold or form especially designed for forming concrete walls of hollow structures, such as a silo wall 1. The device may however be used for forming the walls of any hollow structure whether of circular form as shown in Fig. 1 or of rectangular or other shape in cross section and it is further adapted by providing molds of proper shape and construction, to form upwardly tapering structures such as chimneys and the like.

As shown in the drawings the mold proper consists of an inner wall 2 and an outer wall 3 spaced apart the distance of the desired thickness of the wall and this mold is adapted to be lifted vertically to form succeeding sections or portions of the structure, the mold being left in each position long enough to permit the portion just formed to thoroughly set or harden before the mold is again raised to form the next portion above. The inner and outer walls of the mold are each formed of a plurality of sections and the walls, as shown, are made of sheet metal of sufficient strength to withstand the pressure of the cement placed between them. If desired, however, these may be made of wood as shown in Figs. 6 and 7. The sections of the outer wall 3 are each reinforced by angle bars 4 and 5 secured along the lower and upper edges respectively of the metal plates. Each end of each section is provided with an angle bar 6, Fig. 3, which angle bars when the mold is placed for use, abut the angle bars on the adjacent ends of the sections and the sections are firmly secured together by bolts 7 passed through openings in the angle bars 6. Intermediate the ends of each section of the outer wall is a T-bar 8 secured to the outer face of the wall and extending vertically across the same. This bar is provided with a series of holes 9 to receive a bolt 10 for adjustably and detachably securing thereto a hanger 11 for supporting the mold wall in position, as will be hereinafter more fully described.

The wall 2 of the mold is also formed of a plurality of sections and each section is provided at one end with a bar of wood or other suitable material 12 secured along its edge and formed with a beveled edge 13. The end of the abutting section of the wall is also provided with a similar bar 14 having an edge beveled to correspond with and match the bevel 13 on the other bar. These meeting beveled ends of the sections thus overlap so that when it is desired to move the mold the inner wall 2 of each section may be sprung inward to disengage the mold wall from the inner face of the formed

section of the concrete wall. The ends of the sections of the inner wall of the mold are secured together by providing angle bars 15 on the bars 12 and 14 and connecting the same by bolts 16 passing through openings in the angle bars.

To support the mold walls in position for forming the upper sections of the concrete wall, a supporting mast 17 is erected at the center of the proposed structure. This mast may be of any suitable construction and of a greater height than the desired height of the structure. As shown in the drawings this mast consists of four wooden bars or poles 18 which are preferably rectangular in cross section and are set equal distances apart and form the four corners of the mast or column 17. This mast is held firmly in position while the work is going on, by a foot anchor shown in Fig. 8. This anchor consists of four members or planks 20 set on edge and each provided at one end with a strip 21 extending parallel with the end of the plank and forming a loop to receive one of the other planks. These plank members are thus interlocked to form between them a rectangular box of horizontal dimensions equal to the cross sectional dimensions of the rectangular mast which is made up of the four members, one member of the mast being set in each corner of the box and the box then filled in with cement or concrete to firmly hold them in place. Wedges 22 are driven into the loop on each plank to bind the planks in position and the outwardly extending ends of the planks abut the wall 1 (Fig. 1) of the structure and center the mast therein. After the structure is completed and it is desired to remove the mold and supporting mast, the wedges 22 are knocked out and the planks may then be readily removed from the foot of the mast to release the same.

The inner mold wall 2 is supported in position for use by rectangular shaped cross beams 23 set at right angles to each other and of a size to fit between the four bars 18 forming the mast. Each beam is provided with a reinforcing member 24 to strengthen the same at its points of intersection with the other beam and upon the outer ends of each beam is supported a sliding extension bar 25 supported upon the upper edge of the beam and guided thereon by a strap 26 secured to the inner end of the extension and carrying a roller 27 engaging the lower side of the beam. A guide fork 28 on each end of each beam carries a roller 29 engaging the under side of the extension bar 25 and said fork extends upward in engagement with the sides of the extension bar to guide the same in its inward and outward movement on the beam. An upwardly extending hook 30 (see Figs. 1 and 4) on the outer end of each extension bar engages an opening in an angle bar 31 secured along the lower edge of each section of the inner wall 2 of the mold to support said sections upon the extension bars and detachably attach the same thereto. A bracket 32 secured upon each extension bar extends upwardly therefrom and is provided at its upper end with a hook 33 to engage an opening in an angle bar 34 secured along the upper edge of each section of the inner wall of the mold and detachably hold the upper edge of the section. Each section of the inner wall of the mold is thus carried upon one of the extension bars so that by an inward movement of the extension upon the beam the section of the mold wall may be moved inward away from the concrete wall and said section will at the same time be supported in position to be raised into position for forming another portion of the structure.

Securing bars or beams 35 arranged at right angles to each other and of a rectangular cross section to fit between the members of the mast are provided and positioned at such a distance above the beams 23 that the workmen may conveniently stand erect upon said beams beneath the beams 35. The beams 35 are provided with reinforcing bars 36 and extend radially outward some distance above and beyond the upper edge of the mold. The outwardly extending ends of the beams are notched to receive loops 37 secured upon the upper end of the hangers 11 and adjustably hold the hangers in position to properly support the outer mold wall 3. The beams 23 and 35 are adjustably held in position between the four members of the mast by clamping blocks 38 engaging the outer sides of the members of the mast and drawn inward toward each other by bolts 39 extending through the blocks and between the members of the mast, thus when the nuts on the bolts are turned up forcing said members toward each other into firm frictional engagement with the sides of the beams and into the angles formed by the meeting of crossed beams. Each set of supporting beams is thus frictionally held in any position to which they may be adjusted upwardly along the mast and by loosening the nuts on the bolts 39 the members of the mast may be sprung outwardly and the beams slid upwardly between them to raise the mold. To so raise the mold into position for forming another portion of the wall of the structure, the beams 23 and 35 are connected by a ratchet bar 40 secured at its ends to the beams and extending vertically in the center of the mast between the four members forming said mast. Bearings 41 are adjustably clamped to two of the four members of the mast by clip bolts 42 so that said bearings may be readily adjusted to any desired position upward or downward along the mast. A rocker bar 43 is provided hav-

ing laterally extending trunnions 44 to engage the bearings 41 and this rocker bar carries two pawls 45 pivotally attached to the bar in position to engage the ratchet bar 40. These pawls 45 are each weighted at one side so that they will be normally held in engagement with the ratchet bar. Outwardly extending handle portions 46 on the rocker bar are provided for rocking said bar to alternately engage the pawls with the notches of the ratchet bar and raise the carrying beams 23 and 35 upward along the mast, when the clamping blocks are released to release and spread the four members of the mast from frictional engagement with the beams.

It may be found desirable to form a tapering wall, as for instance, in the construction of chimneys and it may also be desirable to form the structure rectangular in plan view. Such a construction is illustrated in Fig. 9, the outer wall 47 of the mold being formed tapering and made in sections there being integral corner sections 48 and intermediate sections 49 fitting between the corner sections and having beveled side edges overlapping similarly formed side edges on the corner sections. The intermediate sections 49 are held in place by strips 50 secured to the edges of the corner sections. When a mold having a tapering wall of this character is raised to form the next portion of the structure it becomes necessary to contract said wall sufficiently to bring its lower edge into engagement with the upper edge of the portion just formed and to do this the intermediate sections 49 may be replaced by others of lesser width. If found desirable, the intermediate section of the outer mold wall may be formed tapering as shown at 56 in Fig. 6.

As shown in Fig. 9 the inner mold wall 51 may also be made up of corner sections 52 and intermediate sections 53 formed with beveled side edges engaging similarly formed edges on the corner sections, and the intermediate sections in place by strips 54 secured to the corner sections. In this construction of inner wall, said wall is collapsed to disengage it from the concrete wall by lifting the intermediate sections out vertically and if found desirable said sections may be formed tapering as shown at 55 in Fig. 7 to assist in their release.

The entire mold structure is thus carried by a single center mast of a height equal to or greater than the desired height of the structure to be formed and by means of the pawls and ratchet the whole mold structure may be quickly and easily lifted and adjusted upon the mast. The supporting beams which carry and support the mold also form a scaffold for the workmen and a very cheap and convenient adjustable mold for forming vertical walls is secured.

Obviously changes in the details of construction and arrangement of parts may be made without departing from the spirit of my invention and I do not care to limit myself to the particular form and arrangement shown.

Having thus fully described my invention what I claim is:—

1. In a device of the character described, the combination of a supporting mast, means adjustable vertically upon said mast for carrying a mold, a lever, means for adjustably securing and pivotally supporting said lever upon said mast, means actuated by said lever for raising the mold supporting means vertically upon the mast, and means on the mast for holding said supporting means in the position to which it is adjusted.

2. In a device of the character described, the combination of a supporting mast formed of a plurality of vertically extending parallel bars, cross beams extending between said bars for supporting and carrying a mold, said beams being adjustable vertically between said bars, and means for clamping the bars of the mast to frictionally hold the beams in the position to which they are adjusted.

3. In a device of the character described, the combination of a mast comprising four vertically extending spaced parallel bars, beams extending between said bars and crossing at right angles to each other for carrying a mold, means for raising said beams vertically between said bars, and means for forcing the bars of the mast toward each other to clamp the beams between them.

4. In a device of the character described, the combination of a mast, radially extending carrying beams supported by said mast and adapted to support an outer wall of a mold, radially extending beams carried by the mast at a distance below the other beams, extension bars carried by the lower beams adapted to be attached to an inner wall of a mold, a ratchet bar connecting the upper and lower beams, a lever adjustably and pivotally supported upon the mast, and a pawl carried by said lever to engage the ratchet bar and lift the beams.

5. In a device of the character described, the combination of a mast comprising four spaced vertically extending bars, cross beams between the bars of the mast and adapted to be connected to a mold for forming a circular wall, means on the mast for raising the beams and holding the same in their raised position, a foot anchor for said mast comprising four members arranged at right angles to each other with overlapping connected inner ends forming between them a rectangular box to receive the lower ends of the bars forming the mast, the outer ends of said members being adapted to engage

the circular wall formed by the mold carried by the beams and center the mast therein.

6. In a device of the character described, the combination of a mast comprising four spaced parallel bars of rectangular form in cross section, horizontally extending beams between the bars of the mast arranged at right angles to each other, clamping means for the bars of the mast to frictionally clamp the beams between them, a ratchet bar extending longitudinally of the mast and attached to the beams, a lever, a pivot bearing for the lever, means for adjustably securing the pivot bearing to the mast to be adjusted longitudinally thereon, and pawls operated by the lever to engage the ratchet bar and lift the beams.

7. In a device of the character described, the combination of a mast comprising four parallel spaced bars, upper beams extending at right angles to each other between the bars, lower cross beams extending at right angles to each other between the bars, clamping means for the bars adjacent to the upper and lower beams for holding the beams by clamping them between the bars, extension members on the lower beams, means for guiding the extension members upon the beams, brackets upon the beams adapted to form supports for an inner wall of a mold, hangers adjustably attached to the outer ends of the upper beams adapted to support an outer wall of a mold, a ratchet bar connecting the upper beams with the lower beams, a lever, pawls carried by the lever to engage the ratchet bar, and a pivot bearing for the lever adjustably secured to the mast to be adjusted vertically thereon.

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

HENRY G. SELLMAN.

Witnesses:

ANNA M. DORR,

G. E. MCGRANN.