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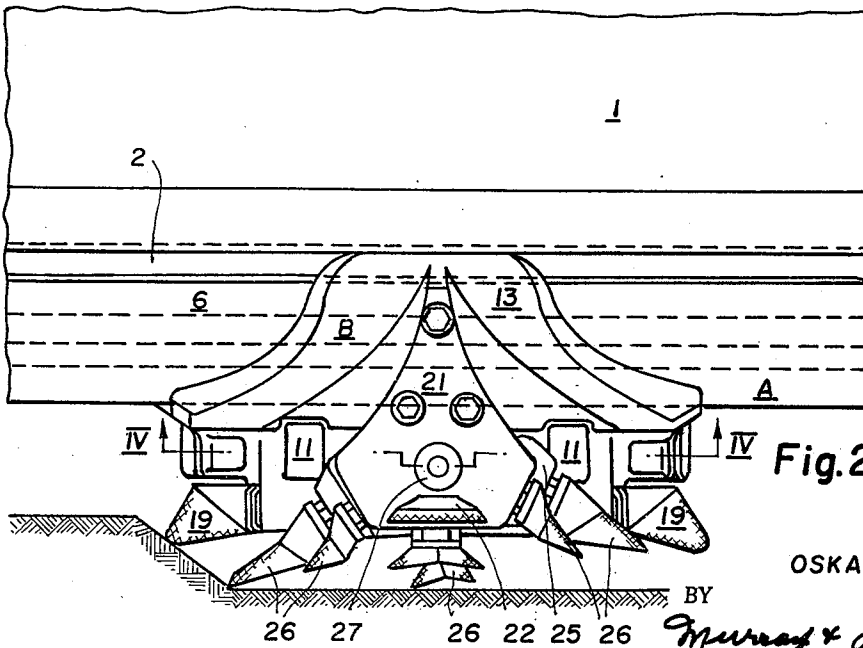
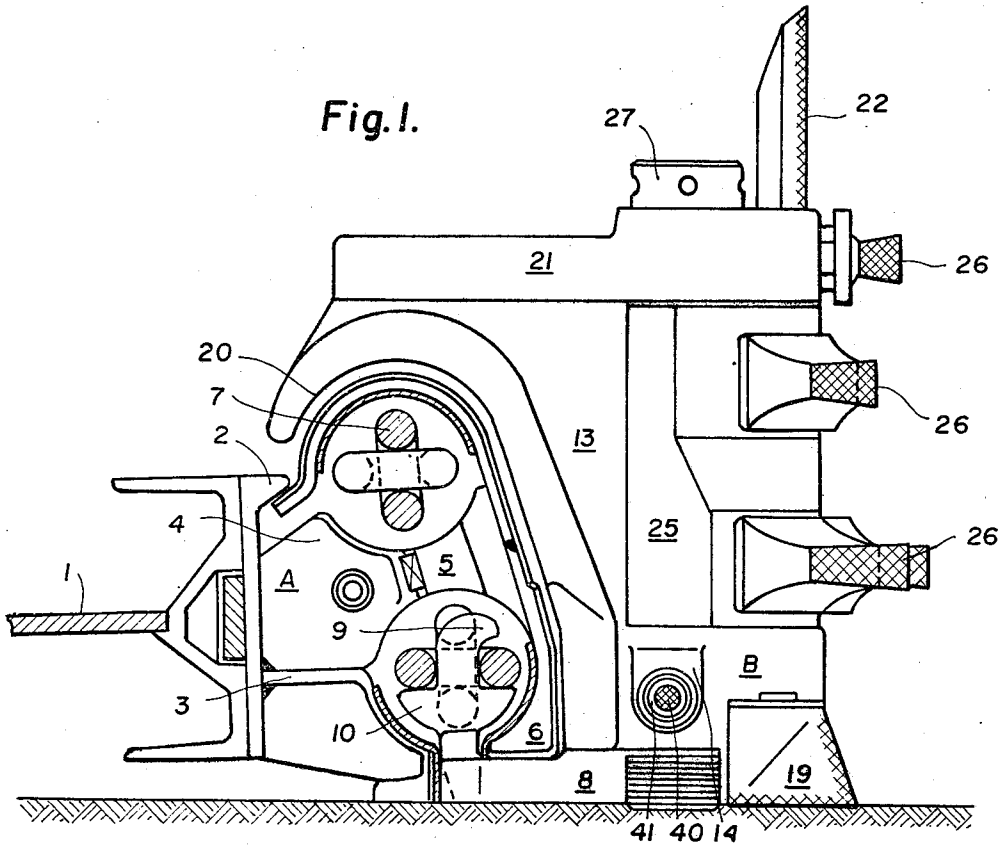
O. WILLNER

3,493,267

SCRAPER TYPE CUTTER FOR LONGWALL MINING

Filed Aug. 21, 1968

4 Sheets-Sheet 1



INVENTOR.  
OSKAR WILLNER

BY

*Murray & Linkhauer*

his ATTORNEYS

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O. WILLNER

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Fig. 3.

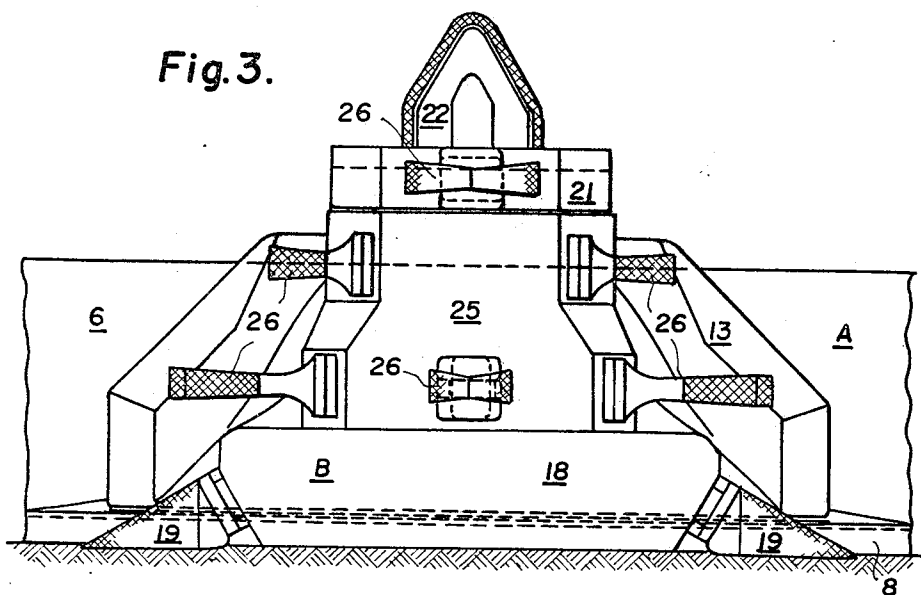
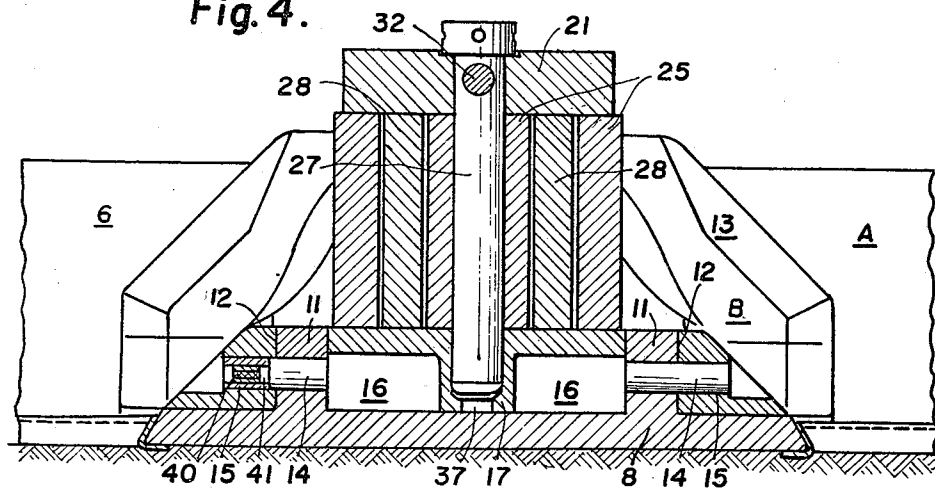


Fig. 4.



INVENTOR.

OSKAR WILLNER

BY

*Murray & Linkhauer*

his ATTORNEYS

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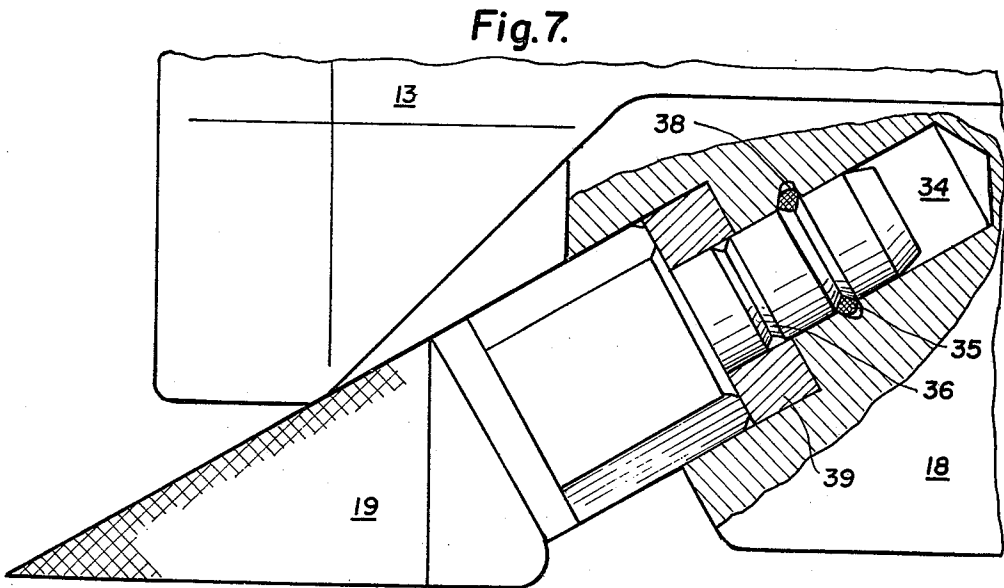
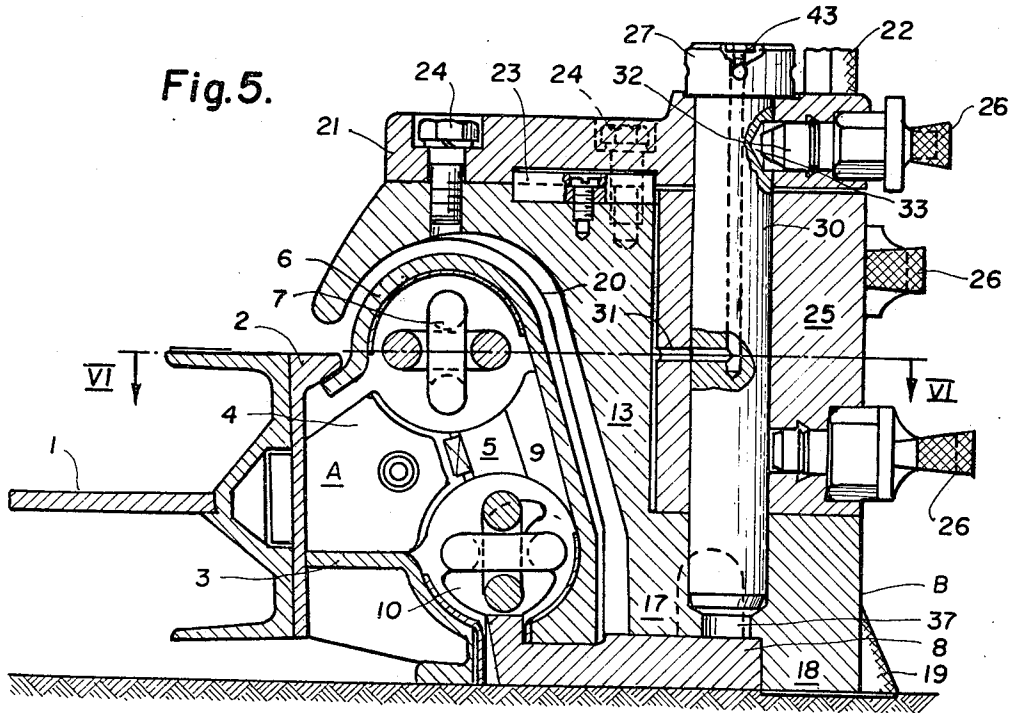
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INVENTOR.

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BY

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his ATTORNEYS

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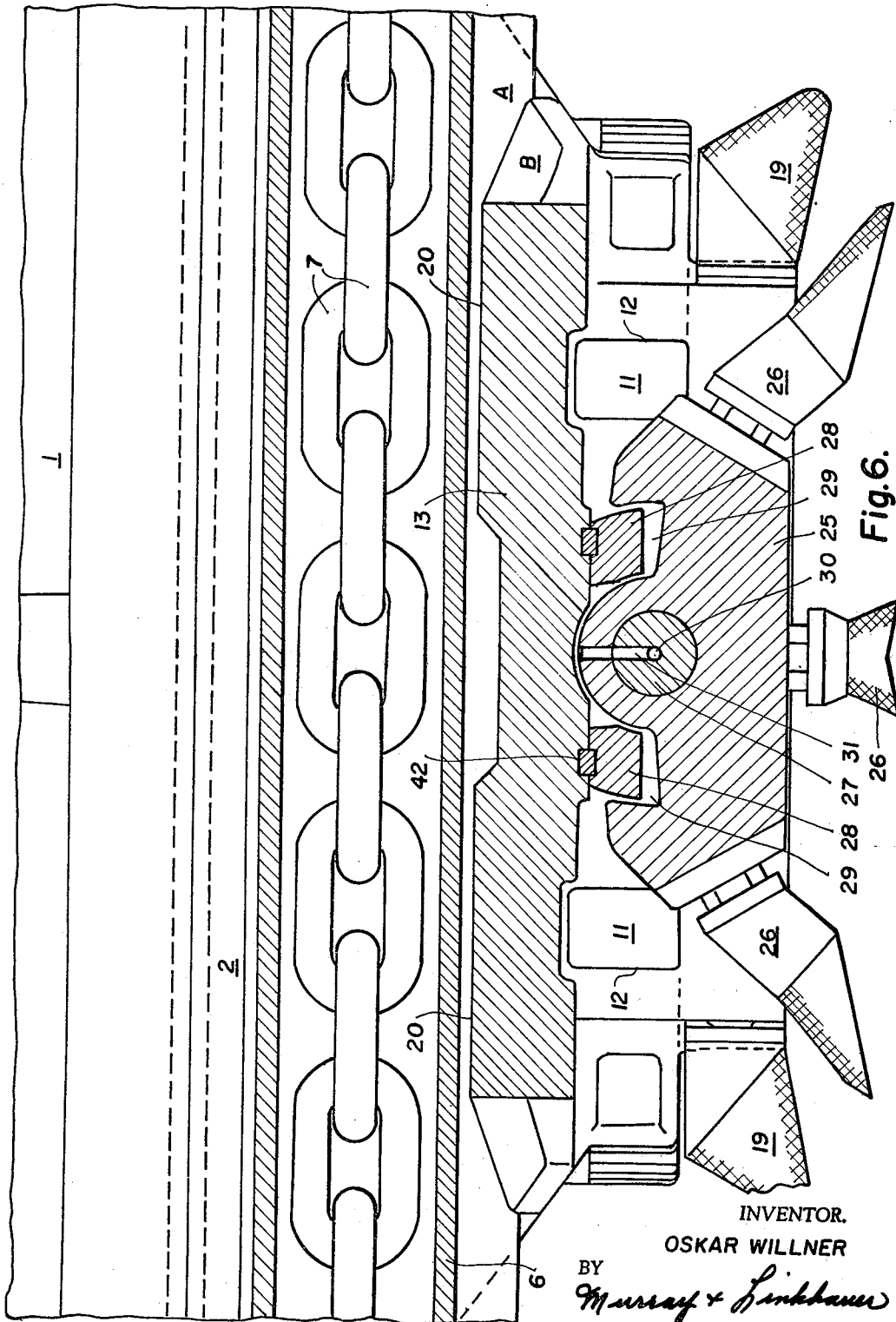


Fig. 6.

INVENTOR.

OSKAR WILLNER

BY

*Murray & Linkhauer*

his ATTORNEYS

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## 3,493,267 SCRAPER TYPE CUTTER FOR LONGWALL MINING

Oskar Willner, Bochum, Germany, assignor to Gebr. Eickhoff Maschinenfabrik und Eisengesserei m.b.H., Bochum, Germany, a corporation of Germany

Filed Aug. 21, 1968, Ser. No. 754,391

Claims priority, application Germany, Aug. 24, 1967, E 34,648

Int. Cl. E21c 27/32

U.S. Cl. 299—34

8 Claims

### ABSTRACT OF THE DISCLOSURE

This patent relates to an improvement in longwall mining apparatus of the kind having a scraper-type cutter that grasps an endless chain running on the face side of the conveyor, with the chain being covered with a diagonally extending cover plate. In the invention, the body of the cutter has a base plate that glides on the footwall, and the base plate clasps the cover plate and is supported upon a guide rail. Lugs extending toward the face grip the lower run of an endless chain. Vertically extending projections of the base plate fit into openings of the upper part of the scraper cutter, which contacts the mineral. Bolts passing through the projections join the upper part to the base plate, and the upper part has an extension portion, capable of having undercutters mounted on it, protruding further toward the face than the base plate does. The upper part has a rear surface that conforms to the cover plate that covers the chain, and a rear surface of the upper part grasps the cover-plate outline or profile from behind.

### BACKGROUND OF THE INVENTION

#### Field of the invention

This invention relates to a scraper-cutter for use in longwall mining of coal or other mineral.

#### Description of the prior art

In the longwall mining of coal or other minerals, it is usual to provide a conveyor that runs generally parallel to the face to be cut and the cutter having a working member that sweeps along the surface of the mineral face to be cut, dislodging mineral therefrom and, preferably, also urging it toward the conveyor. Longwall mining differs from room-and-pillar mining in that instead of so cutting the mineral as to leave a number of pillars in place to support the mine ceiling, the cut is taken along a face, and then, the conveying means and its associated roof supports are moved toward the face that has just been cut, and the cutter then traverses the face in the opposite direction, dislodging additional mineral; no support is provided for the roof in areas that have been mined. In such mining, therefore, the apparatus used consists importantly of a conveyor running parallel to the face to be cut and a mineral-dislodging means mounted for movement along the length of the conveyor.

The mineral dislodging means may be a cutter or drill or scraper. It is known to provide apparatus of this kind wherein the mineral dislodging means is a scraper that is caused to move along the face conveyor by means of an endless round-link chain that is covered by two cover plates, one protecting its upper run and the other protecting its lower run, with the lower cover plate being combined structurally with a slide upon which the scraper is mounted. The slide limits the cutting depth and prevents the scraper from penetrating the footwall. The back face of the slide absorbs the forces of reaction that are directed onto the face conveyor and are consequently

trying to tilt the planing body about the longitudinal axis of the lower run of the chain.

Apparatus is known comprising a cutter that is used together with a scraper. The scraper loosens the coal that has been missed by the tools of the cutter that creates a pile of this missed coal, together with the coal pile that is not carried out by the cutting tools into the face conveyor.

Scrapers are also known that consist of several members that are placed behind each other on a strand of an endless round-link chain. The individual scrapers, which fasten under the covering of the lower strand or run of chain with their base plate, are supported on a guide bar, which is mounted on the side wall of the face conveyor, by their base plate which slides on the footwall. A plate which rises diagonally toward the upper edge of the face conveyor is bolted on this base plate. Such scrapers, which usually work in combination with a cutter moving ahead thereof, penetrate the pile of coal which is formed in the mining during their movement, which is parallel to the working face, and during the simultaneously occurring return motion of the face conveyor toward the face. Such scrapers permit the pile of coal to pass into the face conveyor.

It has also already been suggested that at least one of the members of such scrapers be allowed to project beyond the other members and that it be given scraper blades. With the use of this scraping member or these scraping members, the scraper is in a position to loosen the missed coal left standing at the footwall by the working tools of the cutter which proceeds the scraper, and to load it together with the debris on top of it, if the cutter enters the bed with only one top cut of its roll which does not reach to the footwall due to the smaller roll diameter. However, the use of such scrapers makes it possible to work the bed in deformed areas that cannot be worked by a roll cutter, because of the slight thickness of the bed.

Prior art apparatus of the kind discussed above is thus characterized by a number of drawbacks or difficulties, which are sought to be overcome by the use of the apparatus of the present invention. One such drawback is that, due to the forces of reaction that are exercised upon the cutting tools, the device tends to "climb" or be moved out of position. Another drawback is that the cutter or scraper is usually designed in such a way that it is difficult to mount undercutters upon it. Yet another difficulty is that apparatus should be provided that can easily be incorporated as another member in an already existing mining machine that consists of several members that are placed in sequence on the strand or run of an endless round-link chain.

### BRIEF SUMMARY OF THE INVENTION

The invention comprises a cutter that engages with the endless round-link chain that rotates in front of the bank wall of the face conveyor and is covered by a plate that rises diagonally with respect to the upper edge of the face conveyor. In accordance with the invention, the body of the scraper-cutter is provided with a base plate that slides upon the footwall. This base plate fastens under the cover plate and is supported on a guide bar. It fastens then to the tight strand or run of the chain, with lugs that are bent toward the bank of coal to be worked upon, and it has projections that extend into recesses contained in an upper part. The upper part is connected with the lower part that slides upon the footwall by means of bolts that are placed in the upper part and pass through the projections. The upper part has a section that extends toward the bank of coal to be worked, and this section or extension projects beyond the base plate and can be provided with undercutters. The upper section also has a

back face that is adapted or conformed to the profile of the cover plate and fastens behind the upper part of the cover-plate profile, providing support in the event that the base plate is brought opposite to an area where it is not supported by the footwall. The body of the cutter or scraper that is formed in such a way can be suspended by the extensions of its base plate in the tight strand or run of the chain, even when the cover plate is removed. After the cover plate is replaced, it can be connected with its upper part. Thus, this makes an integral structure. During working, the forces of reaction which act upon the upper part can be absorbed, without loading the connecting organs in which the base plate which is supported on the guide bar is locked. This is done by the extension of the upper part, which is at the working face side and which is provided with undercutters, or by the cover plate upon which the upper part rests with its back face. Since the upper part of the cutter locks behind the upper part of the cover plate, the scraper is directed both in this zone as well as at the footwall by the part of the cover plate which forms the lower chain passage. Consequently, it is able to operate without a slide, since the task of preventing the scraper from penetrating the footwall is assumed by the cover plate of the guide rail.

Preferably, the bolts that connect the base plate and the upper part together are placed in bores that run parallel to the face conveyor. The parts of bores that lie between the projections of the base plate have a larger diameter than the parts of the bores that are outside of the projections. This makes it possible to simplify the mounting of the scraper, because the bores that receive the bolts are more accessible from the outside. Moreover, this makes it possible to separate the upper part from the base plate more rapidly, because the bolts can be driven into the widened bore sections with a few blows. This embodiment is particularly advantageous in low seams in which the cutter roll of the cutter cannot be lifted, because the upper part of the scraper-cutter can be quickly separated from the base plate at the end of the longwall face. Moreover, when resting on the guide rail, it can be drawn so far in toward the face conveyor that it no longer hinders the cutter, which works ahead of it, when the scraper passes over.

A vertical bore placed in the upper section and a cover plate which is drilled and can be placed on the top face of the upper part receive the ends of a pivot bolt that bears the holder having the scraper blades, so as to be able to be swiveled to a limited extent between the bottom and the cover plate. With the exception of the undercutters and the scrapers which are coordinated with the cover plate, all scraper-cutters can be pivoted. Thus, only the cutters of this holder which are actually active come into contact with the mineral to be loosened, while the back scraper-cutters in the direction of travel are lifted away from the working face.

Vertical bars, coordinated with the upper part, extend from the bottom to the cover plate. They reside in suitable recesses at both sides of the axis of rotation, limit the extent of the swing of the holder, and close the gap between the upper part and the rotatable holder. These bars prevent small coal from entering the gap and blocking the holder. Since the pivot bolt is provided with an axial boring that emerges in its collar and which is connected with a space between the two bars by a radial boring, this space can be filled with grease. Thus, an additional means is created for preventing the entry of fine coal.

In order to be able to fix the pivot bolt in the axial direction, a recess into which a scraper-cutter fits with its shaft end is provided in its periphery.

The cylindrical cutter shafts are provided with two recesses, one of which receives the peripheral parts of an elastic ring that extends from the recess of the drilling according to the drilling depth of the cutter. Thus, the scrapers can be placed in two different cutting positions. Spacers which can be put on the drill shafts, which limit

the drilling depth of the scraper-cutter and which always fill the intermediate space between the cutter head and the drilling, if the drill shaft has been directed into the drilling only by part of its length, absorb the intermediate cutting forces that act on the scraper-cutters. These spacers thus prevent force from being placed upon the elastic ring, which has only the task of connecting the scraper-cutter so as to be form-engaging with the supporting part of the scraper.

## BRIEF DESCRIPTION OF THE DRAWINGS

A complete understanding of the invention may be had from the foregoing and following description thereof, taken together with the accompanying drawings, in which:

FIGURE 1 is a section passing through a contact point of the face conveyor and the guide rail, presenting a front view of the scraper-cutter;

FIG. 2 is a corresponding plan view of the cutter;

FIG. 3 is a side view of the cutter, seen from along the coal working face;

FIG. 4 is a view taken along the line IV—IV of FIG. 2;

FIG. 5 is a view taken along the line V—V of FIG. 3;

FIG. 6 is a view taken along the line VI—VI of FIG. 5; and

FIG. 7 is a detailed view of the mounting of the cutters.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

The guide rail A is placed at the working face side of the face conveyor 1. It consists basically of a sheet metal holder 2 bolted to the side wall of the face conveyor; the guide rail 3, which is welded with the holder 2 and which is lower at its lower edge than the lower edge of the face conveyor; and the guide pieces 5, which are placed between rib pairs 4 of the holder 2 and which bear the cover plate 6. The latter covers both strands of the endless round-link chain 7, whose lower tight strand or run is connected with the members (not shown) of a miner.

The cutter B which serves to loosen the missed coal or to loosen deformed areas has a base plate 8, which slides on the footwall and which engages in the lower strands of round-link chain 7 with lugs that are bent toward the bank. The base plate has, in plan view, basically the shape of a trapezoid with its longer base toward the guide bar 3. It is supported on the guide bar with the surface located here during the mining process. The bent lugs 9 make it possible to suspend the base plate 8 in the tight strand of round-link chain 7 when cover plate 6 is removed. Thereby the lugs engage below the corresponding horizontal member of the round-link chain with lateral extensions 10 and prevent the base plate from moving toward the working face when the cover plate 6 is on. Two projections 11, which are found on the base plate 8, engage suitably dimensioned recesses 12 of the upper part 13 and connect the base plate 8 and upper part 13 snugly. Locking pins 14, which are introduced into bores 15 of the upper section 13 which run parallel to the face conveyor 1 and are secured with the use of a locking pin 41, sealed off with a rubber stopper 40, fit into corresponding bores of the projection 11 and assure this connection. By the driving of bolts 14 into the widened boring part 16, the connection can also be loosened rapidly, and both bolts 14 can, after removal of the upper part 13, be removed from the widened portions of the bores 16. At its base 17, the upper part 13 rests on the section of base plate 8 which projects beyond the cover plate 6 and is extended by its extension 18, which projects both toward the bank as well as to the footwall ahead of the face of base plate 8 which is turned toward the working face. Undercutters 19, which are placed on both front sides of this extension 18, scrape the footwall free during the mining operation. The back face 20 of the upper part 13 is adapted to the shape of the cover plate 6 and is directed down to the highest elevation of the cover plate 6. Due

to the forces of reaction which occur, the cutter is pressed against the guide bar 3 and against cover plate 6; in the opposite direction, however, it is held back by the part of the back face which locks in behind the cover plate 6 and by extensions 10 which lock in the lower chain passage.

Cover plate 21 is bolted on the top face of upper part 13. It lies with its part that projects over the top face above base 17 of upper part 13 and bears a vertically placed cutter blade 22. An adjusting spring 23 unloads the clamping bolts 24 from the forces of cutting. Between base 17 and the projecting parts of the cover plate is holder 25. It is provided with several scraper cutters 26 and can be turned about the vertical pivot bolt 27. The latter is passed from above through a bore in cover plate 21 and rests in bore 37 of base 17 with its lower end through a bore in holder 25. Two vertical bars 28, which extend from base 17 to cover plate 21 and which are bolted with the upper section 13 and are secured by adjusting springs 42, reside in recesses 29 of holder 25 which are placed at both sides of the bolt 27 and form a labyrinth with the recesses 29. The two bars 28 which prevent fine coal from being deposited between upper part 13 and a holder 25 and from hindering its swing also limit the swing of the holder 25. For a better sealing, the space between the bars 28 can be filled with grease which is introduced into this space by the grease connection 43, axial bore 30, and radial bore 31 of the pivot bolt 27. The scraper-cutter 26 which resides in a peripheral recess 33 of pivot bolt 27 with its shaft 32, secures pivot bolt 27 against axial movements. Like all scraper-cutters 26 and undercutters 19, it is provided with cylindrical shafts and is connected so as to be form-locking with the holder 25 or extension 18 by means of a rubber ring. The cutter shafts which are provided with two recesses 36 can be placed in two different positions by means of rubber rings 35 which are found in recesses 38 of the drilling. Spacers 39, which are slipped on the cutter shafts with their bores, absorb axial forces acting on the scrapers and prevent forces from loading the rubber ring 35, if the cutter shaft has not been introduced into drill hole 34 up to the element of the cutter head.

While I have shown and described herein a certain embodiment of my invention, I intend to cover as well any change or modification therein which may be made without departing from its spirit and scope.

I claim as my invention:

1. In mining apparatus comprising a face conveyor having an endless chain mounted on the wall of said face conveyor at the face side, the lower run of said chain being tight and said chain being covered by a plate rising diagonally to the upper edge of said face conveyor, the combination therewith of a cutter scraper having a body that comprises a base plate that slides upon the footwall and is supported in a guide rail associated with said face conveyor, said base plate locking under said cover plate and being engaged in said tight strand of chain by means of lugs bent toward said face, said base plate further being provided with upwardly extending projections, said body

comprising an upper part having recesses into which said projections project, said upper part being connected to said base plate by means of bolts, said bolts passing through said projections, said upper part having at its bank side an extension provided with undercutters and lying in front of said base plate, said upper part further having a back face shaped to the outline of said cover plate and locking in behind the upper part of said cover plate.

2. Apparatus as defined in claim 1, characterized in that said bolts connecting said upper part of said base plate pass through bores that run parallel to said face conveyor, said bores having sections that are located between adjacent ones of said projections and have a greater diameter than portions of said bores which lie outside said projections.

3. Apparatus as defined in claim 2, characterized in that a vertical bore is provided in the base of said upper part and a bored cover plate is placed on the top face of said upper part, the ends of a pivot bolt being supported between said bored cover plate and said vertical bore in said base of said upper part, said pivot bolt bearing a holder that is provided with scraper-cutters in such manner as to be pivotable to a limited extent between said base and said cover plate.

4. Apparatus as defined in claim 3, characterized by vertical bars coordinated with said upper part and extending from the base of said upper part to said cover plate and residing in suitable recesses of said holder at both sides of its axis of rotation about said pivot bolt so as to limit the rotational motion of said holder.

5. Apparatus as defined in claim 4, characterized by the fact that the pivot bolt is provided with an axial bore emerging in its collar and connected with the space between said vertical bars by means of a radial bore.

6. Apparatus as defined in claim 5, characterized by a recess provided in the periphery of the pivot bolt and a scraper-cutter having its shaft end residing in said recess.

7. Apparatus as defined in claim 6, characterized by the fact that the cylindrical cutter shafts of said scraper-cutters are provided with two recesses, one of which receives the peripheral parts of an elastic ring that projects from recesses of the bore, according to the drilling depth of said cutter.

8. Apparatus as defined in claim 7, characterized by spacers placed on said cutter shafts that limit the drilling depth of said scraper-cutters.

#### References Cited

##### FOREIGN PATENTS

1,201,790 9/1965 Germany.  
1,205,030 11/1965 Germany.

ERNEST R. PURSER, Primary Examiner

U.S. Cl. X.R.