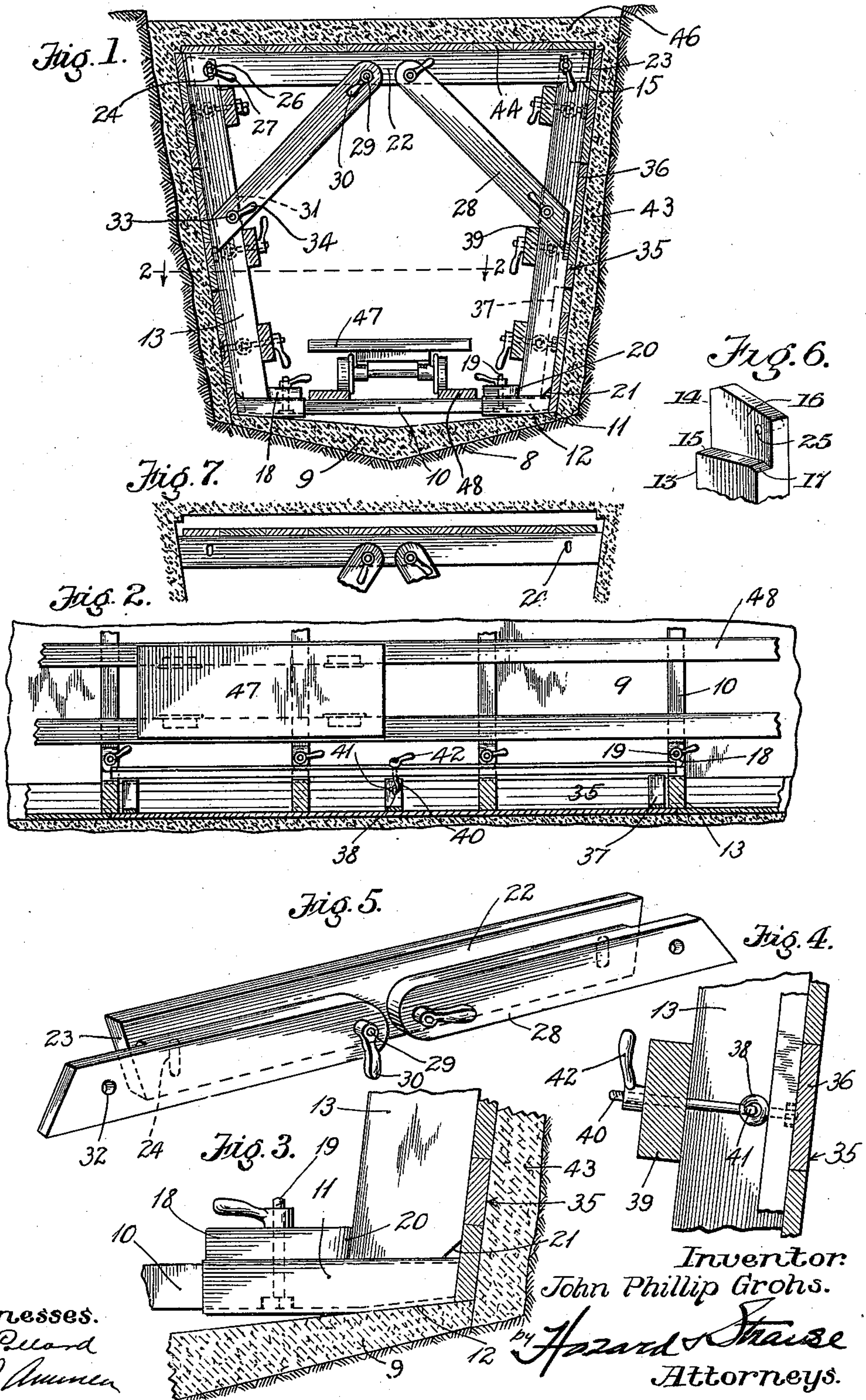


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 APPARATUS FOR MAKING CONDUITS AND TUNNELS.
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Patented Nov. 8, 1910.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR MAKING CONDUITS AND TUNNELS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN PHILLIP GROHS, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Apparatus for Making Conduits and Tunnels, of which the following is a specification.

This invention relates to the construction of conduits, tunnels and similar structures adapted to be formed of cement or concrete. It is a common practice in forming structures of this kind to provide forms which are set in the excavation or ditch, and comprising side panels which are set in position so as to facilitate the forming of the side walls of the conduit or tunnel. As usually constructed, the frames of these forms must be removed after the side walls of the conduit are formed, and other forms are introduced for supporting the roof or cover when the upper wall or concrete roof of the structure is being formed. Removing the forms from the excavation or ditch in the manner suggested interferes considerably with the excavating operation and greatly hinders the progress of the work.

The object of this invention is to provide an improved process for forming the side walls and roof of the structure and also to provide a form of improved construction which will obviate the necessity for removing the forms from the excavation before the concrete roof is made. In this way, by providing a track within the structure, the forms may be knocked down and sent forward within the tunnel or conduit on flat cars, without substantially interfering with the work.

The invention consists in the process and apparatus to be described more fully hereinafter and particularly set forth in the claims.

In the annexed drawing which fully illustrates my invention, Figure 1 is a vertical cross section taken through a conduit constructed according to my invention and showing the form in position. Fig. 2 is a horizontal section taken through the conduit on the line 2—2 of Fig. 1, and showing the form in process of erection. Fig. 3 is a vertical section taken through the bottom of the conduit at one side and particularly illustrating the manner of stepping the side posts of the form. This view is upon an enlarged scale. Fig. 4 is a vertical section taken

through one of the side panels and showing the manner of securing the same to the posts of the form. Fig. 5 is a perspective showing the beam of the form with its braces folded upon it as when the form is taken apart for sending the same forward on the flat cars as suggested. Fig. 6 is a perspective showing the upper end of one of the side posts. Fig. 7 is a vertical cross section taken through the upper part of a conduit or tunnel constructed according to my invention and showing the manner in which the roof boards are left temporarily when not in use.

Referring more particularly to the parts and especially to Figs. 1 and 2, in practicing my invention I form an excavation or ditch having a dished or shallow V floor 8 upon which is laid a dished bottom 9 of concrete or cement. On each side of the central axis of the conduit, the upper face of the bottom 9 inclines upwardly toward the sides of the excavation. I now lay on the bottom 9 a plurality of sills 10. These sills are made of stout timbers, the ends of which are inclosed in metal shoes 11 as indicated most clearly in Fig. 3. At their ends these sills are slightly beveled on their under side so as to form seats 12 which rest upon the bottom 9 as indicated. On the upper sides of the shoes 11 I provide posts 13 which are formed of heavy timber and these posts are formed at their upper ends with deep notches 14 presenting horizontal seats or shoulders 15. These notches 14 pass substantially half way through the thickness of the post so that each post presents an upwardly extending tongue 16 beyond the shoulder 15. The inner edges of the shoulders 15 are formed with a slight bevel 17 for a purpose which will appear more fully hereinafter. On the upper sides of the shoes 11 blocks 18 are provided, said blocks being rotatably mounted on bolts 19 which pass upwardly through the sills from the under side thereof as indicated in Fig. 3. The heads of these bolts are preferably counter sunk into the under side of the cells as indicated. These blocks, as shown in Fig. 2, are elongated transversely of the tunnel or conduit when in their normal position and present rounded or beveled noses 20 which are adapted to abut against the inner edge of the foot of each post so as to prevent the post from moving inwardly as will be readily understood. As

shown most clearly in Fig. 3, the outer edge of the foot of each post 13 is cut away so as to form a bevel 21 for a purpose which will appear more fully hereinafter.

5 On the seats or shoulders 15 aforesaid, I provide a cross bar or beam 22 the form of which is clearly illustrated in Fig. 5. This beam has beveled end faces 23 which conform to the taper of the side of the conduit
10 as indicated in Fig. 1, and near their ends the beams are provided with vertically elongated slots 24. These slots are adapted to register with bolt holes 25 formed in the upper ends of the posts, that is, in the
15 tongues 16, and through these registering openings clamping bolts 26 pass, said bolts being provided with rat tail nuts 27 for clamping the beams on the shoulders as will be readily understood.

20 Near the middle points of the beams 22 diagonals or braces 28 are pivotally attached on bolts 29, said bolts having rat tail nuts 30 for clamping the braces to the beams as will be readily understood. The lower ends
25 of these braces are formed with inclined transverse rabbet grooves 31 which are adapted to receive the edges of the posts in a manner indicated in Fig. 1. The lower ends of the braces are provided with bolt
30 openings 32 through which clamping bolts 33 pass, said clamping bolts being provided with rat tail nuts 34 for clamping the braces rigidly to the posts. It will be seen that the posts are constructed so that they di-
35 verge outwardly in an upper direction which gives the conduit greater width above. After setting up a number of these frames comprising the transverse beams, the side posts, the sills and braces, I set in place the
40 side panels 35. As indicated in Fig. 1 there may be three sections of these side panels to form the concrete side wall of the form, and each section may be built up of longitudinally extending boards 36. On the in-
45 ner sides of the panels cross bars or strong backs 37 are arranged, and these cross bars are provided on their inner sides with eye bolts 38 as indicated most clearly in Fig. 4. Running longitudinally of the conduit, I
50 provide stringers 39 which seat against the inner edges of the posts, and these stringers are provided with hook bolts 40 the inner ends of which are formed into hooks 41 which engage the eye bolts 38. The ends
55 of these bolts which pass through the stringers are threaded so as to receive rat tail nuts 42 which enable the side panels and the stringers to be clamped securely to the posts. The side panels are arranged so that the
60 lower edge of the lower section rests upon the edge of the bottom 9 as indicated in Fig. 1. In this connection it should be noted that the sills 10 are slightly shorter than the width of the bottom so as to permit such
65 an arrangement. As also indicated in Fig.

1, the upper edge of the uppermost panel is substantially flush with the upper edge of each of the beams 22.

When the side walls have been attached to the frames in the manner shown, the con- 70
crete side walls 43 of the conduit or tunnel are flowed into the excavation at the sides. In this connection attention is called to the fact that the excavation is made in such a way that the lower edges of these side walls 75
extend below the side edges of the bottom 9. In this way I make the bottom 9 reinforce the lower edges of the side walls of the structure so as to resist outside pressure which might tend to collapse the side walls in- 80
wardly. After forming the side walls 43 I permit them to set sufficiently, and then in order to form the roof of the conduit, I make a roof on the form by means of boards 44 laid on the beams as indicated in Fig. 1 85
and extending longitudinally of the conduit. After this form-roof is in position, I place the cover 46 of concrete or similar material over it and this concrete sets on the side walls 43 and forms a substantially 90
monolithic structure therewith. After the side walls and the cover of concrete have been permitted to set a sufficient time, I dismember the form and send its parts for-
wardly on flat cars such as the car 47. These 95
cars are mounted on wooden or board rails 48 laid longitudinally on the sills as indicated in Fig. 2. In dismembering the form I knock the toes 20 of the blocks 18 laterally
so as to permit the lower ends of the posts to 100
move inwardly. I also detach all the stringers 39 by releasing the eye bolts 38 from the hooks. The diagonal braces 28 are also removed so as to permit the posts to swing in-
wardly at their lower ends. By swinging 105
the posts inwardly in this way at their lower ends they can be removed. In this connection special attention is called to the bevels 21 and 17 which greatly facilitate this removal of the posts, as these bevels permit a 110
lateral movement of the ends of the posts. It will be noted that the beams 22 are cut somewhat shorter so that a slight clearance is produced at their ends between the bevel faces 23 and the sides of the conduit. On 115
this account, when the posts and side panels of the structure have been removed, the beams 22 will descend or settle slightly in the prism of the conduit and come to rest in a slightly lower position, as indicated in 120
Fig. 7. In this way I leave the roof boards 44 temporarily in place, while I send the pieces of the form forward to erect the frames farther along in the excavation. In this way I form a convenient place for stor- 125
ing the boards which are not in use, but, on account of the settling of the beams 22, it will be seen that a considerable clearance space is formed between the concrete roof 46 and the beams, which greatly facilitates 130

the removal of the boards when they are required again for use. It is most convenient to shove these roof-boards along on the beams so as to bring them into position in the new section being erected.

Special attention is called to the slots 24. By providing slots at these points, I insure that the lower edges of the beams will always rest upon the seats 15 on the posts, and in this way the clamping bolts 26 are subjected to no strain save the clamping strain. Attention is also called to the rabbet grooves 31 of the braces, which rabbet grooves seat against the inner edges of the posts and relieve the clamping bolts 33 of much of the strain to which they would otherwise be subjected.

In constructing a conduit in this manner it will be seen that certain of the beams 22 will be left in place to support the form-roof when not in use, but the other beams can be taken down with their braces folded upon them, as indicated in Fig. 5, and sent forward in the excavation on the flat cars with the posts, sills and panels. The sills are left temporarily in place to form cross ties for the crude track which is formed in the bottom of the conduit, but when the conduit is completed, of course the wooden rails 48 are taken up and also the sills, leaving the interior of the conduit unobstructed.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A form of the class described, comprising a frame having a bottom sill, rotatable blocks on the upper side of said sill near the ends thereof, posts stepped on the ends of said sill and abutting the outer faces of said blocks, said posts diverging outwardly in an upper direction, the upper ends of said posts having seats formed thereupon, a beam resting on said seats, diagonal braces pivotally attached to said beam, means for detachably securing said diagonal braces to said posts, side-panels, and means for attaching the same to said posts.

2. In a conduit form, in combination, a plurality of bottom sills, side posts stepped on the ends of said sills, means on the upper sides of said sills for holding said posts against inward movement, said posts having seats formed at the upper ends thereof, beams resting upon said seats, means for detachably securing said beams to said posts, stringers extending longitudinally on the inner sides of said posts, panels disposed on the outer sides of said posts and forming the side walls of the form, and means for clamping said panels and said stringers on said posts.

In witness that I claim the foregoing I have hereunto subscribed my name this 24th day of December, 1909.

JOHN PHILLIP GROHS.

Witnesses:

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EDMUND A. STRAUSE.