C. C. McCARTY.

MANUFACTURE OF CONCRETE WALLS.

APPLICATION FILED MAY 16, 1908.

915,995. Patented Mar. 23, 1909.

Fig. 1.

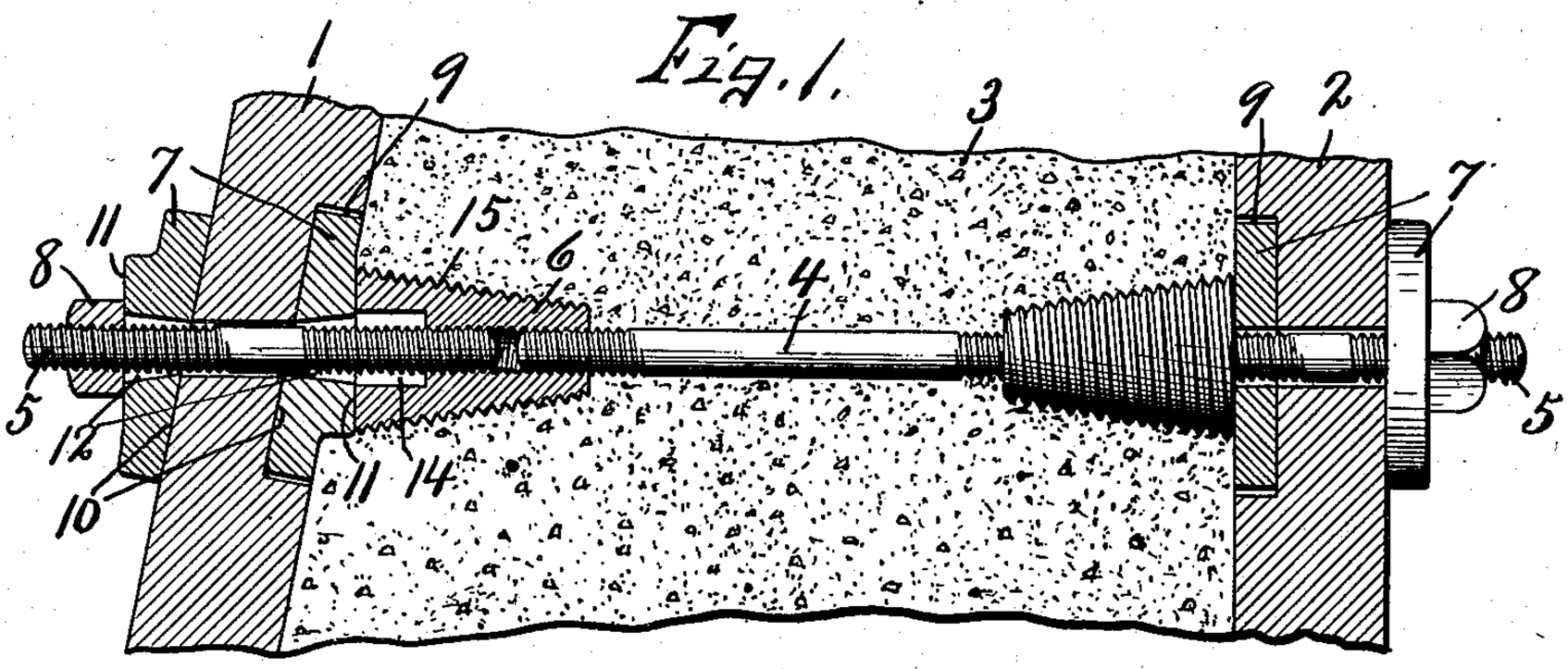

Fig. 2.

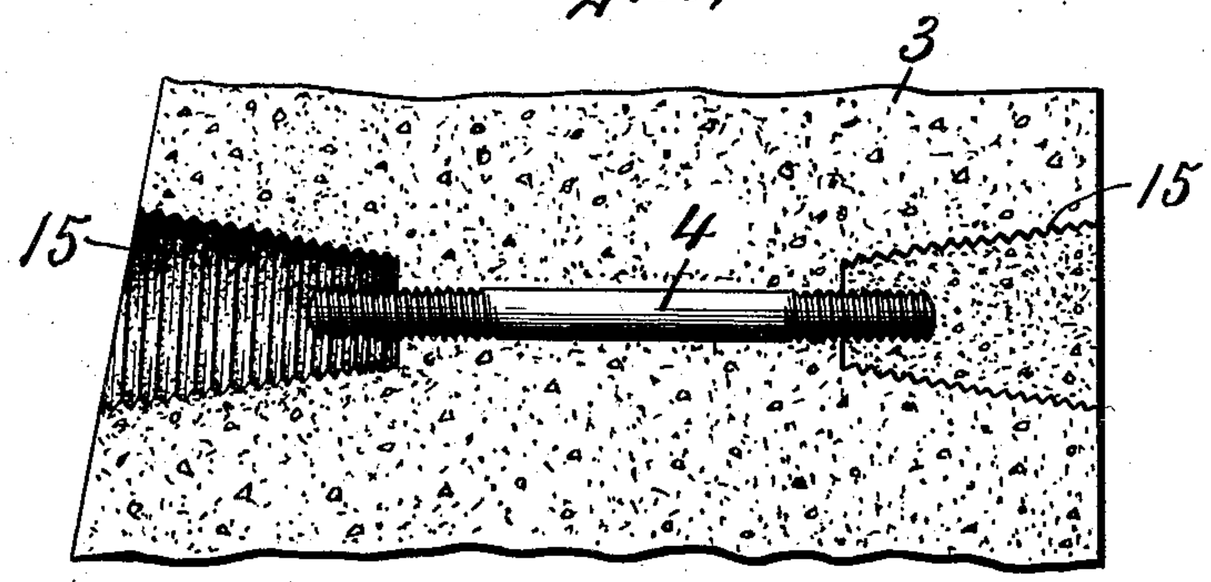

Fig. 3.

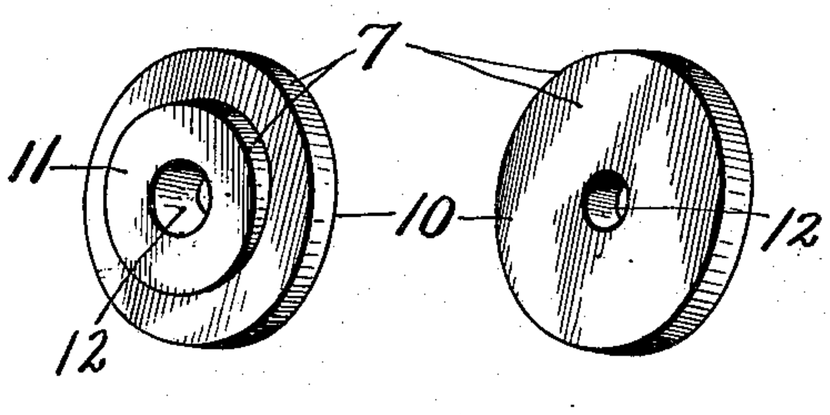

Fig. 4.

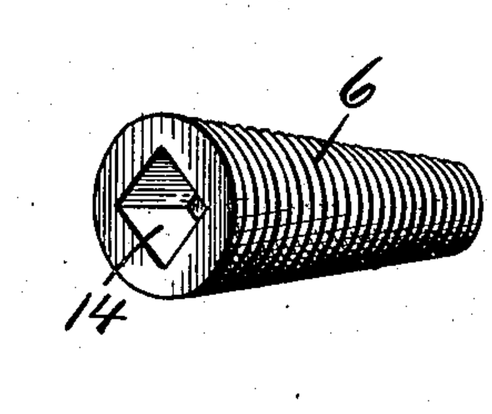

Fig. 5.

Witnesses.
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UNITED STATES PATENT OFFICE.

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MANUFACTURE OF CONCRETE WALLS.

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Application filed May 16, 1908. Serial No. 433,329.

To all whom it may concern:

Be it known that I, CHARLES C. McCARTY, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in the Manufacture of Concrete Walls, of which the following, taken in connection with the accompanying drawings, is a full, clear and exact description.

This invention relates to certain improvements in the manufacture of concrete walls, such as piers, abutments, retaining walls and similar concrete structures having either vertical or battered sides.

The concrete walls are usually constructed in suitable forms of wood or equivalent material which are removed when the concrete is sufficiently hardened or set to be self-sustaining. These walls are often built to a considerable height or vertical depth and it, therefore, becomes necessary to hold the forms rigidly in place against inward compression as well as against spreading in order that the finished concrete may assume the designed form.

My main object, therefore, is to provide means whereby opposite sides of the form may be speedily and economically connected in such manner as to tie and brace them against inward compression and also against spreading and at the same time to enable the forms to be readily removed when the concrete is set, leaving a very small part of the tie and brace connections permanently embedded in the finished concrete wall, the majority of such connections being removed with the forms.

Another object is to provide each connection with one or more removable conical bushings threaded interiorly to receive the tie rods and also threaded exteriorly at the same pitch to form serrations in the concrete sockets made thereby, so that when the conical bushings are removed and the sockets filled with concrete, such concrete will be held in place by the threaded or serrated walls of the socket.

A further object is to provide brace collars or bearings engaging the inner and outer faces of one of the forms and surrounding the adjacent portion of the tie rod and provided with bearing faces disposed at any suitable angle with their axes to conform to the batter or vertical incline of the adjacent form or side of the wall to be constructed.

Other objects and uses will be brought out in the following description.

In the drawings—Figure 1 is a longitudinal sectional view of a portion of an upright wall, such as a pier or retaining wall showing portions of the wood forms in place and my improved tie and brace connections between the forms and extending through the concrete, one of the sides of the form and adjacent side of the walls being shown as battered or inclined from a vertical position while the other side is shown as disposed in a vertical plane. Fig. 2 is a sectional view of the finished concrete showing the forms and greater portion of the connection as removed leaving a single tie rod embedded and showing one of the sockets formed by the conical bushing as filled with concrete. Figs. 3, 4 and 5 are perspective views respectively of the outer and inner bearing plates or washers and adjacent conical bushing seen at the left of Fig. 1.

In carrying out the objects stated, a suitable form composed of opposite side pieces —1— and —2— spaced a predetermined distance apart is erected to receive between them a concrete filling or wall —3— of predetermined form corresponding to the form of the intervening spaces of the side pieces —1— and —2—. These forms are usually spaced a considerable distance apart as in the manufacture of concrete dams, retaining walls, bridge abutments and similar structures and are also of considerable length thereby necessitating the use of a large number of connections distributed at intervals throughout the area of the sides —1— and —2— of the form and constituting at once braces to hold all portions of the form a uniform distance apart against collapse or endward displacement and also serving to tie the sides of the form against spreading or outward displacement so that when the form is completed with the braces or tie pieces therein prior to the introduction of concrete, it is self-sustaining and rigid at all points throughout its area against collapse or spreading. In order to effectively accomplish this purpose, it becomes necessary to leave some portion of the connections between the sides of the form in the finished

concrete when the forms are removed and one of the essential objects of my present invention is to reduce this portion of the connection which is left in the finished concrete to a minimum and to enable all other portions of the clamp or connection to be readily removed. In order to carry out this object each connection or clamping device connecting the sides —1— and —2— of the form is made up of center and opposite end tie rod sections —4— and —5— which are coaxial and arranged end to end as best shown in Fig. 1, conical bushings —6—, metal bearing plates or washers —7— and clamping nuts —8—, all of which parts except the rods —4— and —5— are made of cast metal or malleable iron, while the rods are preferably made of wrought iron of suitable gage and of sufficient tensile strength to hold the form sections —1— and —2— in fixed relation to each other.

The conical bushings —6— project inwardly from the inner sides —1— and —2— with their smaller ends or apexes facing each other and are threaded interiorly and screwed upon the adjacent threaded ends of the tie rods —4— and —5— which meet inside of the side pieces —1— and —2— of the form, said bushing being also threaded exteriorly for a purpose hereinafter described.

The inner bearing plates or washers —7— are let into suitable recesses —9— in the inner faces of the side pieces —1— and —2— while the outer bearing plates or washers —7— bear against the outer faces of the side pieces —1— and —2— and are held tightly in place by the clamping nuts —8—.

The tie rod sections —4— and —5— are arranged end to end in the same straight line usually in a horizontal position and when it is necessary to incline one or the other of the sides of the form from a vertical position as shown at the left of Fig. 1 to give the desired batter or vertical incline to the adjacent side of the concrete wall —3—, the adjacent pair of bearing plates or washers —7— are similarly inclined in order that they may have a broad flat bearing against the contiguous faces of the side as —1— of the form and in order that the base of the adjacent cone —6— and inner face of the clamping nut —8— may have a flat bearing against the contiguous face of the plate —7—, which plate at the vertically inclined side of the form is formed with inner and outer bearing faces —10— and —11— disposed at an angle with each other and at different angles with the axis of the tie rod which passes therethrough as best seen in Fig. 1, the angle between said faces varying according to the pitch or batter of the wall so that when the adjacent bearing faces of the coacting bearings or washers —7— are brought to the desired pitch or incline the opposite faces will be disposed in substantially vertical parallel planes against which the adjacent ends of the bushing —6— and nut —8— may abut flatwise. These bearing plates are provided with central flaring openings —12— to receive the tie rod —5— and permit a slight tilting adjustment of the plate thereon, one end of the flaring opening being of substantially the same diameter as that of the rod while the other end is somewhat larger.

At the right of Fig. 1, I have shown the side —2— of the form as substantially vertical while the opposite sides of adjacent bearing plates —7— are also vertical or at right angles to the rod —5— which they surround, the purpose of this view being to show that different bearing plates are used for different vertical angles at which the sides of the form may be disposed but in each instance, the inner bearing plate is let into a suitable bore or recess in the adjacent inner side of the form section to afford a broad bearing against the form with a minimum opening in the concrete, it being understood that the bearing plates —7— are of considerably greater diameter or area than that of the adjacent end of the conical bushing —6— which it engages, the boss of each plate used in connection with the batter side of the wall being of substantially the same diameter as the base of the conical bushing.

The inner face of each of the inner plates —7— adjacent to the concrete and surrounding the adjacent ends of the bushings —6— are substantially flush or coincident with the inner faces of the form sections —1— and —2— so that the opening in the adjacent sides of the concrete left by each boss of the plate —7— is comparatively small.

It is now clear that when the concrete is filled in between the sides —1— and —2— of the form, it will surround and envelop the conical bushings —6— and intervening portion of the central tie rod —4— which become embedded in the concrete, the center tie rod —4— remaining permanently in the finished wall while the conical bushings —6— are removable after the sections —1— and —2— of the form have been removed. This removal of the bushings —6— which is accomplished by the application of a suitable wrench to angular sockets —14— in the outer ends thereof leaves the concrete body with a series of conical sockets —15— opening from the outer sides or faces of the concrete. The walls of these sockets, therefore, become threaded or serrated by the exterior threads on the conical bushings and these threads are of substantially the same pitch as those of the interior threads of the rods —4— and —5— so that when the sections —1— and —2— are removed by the removal of the nut —8—, and outer bearing plates —7—, the inner

bearing plates —7— may be removed with the form or separately after which a suitable wrench may be applied to the socket —14— in the end of the bushing by which said bushing may be turned or unscrewed from the concrete leaving the serrated conical socket just previously mentioned.

After the bushing is removed, the socket is filled with additional concrete which is thoroughly worked and pressed thereinto filling the threaded interstices and thereby establishing a permanent or adhering surface which permanently retains the conical concrete filling in place allowing it to be finished up on the outer face coincident with the adjacent face of the wall.

In erecting the sides —1— and —2— of the form, from the foundation up, the bushings —6— are screwed upon the opposite ends of the tie rod sections —4— and are then temporarily held by hand or otherwise in the desired position for the reception of the opposite end tie rod sections —5— which are screwed into the outer ends of the bushings —6— through suitable apertures previously formed in the form sections —1— and —2—, the inner bearing plates or washers —7— being placed upon the inner ends of the end tie rod sections —5— just before screwing them into the outer ends of the bushing —6—, said bushings being adjusted by hand or otherwise by rotating the same upon the rods —4— and —5— until they engage the inner faces of the washers —7— and clamp them firmly against the inner sides of the form sections —1— and —2— within the recesses —9—. After this is done, the outer clamping plates are placed on the outer tie rod sections —5— against the outer sides of the form sections —1— and —2— and the nuts —8— are then screwed upon the outer threaded ends of the rods —5— to tighten the rods against the outer faces of the form sections thereby forcing these form sections firmly against the inner stop plates —7—. Or in other words this may be better explained by stating that the central rods —4— are made considerably shorter than the transverse width of the concrete from face to face but of greater length than the distance between the bushings —6— which are to be screwed thereon thus permitting the rod —4— to be held by hand or otherwise in place while the bushings —6— are adjusted by rotation to give the proper distance between the outer ends of the bushings which determines the transverse width of this portion of the concrete wall after which the end rods —5— may be screwed into the central threaded openings in the bushings and the inner washers —7— placed thereon until they abut against the outer ends of said bushings, with their main portions disposed at the predetermined vertical angle of the wall. Additional form sections —1— and —2— are then placed upon the rods —5— building up from the bottom and thus supporting the rod —4—, bushing —6— and inner bearing plates —7—. When the form sections —1— and —2— are brought firmly against the outer faces of the inner washers —7—, the outer washers —7— are then placed upon the protruding ends of the tie rods —5— and clamped in place by the nuts —8—, this operation being continued in the construction of the form until the latter is completed for the reception of the concrete. The concrete is now filled in between the form sections —1— and —2— entirely surrounding the bushings —6— and center rod —4— and when the concrete is set and seasoned and hardened sufficiently to permit the removal of the form, the nuts —8— and outer washers —7— are first removed by simply unscrewing the nuts —8— and withdrawing the same endwise, after which the rod sections —5— may be unscrewed and removed from the bushings —6—. The form sections —1— and —2— may then be removed from the sides of the concrete and in like manner the inner washers or bearing plates —7— may be similarly removed. When these inner washers and end rods —5— are removed in the manner described, a suitable wrench is inserted in the angular sockets —14— in the outer ends of the bushings —6— and turned in the direction to unscrew said bushings from the concrete, it being understood that owing to the conical shape of said bushings, a slight turn will readily free them from the completed wall leaving the walls of the sockets serrated or threaded. This removal of the bushings —6— frees them from the center rod leaving the latter permanently embedded in the concrete with portions of its threaded ends protruding into the sockets —15— which together with the serrated walls of said sockets affords ample gripping surface for the retention of additional concrete or cement which is filled into the sockets —15— to give the proper finish to the wall —3—.

By making the bushing or nut —6— separate from the tie rod section —5—, the latter may be removed separately from the bushing or inner nut —6— thereby freeing the adjacent section of the form and permitting the latter to be removed upwardly in a comparatively small space as in many places on isolated structures, such as heavy concrete piers, abutments and the like, it would be practically impossible to remove the forms if the tie rod sections —5— were integral with the nut —6— which is embedded in the concrete. Another advantage in making the bushing —6— separate from the tie rod section —5— is that after the tie rod section is removed the nut or

sleeve —6— may be left in the concrete, anchored to the tie rod section —4— and used as an anchorage for another bolt for securing some external fixture which it may be desired to secure to the adjacent side of the completed concrete or these conical bushings may be reversed end for end before the concrete is filled in around the tie rod sections and bushing, leaving the outer end at the inside and the outer internally threaded end exposed to the exterior of the concrete wall for the reception of a bolt by which external fixtures may be secured to the concrete. The separability of the tie rod section —5— from the bushing or inner nut —6— is, therefore, an important feature of my invention and although the conical form of bushing is preferable I do not wish to limit myself to this exact form.

What I claim is:

1. In a tie brace for concrete forms, in combination with one side of the form, two coaxial tie rod sections, one projecting inwardly and the other outwardly through the side of the form, said tie rod sections having their meeting ends threaded, an internally threaded bushing engaging the threaded meeting ends of the tie rods, bearing plates engaging the inner and outer faces of the form and surrounding the outer tie rod, the inner bearing plate engaging the adjacent end of the bushing, and a nut on the outer end of the outer clamping plate.

2. In a tie for concrete forms, a pair of washers engaging the inner and outer faces of one side of the form and provided with central apertures, a tie rod threaded at both ends and passed through said side of the form and apertures in the washers, and nuts engaging the inner and outer ends of said tie rod and clamping said plates against opposite faces of the form, and an additional threaded tie rod screwed into the inner end of the inner nut and adapted to be embedded in the concrete.

3. In a tie for concrete forms, a pair of washers engaging the inner and outer faces of one side of the form and provided with central apertures, a tie rod threaded at both ends and passed through said side of the form and apertures in the washers, and nuts engaging the inner and outer ends of said tie rod and clamping said plates against opposite faces of the form, and an additional threaded tie rod screwed into the inner end of the inner nut and adapted to be embedded in the concrete, each of said washers having its opposite faces disposed at an angle to each other.

4. In the manufacture of concrete walls, the combination with the opposite sides of a form spaced apart for receiving a body of concrete between them, a tie rod section secured to one side of the form and extending partially across the intervening space toward the other side of the form and provided with a threaded end, an internally threaded bushing screwed upon and extending beyond said threaded end, a separate threaded tie rod section screwed into the outer end of the bushing and extending through the adjacent side of the form, and a nut engaging the outer threaded end of the additional tie rod section.

5. In the manufacture of concrete walls, in combination with the side of a form, a tie rod section extending through and beyond the inner and outer faces of said side, an internally threaded nut screwed upon and extending inwardly beyond the inner threaded end of the tie rod section, an additional tie rod section screwed into the inner end of the bushing, and a nut screwed upon the outer end of the first named tie rod section.

6. In the manufacture of concrete walls, a tie rod section having opposite threaded ends, internally threaded nuts screwed upon and extending beyond the threaded ends of the tie rod section, an additional tie rod section screwed into the outer end of one of the nuts and separable therefrom, and a nut screwed upon the outer end of the additional tie rod section.

In witness whereof I have hereunto set my hand this 12th day of May 1908.

CHARLES C. McCARTY.

Witnesses:
MILDRED M. NOTT,
C. M. McCORMACK.