Feb. 26, 1952 E. E. MILLER 2,587,362

TUNNEL MUCKING APPARATUS

Filed April 20, 1949 2 SHEETS—SHEET 1

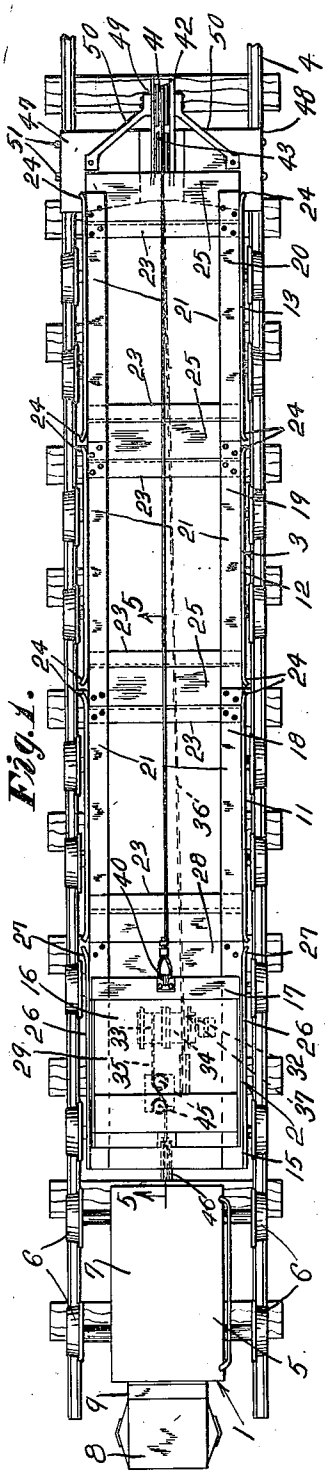


Fig. 1.

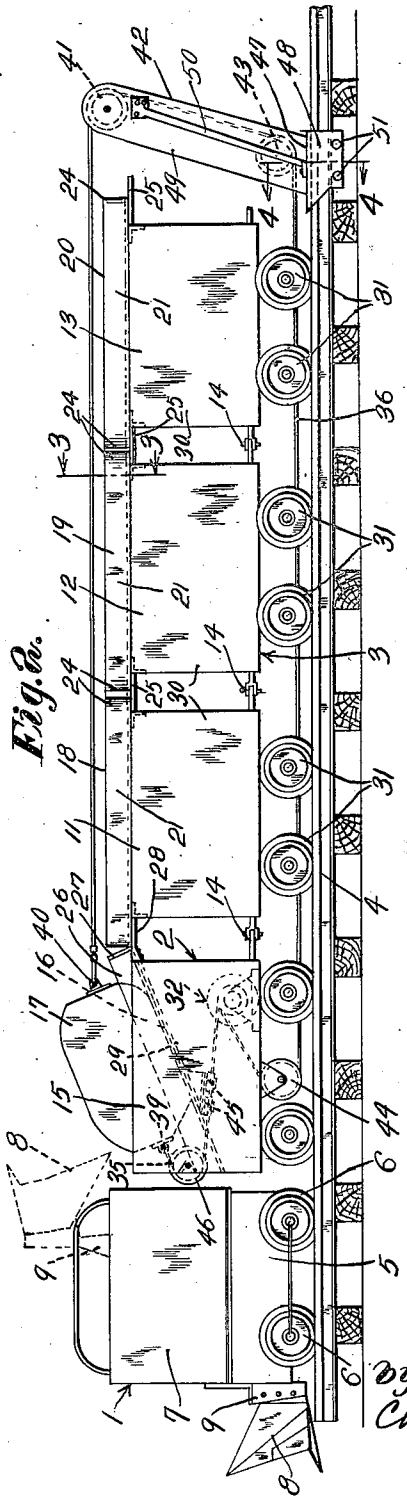


Fig. 2.

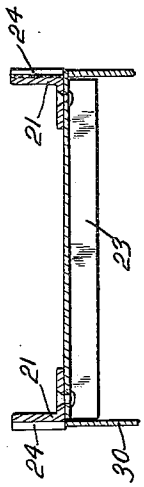


Fig. 3.

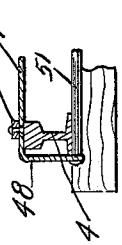


Fig. 4.

Inventor:
Earl E. Miller:
by
Charles F. Osgood,
Attorney.

Feb. 26, 1952 E. E. MILLER 2,587,362

TUNNEL MUCKING APPARATUS

Filed April 20, 1949 2 SHEETS—SHEET 2

Fig. 5.

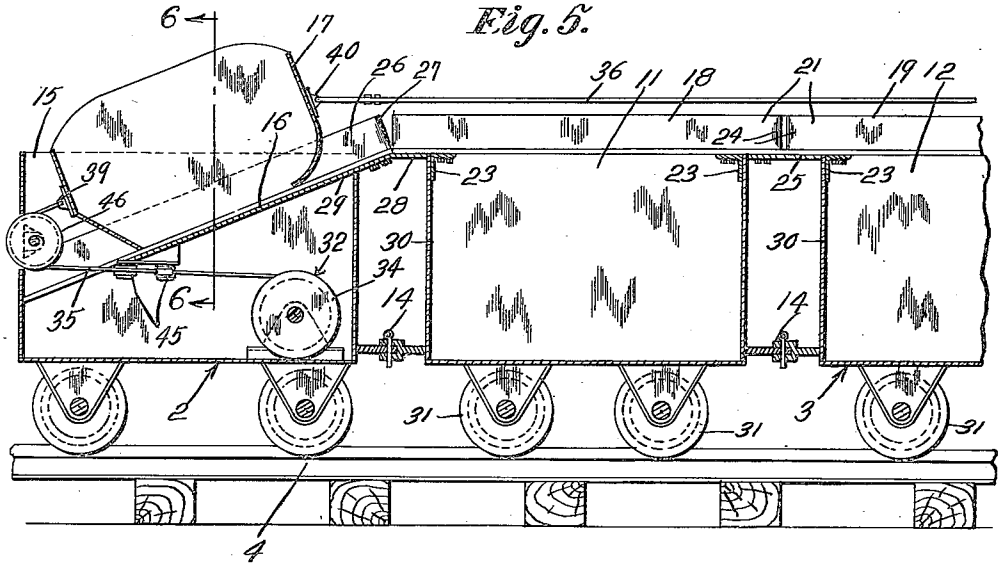


Fig. 6.

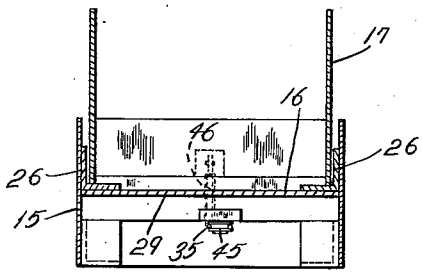
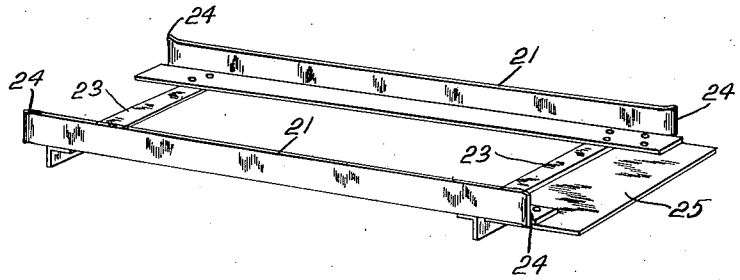


Fig. 7.



Inventor:
by Earl E. Miller.
Charles F. Osgood,
attorney.

Patented Feb. 26, 1952 2,587,362

UNITED STATES PATENT OFFICE

2,587,362

TUNNEL MUCKING APPARATUS

Earl Edward Miller, El Paso, Tex., assignor to Joy Manufacturing Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application April 20, 1949, Serial No. 88,521

7 Claims. (Cl. 214—90)

1

This invention relates to tunnel mucking apparatus and more particularly, but not exclusively, to a mucking train and scraper loader for loading muck in small rock tunnels in metal mines.

In small rock tunnels such as are encountered in certain metal mines, the veins are relatively narrow, the drifts and cross cuts are relatively small, and relatively small tonnages are handled, and it has accordingly been found difficult to mechanize. In such mines some of the cross cuts extend a long distance to a vein, or in the case of limestone deposits to the ore body. Under such conditions driving of tunnels has been a relatively slow and expensive process, involving hand loading into small cars which must be separately trammed relatively long distances, often loading out but one round per day. In one known instance, the rock is drilled and blasted during one shift and during the next shift the muck is loaded by hand into small cars and these cars when loaded must be manually trammed relatively long distances thereby making the mining process not only relatively slow and expensive but also extremely laborious. The present invention contemplates improvements over known methods of loading and tramming of cars in small rock tunnels, in that a mechanical shovel loader or mucker of relatively simple design loads the muck at the heading into a muck train, which is trammed by a locomotive, and which embodies a hoist operated scraper mechanism carried by a scraper car for receiving the muck from the shovel loader and for distributing the muck to the several cars of the train. The scraper is guided during its loading movement by separate guide frames or pans respectively carried by the cars of the train; and the hoist, which is carried by the scraper car behind the shovel loader, has its cables guided by a tail sheave support located beyond the outer car and attached to the trackway. Thus the entire rock pile at the heading may be loaded into the cars of the train. When the heading is loaded out the guide pans may be lifted off of the cars of the train and the tail sheave support may be removed from the trackway, and the pans and support may be placed temporarily at one side of the drift. The tail rope may then be wound up on its drum and the loaded train of muck cars may then be trammed from the heading to a suitable point of delivery. The shovel loader and scraper car may be trammed out with the train of loaded cars if desired and may be returned to the heading with the empty train after the next round has been

2

fired, again to load the muck dislodged from the heading. The scraper car, guide pans and tail sheave support are of a relatively simple, rugged and inexpensive construction. By the use of such a muck train the cost of small rock tunnel mucking may be substantially reduced while the mining operation is greatly expedited.

It is accordingly a primary object of the present invention to provide an improved tunnel mucking apparatus for mechanizing the handling of muck in small rock tunnels such as are encountered in metal mines. Another object is to provide an improved muck train comprising a series of mine cars, a scraper car, and separate guide frames respectively carried by the mine cars for guiding a hoist operated scraper along the tops of the cars to distribute the broken rock or muck into the several cars of the train, and a tail sheave support. Still another object is to provide an improved scraper apparatus for mucking small rock tunnels, wherein a shovel loader or mucker loads directly into the scraper. A further object is to provide an improved muck train for small rock tunnels in metal mines wherein a scraper car carries a closed bottom slide for a box scraper and a hoist mechanism for moving the scraper back and forth during the mucking operation. A still further object is to provide an improved train of muck cars coupled to a scraper car and each muck car carrying a guide pan which rests on the top of the car and providing guiding means for the scraper as it is moved along the guide pans back and forth over the tops of the muck cars. Still another object is to provide an improved tail sheave support which may be readily attached to the track rails and which may be readily removed when desired. Another object is to provide an improved muck train especially designed for use in small rock tunnels such as are encountered in metal mining and adapted for association with a conventional muck loader and embodying novel means for receiving the muck discharged from the loader and for distributing the muck into the several cars of the train. A still further object is to provide an improved scraper car providing an incline guide for a box scraper whereby the shovel of the shovel loader may discharge its load directly into the box scraper. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings:

Fig. 1 is a plan view of the improved tunnel mucking apparatus.

Fig. 2 is a side elevational view of the mucking apparatus shown in Fig.1.

Fig. 3 is an enlarged cross sectional view taken on line 3—3 of Fig. 2, illustrating the guide pan structure.

Fig. 4 is a detail vertical sectional view taken on line 4—4 of Fig. 2.

Fig. 5 is an enlarged central longitudinal vertical sectional view taken on line 5—5 of Fig. 1.

Fig. 6 is a detail cross sectional view taken on line 6—6 of Fig. 5.

Fig. 7 is a perspective view of one of the guide frames or pans.

In this illustrative embodiment, as shown in the drawings, a conventional shovel loader or so-called muck loader is generally designated 1, the scraper car is generally designated 2 and the car train is generally designated 3, and the loader, the scraper car and the cars of the train are mounted on wheels adapted to travel along a trackway 4 laid on the tunnel floor.

The shovel loader 1 may be generally similar to that disclosed in the patent to R. C. Osgood, No. 2,201,671, patented May 21, 1940, and generally comprises a self-propelled truck 5 having tramming wheels 6. Swivelled on the truck to turn about a vertical axis is a frame 7 which carries a vertically swingable shovel mechanism including a shovel 8 mounted on a rocking frame 9. The shovel when in lowered position at the front end of the truck may dig into the rock pile and when loaded may swing upwardly and rearwardly over the top of the loader to discharge its contents at an elevated position at the rear side of the truck. The shovel 8 may be turned with the swivelled frame 7 to load out the rock at either side of the trackway in the manner fully described in the above mentioned patent. Since the detail construction of the shovel loader does not enter into the present invention further description thereof is herein unnecessary.

The improved car train 3 is coupled to the scraper car 2 and comprises a series of small muck cars 11, 12 and 13, and the scraper car and the muck cars of the train are coupled together by conventional couplings 14. Evidently, a smaller or larger number of mine cars may be employed in the train. The scraper car 2 has a body 15 which carries an inclined closed bottom slide or platform 16 for supporting a conventional box scraper 17 having an open top and an open bottom. When the scraper is disposed on the slide 16 during the loading operation the closed bottom slide provides a closure for the bottom of the scraper. Arranged on the tops of the muck cars 11, 12 and 13 of the train are separate removable guide frames or pans 18, 19 and 30 which cooperate with the incline slide 16 to provide a substantially continuous guideway for the scraper. Each of the removable guide pans is of rectanguar shape having an open center which overlies the car body. Each guide pan comprises parallel side angle members 21, 21 maintained in rigid spaced relation by cross angle members 23, 23 which may be riveted or otherwise secured to the bottoms of the longitudinal angle members. The ends of the vertical flanges of the side angle members may be laterally bent at 24 to eliminate any sharp edges which might obstruct the free travel of the box scraper along the guideway. At one end of each pan is a horizontal cross plate 25 which extends substantially across the space between a pair of adjacent cars. The slide 16

of the scraper car comprises side angle members having upright flanges 26 which are laterally bent at 27 at their rear ends likewise to avoid sharp edges, and a bent cross plate 28 is secured as by riveting to the inclined bottom plate 29, and this cross plate extends substantially across the space between the scraper car and the next adjacent muck car. Each muck car has a rectangular open top body 30 mounted on wheels 31. When the separate guide pans are placed on the tops of the muck cars the cross angle members 23 have their bottom flanges extending downwardly within the car bodies in engagement with the inner end walls of the body as shown in Fig. 5 to prevent horizontal displacement of the guide frames. One end of each guide frame overlies the projecting portion of the cross plate 25 of the next adjacent guide frame in the manner shown. Thus a substantially continuous guide frame structure is provided from the box scraper as it travels from the slide of the scraper car along the tops of the muck cars thereby enabling distribution of the muck being loaded into the several cars.

Carried by the scraper car 2 beneath the scraper slide 16 is a conventional double drum hoist generally designated 32 which may be generally similar to that disclosed in the R. C. Osgood patent, No. 1,740,707, patented December 24, 1929. This hoist comprises relatively rotatable drums 33 and 34 on which cables or ropes 35 and 36 are respectively wound. The drums are driven by a motor 37 and each drum has a transmission mechanism embodying a friction clutch control 38. Suitable control levers for the clutches may be located at the side of the body of the scraper car. The free ends of the cables are attached at 39 and 40 to the opposite ends of the box scraper 17 and the tail rope 36 is guided by a tail sheave 41 journaled on a support 42. The tail rope passes from the tail sheave downwardly around a guide sheave 43 and then forwardly beneath the train of cars to a guide sheave 44 carried at the bottom of the scraper car near the hoist. The tail rope passes from this sheave onto the drum 34. The pull rope 35 extends from the drum 33 around a pair suitably located guide sheaves 45 carried at the bottom of the scraper slide and extends forwardly around a front guide sheave 46 and from the latter to its connection with the scraper. The tail sheave support 42 may assume various forms but is herein shown, for illustrative purposes, as comprising a cross plate 47 resting on the tops of the track rails and having depending side portions 48 which extend downwardly along the outer sides of the trackway. An upstanding arm 49 carried by the cross plate and rigidly braced at 50 carries the tail sheave 41. Removable cross bolts or rods 51 pass through openings in the side portions 48 beneath the track rails as shown in Fig. 4 when a pull is imparted to the tail rope the support 42 tends to tilt or cant relative to the trackway and is thus locked firmly in position between the top and bottom surfaces of the track rails. By removing the cross bolts or rods 51 the tail sheave support may be readily detached from the trackway. Evidently, the tail sheave 41 may, if desired, be hung from the roof, as from a roof anchor, or the sheave support 42 may be clamped at its sides as by bolts directly to the track rails, in well-known manners.

The general mode of use of the improved tunnel mucking apparatus will be clearly apparent from the description given. The shovel 8 of the

muck loader 1 may be operated to load the loose rock or muck at the heading into the box scraper 17 which is carried by the slide 16 of the scraper car 2, and when the box scraper is filled with muck, the hoist 32 may be operated to pull the scraper along the adjacent guide pan 18 into a position wherein the scraper contents drop by gravity through the pan opening into the underlying body of the car 11. When the first car is filled with muck the box scraper may be moved over the leveled car load and onto the next adjacent guide pan 19 of the next car 12, and these operations may be repeated until the entire train of cars is loaded. The guide pans may then be removed from the tops of the muck cars and the tail sheave support 42 may be detached from the trackway, and the pans and support may be temporarily set at the side of the drift. At this time the box scraper 17 is located on its slide 16 on the scraper car and the tail rope may be disconnected from the scraper and wound up on its drum. The scraper car may then be uncoupled from the muck train and a locomotive may be coupled to the outer end of the train and the loaded train may be trammed from the heading. If desired, the scraper car 2 may remain coupled to the muck train and trammed out from the heading with the car train. The shovel loader has its own propelling means and may be separately trammed from the heading or may be trammed out with the train.

As a result of this invention an improved tunnel mucking apparatus is provided for loading out the muck from the heading of a small mine tunnel, thereby greatly decreasing the time normally consumed in mucking by conventional hand methods. By guiding the box scraper on the slide of a scraper car located at the rear of a conventional shovel loader, the shovel of the loader may dump its load directly into the scraper in a novel manner. The provision of the separate guide frames or pans disposable directly on the tops of the cars of the train, the box scraper may move directly over and discharge its contents directly through the open centers of the frame into the mine cars. By making the guide pans readily removable they may be quickly lifted off from the cars and set to one side when the train is loaded. The scraper structure is relatively simple and rugged in design and may be associated with conventional mine cars without change. By the provision of a muck train which consists of several muck cars coupled together, the time usually consumed in the switching of the separate cars is completely eliminated and the normal mucking time usually consumed in hand loading may be substantially reduced. Other advantages of the invention will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A scraper loading apparatus for use with a train of mine cars adapted to run along a trackway and comprising a scraper car coupled to a mine car at one end of the train and having an inclined slide plate, a series of cooperating separate removable rectangular guide frames resting directly on the tops of the cars of the train and providing a substantially continuous guideway extending lengthwise of the train, each frame having an open center overlying the body of a car by which the frame is directly supported, a box scraper having an open bottom and disposed on said slide plate for receiving the material to be loaded with said plate closing the bottom of said scraper, and a hoist on said scraper car and having pull and tail ropes attached directly to said scraper for moving the latter back and forth to and from said slide plate and along said guide frames, said scraper as it moves from said slide plate along said guide frames discharging the material therein through its open bottom and the frame openings into said cars for loading the material progressively into the cars of the train.

2. A scraper loading apparatus for use with a train of mine cars adapted to run along a trackway and comprising a scraper car coupled to a mine car at one end of the train and having an inclined slide plate, a series of separate cooperating removable guide frames of rectangular shape resting directly on the tops of the cars of the train and providing a substantially continuous guideway extending lengthwise of the train, each frame having an open center overlying the body of a car by which the frame is directly supported, a box scraper having an open bottom and disposed on said slide plate for receiving the material to be loaded with said plate closing the bottom of said scraper, a hoist on said scraper car and having pull and tail ropes attached to said scraper for moving the latter back and forth to and from said slide plate and along said guide frames, said scraper as it moves from said slide plate along said guide frames discharging the material therein through the scraper bottom and the frame openings into said cars for loading the material into the cars of the train, and a tail sheave support attached to the trackway beyond the opposite end of the train for guiding the tail rope of said hoist.

3. In a loading apparatus, a train of mine cars coupled together and adapted to travel along a trackway, a scraper car guided by the trackway and coupled to one end of the train, said scraper car having an inclined scraper slide, an open bottomed box scraper on said slide, open-centered rectangular guide frames one resting directly on the top of each car of the train and cooperating with said slide to provide a substantially continuous guideway for the scraper extending lengthwise of the train, and a hoist on said scraper car and having a cable connected directly to said scraper for moving said scraper from said slide directly along the guideway provided by said guide frames.

4. In a loading apparatus, the combination comprising a shovel loader, a scraper car, a train of mine cars, said loader and said cars adapted to travel along a trackway, and said scraper car coupled to one end of said train, said scraper car having an inclined closed bottom slide, an open bottomed box scraper disposable on said slide in a position to receive material discharged from said shovel loader with said slide closing the bottom of said scraper when the latter is disposed on said slide, a rectangular guide frame disposed directly on the top of each car of said train and said guide frames cooperating to provide a substantially continuous guideway for said scraper extending lengthwise of the train, said scraper having direct sliding engagement with said guideway, and a hoist carried by said scraper car and having pull and tail ropes directly con-

nected to said scraper for moving the latter from said slide along the guideway provided by said guide frames and for retracting said scraper, and said scraper as it moves toward the opposite end of said train along the guideway over the tops of the cars of said train discharging its contents progressively into the mine cars.

5. In a muck loading apparatus for tunnels in metal mines, comprising a scraper car, a series of mine cars, said cars coupled together for movement in unison along a trackway laid on the tunnel floor, a series of separate cooperating removable guide frames of rectangular shape having open centers and resting directly on the tops of said mine cars, said scraper car having an inclined slide plate on which a box scraper is received in a position to receive muck to be loaded into said mine cars, and said slide and said guide frames having overlapping horizontal portions which substantially close the spaces between the cars while permitting relatively free relative horizontal movement, and said slide and said guide frames cooperating to provide a substantially continuous guideway for said scraper extending lengthwise of the train and with which said scraper has direct sliding engagement, and means having direct connection with said scraper for moving said scraper along the guideway thus provided to move the muck loaded therein progressively into said mine cars.

6. In a muck loading apparatus for tunnels in metal mines, comprising a scraper car, a series of mine cars, said cars coupled together for movement in unison along a trackway laid on the tunnel floor, a series of separate cooperating removable guide frames of rectangular shape having open centers and resting directly on the tops of said mine cars, said scraper car having an inclined slide plate on which a box scraper is received in a position to receive muck to be loaded into said mine cars, and said slide and said guide frames having overlapping horizontal portions which substantially close the spaces between the cars while permitting relatively free relative horizontal movement, and said slide and said guide frames cooperating to provide a substantially continuous guideway for said scraper extending lengthwise of the train and with which said scraper has

direct sliding engagement, and means having direct connection with said scraper for moving said scraper along the guideway thus provided to move the muck loaded therein into said mine cars, said scraper having an open top and an open bottom and discharging its contents when it occupies a position over the open center of a guide frame, and said scraper riding over the leveled load in a loaded mine car as it moves its load toward discharging position over the next adjacent car.

7. In a muck loading apparatus for tunnels comprising a frame supporting an inclined side plate which receives a box scraper to be loaded and providing a bottom closure for a scraper disposed thereon, a guide frame adapted to rest on the top of a body of a mine car, said plate and said guide frame having horizontal overlapping portions, and said guide frame having an open center disposable over a car body, a box scraper having an open bottom disposable on said slide, said slide plate and said overlapping portions extending between said first frame and the car to be loaded to prevent discharge between them of the scraper contents during movement of said scraper toward its position overlying the car body, and means for moving the loaded scraper along said slide, over said overlapping portions and along said guide frame to a position wherein it lies over the open center of said frame and its contents are discharged into the underlying car body.

EARL EDWARD MILLER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,232,082	Pratt	July 3, 1917
1,448,756	MacEachen	Mar. 20, 1923
1,528,540	Gartin	Mar. 3, 1925
1,550,239	Billings et al.	Aug. 18, 1925
1,920,500	Garcia et al.	Aug. 1, 1933
1,954,161	Williams	Apr. 10, 1934
2,139,129	McCarthy	Dec. 6, 1938
2,147,093	Haske	Feb. 14, 1939