May 28, 1963 W. GILLESPIE 3,091,440

CUTTER-LOADERS FOR MINING MINERALS

Filed Nov. 29, 1960 3 Sheets-Sheet 1

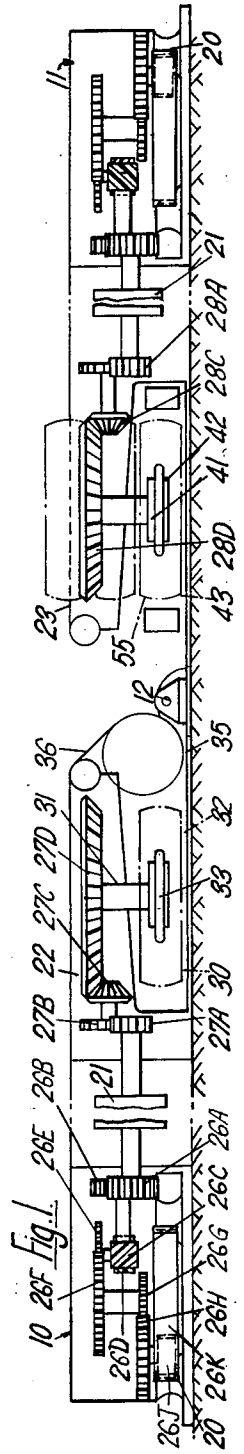


Fig. 1

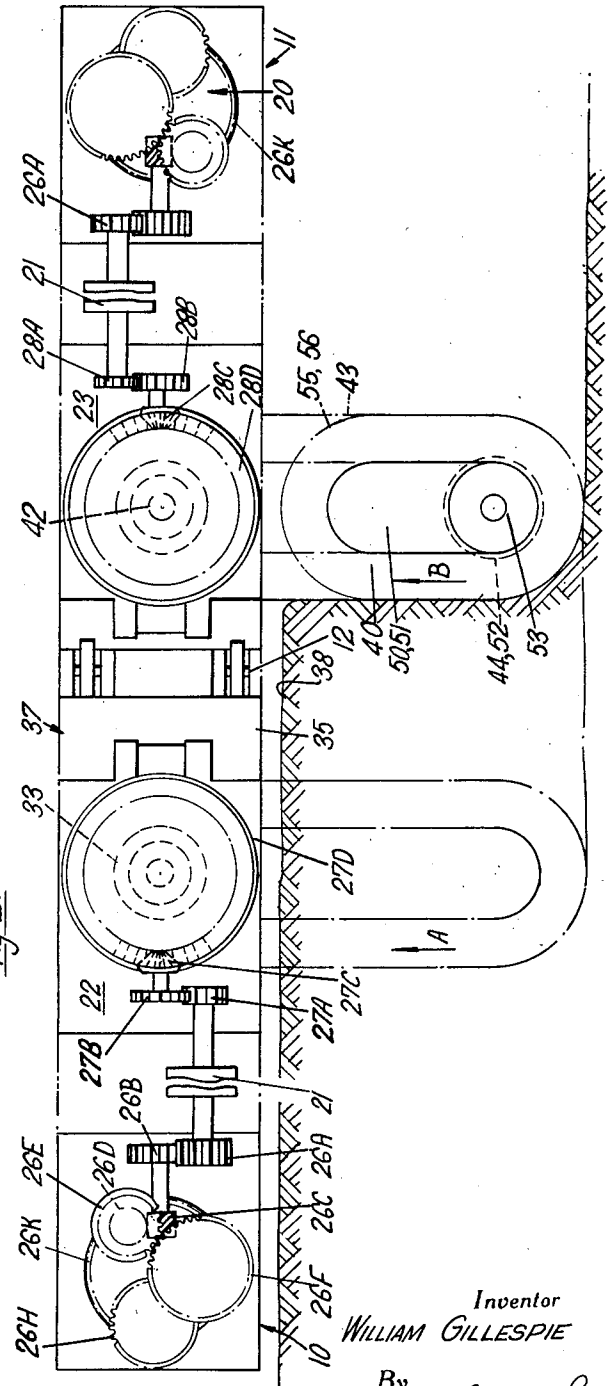


Fig. 2

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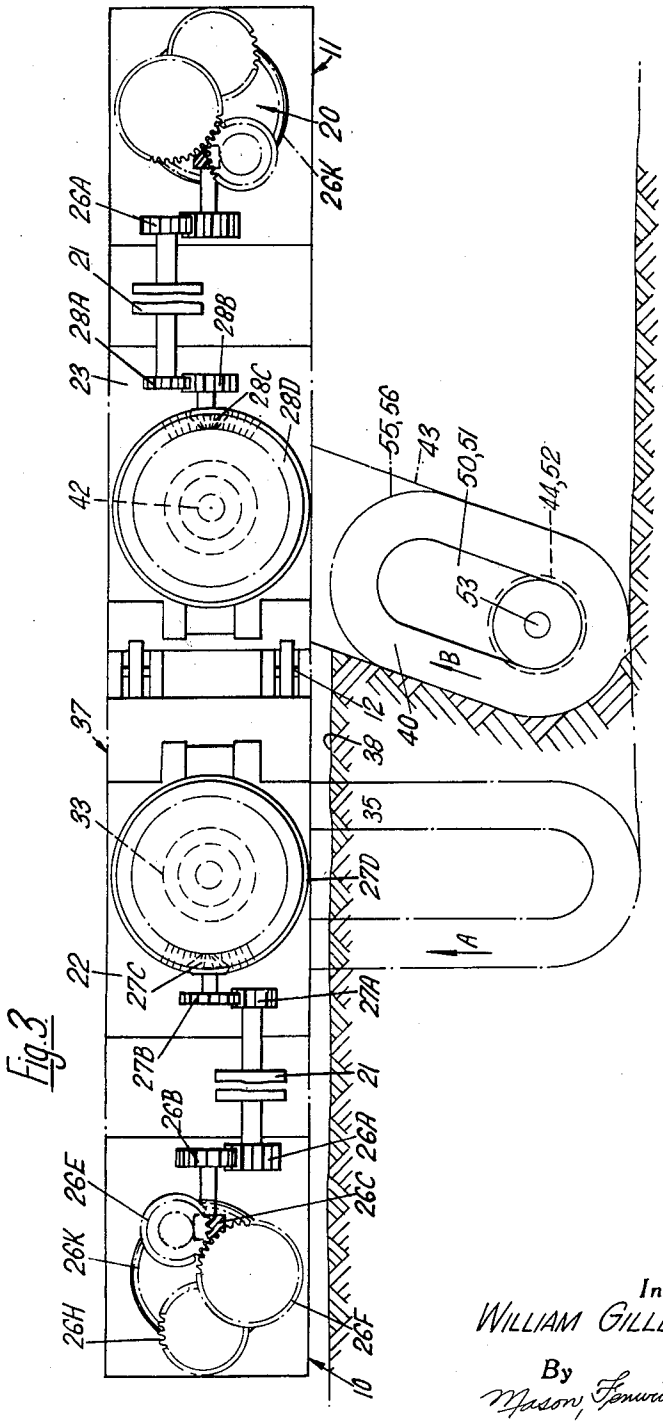


Fig. 3

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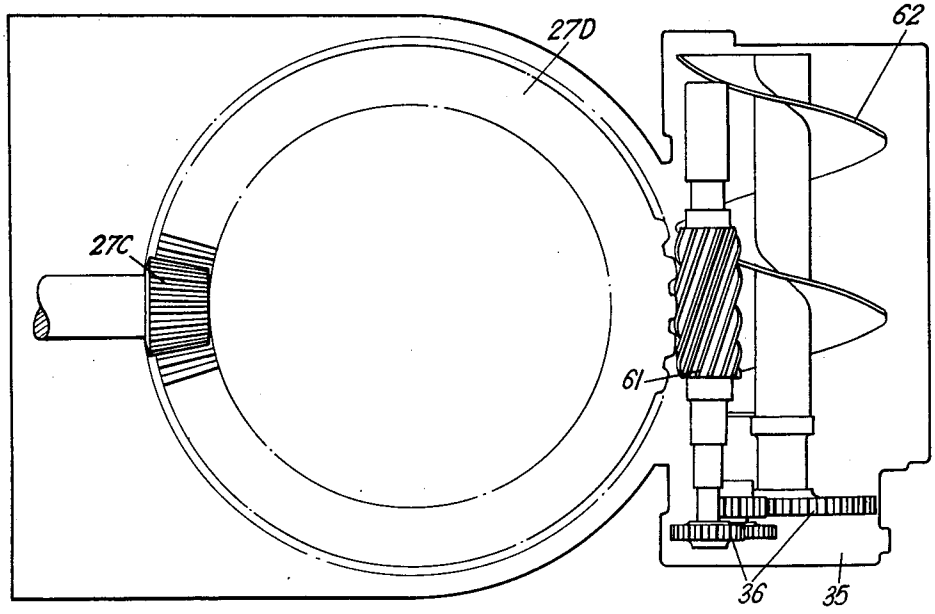
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Fig. 4



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CUTTER-LOADERS FOR MINING MINERALS

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This invention relates to cutter-loaders of the type in which the work of cutting from a mineral seam is done by endless chains equipped with cutting tools driven to travel in endless paths around supporting jibs.

Although these machines are known as "coal" cutter-loaders, seeing that they are designed and used primarily for mining coal, nevertheless they can be used for mining other minerals.

The invention is especially, although not exclusively, applicable to machines for working on thin seams.

The object of the invention is to provide an improved machine which works along the face of a seam disintegrating the face from floor to roof and delivering the cut-down mineral alongside the machine.

According to the invention, a cutter-loader of the type stated comprises, in the order stated from front to rear, a leading jib at about mine floor level for a cutter-chain to under-cut the mineral seam, a transverse conveyor also at about floor level for the mineral and gummings left behind said jib following the work of said cutter-chain, and an assembly of superposed jibs for a transverse loader chain at about floor level and for one or more cutter-chains reaching nearly to mine roof level, the loader chain being driven to discharge inwards towards and beyond the machine the mineral cut down by the one or more cutter-chains above.

It will be apparent that the conveyor and loader act in an intermediate zone extending forwards from the superposed jibs to the active stretch of the cutter chain of the leading jib.

The transverse conveyor is of the helical-worm gummer type in which the worm rotates within a casing and conveys gummings and small mineral matter across and beyond the machine.

Desirably, the loader is of the class in which flights are attached to an endless chain that is driven to travel in an endless path, the loader chain and the cutter-chains above being driven in unison by interconnected sprocket wheels.

An example of a coal cutter-loader according to the invention is shown in the accompanying drawings, which are diagrammatic and in which:

FIG. 1 is a side view, FIG. 2 is a plan of the cutter-loader, FIG. 3 is a plan of the cutter-loader with some parts thereof displayed in an alternative disposition, and FIG. 4 is a detailed view of the gummer drive forming part of the cutter-loader.

In the example, the cutter-loader comprises two bodies **10** and **11** which are made as separate and complete entities and which are jointed end to end. The joint comprises a horizontal-axis hinge **12**. Thus, each body can tilt up and down relatively to the other. The components of the machine are shown so arranged, that, when the machine is set to work, the body **10** will lead and the body **11** will be trailed.

Each body, at its outer end, has a haulage gear **20**. Each body also includes an electric or other motor **21**, which drives the associated outer haulage gear **20** and the mechanism of an inner gear head, which is indicated by **22** in the body **10** and by **23** in the body **11**. The drive to each haulage gear comprises a train of speed-reduction gearing consisting of a pinion **26A** on the motor shaft, a gearwheel **26B** meshing with pinion **26A**, a worm and wormwheel **26C**, **26D**, another pair of gearwheels **26E**, **26F**, yet another pair **26G**, **26H** and lastly

a pinion **26J** engaging an internally toothed wheel **26K** which is incorporated in the customary haulage drum. The mechanism of the inner gear head **22** of the body **10** includes a train of speed-reduction gearing consisting of a pair of gearwheels **27A**, **27B** and a pair of bevel gearwheels **27C**, **27D**. Correspondingly, the mechanism of the inner gear head **23** of the body **11** includes a speed-reduction train consisting of a pair of gearwheels **28A**, **28B** and a pair of bevel gearwheels **28C**, **28D**. In both of said mechanisms the gearwheels **27A** and **28A** are pinions on the shafts of the respective motors **21**.

A jib **30** is connected to the body **10** at floor level, being adapted to be slewed through 180° about a vertical axle **31** in the gear head **22** and being adapted for work at either side of the body. To effect slewing, the two bodies **10** and **11** are temporarily detached. The jib **30** supports an endless cutter-chain **32** which is driven by a sprocket wheel **33** arranged on said vertical axle **31** and in the gear head **22**.

At the rear end of the leading body **10** there is arranged a so-called gummer having a helical worm feed auger **62**. This gummer includes a part-cylindrical casing **35**, which is a fixture on the body **10**, and an internal worm or screw **61** which is rotatable about its axis by a speed-reduction gear assembly **36** connecting it to the adjoining gear head **22**. This gummer extends transversely behind the body **10** to the inner side **37** thereof, namely the side remote from the face **38** of the seam.

The other of the jointed bodies, namely the rear body **11**, has a loader jib **40**, which projects at floor level from the associated gear head **23**. This jib **40** extends from a vertical axle **41** that is driven from the gearing **28A—28B** in the associated gear head. The jib can be slewed through 180° about the axis of this axle while the bodies **10** and **11** are temporarily detached. The axle **41** has a chain-driving sprocket wheel **42**. An endless chain **43** of coal-loading flights is guided round the jib **40**, the chain meshing with the sprocket wheel **42** in the head and driving another sprocket wheel **44** at the jib end. These flights are as usual paddle-like plates which are connected to the links of the chain and which project from the chain at about right angles. The flights may if desired be of so-called "feathering" kind; that is to say, the flights project at about right-angles where they work in straight paths along the front and rear of the jib on the coal to be loaded but when passing round the semi-circular paths underneath the body **11** and at the jib end they are pivoted, each about the vertical axis of its connection into an oblique setting. It will be apparent that this loader jib **40** extends co-planar, at floor level, with the leading jib **30**.

The loader jib serves also as a base structure to carry a number of short cutter-chain jibs directly above. In the example, there are two such jibs, namely a roof-cutter jib **50** and an intermediate jib **51** at a level somewhat higher than that of the leading jib **30**. Each of the two jibs **50** and **51** is a guide frame which at its outer end has a sprocket wheel **52** that is mounted on a splined or equivalent axle **53** extending vertically upwards from the sprocket wheel **44** at the loader jib end, so that all of these wheels rotate in unison when the machine is in operation. Cutter chains **55** and **56** are guided in endless paths around the roof-cutter jib and intermediate jib, respectively, these chains being in mesh with the upper sprocket wheels at the outer ends of their jibs and being driven by them. These cutter chains are guided round semi-circular paths at the inner ends of their jibs in proximity to the body **11**.

If desired, the roof-cutter jib **50** may be carried by means such that the jib can be adjusted up and down to suit the mine roof level. Such carrying means may consist of a jack, which is hydraulic, and appropriate vertical guides, the jack being conveniently operable

by a worker during the progress of the machine along the coal face.

As is customary, provision is made for extending and contracting the several jibs in order to regulate the tension of the several chains.

In operation of the machine, the several cutter and loader chains **30**, **43**, **55**, **56** are driven so that their active leading stretches travel and work inwards from the face as indicated by the arrows A and B in FIG. 2. Accordingly, as the machine is hauled along the face **38**, the several cutter and loader chains all act to pull the machine towards the face, so that it is held up to its work. Moreover, the active leading stretches of the cutter chains serve to convey much of the coal cut by them inwards towards the machine and beyond it upon the mine floor for removal by any appropriate means. Much of the coal cut by the cutter chain **32** of the leading jib **30** is removed beyond the leading body **10** by the cutter chain **32** and the gummer **35** thus leaving the loader **43**, which is of high capacity, to deal with the coal cut down by the rear cutter-chains **55**, **56**. It will be noted that the coal is removed mainly in the intermediate zone behind the active stretch of the cutter chain **32** of the leading jib **30** and in front of the active stretches of the chains **55**, **56** of the rear jibs, **50**, **51**, this zone being of ample size for the purpose.

If desired, the rear jibs **40**, **50**, **51**, may be set forwards at an acute angle to the longitudinal central line of the bodies **10**, **11**, and therefore to the face **38**, so that the active stretches of the chains **55**, **56** incline forwards and outwards from the body **11**. This setting is illustrated in FIG. 3. Such a setting of these chains causes them to exercise a wedging effect on the seam **38** tending to burst the coal from it in large pieces.

An advantage of the mining machine according to the invention is that it can be designed to have approximate equalisation of work between the motors **21** of the front and rear units **10** and **11**. As will be apparent, in a mining machine having cutter means which leads and having additional cutting means behind, the leading cutting means is confronted with the heavy task of working into the solid seam **38**, whereas the following cutting means has the lighter task of cutting out a buttock which is freed from the original compression between the mine roof and floor. In the present machine, accordingly, the coal cutting work of the leading body **10** has been minimised by providing it with a single cutter-chain jib, so that the motor **21** of this unit drives the leading haulage gear **20**, the leading cutter chain **32** and the gummer **35**. On the other hand, the rear unit is provided with jibs having at least the two cutter chains **55**, **56** and the loader chain **43**. Accordingly, the cutting and loading means with which the rear unit **11** is provided deal with considerably more coal than the leading unit **10**. This extra coal-handling work is permissible because the rear motor takes no part in the work of haulage, the rear haulage gear **20** being idle while the machine is at work, and each of the rear cutter chains **55**, **56** has a lighter task than the single leading cutter-chain **32**.

In the example, the machine is double ended. That is to say, the bodies **10** and **11** are made similar to one another and the cutting, conveying and loading components are transferable from one body to the other, so that the cutter and loader jibs can be inter-changed and the gummer **35**, **36** re-arranged so that the machine is set for the body **11** to lead and the body **10** to be trailed. Thus, the machine is devised to perform its working operation first in one direction, next in the opposite direction and so on.

I claim:

1. A cutter-loader of the type in which the work of cutting from a mineral seam is done by endless chains equipped with cutting tools driven to travel in endless paths around supporting jibs, the cutter-loader comprising, in the order stated from front to rear, a single leading jib at about mine floor level for a cutter-chain to under-cut the mineral seam, a transverse conveyor also at about floor level for the mineral and gummings left behind said jib following the work of said cutter-chain, said conveyor being of the helical-worm gummer type in which the worm rotates within a casing and conveys gummings and small mineral matter across and beyond the machine, and a trailing assembly of superposed jibs for a transverse loader chain at about floor level and for one or more cutter-chains reaching from above said loader chain nearly to mine roof level, the loader chain being driven to discharge inwards towards and beyond the machine the mineral cut down by the one or more cutter-chains above.

2. A cutter-loader according to claim 1 in which the loader chain comprises an endless series of interconnected flights driven to travel in an endless path, the loader chain and the one or more cutter-chains above being driven in unison by inter-connected sprocket wheels.

3. A cutter-loader of the type in which the work of cutting from a mineral seam is done by endless chains equipped with cutting tools driven to travel in endless paths around supporting jibs, the cutter-loader comprising two inter-connected bodies one of which leads and the other of which is trailed, a haulage gear at the leading end of the leading body, a single leading jib on the leading body for a cutter-chain, said jib being arranged at about mine floor level, a transverse mineral conveyor of the helical worm type also at about floor level on the leading body behind said jib, power means on said leading body for driving said haulage gear, cutter-chain and conveyor, an assembly of superposed jibs on the trailed body for a transverse loader chain at about floor level and one or more jibs for one or more cutter-chains reaching nearly to mine roof level and power means on the trailing body for operating the cutter and loader chains so that the active stretches of these chains are driven inwards to the trailing body and the mineral cut down by the one or more cutter-chains above is discharged beyond the trailing body.

4. A cutter-loader according to claim 3 in which the trailing body has a haulage gear at its rear end drivable by the power means on this body and in which the two bodies are made similarly, and their cutting, conveying and loading components are transferable from one body to the other so that the machine can be set to operate in either direction.

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