Feb. 5, 1957 P. L. ALSPAUGH ET AL 2,780,451

PROCESS AND APPARATUS FOR BORE HOLE MINING AND CONVEYING

Filed May 26, 1953

Fig. 1.

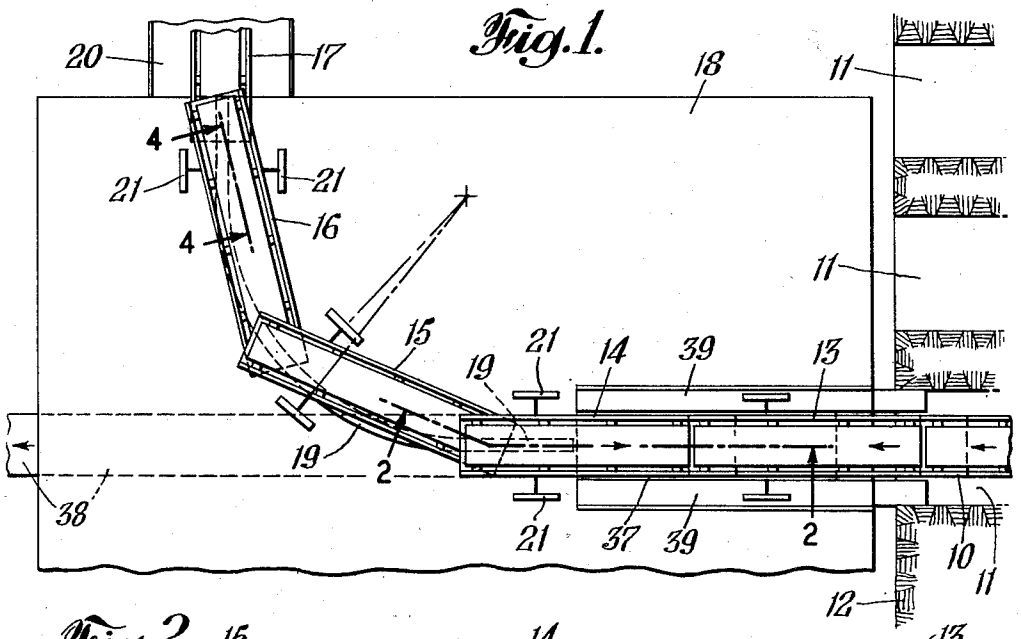
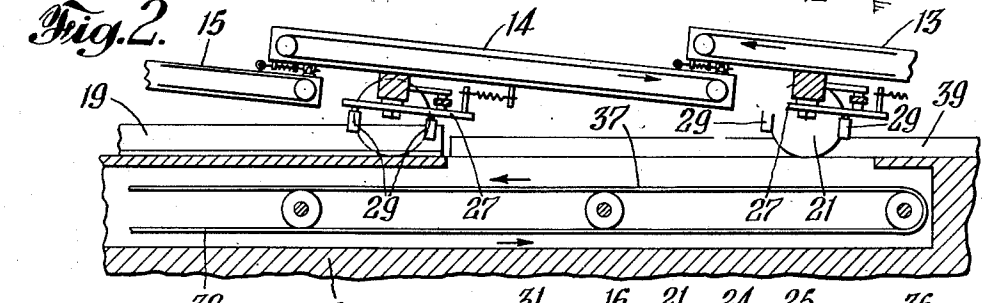


Fig. 2.



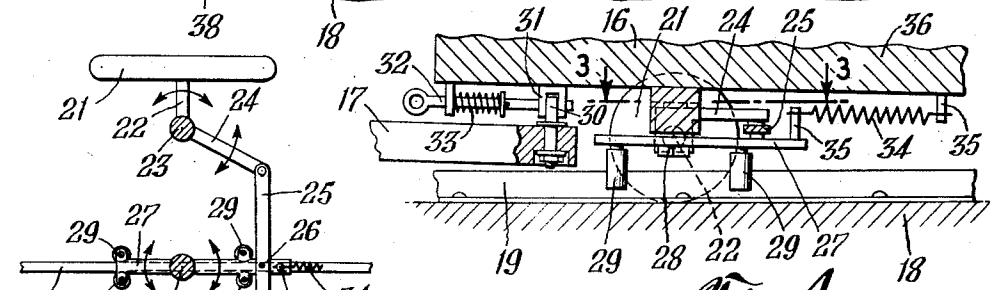


Fig. 4.

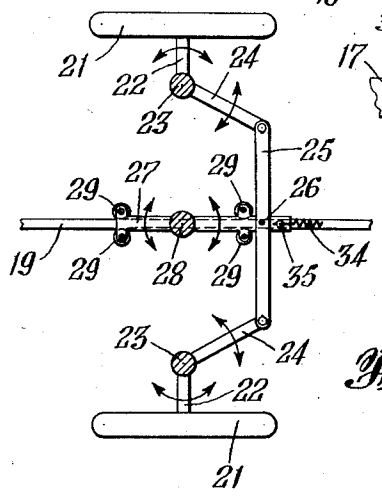


Fig. 3.

INVENTORS
PAUL L. ALSPAUGH
ROBERT R. COSNER
BY Barnwell R. King
ATTORNEY

United States Patent Office 2,780,451 Patented Feb. 5, 1957

2,780,451

PROCESS AND APPARATUS FOR BORE HOLE MINING AND CONVEYING

Paul L. Alspaugh and Robert R. Cosner, South Charleston, W. Va., assignors to Union Carbide and Carbon Corporation, a corporation of New York

Application May 26, 1953, Serial No. 357,462
5 Claims. (Cl. 262—7)

This invention relates to mining and, while not limited thereto, the invention more particularly relates to a continuous conveyor system for bore-mining involving a self-propelled mining machine that is remotely controlled from a station located outside of the holes bored by the machine, which holes are of the order of 500–1000 feet long in selected earth strata.

In the patent of Alspaugh, Heimaster and McNeill, No. 2,699,328 granted January 11, 1955, for "Mining Machine" there is disclosed such a remotely controlled bore-mining machine. In the continuation-in-part application, Serial No. 353,932 of such inventors for "Remotely Controlled Mining System," a train of conveyor sections comprising wheeled vehicles enters a hole being bored by the machine, or emerges therefrom as the machine backs out of such hole. However, in such system it was necessary to stop the machine and conveyors to connect and disconnect each conveyor section on the platform, a hoist being used to lift them on and off such platform.

An object of the invention is to eliminate the previous necessity of connecting and disconnecting conveyor vehicles or sections, or lifting them on and off the launching platform as the mining machine bores, or backs out of each hole. A further object is to provide a more continuous and efficient bore-mining operation. Other objects will appear from the following description.

According to this invention the work, trouble and delay involved in connecting and disconnecting each of the conveyor sections to and from the conveyor train on the launching platform in back of the mining machine has been eliminated. It is now unnecessary to use a hoist inasmuch as the conveyor sections remain connected.

More specifically the floor of the launching platform is provided with a simple guide rail mounted thereon. As each conveyor section moves out of the hole the guide rail operates an automatic steering mechanism on each vehicle which steers the wheels thereof to guide the conveyor train around a turn and down a ramp and along a shelf in a direction generally parallel to an exposed face of the geological seam being mined.

Referring to the drawings:

Fig. 1 is a fragmentary top plan view of apparatus illustrating the invention, showing a train of conveyor sections moving out of a hole and being turned down a ramp;

Fig. 2 is a fragmentary view mainly in side elevation of the conveyor train taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary view partly in top plan and partly in horizontal section taken on line 3—3 of Fig. 4, illustrating the steering mechanism; and

Fig. 4 is a fragmentary view partly in side elevation and partly in vertical-longitudinal section taken on the line 4—4 of Fig. 1.

The rear end portion of a bore-mining machine **10**, Fig. 1, is shown emerging from a hole **11** in a seam **12** of coal, for example, which is being mined. Connected in back of the machine **10** is a train of wheeled vehicles comprising conveyor sections **13**, **14**, **15**, **16**, **17** each having a continuous conveyor by means of which the material mined by the machine is continuously conveyed rearwardly during the bore-mining operation of

the machine **10**. Such conveyor sections and eventually the machine are received in succession on a launching platform **18**. The mining machine **10**, conveyor sections **13** to **17**, and platform **18** are generally of the type disclosed in said continuation-in-part application.

On the floor of platform **18** is mounted a curved guide rail **19** such as a simple structural shape, or lengths of connected pipe the outside of which is fairly smooth. Such guide rail is shown principally in dotted lines in Fig. 1 since it extends from a position axially aligned with the hole **11** and is for the purpose of guiding the conveyor sections **11** through a 90° turn such, for example, as a bend and down a ramp **20** leading from the launching platform **18** to the ground of a shelf and on which the launching platform normally rests. As the conveyor sections are moved out of the hole behind the machine **10** they remain connected. After being moved down the ramp **20** the train extends along the top of the shelf or ledge of ground that is provided for the platform. As shown in Fig. 1 when the mining machine **10** is being moved out of the hole and onto the platform, the conveyor sections eventually extend in a direction toward the top of the drawing so that when the platform is subsequently moved along the exposed face of the coal seam in the opposite direction, to position the machine for cutting the next hole, the train of conveyor sections is drawn along the ledge with the platform.

Each conveyor section vehicle is provided with a pair of load-bearing wheels **21**. For steering the vehicle each wheel **21** is mounted on an axle **22**, which axle is secured to an upstanding pivot **23** as is common in automotive type steering mechanisms. For turning each axle **22** about its pivot **23** a lever arm **24** forms a bell crank with the axle **22** as shown in Fig. 3. The outer ends of the lever arms **24** are connected by a common link **25** which is pivotally connected at **26** to a guide-rail follow member **27** horizontally rotatable about a vertical pivot **28** under the vehicle. The member **27** carries spaced pairs of rollers **29** projecting downwardly therefrom to receive the guide rail **19** between them, Fig. 3. The spaced pairs of followers such as rollers **29** are constructed and arranged to steer the wheels **21** slightly in advance of their reaching a curved portion of the guide rail **19**. The rollers **29** are equally spaced from the pivot **28** of member **27** a distance long enough to give the desired mechanical advantage in rendering the steering easy, yet short enough not to be in danger of engaging a wheel **21** or axle pivot **23**. The guide-rail follower **27** when angularly displaced by the guide rail **19** automatically swings the connecting link **25** toward one wheel **21** or the other, causing both wheels **21** to be turned in the desired direction.

Each conveyor section vehicle is connected to the next by a swivel-tongue **30**, Fig. 4, projecting between a bifurcated lug **31** into which a coupling pin **32** is urged by a compression spring **33** extending around the pin. A tension spring **34** is connected between a projection **35** depending from the chassis frame **36** and the right end of member **27**, Figs. 3 and 4, for normally urging the steering mechanism in centralized position.

The platform **18** is provided with a continuous conveyor **38** disposed under the floor thereof, the latter having an opening exposing a portion **37** of such conveyor into which the mined material is discharged by gravity as the mining machine advances into the seam. To the left of the exposed portion **37**, the conveyor **38** lies beneath the platform floor and beyond the platform discharges into another conveyor, not shown. On either side of the exposed portion **37** of the conveyor **38** are straight ways **39** for the wheels **21** of the vehicles constituting the conveyor sections and for the tractor treads of

the mining machine 10. The guide rail 19 begins about where the ways 39 end. The straight ways 39 preferably have upstanding flanges on the outer sides thereof for the purpose of guiding the conveyor sections toward the end of the guide rail so that the pairs of rollers 29 receive the rail properly as they approach such end. If desired there may be a small longitudinal overlap of guide rail 19 and the flanges on the outer sides of ways 39. All of the conveyor sections are guided by rail 19 through a turn, in the present example one which is 90°, on the platform 18 and down the ramp 20 and along the ground in a direction generally parallel to the exposed face of the seam so that no time is lost in disconnecting conveyor sections as the conveyor train backs out of each hole. When the platform with the mining machine on it moves, downwardly in Fig. 1, to a new position for again entering the seam, the entire conveyor train is also moved, all the conveyor sections not on the platform being run along the ground. The guide rail 19 and steering mechanisms associated with each vehicle maintain the conveyor sections in proper alignment.

As the mining machine 10 bores into the seam it discharges the mined material such as coal out of the mouth of the mine by the conveyor of vehicle 13 and onto the conveyor of vehicle 14. This conveyor 14 is running in reverse at the time discharging the coal off its front end onto the platform conveyor 38. As conveyor 14 reaches the extremity of platform conveyor 38, it is run in the forward direction delivering rearwardly the coal received from 13. The coal falls on conveyor 15 which is then run in reverse, and delivers the coal forwardly onto the exposed portion 37 of conveyor 38. Such exposed portion 37 of conveyor 38 is of greater length than that of each movable conveyor section, i. e., vehicle. Thus, a continuous stream of coal is delivered from the machine 10 and the mining operation becomes substantially continuous as the machine bores into the seam without interruption. The number of movable conveyor sections or vehicles connected in the train behind the machine 10 depends upon the depth of penetration of the machine into the coal seam, which generally is 500–1000 feet, but may be more.

Among the advantages of this invention may be mentioned the great saving in time as compared with the prior art practice in which it was customary for the conveyor sections to be disconnected in succession and moved by a hoist from the platform to the ground as the machine backed out of its hole. Also under that former practice it was necessary, after the machine and platform had been moved to a new position for cutting another hole, to lift the conveyor sections by means of the hoist back onto the platform one at a time as the machine progressed into the mine. It was necessary to stop the machine during the time that each conveyor section was connected or disconnected. The present invention, however, approaches the ideal of complete continuity, the conveyor sections remaining connected during the entire time they are moving in or out of the mine, and also during the time the platform and machine are moved.

The mechanism described for steering the two wheels of each conveyor section is readily adapted for embodiment in a four wheeled vehicle. In any case the mechanism automatically steers the wheels slightly in advance of such wheels coming opposite the curved portion of the guide rail 19. Spring 34 stabilizes the steering action and aids in yieldably holding the wheels 21 in position for substantially straight line movement when the steering mechanism is free of the guide rail. Also the wheels of the vehicles may be individually driven by suitable motors to propel the train as desired, thereby relieving the mining machine in whole or in part of such duty. Also the turn, while 90° in the present example, may be any other necessary or desirable angle, depending upon the terrain, such as 30° or 60°.

The steering mechanism per se that is disclosed herein is claimed in our divisional application, Serial No. 375,391, filed August 20, 1953.

We claim:

1. In a process for mining earth material in which the material is substantially continuously removed from a bore hole in a seam having an exposed face outside of the mine by a train of conveyor sections, the improvement which comprises automatically guiding the train through a preselected turn on entry and withdrawal from the bore hole, moving the entire train outside of the mine in a direction generally parallel to such exposed face of the seam, and again guiding each section of the train through such preselected turn from outside of the mine into said bore hole during the mining operation while discharging the so-mined material continuously from between selected adjacent sections of such train outside of such bore hole.

2. Process of mining which comprises exposing the edge of a selected earth stratum by preparing a ledge running generally parallel thereto, boring a hole into such stratum through such exposed edge, continuously removing through such hole the material being mined as the boring of the hole progresses by means of a train of continuous conveyor sections which have the rear end of each section overlapping the front end of the next section to deliver material thereonto, reversing the continuous conveyor of each section in succession as it approaches the entrance of such hole to discharge the mined material from the train under the overlapping rear end of the preceding section as the bore-mining operation progresses, and continuously receiving and conveying such discharged material.

3. Process of mining as defined by claim 2, in which the conveyor sections are guided around a curve on said ledge, a succession of such holes are bored in the stratum along said ledge in such manner that the train of conveyor sections extends along the ledge, the reversal of each conveyor section takes place as the train turns, and the entire train is moved along said ledge from one hole to the next.

4. Apparatus for mining earth material in which the edge of a selected earth stratum is exposed by preparing a ledge running generally parallel thereto, comprising means for boring a hole into such stratum through such exposed edge, a train of continuous conveyor sections for continuously removing through such hole the material being mined as the boring of the hole progresses, the rear end of each section overlapping the front end of the next section to deliver material thereonto, means for reversing the continuous conveyor of each section in succession as it approaches the entrance of such hole to discharge the mined material from the train under the overlapping rear end of the preceding section as the bore-mining operation progresses, and means for continuously receiving and conveying such discharged material.

5. Apparatus for mining as defined by claim 4, in which means are provided for guiding the conveyor sections around a curve on said ledge, a succession of such holes are bored in the stratum along such ledge in such a manner that the train of conveyor sections extends along the ledge, the means for reversing each conveyor section operates as the train turns, and means are provided for moving the entire train along the ledge from one hole to the next.

References Cited in the file of this patent

UNITED STATES PATENTS

867,765	Strickler	Oct. 8, 1907
2,420,009	Osgood	May 6, 1947
2,479,132	Peale et al.	Aug. 16, 1949
2,616,677	Compton	Nov. 4, 1952
2,674,364	Cartlidge	Apr. 6, 1954
2,699,328	Alspaugh et al.	Jan. 11, 1955