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H. BUECHLER.
EXCAVATING APPARATUS.
APPLICATION FILED DEC. 29, 1904.

2 SHEETS—SHEET 1.

Fig. 1,

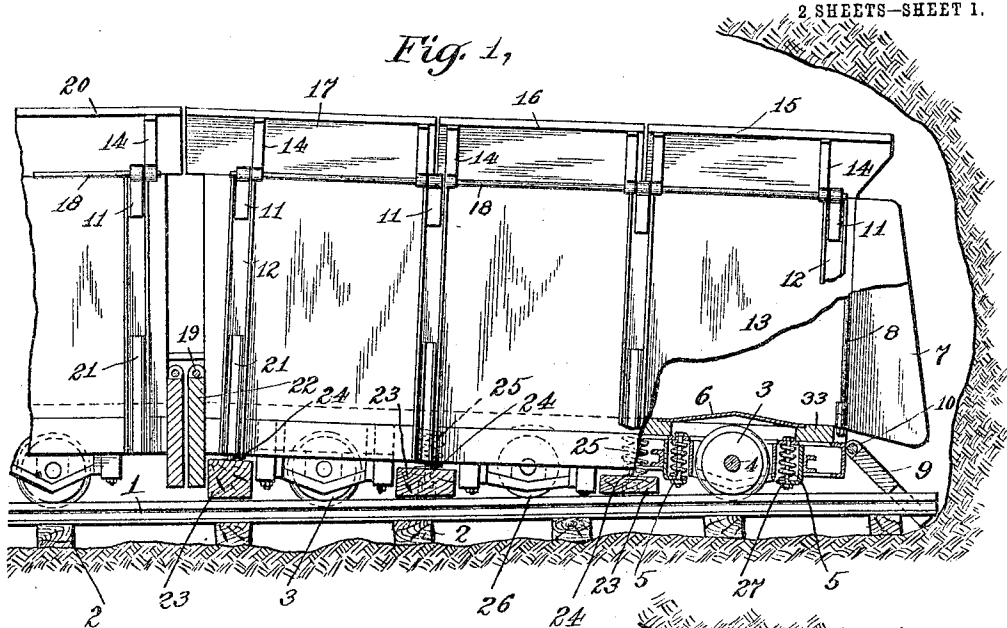


Fig. 2,

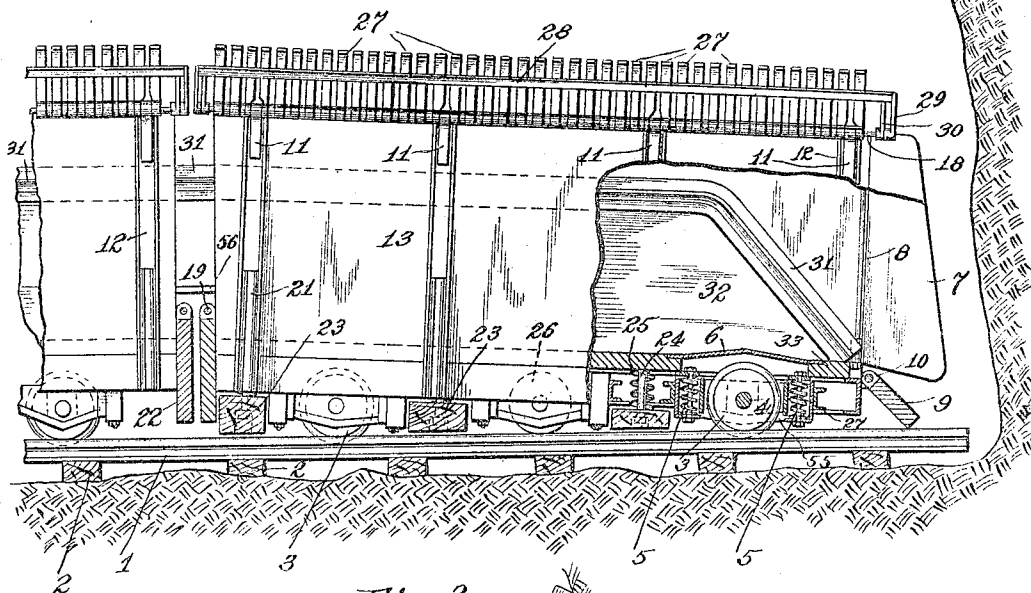
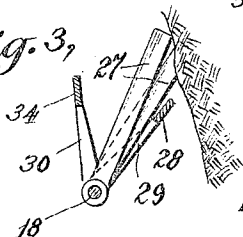


Fig. 3,



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2 SHEETS—SHEET 2.

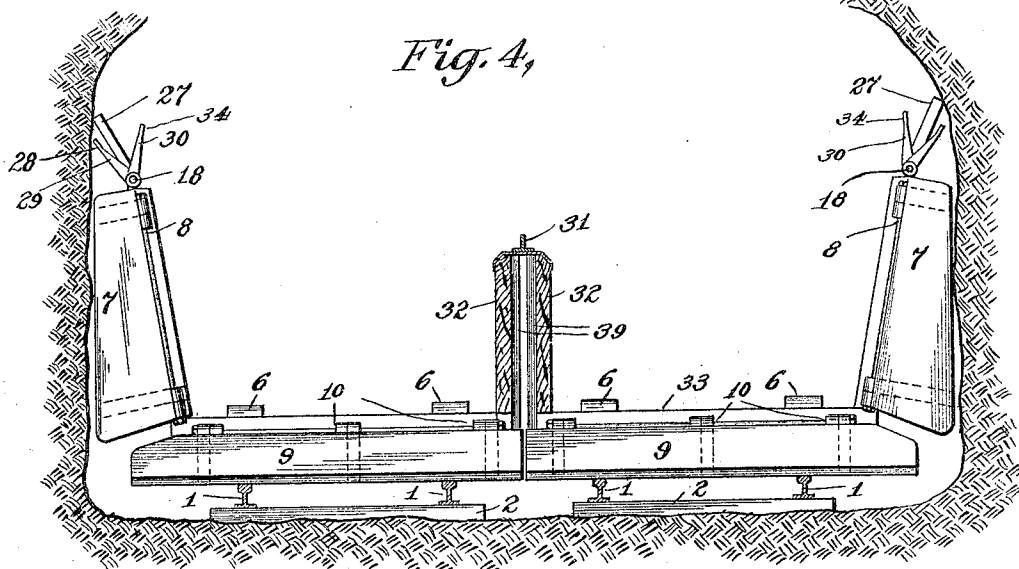


Fig. 5,

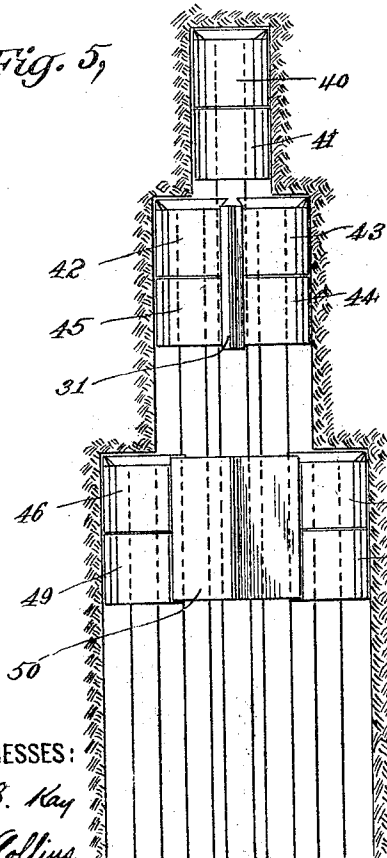
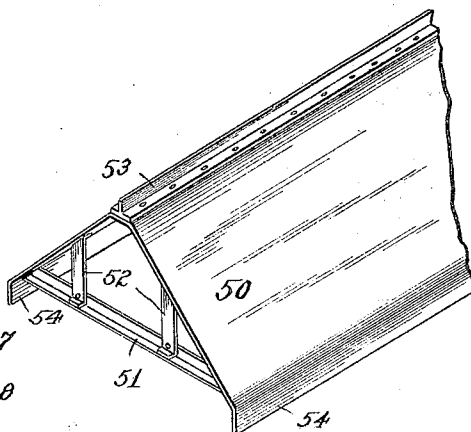


Fig. 6,



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EXCAVATING APPARATUS.

No. 801,848.

Specification of Letters Patent.

Patented Oct. 17, 1905.

Application filed December 29, 1904. Serial No. 238,867.

To all whom it may concern:

Be it known that I, HANS BÜCHLER, a citizen of the Swiss Republic, and a resident of Zurich, Switzerland, have invented certain new and useful Improvements in Excavating Apparatus, of which the following is a specification, taken in connection with the accompanying drawings, which form a part of the same.

This invention relates to excavating apparatus, and relates especially to apparatus for receiving and conveying material excavated from tunnels.

In the accompanying drawings, in which the same reference-numerals refer to similar parts in the several figures, Figure 1 is a side view, partly in section, showing an embodiment of this invention. Fig. 2 is a similar view showing a modification. Fig. 3 is a detail of the same. Fig. 4 is a transverse section of the double form of apparatus shown in Fig. 2. Fig. 5 is a diagrammatic plan view. Fig. 6 is a perspective view showing a part of this apparatus.

In the embodiment of the invention indicated in the drawings a number of cars of special construction are indicated in position in a tunnel or similar excavation for the purpose of receiving the excavated material and conveniently removing it.

As indicated in Fig. 5, the tunnel may be of only sufficient size to accommodate the single cars 40 41, arranged along the railroad-track, or it may be sufficiently wide to accommodate two or more such cars arranged abreast, and, indeed, the tunnel may be conveniently run in sections of varying width, the first section being only wide enough to accommodate a single car and the rear sections subsequently widened in the manner indicated in Fig. 5. The excavated material is preferably received in the first instance in special cars indicated and transported upon them to any desired place where it can be conveniently disposed of.

As is indicated in Fig. 2, the car may be conveniently formed with the necessary rigidity by supporting its sides 13 with channels or other reinforcing-pieces from the heavy frame and floor, the front car being preferably formed with an inclined floor, as indicated, and the several supporting-wheels 3 at either end of the car being arranged in journals of the desired height. These wheels, as indicated, are formed of sufficient diameter so that they properly engage the track and

support the car under the heavy impact of the falling excavated material. These end wheels are preferably formed with flanges to properly engage the tracks 1, mounted on the sleepers 2 in the usual manner, and these flanged wheels may be rigid on the axles 4, which are mounted in suitable journals 55, the ends of which are preferably yieldingly mounted, the heavy springs 5 being indicated to normally press these journals outward from the rigid frame of the car-bottom 33 and these journals being held in the proper position by the bolts 27, passing through the springs. As seen in Fig. 2, suitable raised guards 6 may be let into the car-bottom to accommodate the wheels.

If desired, intermediate wheels 26, preferably formed with cylindrical unflanged faces, may be used and mounted in a similar manner to assist in supporting the weight of the car. It is also desirable in many instances to employ additional supports, which may be in the form of buffers of wood or other similar material, such as 23, which may be mounted loosely upon the pins or bolts 24 and normally held in the position indicated in Fig. 2 by the heavy springs 25, by which they are allowed a limited upward movement. Any desired number of these buffers may be used, and in case of extreme shock after the journal-springs described have yielded to some extent the buffers engage the rails and can move upward relative to the car-body under the influence of the springs to a slight extent, and thereafter the buffers come solidly into contact with the car-frame, and thus prevent injury to the wheels or journals of the same.

In order to direct the excavated material into the cars in a proper manner as the material is blasted or otherwise removed from the face of the working, shields are preferably arranged on the cars so as to intercept all of this material possible. The front shield 9 may be hinged about the heavy bar 10 on the front of the car-frame and allowed to tilt forward, and, furthermore, may be, if desired, given the proper form to fit between the rails and closely engage the bottom of the excavation. Similar lateral shields 7, as indicated in Fig. 1, may be pivoted about the pins 8 in the front sides of the car-frame and may engage the lateral walls of the excavation in a similar manner and for a similar purpose. In order to more effectively guide the material into the top of the car and prevent this material from falling between the sides of the ex-

cavation and the car sides, the shield mounted at the top of the sides of the car is preferably given a sectional or skeleton form and may be formed of a series of separately-pivoted shield-arms 27, as indicated in Fig. 2. These arms, preferably formed of steel or similar material, are all loosely pivoted upon the rod 18, rigidly mounted along the top of the side of the car, and the upper ends of these shield-arms are guided between the guide-bar 28, which is mounted on the arms 29, rigid with the rod 18, and a similar bar 34, mounted upon the arms 30. In this way the whole series of shield-arms may be simultaneously moved outward to closely engage the irregular wall of the excavation, as indicated in Fig. 3, or may be simultaneously thrown inward by swinging them about the rod 18 when the car is withdrawn or moved into place. If desired, however, these shields at the top edges of the car may be formed in sections, as indicated in Fig. 1, in which the several sections 15, 16, 17, and 20 are provided with the bars 14, hinged to similar bars 11, secured in the channels 12, which brace the sides of the car.

Fig. 1 indicates the heavy construction of the car and illustrates the way in which the supporting-channels 12 are reinforced at their lower portions by the channels 21 fitting within them. As is indicated, a number of these cars may be joined end to end, and their floors may be made substantially level by swinging down the end pieces 22, which, as indicated, are pivoted about the rods 19, suitable cover-pieces 56 being arranged to securely cover this joint, if desired. Where a number of these cars are placed side by side in the excavation, as is indicated in Figs. 2, 4, and 5, the cooperating sides 32 of the adjacent cars are preferably given a special form, as indicated, and braced by the channels 39. (See Fig. 4.) These adjacent sides are beveled down adjacent the working face of the excavation and are protected throughout their length by the shield 31, preferably formed of metal and secured by bolts, pins, or other means firmly to each of the cars. These saddles not only rigidly hold the cars in proper relative position, but also prevent material from working between them. Fig. 5 indicates the cars 42, 43, 44, and 45 with their cooperating sides closely adjacent and joined by the shield 31, as is indicated in Fig. 4. Fig. 5 also indicates several cars 46, 47, 58, and 49, which are sufficiently separated laterally, so that the connecting-shield 50, which, as indicated, is provided with the reinforced ridge 53, has a considerable width, and its lateral flanges 54 are adapted to be rigidly secured to the lateral sides of the cars and hold them in position and deflect any material falling upon this shield into the cars themselves. This shield may of course be reinforced with sufficient material to give it the desired rigidity, braces 51 52 being indicated in Fig. 6 for this purpose. In some

instances also this internal bracing may be given such form that cars may be run under the shield and into the central extension of the excavation, where a number of tracks are used, as indicated in Fig. 5. In such cases, of course, suitable switches are arranged for the transfer of the cars from one track to another and for running them out of the excavation to a place where the material can conveniently be disposed of. Furthermore, the cars may be conveniently emptied by bodily inverting them or by tilting them sufficiently to allow the material to run out of them by gravity, and the cars may be either inverted laterally or partially inclined in a longitudinal direction for this purpose.

It is of course understood by those familiar with this art that many changes may be made in the form, size, proportion, and numbers of parts of this apparatus, parts of the same may be used without using the whole, and parts may be used in connection with other devices without departing from the spirit of this invention or losing the advantages of the same. I do not, therefore, desire to be limited to the details of the disclosure which has been made in this case; but

What I claim as new, and what I desire to secure by Letters Patent, is set forth in the appended claims, as follows:

1. In excavating apparatus, cars arranged side by side on tracks, a shield bridging the space between said cars and rigidly and detachably joining the cooperating adjacent sides of said cars, said shield and the attached car sides being beveled downward adjacent the front of the forward cars, the forward car having forwardly-inclined frames and bottoms, spring-mounted flanged wheels on said cars engaging said tracks, intermediate unflanged wheels on said cars, spring-pressed buffers intermediate said wheels and closely adjacent, but normally out of contact with said tracks, hinged shields on the front edges of said cars and a series of shield-arms loosely pivoted on the upper lateral edges of said cars and guide-bars on either side of said arms and rigid with the pivot-bars on which said arms are mounted.

2. In excavating apparatus, cars arranged side by side on tracks, a shield bridging the space between said cars and rigidly and detachably joining the cooperating adjacent sides of said cars, spring-mounted supporting members on said cars engaging said tracks, spring-mounted flanged wheels on said cars engaging said tracks and spring-pressed buffers intermediate said wheels and closely adjacent but normally out of contact with said tracks.

3. In excavating apparatus, cars arranged side by side on tracks, shield bridging the space between said cars and joining the cooperating adjacent edges of said cars and spring-mounted supporting members on said cars engaging said tracks.

4. In excavating apparatus, cars on tracks, the forward cars being provided with forwardly-inclined frames and bottoms spring-mounted flanged wheels on said cars engaging
5 said tracks, hinged shields on the edges of said cars comprising a series of shield-arms loosely pivoted on the upper lateral edges of said cars.

5. In excavating apparatus, a car provided with spring-mounted supporting members to
10 engage tracks, a series of shield-arms loosely pivoted on an edge of said car and guide-bars on either side of said arms and connected to rotate in unison, said guide-bars serving to
15 simultaneously rotate said arms while allowing a limited free movement thereof.

6. In excavating apparatus, a car provided with a forwardly-inclined bottom, spring-mounted supporting members on said car to engage tracks, hinged shields on the edges of said car comprising a series of shield-arms and
20 means to simultaneously swing said arms outward and inward while allowing relative movement between said arms.

7. In excavating apparatus, cars and hinged end pieces to connect a series of said cars together with a substantially uniform bottom.
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Witnesses:

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