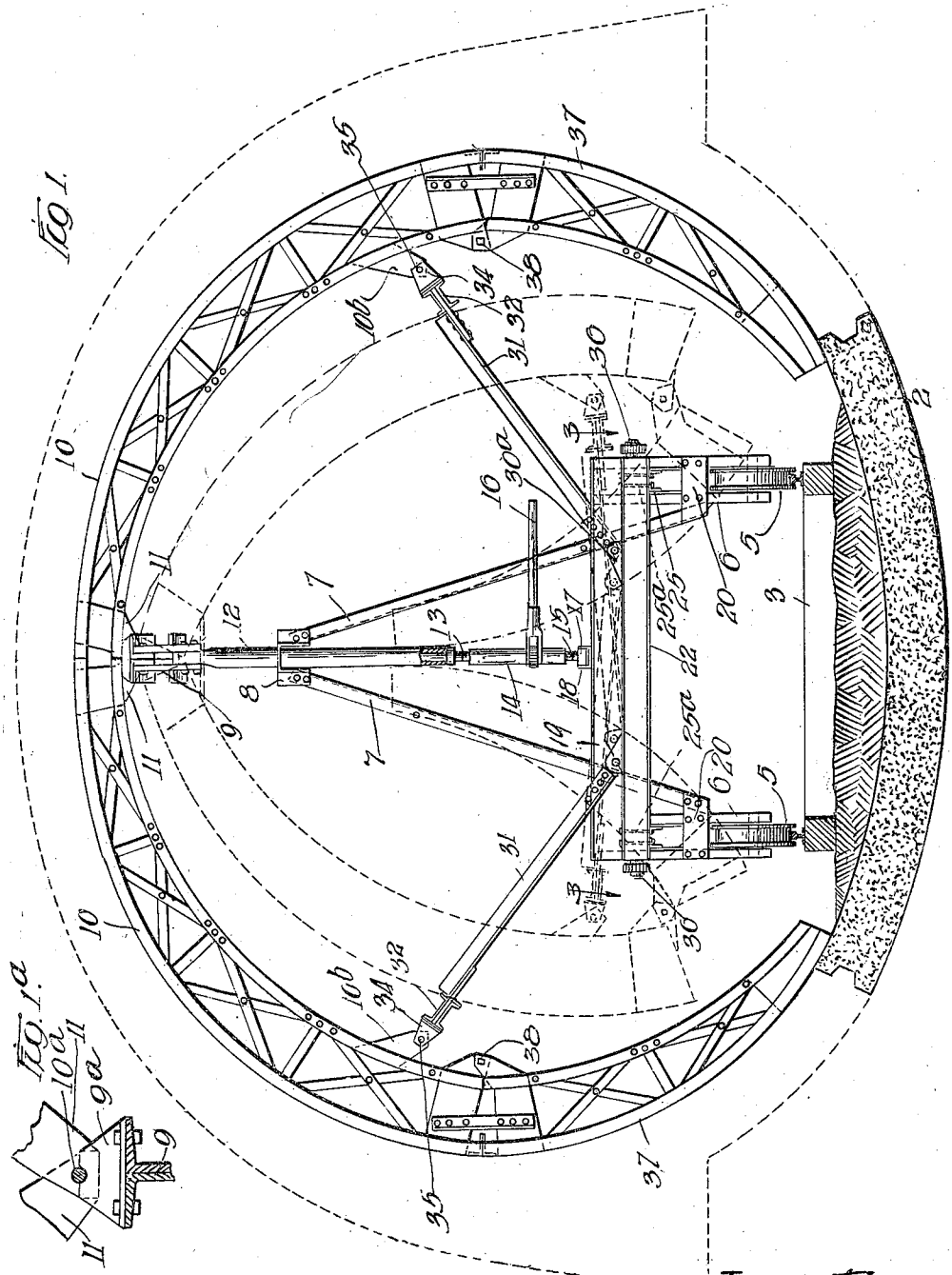
June 24, 1924. 1,498,651

R. H. FOLWELL

APPARATUS FOR HANDLING CONCRETE FORMS

Filed July 16, 1920 3 Sheets-Sheet 1



Witnesses:
Harry P. L. White.
W. F. Kilroy

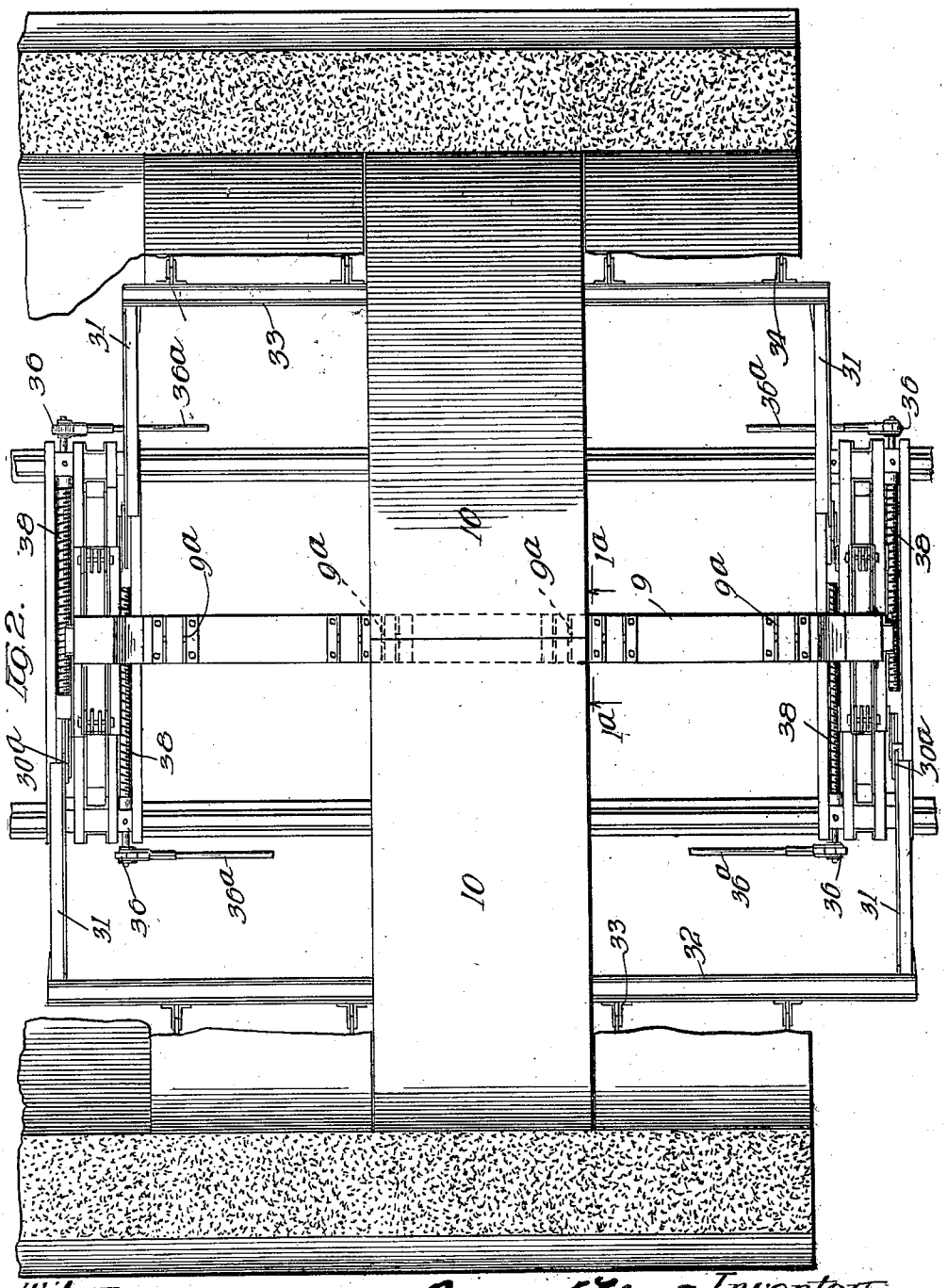
Inventor
Russell H. Folwell
By Church, Thompson & Shumaker
his Atty's.

June 24, 1924. 1,498,651

R. H. FOLWELL

APPARATUS FOR HANDLING CONCRETE FORMS

Filed July 16, 1920 3 Sheets-Sheet 2



Witnesses
Harry R. L. White
W. P. Kilroy

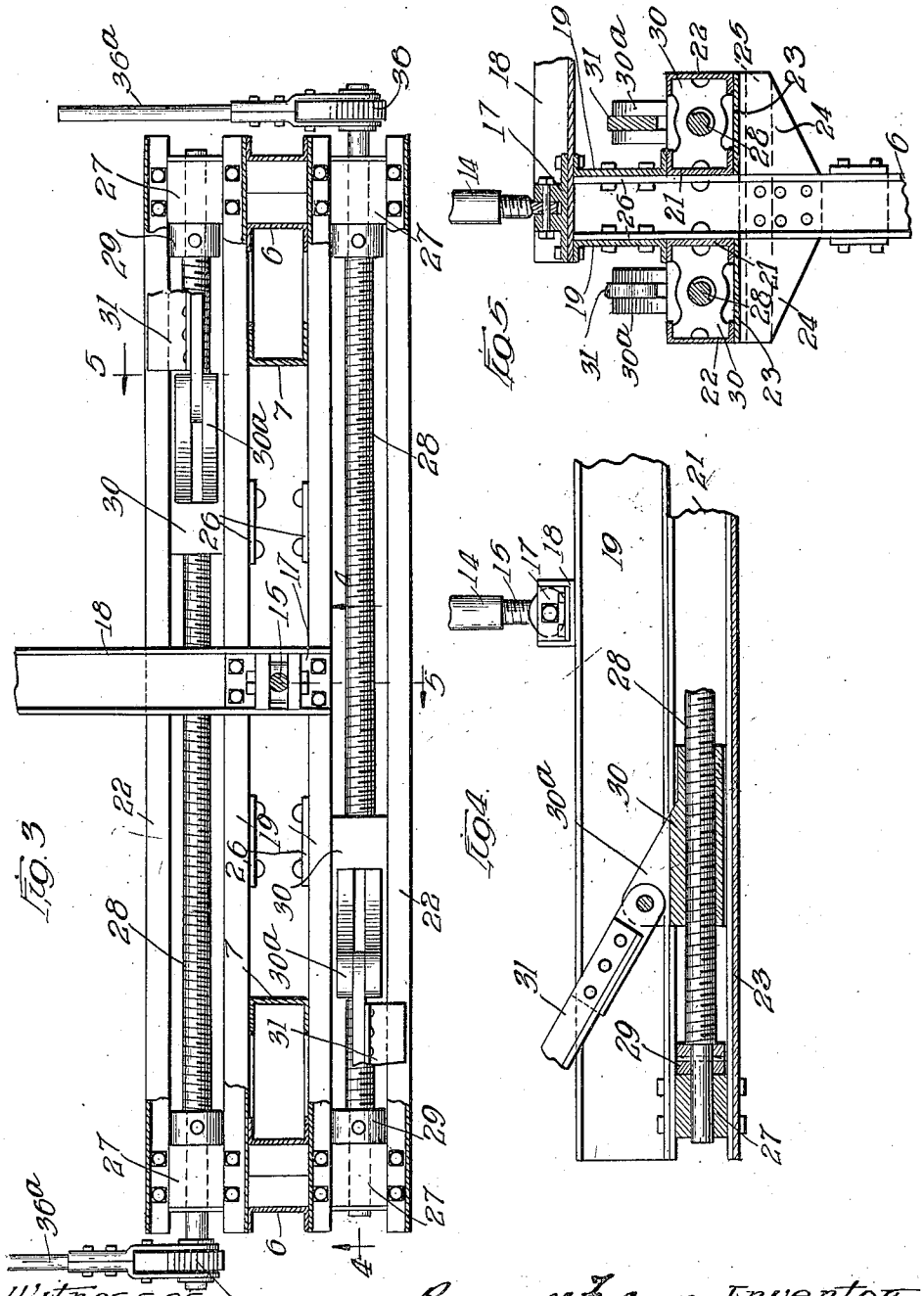
Inventor:
By Pierce, Heinemann & Dunnewald
Their Attys

June 24, 1924. 1,498,651

R. H. FOLWELL

APPARATUS FOR HANDLING CONCRETE FORMS

Filed July 16, 1920 3 Sheets-Sheet 3



Witnesses
Harry R. Whitte
W. P. Kilroy

Russell H. Folwell Inventor.
By Richardson & Bradbury
his Attys

Patented June 24, 1924. 1,498,651

UNITED STATES PATENT OFFICE.

RUSSELL H. FOLWELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO FOLWELL-AHLSKOG COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

APPARATUS FOR HANDLING CONCRETE FORMS.

Application filed July 16, 1920. Serial No. 396,752.

To all whom it may concern:

Be it known that I, RUSSELL H. FOLWELL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Handling Concrete Forms, of which the following is a specification.

The present invention relates to apparatus for handling concrete forms, especially such as employed in the construction of tunnels or the like where the forms are required to be assembled in collapsed and contracted condition to be then expanded, and again collapsed and contracted so that a gang of them carried upon a traveler may move out of a finished section of the tunnel to a new location for continuation of the work there to be expanded for molding the interior of another section of the tunnel.

The object of the present invention is to greatly facilitate the handling of such forms by providing a mechanism which reduces to the minimum the number of operations required to put the apparatus into condition for receiving the forms in their collapsed and contracted state and to expand them and collapse and expand the forms in continuation of the work; also to make all such operations much less arduous than heretofore, while at the same time not requiring any such number of workmen as have heretofore usually been found necessary in the working of apparatus of the general character in question.

The above object is achieved by a novel mechanical arrangement which avoids all interference between elevating and expanding operations notwithstanding the connections are established for doing both these things; in fact both may go on at the same time, according to the present invention, without any one set of power-applying connections interfering at all with another. And the invention provides for the application of power to the best advantage at the very outset of the expanding operation, and for continued effective application of power in the changing angular relationships of the parts, without counteracting resistances. Only a single set of expanding mechanism is required for each gang of forms on each side of the vertical center. No interruption of the work is occasioned by any necessity for uncoupling one set of devices and coupling up another to the forms at an intermediate stage. The invention makes for carrying on of the work of handling the forms with much economy of time.

In the accompanying drawings Fig. 1 is a cross-sectional representation of a tunnel in course of construction with apparatus of the present invention appearing in end elevation and coupled to the fully expanded forms, dotted lines indicating the condition of the apparatus when carrying forms in collapsed state; Fig. 2 is a simplified top plan view of the apparatus omitting all but one pair of forms; Fig. 3 is a sectional plan view on a somewhat larger scale, being taken substantially on the line 3—3 of Fig. 1 and confined to one end of the apparatus; Fig. 4 is a vertical section taken on the line 4—4 of Fig. 3; Fig. 5 is a section taken on the line 5—5 of Fig. 3; Fig. 1^a is a detail cross-sectional elevation on line 1^a—1^a Fig. 2.

The numeral 2 designates the so-called invert which is first laid, and 3 designates the track which is put down over the invert and upon which the traveler runs. The numeral 5 designates wheels of the traveler, 6 channels constituting legs of the frame thereof between which said wheels are journaled, and 7 channels constituting diagonal uprights of this frame which are riveted at their upper ends to a horizontal inverted channel 8. Above this latter channel there is a horizontal beam 9 which supports the hinge-mountings of the forms and is vertically movable. The traveler is of appropriate length to accommodate a gang of pairs of forms closely assembled side by side. Numeral 10 designates the segmental forms of one such pair, the same having hinge-plates or ears 11 to over-lap where the forms meet above the beam 9 and to separably engage the hinge-fixtures upon the latter. These are in the form of notched plates 9^a set on edge and secured upon the top of the beam, being so located that pins 10^a run through the over-lapped ears 11 of the forms may seat in the notches. Depending elongated tubular sockets 12 are secured to opposite ends of the beam 9 and pass down freely through the channel 8 and loosely receive plain prolongations of jack-screws 13 suitably shouldered for the lifting of the sockets and the upper beam 9. Ratchet sleeves 14 engage these jack-screws

and also engage reversely threaded lower jack-screws 15. The numeral 16 designates the handle of one of the ratchets employed for elevating the upper jack-screws and consequently the upper beam and the hinges of the pairs of forms. The lower jack-screws are held between short angle plates 17 in a channel 18 which runs centrally lengthwise of the traveler and constitutes part of the framework thereof. This channel rests upon and is bolted to cross-channels 19 set back to back on opposite sides of and riveted to the diagonals 7 whose lower ends are riveted to plates 20 on the legs 6 of the frame. Other channels 21, also set back to back, are put underneath the channels 19 and with mating facing channels 22 they form transverse slideways for elements of the form-expanding mechanism. Plates 23 close the bottoms of these slideways and knees support them at the ends, said knees being comprised of plates 24 riveted to the leg-channels 6 and angles 25 riveted to said plates and bolted to the bottom plates 23 and channels 21 and 19 by long bolts 25^a Fig. 1. Additional support is supplied at intermediate points by plates 26 riveted to the channels 21 and bolted to the channels 19—see Fig. 5.

There are two of these cross-slideways at each end of the traveler and they accommodate certain mechanism now to be described through which power is supplied to expand the form. Journal blocks 27 are secured in the ends of each slideway and a screw 28 extends the length of the slideway and journals in these blocks as most clearly shown in Figs. 3 and 4. Collars 29 pinned to the screws adjacent said journal blocks hold them against endwise movement. A slide block 30 is fitted into each slideway and constitutes a nut through which the screw 28 works. The slide block conforms in general to the interior contour of the slideway but is preferably shaped to reduce areas of contact between it and the walls of the slideway so as to minimize friction. The block is of somewhat elongated shape and has a pair of ears 30^a projecting from its upper side. Between these ears a strut 31 is pivoted, the same being composed of an angle-bar and a riveted-on pivot piece. The hands of the two screws at one end of the traveler are reversed so that if, for example, the outermost screw in the illustration afforded by Fig. 3 is considered a right-hand screw, the other or inner screw in the illustration would be a left-hand screw. The nuts on these two screws work oppositely to one another, one functioning to expand the forms on one side of the center line and the other functioning to expand the forms on the other side of the center line. The screws at the two ends of the traveler work in pairs, that is to say, the two outermost screws work together and the two innermost screws work together. Thus the two struts 31 which are pivoted to the blocks or nuts 30 engaged by the two outermost screws, are riveted to the opposite ends of a beam 32; and the other two nuts (those engaged by the inside screws) are riveted to the opposite ends of beam 33. These beams are of such length as to provide for their pivotal connection with a gang of forms. Thus as shown in Fig. 2 each of said beams has several sets of pivot ears 34 distributed throughout its length to provide for as many as three pairs of forms. The forms have ears 10^b to overlap ears on the beams, and the pivotal connection is made by removable pins 35 as indicated in Fig. 1.

A suitable ratchet 36 is applied to one end of each of the screws (36^a designating its operating handle) and it will be manifest that with the arrangement above described the turning of the screws 28 will work the slide-blocks or nuts along the slideways, and the turning of these screws in one direction will thrust the nuts outwardly and consequently thrust the lower ends of the struts outwardly and their outer ends carrying the beam outwardly and upwardly, expanding the forms. It will be noted from the dotted line illustration in Fig. 1 that when the forms are fully collapsed the struts stand close to the horizontal and therefore in the most advantageous position to exert a direct thrust in expanding the form, and it will furthermore be noted that as the operation proceeds and the angular relationship between the struts and the forms and between the struts and the slide-blocks changes, power is still applied most advantageously to expand the forms. It should furthermore be noted that the operation of lifting of the hinge-connection between the forms at the top by the turning of the ratchet sleeves 14, is in nowise hampered or interfered with by the strut-connection between lower portions of the forms and the slide-blocks or nuts. The ratchets for operating the latter may be worked simultaneously with the ratchets for elevating the hinge-connections, without there being any working of one of these expanding mechanisms against the other.

Lower pairs of shorter segmental forms 37 are hinged to the upper forms, as shown in Fig. 1 where 38 designates the hinge-connections, and these lower forms are adapted to fold inwardly in the hinges, as indicated by dotted lines when the forms are collapsed. A chain hoist on the traveler will be used for the purpose but is not illustrated, being a common and well known thing in form-handling apparatus of the general character to which the invention relates.

I claim:

1. Concrete form collapsing and expanding apparatus comprising a supporting

frame, crosswise movable members thereon, means for operating said members, and struts pivoted to said members and pivotally attachable to the forms.

2. Apparatus of claim 1 in which the crosswise movable members take the form of nuts occupying channels of the frame, and operating means comprising screws engaging said nuts.

3. Apparatus of the character described comprising a frame work, overhead-hinged forms carried thereon, mechanism for raising and lowering the hinge, struts pivotally attached to lower portions of the forms, crosswise movable slides on the base portion of the frame to which slides the struts are pivotally connected, and mechanism for operating said slides.

4. In a form operating machine, the combination of a collapsible form; means for lifting said form; a car on which said means is mounted; cross supports on said car; travel screw-threaded thrust blocks on said cross supports; push rods extending from said blocks to the form to expand the same; screws operating on said blocks; and means for actuating the screws.

5. A form apparatus for concrete tunnels, culverts and the like comprising a collapsible form, and a traveller with a side collapsing frame adapted to be connected at one end with a side of the form, block means mounted on the traveller for substantially lateral movement, and means for pivoting the frame to said block means.

6. A form apparatus for concrete tunnels, culverts and the like, comprising a collapsible form, and a traveller with side collapsing frame adapted to be connected to the form, block means mounted on the traveller for substantially lateral movement, means for pivoting the frame to said block means, and a screw for actuating the block means.

RUSSELL H. FOLWELL.