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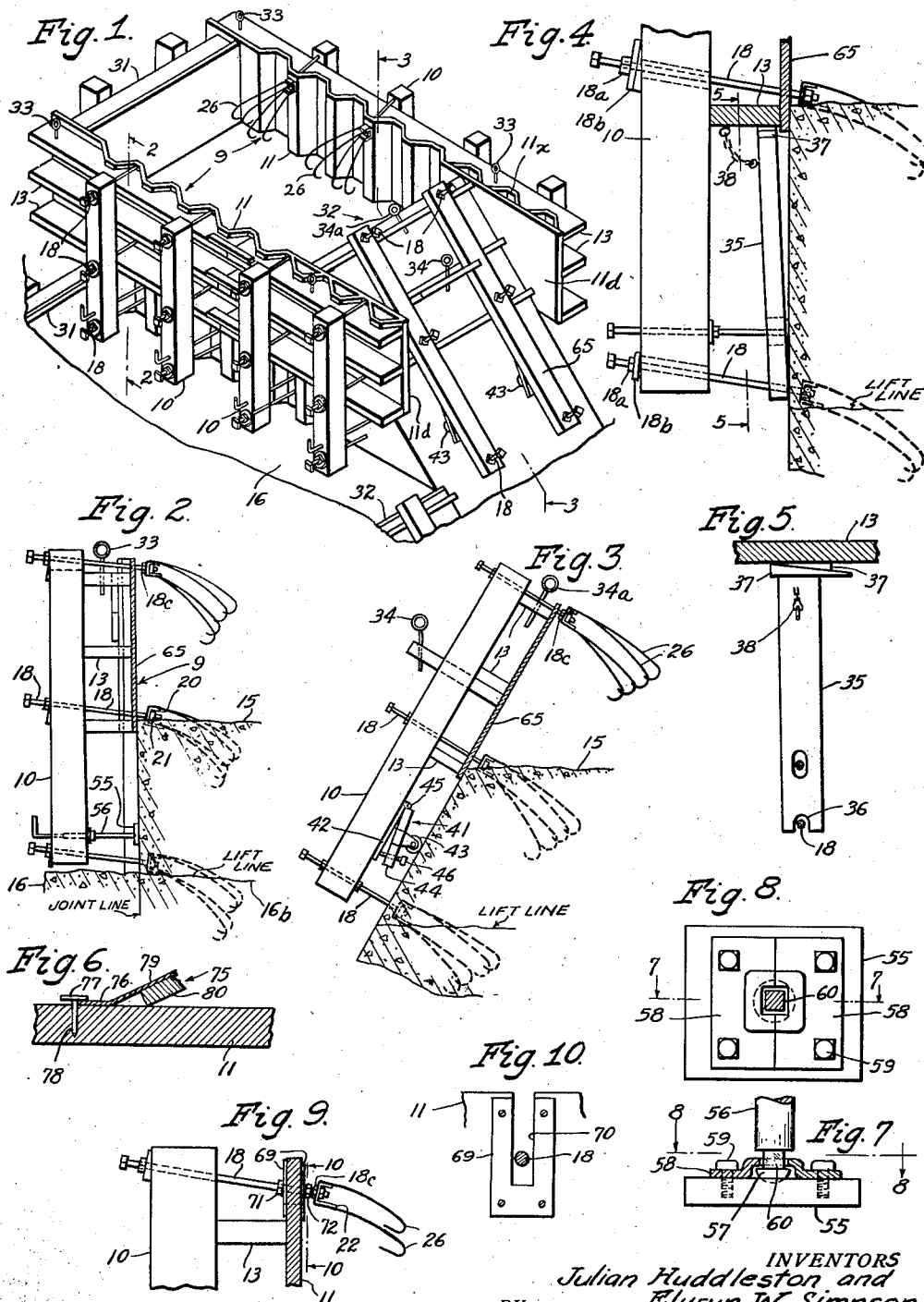
J. HUDDLESTON ET AL

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CONCRETE FORM STRUCTURE

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2 Sheets-Sheet 1



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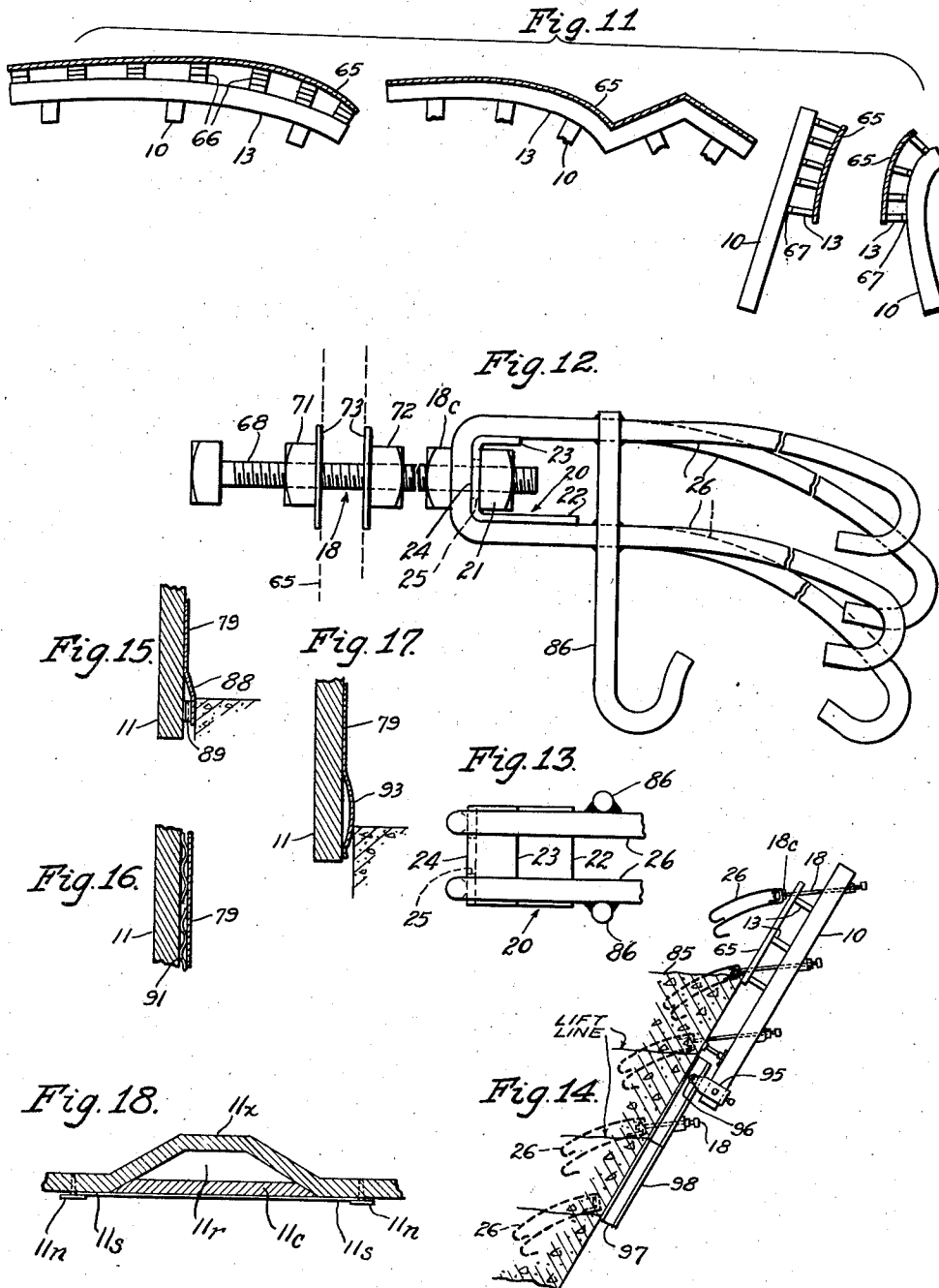
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CONCRETE-FORM STRUCTURE

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This invention relates to a new structure of concrete forms.

Among the objects of the invention are to provide a concrete form structure, which after erection, will be capable of greater latitude of adjustment, such an adjustment being capable of accomplishment in a much easier and more speedy manner than has heretofore been possible; to provide a more convenient means for securing the forms to the concrete structure during the erection of the latter; to provide a more secure, dependable concrete form structure so as to assure a better alinement of the finished concrete product; to provide means whereby, even if a sudden inpouring of the plastic concrete should deflect the form, said form may be forced back to a proper position; to provide forms usable without the addition of any braces after the initial lift or basal part of the concrete has been formed, thereby facilitating the installation of materials embedded in the concrete, such as pipes, water seals, reinforcing steel, structural steel, etc. This latter feature provides a clear unobstructed form surface to which form linings, both absorptive and/or non absorptive, changeable or non changeable may be applied with ease and economy; and minimizes cutting and fitting of the linings, which cutting and fitting impairs the results desired to be produced by the lining.

Another object of the invention is to provide an improved means of attaching auxiliary forms to the main form, said auxiliary forms serving the purpose of making depressions or key-ways or blocking out projections in the completed concrete structure. The advantages of this feature are, ease of application, ease of removal and the reusability of the auxiliary form structure.

A more specific object is to provide for the form an improved anchor structure which is partially, or in some cases fully, embedded in the poured-in concrete.

Still another object of the invention is to provide means for accurately adjusting individual panels of the form as to their proper grade or elevation preparatory to alining fastening devices carried by the panels with anchors in the cement to which the panels are secured by means of said fastening devices.

The invention also provides for the workmen a clear working space and saves the cost of placement of concrete along and near the face of the forms, and eliminates the faulty placement known to occur in other types of forms and with other types of anchors.

Other objects, advantages and features of invention will hereinafter appear.

Referring to the accompanying drawings, which illustrate what is at present deemed to be a preferred embodiment of the invention,

Fig. 1 is a perspective view of a complete form

embodying the invention as used in conjunction with the erection of a concrete pier or dam.

Fig. 2 is a vertical cross section of a side portion of the structure shown in Fig. 1, the plane of section being indicated by the line 2—2 on the latter view. In this view sectioned concrete is shown, together with a body of concrete which represents the lower section of a side portion of the dam.

Fig. 3 is a vertical section through an inclined face portion of the dam, the plane of section, as to the form, being indicated by the line 3—3 on Fig. 1.

Fig. 4 is a sectional detail of the lower portion of one of the panels together with means for adjusting said panel to the proper height preparatory to anchoring it in place.

Fig. 5 is a section on line 5—5 of Fig. 4, parts being omitted.

Fig. 6 is a side elevation of a fragment of one of the panels showing a detachable key member fastened thereto.

Fig. 7 is a detail showing in side elevation the basal portion of the jack shown in the lower portion of Fig. 2.

Fig. 8 is a transverse section on line 8—8 of Fig. 7.

Fig. 9 is a fragmental side elevation showing the upper portion of one of the panels provided with means for anchoring it to the concrete in a variety of angular positions.

Fig. 10 is a section taken on line 10—10 of Fig. 9, looking from right to left of the latter view.

Fig. 11 illustrates, in a group of elevational details, means for varying the surface contour of the panels to vary the shape of the surface of the concrete body.

Fig. 12 is an elevational broken detail illustrating the construction of one of the anchor members.

Fig. 13 is a plan view of Fig. 12 with parts removed.

Fig. 14 is a sectional view illustrating attachment of one of the panels to overhanging walls.

Figs. 15, 16 and 17 are sectional details illustrating various means for spacing the lining from the lagging in order to contour said lining to irregularities in the face of the concrete structure.

Fig. 18 is a sectional detail illustrating means for obliterating any depression in a main form in order to avoid forming the projecting part in the concrete body that would otherwise result.

Referring in detail to the drawings, the main parts of the side panels 9 of the form are the series of upright studs 10, and lagging 11, said lagging being provided with a series of vertically spaced apart horizontal ribs 13, these ribs bridging the space between the lagging and studs. These three parts of the side panel structures

are securely fastened to each other by any suitable well known fastening devices.

In Figs. 2 and 3 is shown a concrete body 15 which represents a section of a dam being built. Also in Fig. 2 is shown a concrete body portion 16 which forms what is known as "the low block" of the dam. The panel 9 of Fig. 2 as a whole is shown secured to the concrete by anchor members each of which comprises a headed rod 18 which extends through a stud 10, through the space between said stud and lagging, and also projects through the lagging into the space occupied by the concrete. This projecting portion of said rod extends into an angular anchor plate 20 and is screwed into a nut 21 with which cooperates a jamb nut 18c. Each rod 18 is screw-threaded at least throughout its end portions. Retaining nuts 18a are shown cooperating with washers 18b to retain the anchors in adjusted positions. The heads of the rods may consist of nuts welded on after the screw threads have been formed. Said nut 21, or other internally screwthreaded means, may be welded in place.

Said anchor plate 20 is shown bent into a rectangular U having at one side a long limb 22 (Fig. 12) and at the other side a shorter limb 23, these limbs being united by a base 24 which has through it an opening of greater diameter than the rod or bolt 18 in order to provide around the latter a clearance so that the rod may readily be screwed into the nut 21 notwithstanding slight variations in the position of the nut. Said anchor plate 20 acts as a nut retainer, and the object of providing it with the long limb 22 is to distribute over a larger area of concrete the vertical stresses set up by the eccentric pull of the anchor rods in relation to the rods or bolts which screw into the nuts. This anchor means, with the loose nut, is easier to put in place than any type of solid anchorage.

To each of said anchor plates 20 is secured a plurality of anchor rods 26 which are hooked, or looped, or otherwise shaped and may be variously arranged in order to insure a firm anchorage in the concrete.

In addition to the side panels 9 shown in Fig. 1 the form structure includes a panel 31 to define the up-stream face of the dam, and a panel 32 to define the downstream face of the dam. Said panels 31 and 32 are modified in form to suit the desired finished surface of the positions of the dam which they engage. All of the four panels shown are from time to time hoisted to higher levels as the building up of the concrete dam, or other concrete structure proceeds. In Figs. 2 and 3 the hoisting connections are indicated at 33, 34 and 34a, the latter connection being intended for use in applying upward traction in an inclined direction to the panel 32.

Means are provided for accurately adjusting the individual panels, or batteries of panels, as to their proper positions preparatory to aligning the fastening devices carried by the panels with the angular anchor plates already mentioned, while said plates are positioned in the space to be occupied by the concrete. For this purpose struts 35 are provided each of these desirably having in its lower end a notch 36 to receive one of the anchor rods 18 close to the cement body from which it projects, thus, by abutting the upper end of said strut against a rib 13 of the panel to support the latter. One or more wedges 37 may be driven in between the top of the strut and the lower side of said rib accurately to adjust the panel vertically in order that an upper row of its rods 18

may be aligned with the openings 24 of the next higher anchor plates to be brought into use. A chain 38 or other fastening may secure the strut to the form.

In order to overcome friction and to clear the concrete in hoisting, an adjustable dolly 41 is used, said dolly comprising a base 42 attached to one of the studs 10, a wheel 43, frame 44 and hinge or pivot 45 whereby one end of said frame is hinged to said base. Also said dolly includes an adjusting jack bolt 46 whereby the free end portion of said frame is maintained outswung from the base the desired distance.

In Fig. 14 is illustrated the anchoring of one of the panels to an overhanging wall 85 such as is encountered in multiple arch dams and other overhanging structures. The superior anchor means provided by the invention is particularly serviceable in such situations. The various parts of the form structure being the same as those already described they are lettered in the same way and will readily be understood without additional description, except that there is shown attached to a stud 10, a special dolly 95 having a wheel 96. An I-rail 97 is shown secured to the face of the overhanging wall 85, and said wheel 96 of said dolly travels along the inner side of the flange 98 of said rail. If preferred, the rail structure 97 may consist of two channel irons secured together back to back.

Preparatory to putting the panels into use the bottom lift 165 of the concrete may be formed by any well known method, the lower anchor 18 being partially embedded in this lift of concrete. After the forms used in constructing this bottom lift have been removed then the panel 9 is put in place and is attached to the lower anchor. Any conventional bracing means is then applied to the panel to maintain it in its desired position. On the next lift no such bracing means is required, but the form is held in position by the use of the next higher anchor, the bottom anchor and/or jack.

In Figs. 2, 7 and 8 is shown a preferred form of jack to be used for forcing the panels into properly spaced relations to the concrete and maintaining them so positioned. A conventional less expensive form of jack may, however, be satisfactorily used in many situations. The jack shown in Figs. 7 and 8 comprises a base plate 55, a threaded shaft 56, a ball-and-socket joint 57 between these two members and a split retainer plate 58 secured to said base plate by screws 59, or otherwise. The ball portion 57 can be of the same diameter as the shaft 56, or may be made less in diameter, a neck 60 being formed between said ball and shaft. The object of using the split detachable plate 58 is to make it possible to repair or replace parts of the jack without removing the panels from their positions.

The various panels of the structure may be built to conform to various curved and angular or "warped" surfaces, as shown in Fig. 11. When the panels are so used it is necessary either to twist the panel to provide a supplementary lining bed member 65 which may be made adjustable by using shims or wedges 66 placed between said member and the ribs 13; or by the use of shims or wedges 67 between the ribs 13 and the studs 10.

Whenever it is necessary to provide for adjusting the height for setting the anchor means a larger section of threading 68 is used (see Figs. 9, 10 and 12) on the anchor rods, and a slotted plate 69 is attached to one or both sides of the

form, the slot 70 of said plate allowing a swinging adjustment of the rod which passes there-through, and nuts 71 and 72 abutting washers 73 are provided to rigidly hold each anchor in its adjusted position. It is to be understood that the panel will be suitably slotted to admit the bolt.

In Fig. 6 is illustrated an auxiliary form fragment 75 to form keys or depressions in the concrete, said key being attachable to the panels by means of sheet metal foot portions 76 which are designed to underlie side portions of the broad heads 77 of nails 78. These sheet metal foot portions may be made as part of a sheet metal cover member 79 which overlies a wooden part 80. When said keys are to be removed it is not necessary to pull out the nails 78, but the said foot portions can be sprung out from under the nail heads. If desired these forms may be made with sheet metal faces backed by metal instead of wood.

In order to provide a still more secure anchorage for tackle, auxiliary hooked rods 86, one which is shown in Fig. 12 welded to the rods 26, may be added where desired, and directed laterally from the main anchor rods.

In Fig. 15 a sheet metal or other covering is shown with edge portion 88 which is held in an outsprung position by means of cork or other spacers 89 interposed between it and the lagging. In Fig. 16 a larger area of the sheet metal 79 is held spaced away from the lagging by means of marcel springs 91. In Fig. 17 the sheet metal is shown having an outswelled part 93. The various outwardly positioned sheet metal or other covering shown in these three views all aid in conforming portions of the sheet metal or other covering to varied surfaces of concrete.

As the various panels are hoisted to higher levels, the wheel 43 of each dolly 41 prevents marring the previously poured concrete, or the face of the form or any lining attached thereto.

It will be seen that the various bolts 18 are sloped as shown with their anchored ends directed downwardly so as to anchor the bottom of the studs 10 and to clear the adjacent block of concrete as the building of the wall or other structure proceeds. In practice the efficiency of this feature is increased by reason of the anchor rods 26 being inclined at downward angles in relation to the rods 18 and also having their hooks directed downwardly. After the work has proceeded to the extent shown in Fig. 3, the form unit shown in this view will be self-supporting in cantilever fashion.

In Fig. 18 is shown a fragment of a form having a lagging member 11a correspondingly lettered in the right hand portion of Fig. 1. In Fig. 18 the recess 11r within said member is obliterated by means of a cover member 11c having sheet metal edge portions 11s (like the part 76 in Fig. 6) with which cooperate nails 11n that hold the cover in place. In Fig. 1 a larger cover member 11d is shown at each side of the form overlying a plurality of the trough shaped recesses that would otherwise be exposed.

We claim:

1. In a concrete form structure, a panel having a face portion adapted to contact and shape concrete poured into the form, said panel having a

portion extending downwardly below said face portion spaced laterally from said surface portion to provide a space between said downwardly extending portion and the concrete when poured, a dolly carried by said downwardly extending portion of said panel and occupying the space between said last mentioned portion and the concrete, said dolly carrying a rotatable wheel which is positioned to travel upon the face of the poured concrete, and means to hoist said panel in a step-by-step manner as the concrete hardens.

2. A concrete form as defined in claim 1 wherein said dolly is provided with means for forcibly varying the distance between said wheel and the portion of the panel to which the dolly is attached.

3. An anchor for embedding in a concrete body having progressively added to it plastic concrete to increase its height, said anchor consisting of a body portion carrying a screw-threaded means to receive an anchor bolt carried by a form, and anchor rods secured to said body portion and projecting therefrom in a direction for being embedded in the concrete, said rods diverging from each other and having hooked terminal portions.

4. An anchor for embedding in a concrete body having progressively added to it plastic concrete to increase its height, said anchor consisting of an angularly bent plate to which anchor rods are secured, said plate having through it an opening, a bolt projecting through said opening, and a nut located within a space between parts of said bent plate, said bolt screwing into said nut, parts of said bent plate adapted to rest upon the concrete in a flatwise manner.

5. An anchor as defined in claim 4 wherein a material clearance is provided around said bolt where it passes through said hole to provide for adjusting said bolt.

6. In a form structure of the kind described, the combination with a panel which forms a part of said structure and an anchor member embeddable in a cement body; of a strut or supporting member the lower end of which is supportable upon said anchor member, and wedge means insertable between the upper end of said member and a part of said panel to support the latter accurately in adjusted position, preparatory to pouring an additional mass of concrete.

7. In a concrete form structure, an anchor for embedding in a concrete body having progressively added to it plastic concrete to increase its height, said anchor consisting of a body portion having a group of main anchor rods or arms to extend into the concrete, and an auxiliary anchor arm secured to and extending laterally from said main anchor arms.

8. In a form structure of the kind described, the combination, with a panel which forms a part of said structure; of a stiff sheet lining secured to said panel, and spacer means insertable between said panel and lining so that said lining will fit snugly to any irregularities in the face of the previously poured concrete, thus eliminating the leakage of grout and/or other concrete aggregates.

9. The subject matter of claim 8 and, said spacer means including a marcel spring.

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