May 4, 1926. 1,583,075

G. LEWIS

METHOD AND APPARATUS FOR SUPPORTING TIMBERING IN TUNNELS

Filed June 5, 1925 3 Sheets-Sheet 1

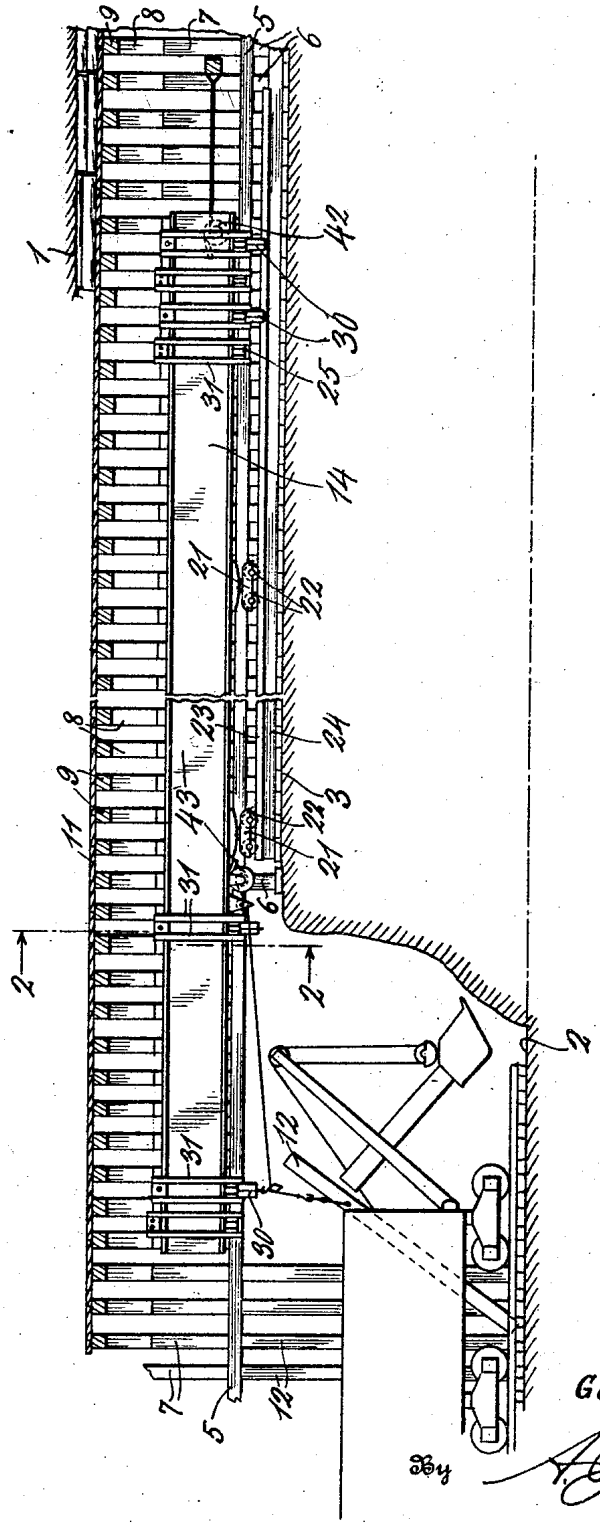

Fig. 1.

Inventor

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By A. O'Brien

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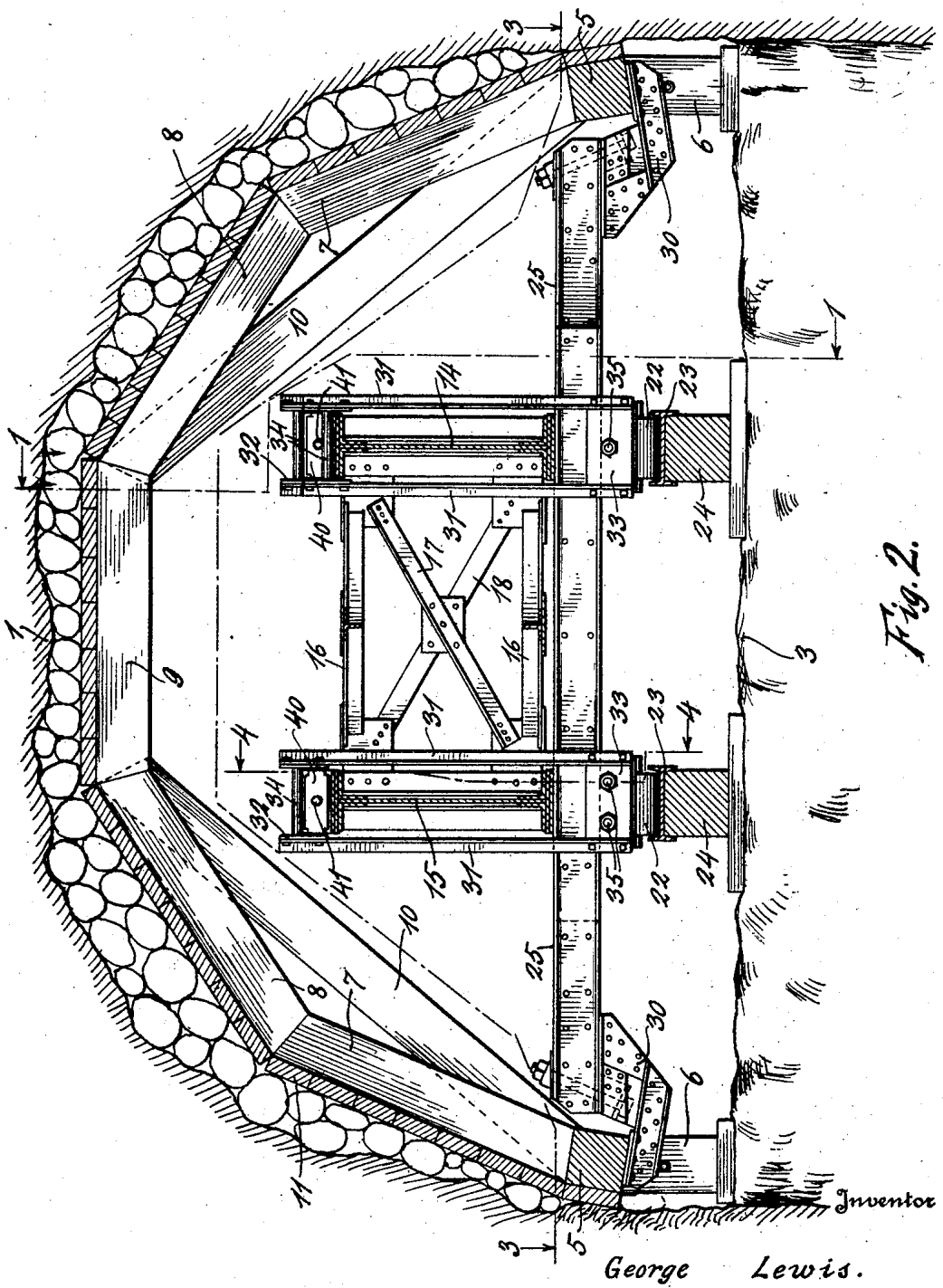

Fig. 2.

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Filed June 5, 1925 3 Sheets-Sheet 3

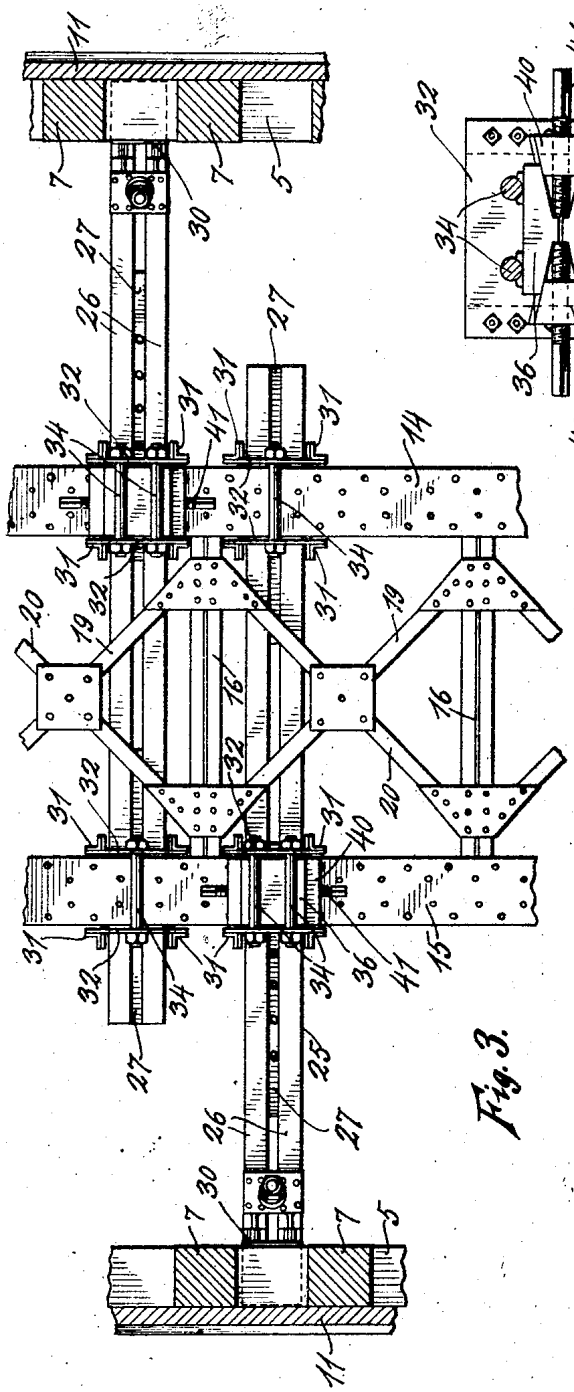

Fig. 3.

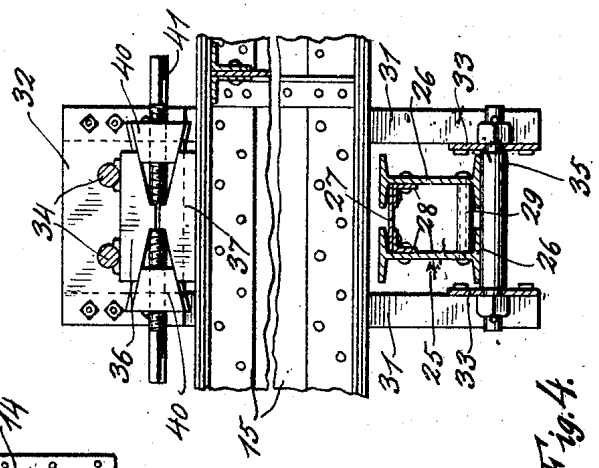

Fig. 4.

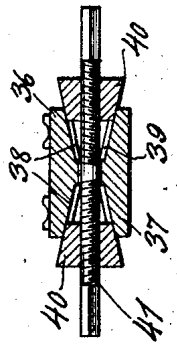

Fig. 6.

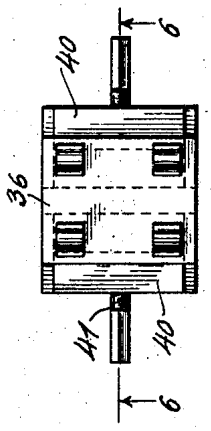

Fig. 5.

Inventor

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By A. O. & V. Brisco

Attorney

Patented May 4, 1926. 1,583,075

UNITED STATES PATENT OFFICE.

GEORGE LEWIS, OF DENVER, COLORADO, ASSIGNOR OF ONE-HALF TO PETER SEERIE.

METHOD AND APPARATUS FOR SUPPORTING TIMBERING IN TUNNELS.

Application filed June 5, 1925. Serial No. 35,166.

To all whom it may concern:

Be it known that I, GEORGE LEWIS, a citizen of the United States, residing at Denver, in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Methods and Apparatus for Supporting Timbering in Tunnels; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this application.

This invention relates to improvements in methods and apparatus for excavating tunnels.

Where tunnels are cut through hills and mountains, for railroads or other purposes, it often happens that a portion of the tunnel has to be cut through ground or rock that is so soft that the roof and walls have to be held in place by heavy timbers. Heretofore it has been customary to first cut a top heading of a height sufficient to provide room for the longitudinal wall plates and roof ribs which were then put in place, properly aligned and blocked. The bench was then excavated. It is evident that since the wall plates and ribs rested on the bench, means had to be provided to support the same when the bench was removed. This was accomplished by putting in place some temporary plumb posts which were later replaced by permanent plumb posts. This method, for reasons that need not be pointed out in detail, is slow and consequently expensive. The position of the temporary plumb posts was such that a steam shovel could not conveniently be used in removing the bench and which therefore increased the amount of labor.

It is the object of this invention to produce a method of tunneling that shall greatly decrease the labor cost and an apparatus by means of which the method may be carried out.

My method, briefly described, consists in cutting a top heading of sufficient height to support the roof timbers, placing the wall plates in place on the upper surface of the porting the wall plates and roof ribs from the upper surface of the bench until the plumb posts have been put in place. By this means it becomes possible to employ a steam shovel to remove the muck from the bench and to prevent the sagging of the roof ribs.

The apparatus employed consists in part of two forty-eight (48) inch I beam girders sixty feet long, cross braced on six feet centers so as to be held in parallel relation. These girders are supported on two tracks, that rest upon the bench, and extend rearwardly over the end of the bench. At their rear ends these girders are provided with cross beams provided at their ends with hangers which engage underneath and support the wall plates between the end of the bench and the permanent plumb posts.

My invention can be most clearly described and will be most readily understood when reference is had to the accompanying drawings where the preferred embodiment of my apparatus has been shown and in which:

Fig. 1 is a longitudinal vertical section of a tunnel showing my apparatus in place;

Fig. 2 is a transverse section taken on line 2—2 Fig. 1;

Fig. 3 is a fragmentary plan view of the girders and lateral beams;

Fig. 4 is a section taken on line 4—4, Fig. 2;

Fig. 5 is a top plan view of the wedge member shown in section in Fig. 6 and

Fig. 6 is a section taken on line 6—6, Fig. 5.

In the drawings numeral 1 represents the top of the tunnel bore and 2 the floor or sub-grade line, while 3 represents the upper surface of the bench. The space between the roof and the upper surface of the bench will be referred to as the "top heading" and has been indicated in Fig. 1 by the numeral 4. The top heading is first cut to any distance desired. The roof must, of course, be supported owing to the nature of the ground which is such that it will fall if it is left unsupported, (where the tunnel is cut through hard rock no timbering is required and my method and apparatus is not employed). The top heading is preferably extended a distance equal to the length of the wall plates

proper level and supported on short posts 6 which are cut to the proper lengths to give the wall plate the necessary support. The roof ribs 7, 8, 9 and 10 and planking 11 are then put in place on the plates in the manner shown in Fig. 2. The space between the planking 11 and the roof of the tunnel is then packed with wood or stone. As the bench upon which the plate 5 and other timbering is supported must be removed, it becomes necessary to provide means for supporting the same for some distance back of the rear end of the bench as the permanent plumb posts 12 cannot be put into place until the side walls of the tunnel have been cut back and made plumb. Heretofore, it has been customry to support the section of the wall plate between the bench and the permanent plumb posts by means of temporary posts. As these posts must be put into place before the side walls have been made vertical, they must be set on an incline. This interferes with the operation of the steam shovel and is objectionable for other reasons. It is evident that if the roof timbering could be temporarily supported without the use of the inclined posts, that there would be more room to work and that therefore the permanent plumb posts could be more easily put in place.

For the purpose of supporting the wall plates 5 and the timbering of the roof while the side walls are being cut away so as to permit the permanent plumb posts to be set, I have provided the following apparatus.

I have built a very strong and rigid bar which consists of two I beam girders 14 and 15 which are held in spaced relation by means of transverse angles 16 and transverse cross braces 17 and 18. Similar cross braces 19 and 20 (Fig. 3) connect the upper and lower flanges of the girders and prevent the bar from bending sidewise. Secured to the underside of each girder at points equidistantly spaced from the center are dollies 21 having each two rotatable wheels 22 which rest upon the web of I beam 23 that are supported on the timbers 24 which in turn are supported from the upper surface 3 of the bench, all in the manner quite clearly shown in Figs. 1 and 2. The I beams 23 and timbers 24 are preferably made of sections each about twelve feet long. As the top heading is extended the track, composed of members 23 and 24, is also extended and properly leveled and aligned so that the bar may be moved whenever necessary. Each end of the bar is provided with pairs of cross beams 25 which project to the sides thereof and which may be moved transversely of the bar and also longitudinally thereof. These cross beams are preferably constructed from two ten-inch I beams 26 held in parallel spaced relation by means of plates 27 that are fastened to the upper flanges, and by means of spacers 29. The outer end of each of these transverse beams are provided with hooks or hangers 30 for engaging underneath and supporting the wall plates 5 in the manner shown in Fig. 2. The transverse beams 25 are secured to the girders 14 and 15 by the following means. A framework consisting of four angles 31 comprising two pair; the angles of each pair being held together at their upper ends by means of plates 32, the pairs being connected at their lower ends by plates 33. Strong bolts 34 connect plates 32 and rollers 35 connect the plates 33. These frames are applied to the girders in the manner shown in Figs. 3 and 4, the plates 32 extending parallel with the girders and the plate 33 transversely. The beams 25 extend through the lower ends of the frames and are supported on the rollers 35 (Fig. 4). As many pair of these transverse beams 25 may be applied to the rear end of the bar as may be found to be necessary to properly support the timbering for a sufficient distance to permit the permanent plumb posts 12 to be set. This may require 6 to 8 pair. It is evident that the enormous weight of the timbering cannot be supported from the rear end of the bar unless the front end is prevented from moving upwardly. I, therefore, secure at least two pair of transverse beams to the front end of the bar. These are hooked underneath the wall plate 5 and serve as anchors to hold the front end of the bar from tipping upwardly.

It is, of course, necessary to move the transverse beams 25 upwardly until they engage firmly the bottom of the wall plate 5. This is accomplished by means of compound wedges each comprising two members 36 and 37 having adjacent surfaces 38 and 39 inclined outwardly from the center. Wedges 40 are connected by means of a bolt 41 having right and left hand threads which cooperate with similar threads in the wedges 40. When the bolt 41 is rotated so as to move the wedges together the blocks 36 and 37 will be forced apart. One of these compound wedges is placed between the top of the girder and the bolts 34 (Fig. 4). By rotating the bolt 41 the frame comprising the angles 31 is moved upwardly and this moves the hooks 30 against the under side of the wall plates 5. It is evident that only one compound wedge is required for each cross beam as the cantilever action will force the inner end of the beam upwardly against one of the girders.

In accordance with my invention the tunneling operation is carried out as follows: The top heading is cut to a level somewhat below the level of the vertical portion of the side walls. If the ground is very soft and crumbly, it may be necessary to first cut

tion of the wall plate 5 in place, the top heading can then be excavated and timbered until the forward end of the wall plate is reached when another section of wall plate is put into place. This is continued until the top heading is at least fifty feet long. The timbers 24 and I beams 23 are then put in place and properly leveled so as to form a track. The bar comprising the girders 14 and 15 is now put in place upon the track which supports the bar through the dollies 21. The transverse beams 25 at the forward end of the bar are now extended so that the hooks 30 engage the underside of the wall plates 5 and adjusted by means of the compound wedges so as to hold the bar level. In a similar manner the transverse beams 25 are put into place with hooks 30 engaging the underside of the plates 5 and adjusted as to height by means of the compound wedges. The bench may now be removed as far as the foremost transverse beam at the rear end. As the bench is removed the weight of the timbering will be supported by the cantilever bar in the manner shown in Fig. 1. Since the timbering is supported from the upper surface of the bench, there is no obstruction and the steam shovel can be used for loading the muck onto cars. While the timbering is held in place by the bar, the side walls can be cut back as far as desired and the permanent plumb posts put into place after which the transverse beams may be released and withdrawn from under the wall plates after which the bar is advanced and is again anchored to the wall plate by means of the transverse beams 25. This is repeated until the tunnel is finished or until such solid formation is reached that timbering is no longer necessary. In the drawing I have shown the cantilever bar provided with an electric hoist 42 which is employed in moving the bar ahead and at the rear with a similar hoist 43 that can be used for any purpose desired and which is used in raising the plumb post 12.

From the above it is apparent that I have produced an apparatus that greatly simplifies and cheapens the construction of tunnels as it makes it possible to do more of the work by machinery. It also makes it possible to do a better and more satisfactory job of timbering.

Having now described my invention what I claim as new is:

1. The method of supporting the roof timbering, in a tunnel having a top heading, while the tunnel is cut to proper depth and until the permanent plumb posts are set which consists in supporting a cantilever bar from the floor of the heading, anchoring the front end of said bar to the walls of the tunnel heading so that it cannot move upwardly

2. An apparatus for supporting the roof timbering of a tunnel so as to permit the bench to be removed and permanent plumb posts put into place comprising a long bar of rigid construction adapted to be inserted into a top heading having roof timbering supported on wall plates, said bar having means at its rear end for engaging underneath and supporting the wall plates and means at its front end for preventing it from moving upwardly when a downward pressure is applied to the rear end.

3. In a tunnel having a top heading, wall plates supported on the floor of said heading and roof timbering supported by said wall plates, means for supporting the wall plates and timbering while the tunnel is cut down to grade said means comprising a rigid, strong bar adapted to extend longitudinally of said top heading, means secured to the rear end of said bar for engaging underneath the wall plates and supporting the same and means operatively attached to the front end of said bar for holding the same against upward movement with respect to the floor of said heading when downward pressure is applied to the rear end.

4. Means for supporting the roof timbering in a tunnel while the plumb posts are being put into place, comprising a bar composed in part of two parallel girders, means for supporting said bar from the floor of a top heading, means for preventing the front end of said bar from moving upwardly when a downward force is applied to the rear end and means attached to the rear end of said bar for engaging and supporting wall plates that support roof timbering said last named means comprising beams projecting to the sides of said bar.

5. Means for supporting the roof timbering of a tunnel while the plumb posts are being put into place comprising, in combination, an elongated bar adapted to be supported intermediate its ends on the floor of a top heading, beams extending transversely from each side of said bar near each end thereof, said beams being adapted to engage the underside of said timbering whereby a portion of said timbering is supported while the level of the tunnel is cut down to grade and while the permanent plumb posts are put into place.

6. A bar for supporting the roof timbering of a tunnel while the plumb posts are being set comprising, in combination, a pair of girders, means for holding said girders in parallel spaced relation, a plurality of pairs of transverse beams secured to the underside of said girders and projecting laterally from each side thereof and means for moving said transverse beams towards or

ing and roof timbering supported from said wall plates, means for supporting a portion of the timbering while the level of the tunnel is cut to grade and while the permanent plumb posts are put into place, said means comprising, in combination, a bar formed in part by two girders, means for holding said girders in spaced parallel relation, a plurality of pairs of beams extending transversely of said bar near each end thereof, means for securing said beams to the girders, said means comprising frames surrounding said girders and beams and means for moving said beams towards or away from said girders.

8. In a tunnel having a top heading, wall plates supported from the floor of the heading and roof timbering supported from said wall plates, means for supporting a portion of the timbering while the level of the tunnel is cut to grade and while the permanent plumb posts are put into place, said means comprising, in combination, a bar formed in part by two girders, means for holding said girders in spaced parallel relation, said means comprising a plurality of cross braces, a plurality of pairs of beams extending transversely of said bar near each end, said beams having hooks on their outer ends for engaging underneath the wall plates, means for securing said beams to the girders and means for moving said beams towards or away from said girders.

9. In a tunnel having a top heading, wall plates supported from the floor of the heading and roof timbering supported from said wall plates, means for supporting a portion of the timbering while the level of the tunnel is cut to grade and while the permanent plumb posts are put into place, said means comprising, in combination, a bar formed in part by two girders, means for holding said girders in spaced parallel relation, said means comprising a plurality of cross braces, a plurality of pairs of beams extending transversely of said bar near each end, said beams having hooks in their outer ends for engaging underneath the wall plates, means for securing said beams to the girders and means for moving said beams towards or away from said girders, said last named means comprising a compound wedge consisting of two relatively movable members having their ends provided with inclined surfaces that cooperate to form inwardly tapering cavities, a wedge in each cavity and a bolt having threaded connection with the wedges for moving them towards or away from each other.

In testimony whereof I affix my signature.

GEORGE LEWIS.

Method And Apparatus For Supporting Timbering In Tunnels

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INVENTOR INFORMATION

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405/138,405/288

CPC CURRENT

TYPE	CPC	DATE
CPCI	E 21 D 11/12	2013-01-01

KWIC Hits

Description

UNITED STATES

(1) GEORGE LEWIS, OF DENVER, COLORADO, MVETHOD AND APPARATUS3 FOR SU Application filed June [To ciii whom it)flUy (oon(CJ~n Be it known that I, GOO.GE Eii, a citizen] c L the United States, residing; at Den- ver, in the city and county of Denver aand State of Colorado, have invented certain new ':nd useful improvemnents in Methods and Apparatus for Supporting Timbering in Tunnels; and I do declare the following to be a full, clear, and exact do- If' sc'iption of the invention, such as w ill enable others skilled in the art to which it -.ppertains to miake and use the same, ref er- ence being had to the accompanying draw- ings, and to the characters of reference]5 marked thereon, which form a part of th]i applicationi.

(2) This invention relates to imiprovements in methods .land apparatus for excavating tunnels.

(3) -Where tunnels are cut through hills and inountains, for railroads or other purposes, it often happens that a portion of the tunnel has to be cut through ground or rock that is so soft that the roof and walls have to be held in place by heavy timbers. Heretofore it has been customary to first cut a top heading of a height sufficient to provide room for the longitudinal wall plates and roof ribs which were then put in place, properly aligned and blocked. The bench was then excavated. It is evident that since the wall plates and ribs rested on the bench, means had to be provided to support the same when the bench was removed. This was accomplished by putting in place soe temporary plumb posts which were later replaced by permanent plumb posts. This method, for reasons that need not be pointed out in detail, is slow and consequently expensive. The position of the temporary plumb posts was such that a steam shovel could not conveniently be used in removing the bench and which therefore increased the amount of labor.

(4) It is the object of this invention to produce a method of tunneling that shall greatly decrease the labor cost and an apparatus by means of which the method may be carried out.

(5) My method, briefly described, consists in cutting a top heading of suflicient height to support the roof timbers, placing the wall plates in -place on the upper surface of the bench, placing the roof ribs in place in the wall plates, cutting away the bench and sup- PATENT OFFICE.

(6) A55TG13TOR O.! OXTE-HALF TO PETER SEERIE.

(7) P7-,ORTYI'IG TIBERING IN TUNNELS.

(8) "r, 1225. Serial No. 35,166.

(9) porting the wall plates and roof ribs -from the upper surface of the bench until the p~lum') posts hav e been lput in place. By this mneans it becomes possible to employ a, steam shiovel to remnove the muck from the 00 bench and .to prevent the sag-aing of the roof ribs.

(10) The appamatus employed consists in part of twvo forty-eight (48) inch I bearn girders sixty feet long, cross braced on six feet con- ters so as to be held in parallel relation.

(11) These girders are supported on two tracks, that rest upon the bench, and extend rear- wardiy over-the end of tme bench. At their rear ends these girders are provided with crossbeams pr'ovided at their ends with han Vers. which enigage underneath and support the wvall plates between the end of the bench and the permanent plumb posts.

(12) My inv ention can be most clearly de- scribedi and will be most readily understood wben refCerence is had to the acculnpaiying drawings where the preferred embodiment of my apparatus has been shown and in which :

(13) Fig. 1 is a longitudinal vertical section of a tunnel showing my apparatus in placee Fig. 2 is a transverse section taken on line 2-2 Fig. 1;

(14) Fig. 3 is a fragmentary plan view of the girders 'and lateral beams;

(15) Fig. 4 is a section taken] on line 4-4, Fig. 2;

(16) Fig. 5 is a top plan view of the wedge member shown in section in Fig. 6 and {0 Fig. 6 is. a section taken on line 6-6, Fig. 5.

(17) In the drawings numeral 1 represents the top of the tunnel bore and 2 the floor or subgrade line, while 3 represents the upper t surf ace of the bench. The space between the roof and the upper surface of the bench will be referred to as the "top heading" and has been indicated in Fig. 1 by the numeral 4.

(18) The top heading is first cut to any distance desired. The roof must, of course, be supported owing to the nature of the ground which is such that it will fall if it is left un- supported, (where the tunnel is cut through hard rock no timbering is required and my method and apparatus is not employed).

(19) The top heading is preferably extended a distance equal to the length of the wall plates or for the purpose of this illustration twenty feet. The wall plates V are adjusted -to the proper level and supported on short posts 6 which are cut to the proper lengths to give the wall plate the necessary support. The roof ribs 7, 8, 9 and 10 and planking 11 are then put in place on the plates in the manner shown in Fig. 2. The space betw een the planking 11 and the ~roof of the tunnel is then packed with wood or stone. As the bench upon which the plate 5 and other timbering is supported must be removed, it be- conmes necessary to prov ide means for supporting the same for some distance back of thme rear end of the bench as the permanent plumb posts 12 cannot be put into place until the side walls of the tunnel have been cut back and made plumb. Heretofore, it has been customry to support the section of the wall plate between the bench and the permanent plumb posts by means of temporary posts. As the= e posts must be put into place before the side walls have been made vertical, they must be sct on an incline.

(20) This interferes with tihe operation of the steam shovel and is objectionable for other reasons, It is evident that it' the roof timbering could be temporarily supported without the use of the inclined posts, that there would be more room to work and that therefore the permnaent plumb posts could be more easily put in place.

(21) For the purpose of supporting the wall plates 5 and the timbering of the roof while the side walls are being cut away so as to permit the permanent plumb posts to be set, 1 have provided the following apparatus.

(22) I have built a very strong and rigid bar which consists of two I beam girders 14 and 15 which are held in spaced relation by means of transverse angles 16 and transverse cross braces 17 and 18. Similar cross braces 19 and 20 (Fig. 3) connect the upper and lower flanges of the girders and prevent the bar frain bending sidewise. Secured to the underside of eamch girder at points equidistantly spaced from the center are doilies 21 having each two rotatable wheels 22, which rest upon the web of I beam 23 that are supported on the timbers 24 which in turn are supported from the upper surface 3 of the bench, all in the manner quite clearly shown in Figs, 1 and 2. The I beams 23 and timbers 24 are preferably ipade, of sections each about twelve feet long. As the top heading is extended the tr~ack, composed-of members 23. and 24, is also extended and properly leveled and aligned so that the bar may be moved whenever necessary. Each end of the bar is provided with pairs of cross beams 25 which project to the-sides thereof and which may be i noyedl transversely of the. bar and also longitudinally thereof. These cross beams, are preferably constructed from two ten- inch I beams 26 held in parallel spaced relation, by means of plates.-27 that ,re, fas- 65> tened to ,algle~ 28 aecured to; th1e wruls close to the upper flanges, and by means of spacers 29. The outer end of each of these transverse beams are provided with hooks or hangers 30 for engaging underneath and supportinlg the wall plates 5 in the manner shown in F+ig. 2. The transverse beams 25 are secured to the girders 14 and 15 by the following; means. A framework consisting of four angles 31 comprising two pair; the angles of each pair being held together at their upper ends by means of plates 32, the pairs being connected at their lower ends by plates 33. Strong bolts 34 connect plates 32 and rollers 35 connect the plates 33. These frames are applied to the girders in the manl ncr shown in Figs. 3 and 4, the plates 32 ex- tendin , parallel with the girders and the plate 33 transversely. The beams 25 extend through the lower ends of the frames and are supported on the rollers 35 (Fig. 4). As many pair of these transverse beams 25 may be applied to the rear end of the bar as may be found to be necessary to properly support the timbering for a. sufficient distance to permit the permanent plumb posts 12 to be set. 00 This may require 6 to 8 pair. It is evident that the enormous weight of the timbering cannot be supported from the rear end of the bar unless the front end is preven~ted from moving upwardly. I, therefore, secure 9 at least two pair of transverse beams to the front end of the bar. These are hooked underneath the wall plate 5 and serve as on- chors to hold the front end of the bar from tip~ping upwardly.

(23) It is, of course, rnecessary to move the transverse beams 25 upwardly until they engage firmly the bottom of the wall plate 5. This is accomplished by means of comn- pond wvedges each comprising two mein- bcrs 36 and 37 having adjacent surfaces 3&'

(24) and 39 inclined outwardly from the center.

(25) *Wredges 40 are connected by means of a bolt 41 having right and left hand threads which cooperate with similar threads in the wedges 4-0. WVhen the bolt 4 1 is rotated so as to move the wedges together the blocks 36 andi 37 will be forced apart. One of these comn- poun~d wedges is placed between the top of the girder and the bolts 34 (Fig. 4). By rotating the bolt 41 the frame comprising the an:gles 31 is moved upwardly and this moves the hooks 30 against the under side of the wall plates 5. It is evident that only one compound wedge is required for each cross beam as the cantilever action will force the imr end of the beam, upwardly against one of the girders.

(26) In accordance with my invention the tuE- nielinlg operation is carried out, as followS:

(27) The top heading is cut to a level somewhat below the level of the vertical portion of the side walls.. If the ground- is very soft and crumbly, it- may be_ necessary to first cut smnali openings onl

each Miele asi rto ~ut a~ s tion of the wall plate 5 in place, the top heading can then be excavated and timbered until the forward end of the wall plate is leached when anotber section of wall plate is a put into place. This is continued until the top heading is at least fifty feet .long. The timbers 24 and I beams 23 are then put in place and properly leveled so as to form a track. The bar comprising the girders 1') 14 and 15 is now put in place upon the track which supports the bar through the dollies 21. The transverse beams '25 at the forward end of the bar are now extended so that the hooks 30 engage the underside of the wall plates 5 and adjusted by means of the corn- pound wedges so as to hold the bar levee.

(28) In a similar manner the transverse beams 25 are put into place with hooks 30 engaging the underside of the plates 5 and adjusted as to height. by means of the compound wedges.

(29) The bench m~ay now be removed as far as the foremost transverse beam at the rear endl. As the bench is removed the -weight of the timbering will be supported by the cantilever bar in the manner shown In Fig. 1.

(30) Since the timbering is suppmortedl from the upper surface of the bench, there is no olb- struction and the steam shovel can be used for loading the muck onto cars. While the timbering is held in place by the bar, the side walls can be cut back as far as desired and the permanent plumb posts put into place after which the transverse beams may be released and withdrawn from under the wall plates after which the bar is advanced and is again anchored to the wall plate by means of the transverse beams 25. This is repeated until the tunnel is finished or until such solid formation is reached that timi- bering is no longer necessary. In the drawing I have shown the cantilever bar provided with on electric hoist 42 which is employed in moving the bar ahead and at the rear with a similar hoist 43 that can be '13 used for any purpose desired and which is used in raising the plumb post 12.

(31) From the above it is apparent that I have produced an apparatus that greatly simplifies and cheapens the construction of tunnels as it mnakes it possible to do more of the work by machinery. It also makes it p~ossible to do a better and more satisfactory job of timbering.

(32) Having now described my invention what

Claims

1. The method of supporting the roof tim-bering, in a tunnel having a top heading, while the tunnel is cut to proper depth and until the permanent plumb posts are set 00 which consists in supporting a cantilever bar fromt the floor of the heading, anchoring the front end of said bar to the walls of the tunnel heading so that it cannot move upwardly and supporting a portion of said timber ing from the rear eild of said bar,

2. An apparatus for supporting the roof timbering of a tunnel so as to permit the bench to be removed 'and permanent plumb posts put into place comprising a long bar of rigfcd construction adapted to be inserted 7]1;to a top heading having roof timbering supported on wall plates, said bar having means at its rear' end for engaging under neath and supporting the wall plates and means at its front end for preventing it 73 from moving upwardly when a downvard pres~sure is applied to the rear end.

3. In Pa tunnel having a top heading, wall plates supported on the floor of said heading and roof timbering supported by said wall a plates, means for supporting the wall plates and timbering while the tunnel is cut down to grade said means comprising a rigid, strong bar adapted to extend longitudinally of said top heading, means secured to the rear end of said bar for engaging under-,lcath the wail plates and supporting the sane and mleans operatively attached to the front end of said bar for holding the same against upward movement w ith respect to the floor of said beading when downward presur is applied to the rear endl.

4. Means for supporting the roof timbering in a tunnel while the plumb posts are being put ito place, comprising a bar com- 0 posed in part of two parallel girders, means -for supporting said bar from the floor of a top heading, means for preventing the front. end of said bar from moving upwardly when a downward force is applied to the rear end 10n and means attached to the rear end of said bar for

engaging and supporting wall plates that support roof timbering said last named means comprising beams projecting to the sides of said bar. 105i

5. Means for supporting the roof timbering of a tunnel while the plumb posts are being put into place comprising, in comnbi-nation, an elongated bar adapted to be supported intermediate its ends on the floor of a top heading, beams extending transversely from each side of said bar near each end thereof, said beams being adapted to engage the underside of said tinbering whereby a portion of said timbering is supported while 1 1 the level of the tunnel is cut dlown to grade and while the permanent plumb posts are put into place.

6. A bar for supporting the roof timbering of a tunnel while the plumb posts are being set com~prising-, in combination, a pair of girders, means for holding said girders in parallel spaced relation, a plurality of pairs of transverse beams secured to the underside of said girders and projecting lat- 123 orally from each side thereof and means for moving said transverse beams towards or aw ay from the bottom of said girders.

7. In a tunnel having a top heading, wall p1lates supported fromn the floor of the heading and roof timbering supported from said wall plates, means for supporting a portion of the timbering while the level of the tnnel is cut to grade and while the permanent 5plumb posts are put into place, said means comprising in comnbination, a bar formed in part by two girders, mneans for holding said ,girders in spaced parallel relation, a plurality of pairs of beams extending transversely ,o of said bar near each end thereof, means for seering said beais to the girdlers, said means comprasing frames surrounding said gidcers~ and beams and means for mnoving said bears towards or away from said girders. S. In a tunnel having a top heading, wall plates supported from the floor of the heading an'] roof timbering supported from said wall plates, mieans for supporting a portion 2'0 of the timbering while the level of the tunnel is cut to grade and while the permanent plumb posts are put into place, said means comprising, in combination, a bar formed in 25part by tw o girders, means for holding said 2girders in spaced parallel relation, said means comprising a plurality of cross braces, a plurality of pairs of beams extending transversely of said bar near each end, said beams having hooks on their outer ends for engaging underneath the wall plates, mean,; for securing said beams to the girders antd means for moving said beams towards or aw:ay from said girders.

9. in a tunnel having a top heading, wall plates supported from the floor of the heading and roof timbering supported from said wall plates, means for supporting a portion of tbc timbering while the level of the tunnel is cut to grade and \iBile the permna-nent plumb posts are put into place, said means comprising, in combination, a, bar formed in part by two girders, means for holing said girders in spaced parallel rela-tion, said means comprising a plurality of cross braces, a plurality of pairs of beams extending transversely of said bar near each end, said beams having hooks in their outer ends for engaging underneath the wall plates, means for securing said beams to the girders and means for moving said beams towards or away from said girders, said last named means comprising a compound wedge cons' sting of tvwo relativ ely movable members having their ends provided with inclined surfaces that cooperate to form in-wardily tapering cavities, a wedge in each cav ity al a bolt havring threaded connec.-tion wvith the wedges for moving them towards or away from each other. in test~niony whereof I affix my signature. GEORGE LEWIS.