March 12, 1935. E. R. HOLE 1,993,930

MOLD FOR BUILDING CONSTRUCTIONAL ELEMENTS OF CONCRETE

Filed Dec. 23, 1933 4 Sheets-Sheet 1

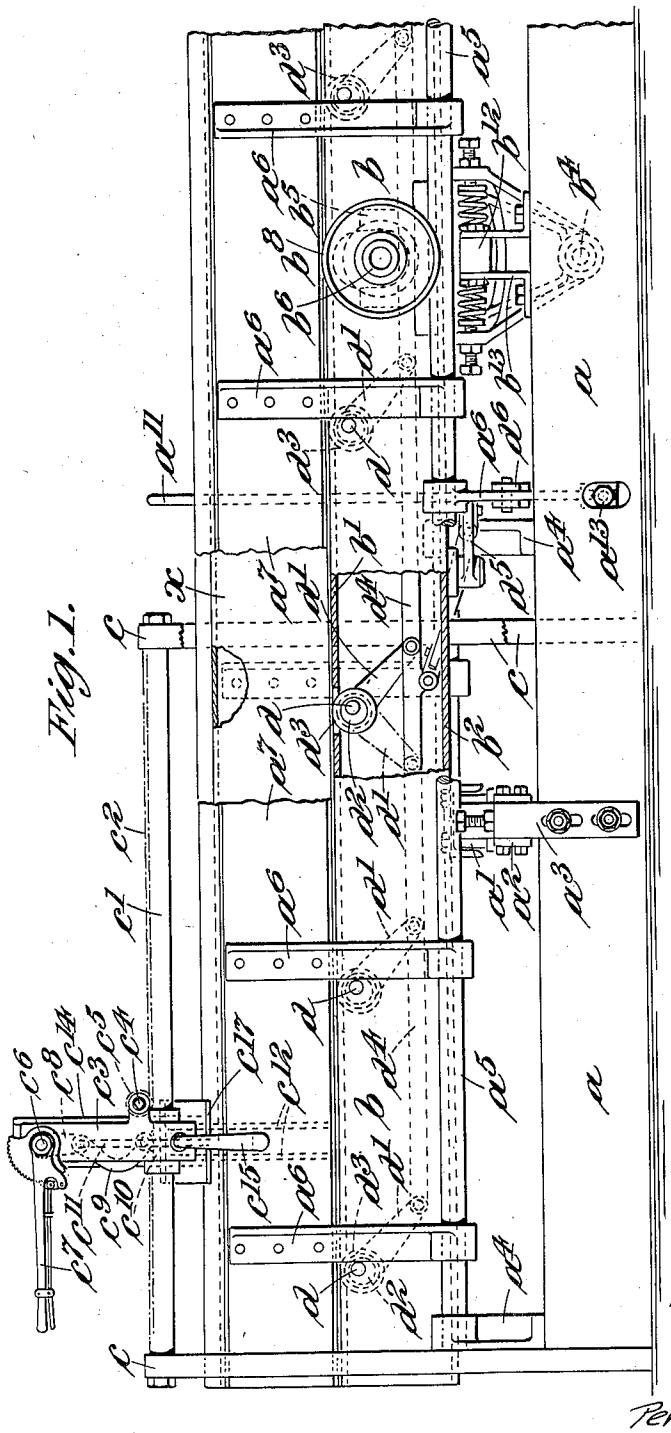


Fig. 1.

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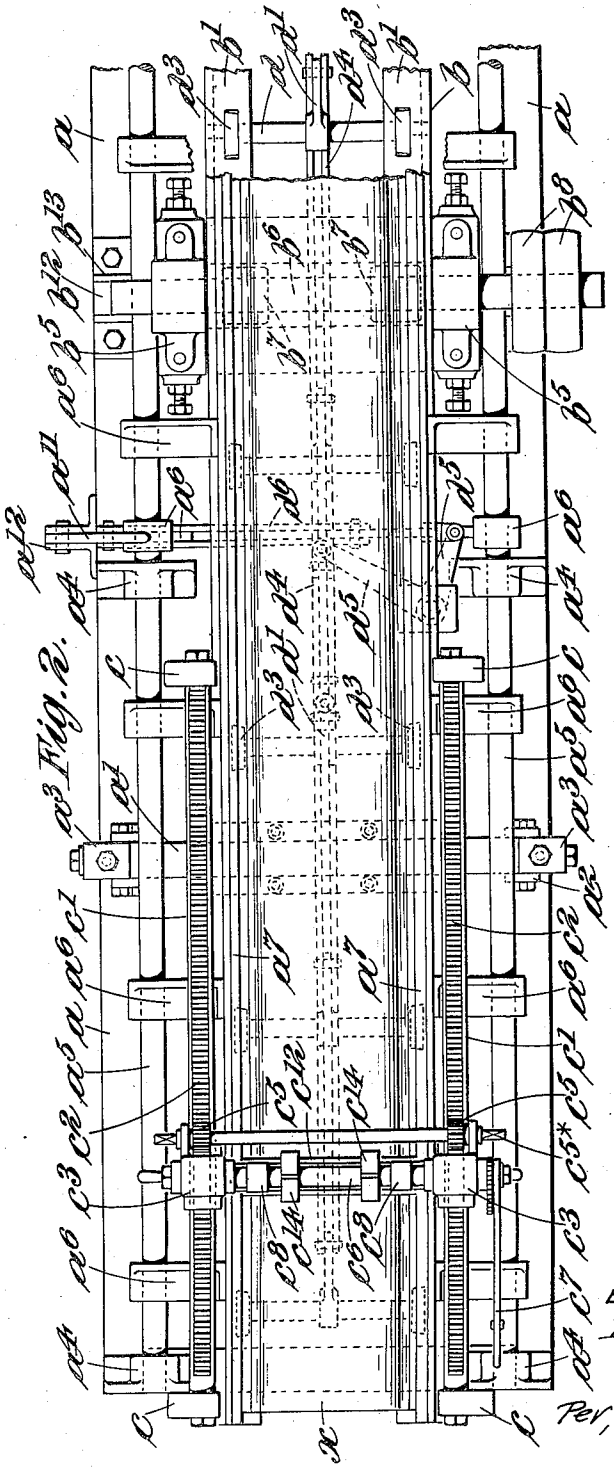


Fig. 2.

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Fig. 3.

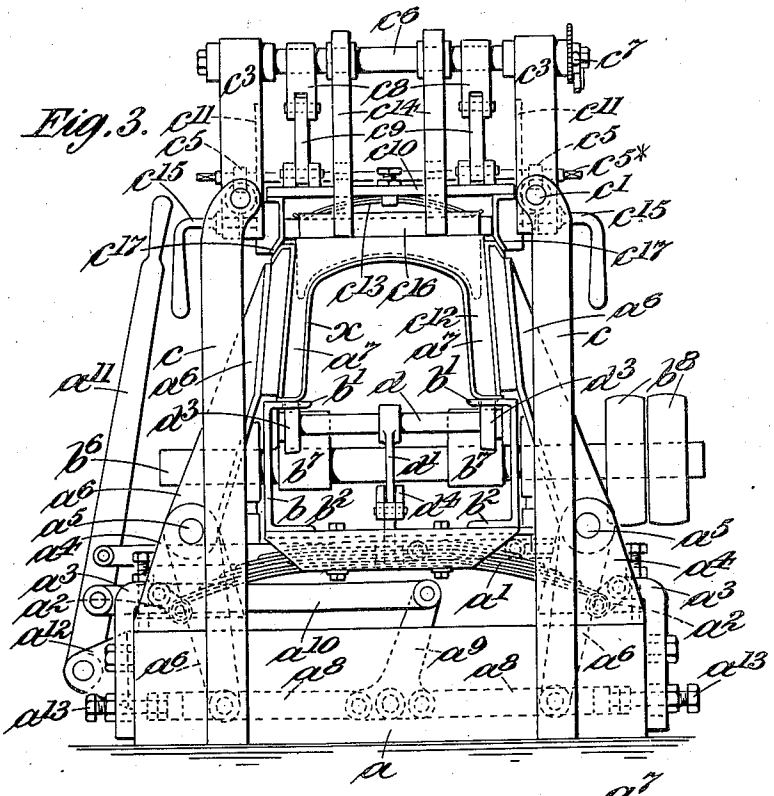


Fig. 4.

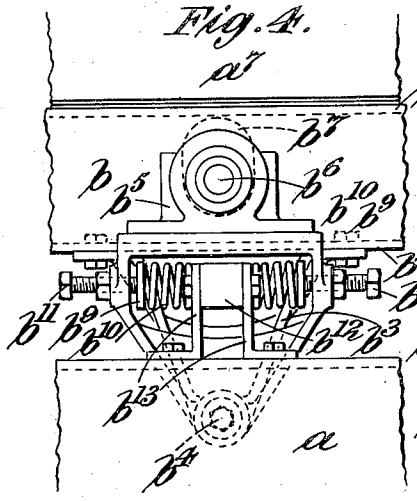
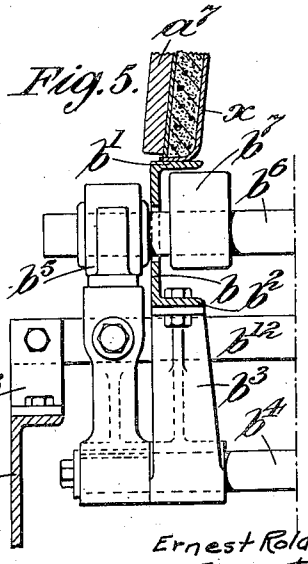


Fig. 5.



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Fig. 6.

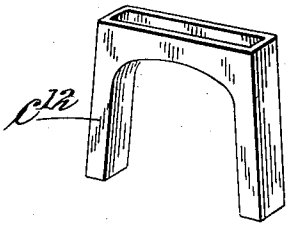
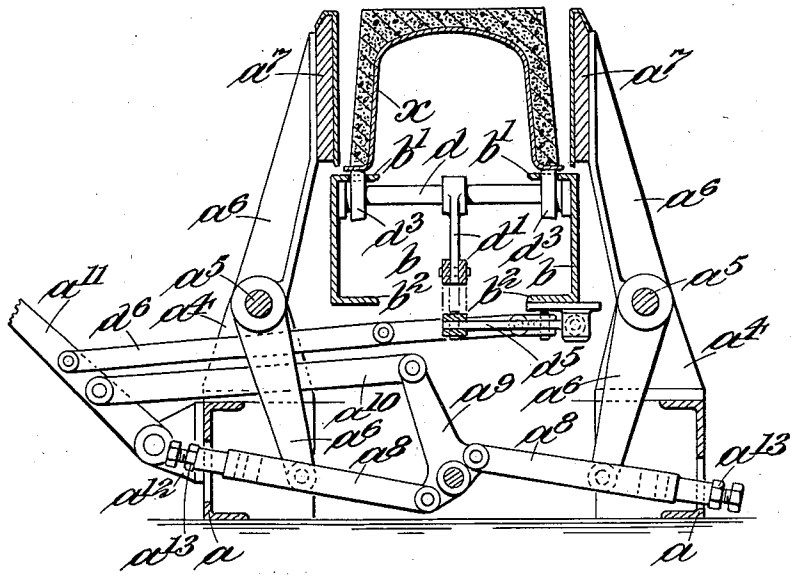


Fig. 7.



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Patented Mar. 12, 1935 1,993,930

UNITED STATES PATENT OFFICE

1,993,930

MOLD FOR BUILDING CONSTRUCTIONAL ELEMENTS OF CONCRETE

Ernest Roland Hole, London, England, assignor to The Trussed Concrete Steel Company Limited, London, England, a British limited-liability company

Application December 23, 1933, Serial No. 703,797
In Great Britain January 6, 1933

5 Claims. (Cl. 25—41)

This invention relates to improvements in molds for building constructional elements of concrete and has for its object the provision of a molding machine which can be readily transported from place to place, can be adjusted for dealing with elements of varying dimensions within a given range, enables the casting to be rapidly and effectively carried out and the cast element to be removed from the machine for setting.

This invention consists of an improved mold for building constructional elements of concrete comprising a stationary framework, a movable framework resiliently mounted on the stationary framework, means for vibrating the movable framework in a substantially vertical direction only, means on the movable framework for supporting a removable mold bottom and sides and ends of the mold movably carried on the stationary framework adapted to be brought into and maintained in a registered position relative to the mold bottom for the casting of the element and to be released to allow the cast element and mold bottom to be removed as a unit for final setting. It also consists in the detail mechanical arrangements for carrying out the steps of operation in proper sequence which arrangements are hereinafter described.

In order that the invention may be the better understood I will now proceed to describe the same in relation to the accompanying drawings, reference being had to the letters and figures marked thereon. Like letters refer to like parts in the various figures in which:—

Figure 1 is a view in elevation of rather more than the left hand half of a molding machine constructed in accordance with this invention, the other half being a replica of that shown to the other hand.

Figure 2 is a plan of Figure 1.

Figure 3 is an end elevation.

Figures 4 and 5 are two views of the vibration control device.

Figure 6 is a perspective view of one of the ends of the mold, and

Figure 7 is a skeleton diagrammatic end view of a cast element on the mold bottom raised from the supports by the movable frame and the control mechanism for the mold sides and raising gear.

Upon a stationary frame a of such a construction as to be capable of being moved as a whole either on wheels or be lifted by slings or the like are mounted at each end springs a^1 carried by shackles a^2 supported by brackets a^3 adjustably secured to the side of the frame a for levelling purposes. The springs a^1 carry a movable framework b having channel section members at each side thereof and extending for the full length of the machine. On the upper flanges b^1 of the channels the bottom of the mold x is supported at each side along its length. Upon the lower flange b^2 of each member is mounted a stirrup b^3 which carries at its lower end a transverse bar b^4 so as to connect the stirrups b^3 together. At each end of the bar b^4 is carried a bearing b^5 in which is supported a shaft b^6 carrying eccentrically disposed weights b^7 and fast and loose driving pulleys b^8. The base b^9 of each bearing b^5 as of hollow formation and has two springs b^{10} mounted therein the outer ends of which coact with screw adjustments b^{11} carried by the base b^9 while the inner ends rest against a bar b^{12} carried by brackets b^{13} mounted on the fixed framework a at each side thereof. The purpose of this arrangement is to control the character of the vibration set up in the movable framework b by the rotation of the eccentrically disposed weights b^7 so that vibration is freely set up in a vertical direction and is materially if not wholly damped in a horizontal direction in order to prevent any translation motion of the concrete in the mold during the period of vibration of the mass.

On each side of the stationary framework a is mounted a set of bearings a^4 in which a shaft a^5 is mounted and on each shaft a number of levers a^6 are fixed on the upper ends of which one side a^7 of the mold is carried while the lower end is coupled by a connecting rod a^8 to a double armed bell crank lever a^9 pivoted on the framework a. The lever a^9 is connected by a connecting rod a^{10} to a hand lever a^{11} pivoted in a bracket a^{12} mounted on the side of the framework a. In Figure 7 the sides a^7 are shown in the withdrawn position while in Figure 3 the sides a^7 are in their closed up position and the arms of the bell crank lever a^9 and connecting rods a^8 are in a straight line and act as toggle levers to register the position of the sides a^7. The connecting rods a^8 are provided with screw adjustments a^{13} to enable their length to be varied to produce the desired result.

The stationary framework a is provided with vertical members c which carry at their upper end parallel bars c^1 having a rack c^2 along the upper side thereof. Upon the bars c^1 is slidingly mounted a movable head c^3, on which is mounted a transverse shaft c^4 having pinions c^5 mounted thereon adapted to engage with the rack c^2 said

shaft c^4 having a square end c^5* or like device for a handle by which the pinions c^5 can be rotated to vary the position of the head c^3 along the length of the machine so as to vary the length of the element to be cast in the mold by determining the position of the end wall thereof. To effect this purpose the head c^3 carries at its upper part a shaft c^6 having a ratchet lever c^7 for operating it and also two levers c^8 to which are pivoted connecting rods c^9 of curved formation which in turn are pivoted to a crosshead c^{10} adapted to slide up and down in guides c^{11} provided on the head c^3. The end wall of the mold is in the form of a removable hollow casting c^{12} shown in Figure 6 which is placed in position between the sides a^7. The lower part of the crosshead c^{10} carries a supporting device c^{16} having a slightly tapered end adapted to enter the casting c^{12} and position the same as the end of the mold. A spring c^{13} is disposed between the crosshead c^{10} and device c^{16} in order to press the casing c^{12} tightly down on the movable framework b. In order to register the position of the casting c^{12} vertically two pairs of arms c^{14} extend downwards from the head and contact with the hollow casting c^{12} so as to act as cantilevers to prevent the casting c^{12} being forced outwards under pressure from the concrete during casting and before setting. The arms c^{14} are raised and lowered with the crosshead c^{10}, a small amount of free motion being provided. There is a head c^3 at each end of the machine although for simplicity only one is shown in the drawings and when the position has been determined for any given length of element each head can be locked in such position by means of the jamming screws c^{15}.

In order to facilitate the easy and safe removal of the bottom with the cast element thereon from the machine at intervals along the length of the movable framework b are arranged a series of transverse shafts d pivoted thereon. Each shaft d has a lever d^1 fixed thereto and each of the shafts has an eccentric portion d^2 on which a roller d^3 is rotatably mounted. Each of the levers d^1 is pivotally connected to a common connecting rod d^4 which is connected to a bell crank lever d^5 one arm of which is connected by the rod d^6 with the hand lever a^{11} which when operated causes the rollers d^3 to rise to a higher position owing to the eccentricity of their journal so that the periphery of the rollers d^3 stands above the plane of the flanges b^1 of the channels raising the bottom of the mold x from the movable frame b simultaneously with the opening out of the sides a^7 and conversely when the sides a^7 are closed-in the rollers d^3 drop allowing the bottom of the mold x to drop on to the flanges b^1 of the channels. In order to prevent the sides a^7 from being forced outwards during the casting operation means such as inclined faces c^{17} are provided on the crosshead c^{10} to grip the outside of the sides a^7 in order to resist spreading of the same.

In operating the machine the mechanical parts are put into their open position a mold bottom x is run into the machine on the rollers d^3, the castings c^{12} are then put into position in the crossheads c^{10} of the two heads c^3 the position of which has been initially set by the pinions c^5 and locked by the screws c^{15}. The hand lever a^{11} is now operated causing the sides a^7 to approach each other and the rollers d^3 to drop to their lower position. The ratchet lever c^7 is now operated and the crosshead c^{10} lowered to press the casting c^{12} down on the movable frame b and position the same thereon. The concrete is now placed in the mold up to the top thereof after which the vibrating mechanism is started and kept on for a short time during which the particles of the matrix become closely packed together while coated with particles of cement and after remaining within the mold a sufficient time the hand lever a^{11} can be operated causing the sides a^7 to move outwards and the rollers d^3 to lift the bottom x and the constructional element cast thereon as shown in Figure 7 so that they can be moved on the rollers d^3 easily and safely out of the machine for final setting. The element illustrated in this figure is only given as an example and it will be understood that an element of any section can be effectively cast therein which requires only side and end walls and a bottom for a mold.

I claim:—

1. An improved mold for building constructional elements of concrete consisting of, in combination, a stationary frame, a movable frame, resilient means disposed between the two said frames adapted to support the movable frame, levelling means arranged on the resilient means to horizontalize the movable frame, vibrating means mounted on the movable frame intermediate of its ends, a removable mold bottom normally resting on the movable frame, a series of rollers mounted on said movable frame and adapted to be raised so as to coact with the mold bottom to raise said bottom from the movable frame structure, two side walls of the mold mounted on the stationary frame in a hinged manner and adapted to coact with the mold bottom in their operative position, and two end walls of the mold detachably mounted on the stationary framework and disposed tightly between the said side walls when in their operative position for molding operation.

2. A mold, as claimed in claim 1, including longitudinal adjusting means mounted on the stationary frame adapted to locate the positions of the end walls of the mold so as to deal with the production of elements of various lengths.

3. A mold, as claimed in claim 1, in which said vibrating means comprising a shaft rotatably mounted on the movable frame, a weight or weights eccentrically mounted on said shaft, means mounted on the stationary frame adapted to damp the vibration set up by the weight or weights in every direction except the vertical one and a source of rotary power.

4. A mold, as claimed in claim 1, including hinged carrying means for operating each side wall of the mold mounted on the stationary frame and connecting mechanism for operating the two side walls simultaneously.

5. A mold, as claimed in claim 1, including hinged carrying means for operating each side wall of the mold mounted on the stationary frame, connecting mechanism for operating the two side walls simultaneously and mechanism for operating the roller raising device simultaneously with opening and closing actions of the side walls.

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