

July 25, 1950

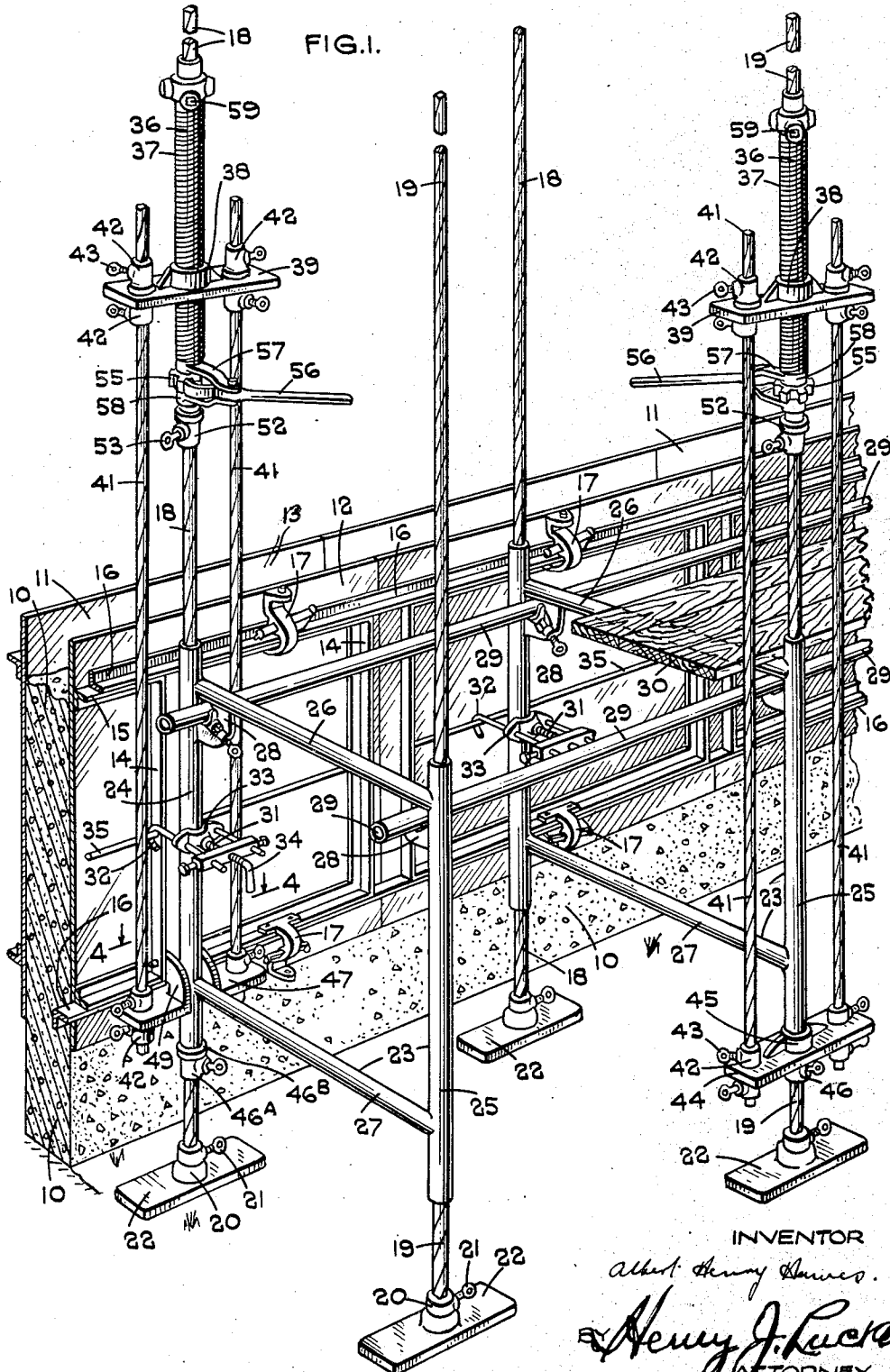
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2,516,318

MEANS FOR SUPPORTING AND ADJUSTING MOVABLE SHUTTERING
FOR USE IN THE CONSTRUCTION OF WALLS OR THE
LIKE FROM CONCRETE OR SIMILAR MATERIAL

Filed Sept. 26, 1946

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

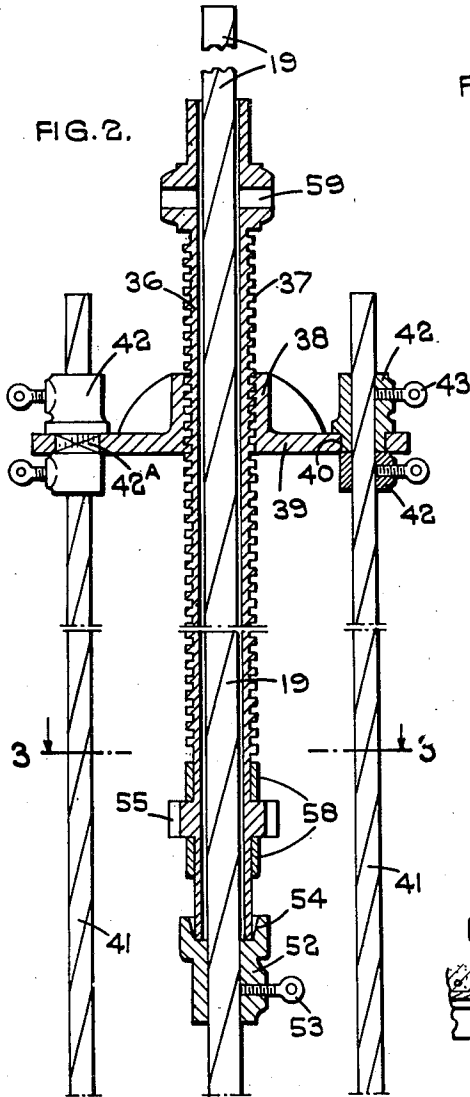


FIG. 2.A

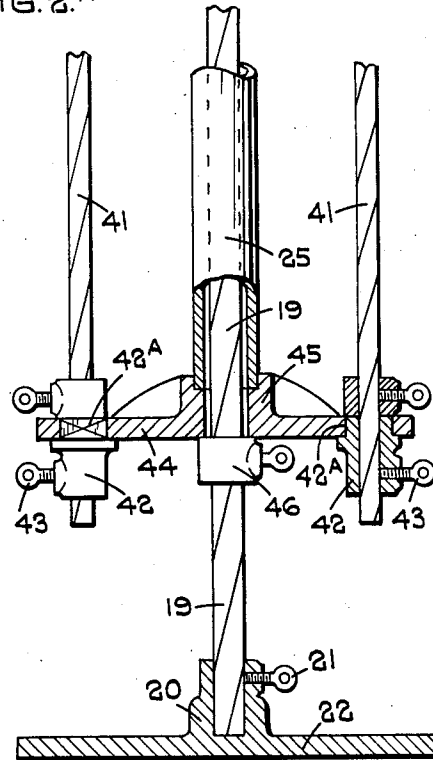


FIG. 4.

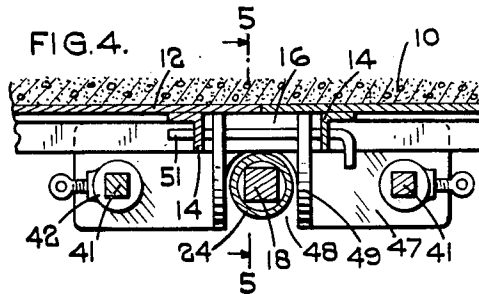


FIG. 3.

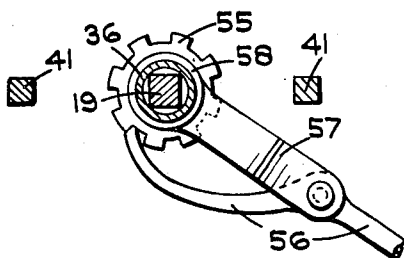
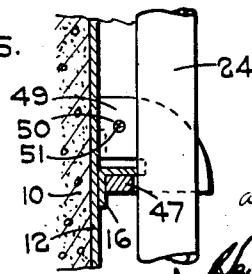


FIG. 5.



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UNITED STATES PATENT OFFICE

2,516,318

MEANS FOR SUPPORTING AND ADJUSTING
MOVABLE SHUTTERING FOR USE IN THE
CONSTRUCTION OF WALLS OR THE LIKE
FROM CONCRETE OR SIMILAR MATERIAL

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3 Claims. (Cl. 25—131)

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When a wall or like structure of substantial height is to be moulded in concrete or similar material which is confined during setting by removable shuttering plates or members, it is a known procedure to effect successive pourings of the plastic material and at the same time to raise the shuttering bodily so that its upper edge maintains a substantially constant relationship to the upper surface of the cast material, the shuttering used being of such a height that the cast material progressively uncovered by its lower edge has had time to solidify.

The present invention is concerned with the supporting and adjustment of shuttering members for use in the continuous moulding of walls or like structures as above described; that is to say, the progressive elevation of such members, each in its own plane, as casting of the concrete or similar material proceeds, this progressive elevation, of course, permitting the use of a shuttering assembly whose height is only a fraction of that of the wall to be produced.

The present invention relates to a new or improved means for supporting and adjusting the shuttering members as aforesaid, which is hereinafter referred to as shuttering supporting and adjusting means of the kind specified.

In moulding the walls of a building by the continuous method aforesaid, it has been the practice hitherto to pour the plastic material between internal and external shuttering built of wood, the two shuttering assemblies being bolted to substantial vertical wooden members connected above the shuttering by transverse beams, and the various bridge structures thus formed being braced together so as to be self-supporting. Metal rods are set vertically within the moulding cavity, one beneath each of the transverse beams, and further rods are connected end-to-end with these to produce a series of sectional columns, each extending through a hollow vertical jack-screw rotatably mounted in or on the adjacent transverse beam. The lower end of each jack-screw carries toggle-action grippers which engage the columns when the jack-screws are screwed downwardly, so that, by simultaneous operation of all the jacks, the bridge structures, which may carry a decking covering the whole area of the building, may be raised bodily in relation to the columns as pouring proceeds, carrying with them the shuttering. When the shuttering has been raised to the full extent permitted by the jack-screws, the latter are retracted either singly or in groups, and as each obtains a fresh grip on its column (which may

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be lengthened as requisite), it is again actuated to raise the associated shuttering members, the movements of the various jacks being carefully co-ordinated so that the upper edges of the shuttering are maintained in substantially the same horizontal plane throughout the whole moulding operation.

It will be appreciated that to lift shuttering extending around the whole perimeter of a building by this method involves a very large number of jacks and workmen to operate them, together with a complicated and bulky structure which it is not economical to erect unless the height of wall to be cast is at least thirty feet.

A further disadvantage of this hitherto known continuous method, is that the metal rods which are set vertically within the moulding cavity are necessarily left within the concrete or like material so that they cannot again be used and are consequently wasted and owing to the fact that with such a method the maximum number of rods are required near the corners of the building, the rods are not disposed at the proper positions for reinforcing the concrete such reinforcements being required at positions remote from the corners and consequently the rods are of little value as reinforcements for the concrete. The amount of metal rod wasted in this way is considerable and adds materially to the cost of the building.

For smaller heights of wall it has been usual hitherto to employ stationary shuttering which is built up as casting proceeds.

In the specification of U. S. A. Patent No. 2,396,174 filed by myself there is described improved shuttering for use in the construction of walls or the like from concrete or similar material, such shuttering comprising a plurality of rectangular metal or wooden plates adapted to be assembled together in edge-to-edge relationship to form a panel, reinforcing strips provided on the outer face of each plate adjacent to, but spaced inwardly of, two opposed edges thereof, and extending parallel to such edges, bars adapted to extend along the panel aforesaid to align a longitudinal row of plates and means provided on the plates for forcing these aligner bars into simultaneous engagement with the outer faces of the plates and the sides of the reinforcing strips.

The present invention is particularly applicable to the supporting and adjusting of such shuttering although its application is not limited thereto.

One of the objects of the present invention is

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to provide an improved means for supporting and adjusting movable shuttering for use in the construction of walls or the like from concrete or similar material.

A further object of the present invention is to provide new or improved means for supporting and adjusting movable shuttering as is described in the prior specification aforesaid.

Further objects of the invention will become apparent from the following description and in the drawings accompanying, of which:

Figure 1 is a perspective view showing a portion of a wall of a building in course of construction and depicting a portion of the means for supporting or adjusting shuttering constructed as described in the said prior specification.

Figures 2 and 2A are side elevations showing the upper and lower parts respectively of one of the columns for supporting the shuttering in the arrangement shown in Figure 1.

Figure 3 is a sectional view on the lines 3—3 of Figure 2.

Figure 4 is a sectional view on the lines 4—4 of Figure 1.

Figure 5 is a sectional view on the lines 5—5 of Figure 4.

In the drawings the invention is shown applied to the construction of an ordinary cast concrete wall of a building, such wall being depicted generally at 10 and the wall is moulded between two sets of shuttering plates of which the inner set 11 is depicted only in outline for the sake of clarity, the outer set 12 being shown in a more detailed manner.

The shuttering plates are constructed as described in the specification of Patent No. 2,396,174 aforesaid and comprise rectangular metal plates 13 which are assembled together in vertical edge-to-edge relationship to form a horizontally extending panel, vertical and horizontal reinforcing strips 14, 15 being provided on the face of each plate remote from the wall adjacent to but spaced inwardly of the edges of the plate and extending parallel to such edges, horizontal aligner bars 16 being provided adapted to extend along the horizontal panel aforesaid to align a longitudinal row of plates and wedge clamping means indicated generally at 17 being provided for forcing these aligner bars into simultaneous engagement with the adjacent faces of the plates and the sides of the horizontal reinforcing strips 15.

Such wedge clamping means are described particularly in the specification of my prior patent application No. 674,216 now abandoned.

For supporting and adjusting shuttering constructed as so described I provide improved means for supporting both the inner and the outer row of shuttering plates but for clarity the means for supporting the outer row of plates 12 are only depicted in the drawings, the means for supporting the inner row 11 not shown being identical with that for supporting the outer row.

Such means comprise inner and outer rows of vertical columns, the term inner row herein employed denoting the row of columns which is nearest to the wall and the term outer row meaning the columns which are more remote from the wall.

The inner and outer rows comprise vertical steel or other metal bars 18 and 19 respectively, which bars are of rectangular, triangular or other polygonal section which has been helically twisted so as to produce thereon in effecting a multi start screw thread having a very large pitch in relation to its diameter.

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Such a bar is described more particularly in the specification of my prior patent application No. 627,002.

The bars which constitute the columns are preferably spaced apart in each row by a distance of six feet and the two rows are spaced by a distance which may be approximately four feet with each outer column directly opposite an inner column.

The lower end of each column engages within a socket member 20 having an internal formation of corresponding shape to that of the column, the socket member being provided with a locking screw 21 and being secured to a foot plate 22 which engages with the ground.

Oppositely disposed inner and outer columns are maintained in parallel relationship by means of scaffold frame units indicated generally at 23 and each comprising two vertical tubular members 24, 25 slidably mounted on the inner and outer columns respectively and rigidly and permanently connected together by vertically spaced upper and lower horizontal members 26, 27 respectively, each frame unit adjacent the junction of its vertical members with the upper horizontal member having clamping devices 28 secured permanently thereto by which are secured to the frame units transverse ledger members 29 which serve to secure adjacent frame units together and hence to secure in the correct relative relationship the inner and outer columns in each row.

Such frame units 23 forming the subject of my co-pending patent application, Ser. No. 696,081 filed September 11, 1946, now U. S. Patent No. 2,472,423, in the specification of which they are fully described.

The frame units 23 and ledgers 29 collectively provide a rigid staging extending along the wall for the full length thereof and where the wall extends continuously around a building the staging similarly extends therearound, the whole staging being capable of being slidden vertically bodily up or down the vertical columns 18, 19 aforesaid.

The upper horizontal members 26 of each frame unit serve to support a working platform formed of battens 30 laid side by side and end to end. For clarity only a portion of such battens are shown in the drawing but it will be understood that they will in fact cover the entire space between the inner and outer rows of columns.

The shuttering plates are all supported rigidly from the frame units 23 by providing the inner vertical members 24 of such units with tie-clamps 31 including a pair of horizontally spaced hooks 32 secured to a clamping plate 33 which is held in clamping engagement with the member 24 by means of the clamping screw 34 and the said hooks engage with horizontally extending tie-rods 35 which extend along the row 12 of shuttering plates and pass through openings in the vertical reinforcing strips thereof 14.

The columns 18 and 19 aforesaid are of a length several feet greater than the vertical depth of the shuttering plates so that when the latter are adjacent to the ground as shown in the drawing the columns project appreciably above the plates and on the projecting parts of some of these columns are slidably mounted hollow tubular jack-screws 36.

Conveniently such jack-screws are provided on alternate columns in each row but so arranged that they are not opposite to each other, i. e. one jack-screw is provided at a position corresponding to each frame unit although in the case of

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a building two jack-screws may be provided for each frame unit at the corners where additional reinforcement is required.

The form of the jack-screw is shown more particularly in Figure 2 and each has a thread 37 of square form working within a nut 38 secured centrally to a bracket 39 in the form of a rectangular plate opposite ends of which are provided with openings 40 through which extend the upper ends of vertical staging supporting bars 41, a pair of such bars being associated with each jack-screw and these bars are conveniently of the same configuration as that of the columns 18, 19 but of smaller section.

Each staging supporting bar 41 is rigidly secured to its bracket 39 by means of a pair of nuts 42 carrying clamping screws 43 disposed on opposite sides of the bracket, the nuts being threaded to an internal configuration corresponding to that of the bars 41 and the bars extend downwardly parallel to their respective columns on opposite sides thereof.

The lower ends of the supporting bars 41 associated with the outer columns are connected in the same way by a similar pair of nuts 42 to a second rectangular plate-like bracket 44. Rotation of the upper nut 42 of each pair relative to the bracket 39 and of the lower nut of each pair relative to the bracket 44 is positively prevented by providing the same with a squared end 42A which fits within a corresponding opening in the bracket. Thus owing to the helical formation of the bars 39 and nuts 42 relative vertical movement between the brackets 39 and 44 is impossible even if the clamping screws 43 should be loose so that a rigid support is provided for the brackets 44.

Each bracket 44 is provided centrally on its upper side with a cylindrical socket 45 which is shouldered internally at its upper end to receive the lower end of the outer tubular member 25 of the adjacent frame unit 23 and immediately beneath the said bracket and adjustably mounted upon the adjacent column 19 is a clamping nut 46 of a form similar to the nuts 42.

The inner columns 18 which carry jack-screws are provided near their lower ends with internally threaded nuts 46A similar to the nuts 46 but provided with flanges 46B which are recessed internally to receive and engage the lower end of the adjacent vertical member 24 of the frame unit.

The staging supporting bars 41 associated with the inner columns have their lower ends similarly connected to a plate-like bracket 47 which is provided centrally along one of its longer edges with a recess 48 so that the bracket embraces partially the lower end of the adjacent vertical member 24 of the adjacent frame unit and the opposite longer edge of this bracket engages beneath the lower aligner bar 16 of the shuttering plates 12 so that the latter are supported directly by the staging supporting bars 41 from the jack-screw 36, and by the connection of the shuttering plates to the tie-clamp 31 the frame unit adjacent to the said jack-screw is also supported therefrom.

Additional support for the shuttering from the bars 41 is ensured by providing each bracket 47 with a pair of integral ears 49 disposed on each side of the adjacent vertical member 24, which ears extend towards the adjacent shuttering plates above the horizontal reinforcing strips 15 thereof and are provided with openings 50 through which are passed pins 51 which pass

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also through corresponding openings in the vertical reinforcing strips 14 of the shuttering plates.

Each jack-screw is supported on its associated column by providing the latter with a supporting collar 52 having a set screw 53, the collar being shaped internally to correspond with the helically twisted form of the column, the collar being in fact constructed as described in the specification of my pending application No. 627,002.

The collar is flanged at its upper end to receive the lower end of the jack-screw as indicated at 54 and the arrangement has the great advantage that while the collar can readily slide on the column when the set screw is loosened, tightening of the set screw 53 against the column produces, owing to the helical formation of the collar, a highly efficient locking connection.

Thus by means of the jack-screw, the staging supporting bars 41 and their associated brackets, the staging and shuttering is supported from the columns, the outer columns of which are provided with jack-screws serving to support therefrom directly the staging and indirectly the shuttering (by connection of the shuttering to the staging), and the inner columns associated with the jack-screws serving to support therefrom directly the shuttering and indirectly the staging.

Furthermore, owing to the interconnection of the frame units by the ledger members 29 and the interconnection of the shuttering plates by the aligner bars 16 in the event of the support by any one jack-screw being removed, the load is taken from the columns associated with the remaining jack-screws without collapse or distortion of the staging and shuttering occurring, the spacing of the jack-screw carrying columns being sufficiently close as to ensure this.

The columns which are unprovided with jack-screws serve merely to align the frame units, and in the case of the inner columns to align also the shuttering plates.

Each jack-screw is provided near its lower end with a ratchet pinion 55 welded or otherwise rigidly secured thereto and which is engaged by one end of a ratchet lever 56 pivoted intermediate its ends between a pair of arms 57 having integral collars 58 mounted rotatably upon a recessed part of the jack-screw on each side of the pinion, the arrangement being such that on turning the lever 56 in a clockwise direction viewed from above about the axis of the adjacent column, the jack-screw is rotated on its supporting collar 52 causing the nut 38 and associated bracket 39 carried thereby to be traversed upwardly of the column thus raising the associated adjacent shuttering and staging. On turning the lever 56 in the other direction it rides freely over the pinion teeth.

At its upper end each jack-screw is provided with a number of radially disposed sockets 59 adapted to receive a tommy bar for a purpose to be hereinafter described.

In using the invention so far described the various parts already described are so assembled that the shuttering initially rests on or near the ground with the brackets 39 at the lower end of their respective jack-screws and the nuts 46 and nuts 46A in abutment with the under sides of brackets 44 and vertical members 24 respectively.

Both sets of shuttering plates 11 and 12 are supported in this manner and concrete is now poured into the cavity between the shuttering plates to a height of say three feet assuming that the shuttering plates have a vertical depth of four feet.

As soon as the concrete has set partially the

screw-jack operating levers 56 are actuated in turn so as to turn each screw-jack successively by one or two revolutions at a time and thus gradually raise the staging and shuttering until the brackets 39 have travelled along the length of the screw-jack through a distance somewhat less than the height of the previously cast concrete, which distance may be the length of the jack-screw.

The shuttering plates are now in a position for further pouring of the concrete and while this is being carried out the nuts 46 and 46A at the lower ends of the columns are unlocked and raised until they are again in engagement with the lower side of the brackets 44 or lower end of the members 24 respectively, thus securing the staging and shuttering in its new position irrespective of the support provided by the jack-screws.

The jack-screws are now turned in the opposite direction by inserting a tommy bar into one of the sockets 59 so as to displace the jack-screw upwardly in relation to its bracket 39 until the latter is again at the lower end of the threaded part of the jack-screw, i. e. the jack-screw has been raised bodily upwardly in relation to its associated column.

The collars 52 are now raised on their respective columns so as to engage again the lower ends of the jack-screws and support the latter on their columns and the staging and shuttering is now ready for a further elevation as required, the above sequence of operations being repeated until the full height of the wall has been cast, care being taken to see that the various portions of the shuttering assembly are raised evenly so as to maintain the whole structure substantially horizontal during the raising operation.

In the case of a building, all the walls may be cast more or less simultaneously to the same height so that the shuttering associated with each wall would be at approximately the same height above the ground.

To cast the walling of the average two story dwelling house may entail five repetitions of the cycle of operations described.

In the apparatus described the twisted bars forming the columns 18, 19 are made sufficiently long for the height of wall required but if desired, the bars may be made in sections, each section being connected by a spigot and socket joint of rigid construction.

Although the invention has been described as applied to the construction of plain concrete walls it should be understood that it may be applied equally well to the construction of walls embodying pre-cast blocks to which concrete or other suitable facing material is applied by a pouring or casting operation using the shuttering plates aforesaid. Furthermore, in addition to applying the invention to the construction of walls it may be applied to the construction of other vertical structures which are formed from concrete or similar material, for example, columns, projections and other structures.

Furthermore, where the wall is built up from blocks the concrete may be applied on the outer face only, in which event the inner shuttering plates 11 and their associated staging and columns would be omitted.

Where shuttering is provided at both sides of the wall or other structure the inner shuttering 11 may, if desired, be supported from the staging associated with the outer shuttering 12, the staging and columns associated with the inner shuttering 11 and not shown in the drawing being

dispensed with, the upper parts of the shuttering plates at each side of the wall being tied together by suitable connecting members.

What I claim then is:

1. A scaffolding structure for building a wall comprising in combination, two spaced rows of vertical columns, a horizontal platform disposed between and supported from said two rows of columns and extending longitudinally thereof, a row of shuttering adapted to form one face of the wall, said shuttering being disposed wholly to one side of both of said two rows of columns and extending longitudinally thereof, hollow tubular jackscrews mounted rotatably on said columns and adjustable independently of each other axially of said columns, nuts on said jackscrews engaging therewith, means supporting said platform and shuttering from said nuts, said shuttering having its wall forming face directed away from the columns which support it, said shuttering supporting means being disposed between said shuttering and the rows of columns, means for rotating said jackscrews in one direction to raise said nuts and platform and shuttering assembly carried thereby, each of said jackscrew supporting columns comprising a helically twisted polygonal metal bar forming a multi-start screwthread having a very large pitch in relation to its diameter, supporting collars shaped internally to correspond with the helically twisted bars mounted thereon and adapted to engage with the lower end of said jackscrews, set screws on said collars adapted to lock the same to said twisted bars, nuts on said twisted bars shaped internally to correspond with the helically twisted bars, set screws on said nuts adapted to lock the same to said twisted bars, said nuts being adapted when locked to support said staging and shuttering assembly on said columns and means for rotating said jackscrews in the opposite direction relative to the nuts thereon into a position for further raising of said platform and shuttering assembly.

2. A scaffolding structure for building a wall comprising in combination two spaced rows of vertical columns, said columns in one row being disposed opposite to the columns in the other row, a scaffold frame unit mounted slidably for vertical movement on each pair of opposed columns, each of said units comprising a pair of vertical members connected rigidly by a horizontal member, ledger members extending along said rows connecting said units and forming therewith a staging adapted to support a horizontal platform disposed between said two rows of columns and extending longitudinally thereof, a row of shuttering adapted to form one face of the wall, said shuttering being disposed wholly to one side of both of said two rows of columns and extending longitudinally thereof, hollow tubular jackscrews mounted rotatably on said columns and adjustable independently of each other axially of said columns, nuts on said jackscrews engaging therewith, means supporting said frame units and shuttering from said nuts, said shuttering having its wall forming face directed away from the columns which support it, said shuttering supporting means being disposed between said shuttering and the rows of columns, means for rotating said jackscrews in one direction to raise said nuts and staging and shuttering assembly carried thereby, each of said jackscrew columns comprising a helically twisted polygonal metal bar forming a multistart screwthread having a very large pitch in relation to its diam-

eter, supporting collars shaped internally to correspond with the helically twisted bars mounted thereon and adapted to engage with the lower end of said jackscrews, set screws on said collars adapted to lock the same to said twisted bars, nuts on said twisted bars shaped internally to correspond with the helically twisted bars, set screws on said nuts adapted to lock the same to said twisted bars, said nuts being adapted when locked to support said staging and shuttering assembly on said columns and means for rotating said jackscrews in the opposite direction relative to the nuts thereon into a position for further raising of said staging and shuttering assembly.

3. A scaffolding structure for building a wall comprising in combination two spaced rows of vertical columns, a horizontal platform disposed between and supported from said two rows of columns and extending longitudinally thereof, a row of shuttering adapted to form one face of the wall, said shuttering being disposed wholly to one side of both of said two rows of columns and extending longitudinally thereof, hollow tubular jackscrews mounted rotatably on said columns and adjustable independently of each other axially of said columns, nuts on said jackscrews engaging therewith, said nuts supporting each a pair of vertical bars depending therefrom disposed one on each side of the adjacent column, brackets connecting said staging and shuttering assembly to the lower ends of said depending bars, said shuttering having its wall forming face directed away from the columns which support it, means for rotating said jackscrews in one direction to raise said nuts and platform and shuttering assembly carried thereby, each of said

jackscrew supporting columns comprising a helically twisted polygonal metal bar forming a multi-start screwthread having a very large pitch in relation to its diameter, supporting collars shaped internally to correspond with the helically twisted bars mounted thereon and adapted to engage with the lower end of said jackscrews, set screws on said collars adapted to lock the same to said twisted bars, nuts on said twisted bars shaped internally to correspond with the helically twisted bars, set screws on said nuts adapted to lock the same to said twisted bars, said nuts being adapted when locked to support said staging and shuttering assembly on said columns, and means for rotating said jackscrews in the opposite direction relative to the nuts thereon into a position for further raising of said staging and shuttering assembly.

ALBERT HENRY HAWES.

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