Dec. 9, 1952 F. SCHARSACH 2,620,543

MOLDBOARD APPARATUS

Filed Oct. 24, 1950 2 SHEETS—SHEET 1

Fig. 1

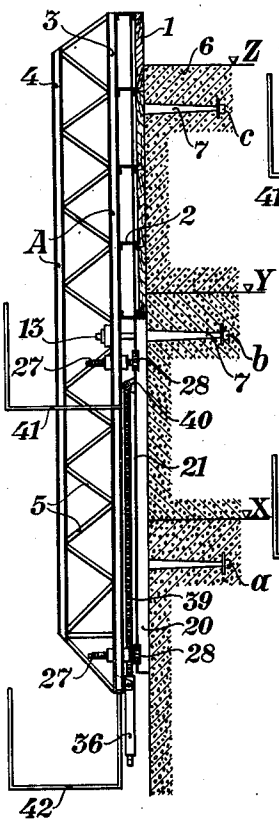


Fig. 2

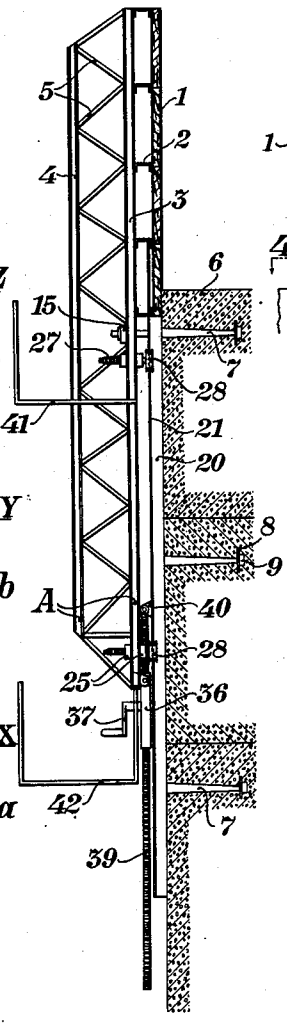


Fig. 3

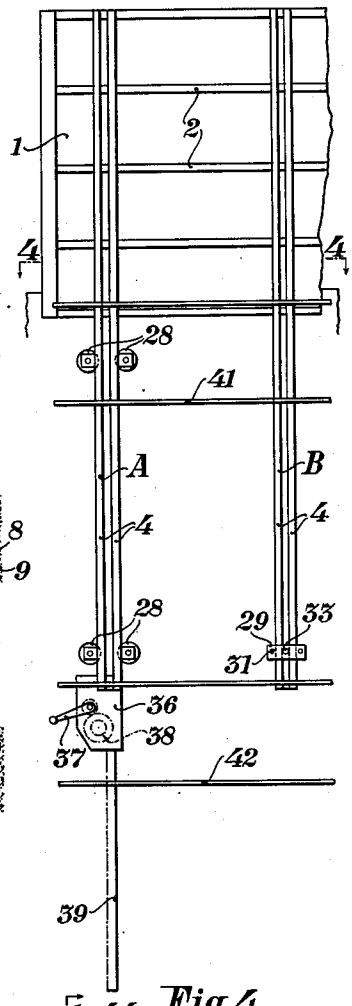
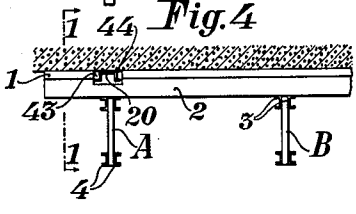


Fig. 4



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Fig. 5

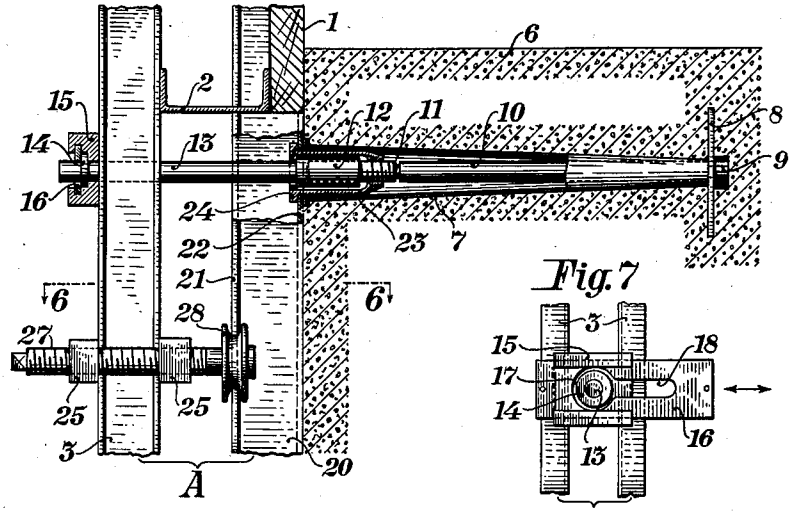


Fig. 7

Fig. 6

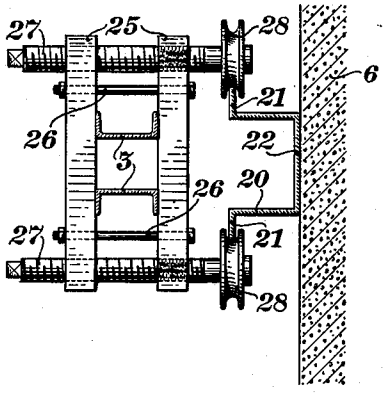


Fig. 8

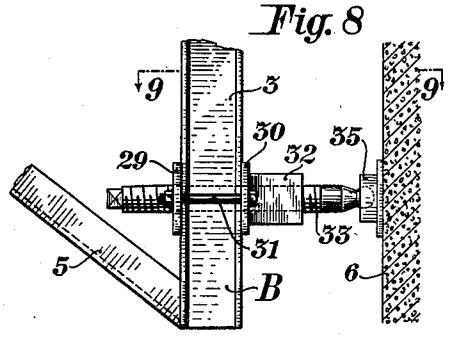
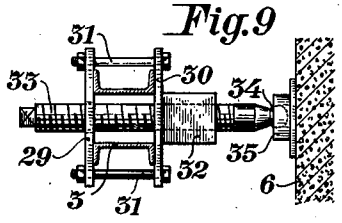


Fig. 9



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MOLDBOARD APPARATUS

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9 Claims. (Cl. 25—131)

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My invention relates generally to a mould-board apparatus utilized for the erection of concrete and similar cast structures, more particularly to an apparatus of this kind comprising several mould-boards which are lifted after moulding and setting of a concrete layer, so as to serve as a mould or form for pouring the next higher concrete layer again and again. The apparatus of my invention is suitable for building particularly large concrete structures, such as dams for power basins of water power plants, as well as for erecting walls of a house and the like.

Especially in the building of particularly large concrete structures, the weight of the vertically adjustable mould-boards is very considerable so that it is extremely troublesome and takes up much time, to lift the heavy boards and to bring them in correct position between the successive moulding or pouring operations. For supporting the mould-boards, moreover, extensive and expensive crane installations or the erection of strong frames are required. The mounting and operating of such cranes causes considerable difficulties and requires much staff and time. Such cranes, moreover, occupy much space and impede the supply of concrete to the structure to be moulded.

The main object of my invention is to remove said inconveniences and to provide a mould-board apparatus of the said kind which greatly facilitates and simplifies the elevation of the mould-boards so that the building can be erected much more rapidly and at considerably reduced costs.

A further object of my invention is to provide an apparatus of the character referred to above which renders superfluous any cranes or stationary frames from which the mould-boards are suspended.

Further objects and advantages will be apparent from the following description in connection with the accompanying drawings wherein I have shown a preferred embodiment of my invention.

In the drawings:

Figs. 1 and 2 are vertical sections along the line 1—1 of Fig. 4, showing two different positions of the apparatus.

Fig. 3 is a front view of Fig. 2.

Fig. 4 is a horizontal section along the line 4—4 of Fig. 3.

Figs. 5 to 9 show various details in an enlarged scale.

Fig. 5 is a vertical section showing the means for securing and guiding the mould-board.

Fig. 6 is a horizontal section along the line 6—6 of Fig. 5.

Fig. 7 is a front view of the device for securing the mould-board.

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Fig. 8 is a side view of a supporting device for the lower end of a post of the mould-board.

Fig. 9 is a horizontal section along the line 9—9 of Fig. 8.

The mould-board substantially comprises a number of similar juxtaposed units of which one will be described hereinafter. Each of these units comprises a rectangular mould-board 1 composed of a number of plates consisting of wood or strong sheet steel. This mould-board 1 is stiffened by a series of horizontal channel irons 2 interconnected by three vertical posts, namely two outer posts A and one intermediate post B (see Figs. 3 and 4). Alternatively, the number of such posts may be greater than three. In Figs. 3 and 4, the right half of said unit is not to be seen, but this half is identical with the left half, that is the unit is symmetrical relatively to the axis of the intermediate post B.

Each of the said three posts is constituted by an inner pair of channel irons 3 and an outer pair of channel irons 4, which pairs are interconnected by diagonal ties or bracing members 5 so as to form a strong lattice girder which shows high bending strength and therefore efficaciously resists to the considerable horizontal pressure exerted by the fresh concrete. As it will be seen from Figs. 1, 2 and 3, the posts A and B extend downwards beyond the mould-board 1 proper.

In the present example it is assumed that a concrete body 6 of great thickness, for instance a dam for a power basin, is to be erected so that in Figs. 1, 2 and 5 the right-hand limit of such body is not to be seen. It will be understood, however, that on the right side of the concrete body 6, there is provided a unit similar to the unit arranged on the left side thereof. In the following, the means for securing said unit comprising the mould-board 1 and the three posts A and B, will be described.

As shown in Fig. 5, in the concrete body 6 is embedded a slightly conical metal sleeve 7 on the inner end of which bears a metal disc 8 provided with a central boss 9 into which the rear threaded end of an anchor bolt 10 is screwed. The front end of this bolt does not project from the concrete and has a thread 11 engaging an interiorly threaded sleeve 12 formed on the rear end of a bolt-shaped anchor head 13 provided near its front end with a circular collar 14. The latter is situated in a housing 15 secured to the channel irons 3, a rectangular locking plate 16 being guided in this casing so that it may be displaced in the direction of the arrow in Fig. 7. The locking plate 16 has a circular opening 17 the diameter of which is slightly larger than that of the collar 14, this opening merging into a lateral narrower slot 18.

With the locking plate 16 in the position according to Fig. 7, the opening 17 is in alignment

with the axis of the anchor head 13 so that, when the latter is unscrewed from the anchor bolt 10 by means of a suitable spanner, the collar 14 is allowed to pass the opening 17 and the anchor head can be removed. If, however, the locking plate 16 is displaced from the position of Fig. 7 to the left, the walls of the slot 18 are moved in front of the collar 14 so that the anchor head 13 may be rotated within the casing 15, but is coupled with the latter and therefore also with the post A in an axial direction. When, with the locking plate 16 in this latter position, the anchor head 13 is rotated relatively to the anchor bolt 10, the post A will be therefore approached to, or removed from the concrete body 6, according to the direction of rotation. In this manner, the mould board 1 can be cleared from the concrete.

It is to be noted that the described anchoring device is provided not only on the outer posts A, but also on the intermediate post B. As it is shown especially in Fig. 4, a vertical rod 20 is arranged behind each of the posts A (but not behind the post B), this rod having a substantially U-shaped cross-section and being provided with two opposite, outwardly extending webs 21. The web 22 bearing on the concrete body 6, is provided near its upper end with a round hole passed by a sleeve 23 having a rear threaded end which engages the thread 11 of the anchor bolt 10. An outer front flange of this sleeve 23 bears against the web 22 whereby the rod 20 is secured to the concrete body 6. The rod is moreover secured near its lower end in a similar manner to an anchor bolt 10 situated at a lower level.

As shown in Figs. 5 and 6, two cross members 25 are secured to both channel irons 3 of each post A by means of bolts 26. Two threaded spindles 27 screwed into the cross members 25 carry rollers 28 which may roll along the webs 21 and are guided by them. As it is to be seen from Figs. 1, 2 and 3, each post A is provided with two pairs of such rollers 28 so that the posts A and therefore the whole mould unit are guided in a vertical direction.

According to Figs. 8 and 9, two cross members 29, 30 are secured to the channel irons 3 of the intermediate post B by means of bolts 31. The rear cross member 30 has formed thereon a boss 32 in which a threaded spindle 33 is screwed. A spherical head 34 of this spindle engages a shoe 35 bearing on the concrete body 6.

On the lower end of each of the posts A, there is secured a winch 36 which may be actuated by a hand crank 37. A gear wheel 38 of this winch meshes with a vertical rack 39 secured on its upper end to a bracket 40 projecting from the guiding rod 20. For easily actuating the hand crank 37 and the anchor heads 13, the mould unit is provided with two platforms or galleries 41 and 42. It will be understood that the winches 36 may be actuated by electromotors instead of hand cranks.

As it is shown in Fig. 4, the mould board 1 is provided on its side facing the concrete with vertical recesses or grooves 43 for accommodating the guiding bars 20. In order to avoid any interruption of this side of the board, the grooves 43 are covered by vertical strips 44 of sheet iron.

The operation of the apparatus of my invention is as follows: The concrete body 6 is moulded in successive sections or layers two of which are indicated in Figs. 1 and 2, viz. one layer between the levels X and Y, and the other between the levels Y and Z. In Fig. 1 three superimposed anchoring devices as described above are generally indicated with *a*, *b* and *c*, the vertical distances between these devices corresponding to the height of the concrete layers.

It is assumed that at a given moment the top surface of the concrete set is at the level Y. At this stage the mould unit is held in position by the posts A and B being secured to the concrete body by anchor bolts 10 and anchor heads 13 arranged at *b*. The guiding rods 20 associated to the two posts A, are in such position that their upper ends are substantially at the same level as the top surface of the mould board 1, and the rods 20 are fixed by means of the threaded sleeves 23 engaging the anchor bolts 10.

At the position *c* the members 7, 8, 10, 13 and 15 are now secured to both posts A, as well as to the post B so that the conical sleeves 7 and the anchor bolts 10, the relative concentric position of which is secured by any desired means, are carried by the posts A and B respectively. Now the concrete layer between the levels Y and Z is poured whereby the sleeves 7 and discs 8 situated at *c* are embedded in the concrete. It will be seen that the horizontal pressure exerted by the fresh concrete upon the mould board 1, is transferred by the posts A and B and the anchor bolts 10 at *b* to the concrete already set of the last but one layer. This pressure exerts a moment on the mould board 1, which tends to tilt the latter about the anchors at *b* in an anticlockwise direction. This tilting moment is resisted to by the fact that the lower end of the intermediate post B bears against the concrete body 6 by means of the spindle 33 and the shoe 35 (see Figs. 8 and 9), whilst the lateral rims of the rollers 28 of the posts A bear against the webs 21 of the guiding rods 20.

After the concrete of the last layer has sufficiently set, the six anchor heads 13 of the posts A and B at the positions *b* and *c* are removed so that the mould unit is now supported by the winches 36 of both posts A. The weight of the unit is transferred from the winches 36 to the racks 39 and further to the rods 20 which in turn are supported by the anchor bolts 10 situated at *b* and *c*. Now the cranks 37 of both winches 36 are actuated whereby the unit is lifted to the position of Fig. 2, the unit being guided during this movement by the cooperating rollers 28 and rods 20.

For elevating the guiding rods 20 the following manipulations are required. At first the anchor head 13 of the intermediate post B is screwed on the associated anchor bolt 10 at *c* and then the threaded sleeves 23 of one of the posts A, for instance of the left one, are removed whereby the rod 20 associated with this post is released. In this stage the unit is supported by the anchor bolt 10 of the intermediate post A at *c* and by the winch of the right post A. Now the winch of the left post A is actuated. Owing to the fact that the mould unit and therefore also this winch is fixed relatively to the concrete body 6, the actuation of the winch will result in elevating the rod associated therewith. After this rod is lifted by the height of a concrete layer, it is fixed by applying the threaded sleeve 23 at *c*, whereupon the anchor head 13 is applied to the anchor bolt 10 at this place.

Now the rod 20 associated with the right post A is released by removing the threaded sleeves 23 of the post at *b* and *c* so that this rod can be elevated by actuating the crank 37. After the

threaded sleeve 23 and the anchor head 13 is brought in position again at *c*, the described operating cycle is completed and is then repeated.

The anchor bolts 10 which are no longer used, are unscrewed from the boss 9 of the discs 8 so that they can be removed. Also the sleeves 7 can be drawn out from the concrete owing to their conical shape. It is to be seen therefore that merely the discs 8 remain within the concrete, whereas all other anchoring members can be reused again and again.

Various modifications of the described embodiment of my invention are possible within the scope thereof. For instance, the guiding rods may be formed themselves as racks so that the winches engage the same directly and separate racks are dispensed with. The elevating device carrying the mould unit and being supported in turn by the concrete directly or indirectly, may be constituted by a pulley tackle or similar device and may be actuated by electrical power, hydraulically or by means of compressed air. The guiding rods 20 may be lifted by hand, instead of by means of an elevating device. It will be understood that the mould apparatus may be used also for concrete structures the lateral faces of which are not vertical, but inclined. These faces may be, moreover, curved in vertical and/or horizontal direction. In the last case, the adjacent mould boards include obtuse angles with each other. A desired inclination of these boards in a vertical direction can be adjusted by suitably turning the spindles 27 and 33.

What I claim is:

1. A mould-board apparatus for building up concrete bodies by moulding vertically successive layers, which comprises a mould-board, a plurality of upright posts secured to and extending downwardly beyond said board, a plurality of winches each of which is secured to one of said posts, a plurality of racks engaging said winches and arranged behind and parallel with said posts, and means to detachably secure said racks to the concrete body.

2. A mould-board apparatus for building up concrete bodies by moulding vertically successive layers, which comprises a mould-board, a plurality of upright posts secured to said board, a plurality of winches on said posts to lift said board, a plurality of racks engaging said winches and temporarily secured to the concrete body, and means to temporarily secure said posts to the concrete body, said last named means comprising an anchor bolt having its front end within the concrete, and an anchor head engageable with this end and securing one of said posts thereto.

3. A mould-board apparatus for building up concrete bodies by moulding vertically successive layers, as claimed in claim 2, wherein said anchor bolt is surrounded by a conical sleeve embedded in the concrete, a locking member embedded in the concrete being arranged behind said conical sleeve, the rear or inner end of said anchor bolt being engageable with said locking member.

4. A mould-board apparatus for building up concrete bodies by moulding vertically successive layers, which comprises a mould-board, a plurality of upright posts secured to said board, a plurality of guiding rods detachably secured to the concrete body and arranged behind and parallel with said posts to guide the latter in an upward direction, said board being provided with a plurality of vertically extending recesses arranged so as to accommodate said guiding rods, an elevating device on said posts to lift said board, and means detachably secured to the concrete body to support said elevating device.

5. A mould-board apparatus for building up concrete bodies by moulding vertically successive layers, which comprises a mould-board, a plurality of upright posts secured to and extending downwards beyond said board, a plurality of guiding rods detachably secured to the concrete body and arranged behind and parallel with said posts, a plurality of rollers rotatably mounted on each of said posts and cooperating with the guiding rod associated therewith, a winch on each of said posts, and a rack engaging said winch and having its upper end secured to the guiding rod associated therewith.

6. A mould-board apparatus for building up concrete bodies by moulding vertically successive layers, as claimed in claim 5, wherein said rollers are mounted on said post so as to be adjustable relatively to the latter towards or from the concrete body.

7. A mould-board apparatus for building up concrete bodies by moulding vertically successive layers, as claimed in claim 5, wherein at least one of said posts has near its lower end a distance member bearing on the concrete body, said distance member being adjustable so as to vary the distance between said post and said concrete body.

8. A mould-board apparatus for building up concrete bodies by moulding vertically successive layers, which comprises a mould-board, a plurality of upright posts secured to said board, an elevating device arranged on said posts to lift said board, means secured to the concrete body to support said elevating device, and a plurality of devices to detachably secure each of said posts to the concrete body, this device comprising an anchor bolt having its front end threaded and situated within the concrete, an anchor head engageable with said threaded end and situated in front of the concrete body, and a locking member to couple said post with said anchoring head in a direction towards or from the concrete body, but to allow said anchor head to be rotated about its axis.

9. A mould-board apparatus for building up concrete bodies by moulding vertically successive layers, which comprises a mould board, means for guiding said board in an upward direction relatively to the concrete body, a plurality of upright posts secured to said board and extending downwardly therefrom, an elevating device on said posts below said board to lift the latter, an anchor-bolt arranged in the concrete body and having its front end within the latter, a sleeve engageable with this end and supporting said elevating device, a conical sleeve embedded in the concrete and surrounding said anchor bolt and said first named sleeve, a locking member embedded in the concrete behind said conical sleeve, the inner end of said anchor bolt being engageable with said locking member.

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