June 20, 1939. J. F. JOY ET AL 2,162,722

MINING MACHINE

Original Filed March 30, 1936 2 Sheets-Sheet 1

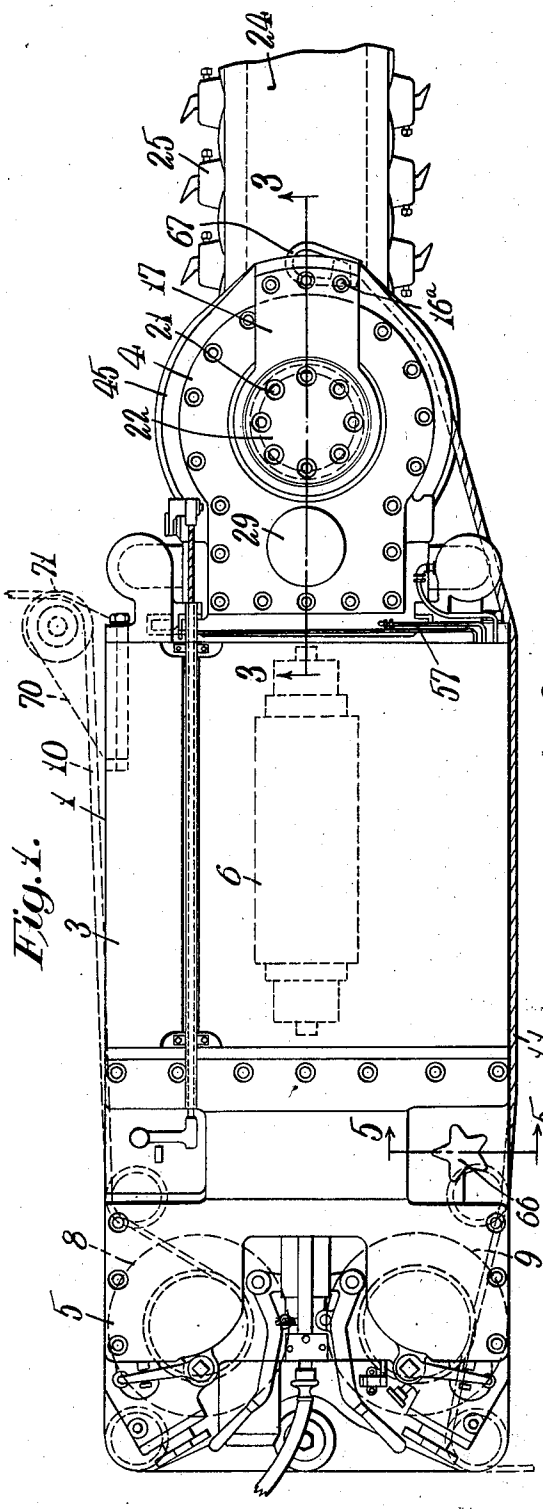


Fig. 1.

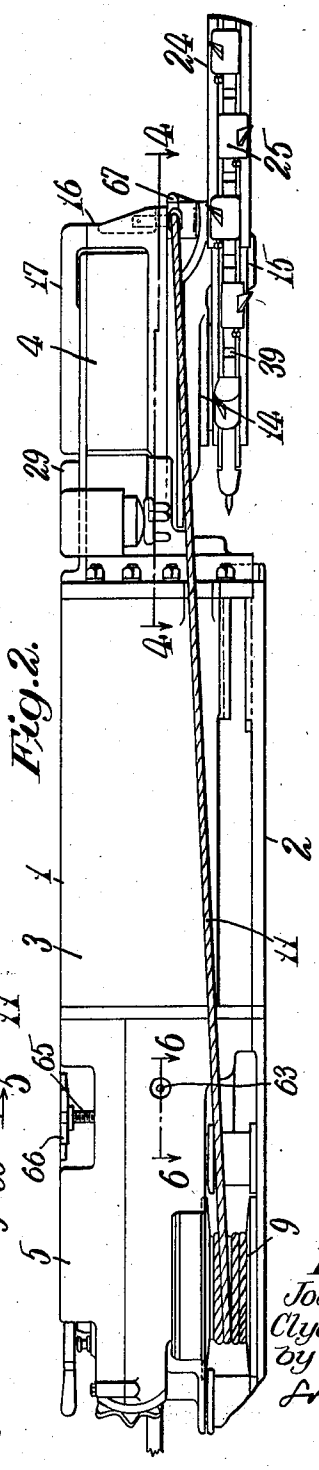


Fig. 2.

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Fig. 3.

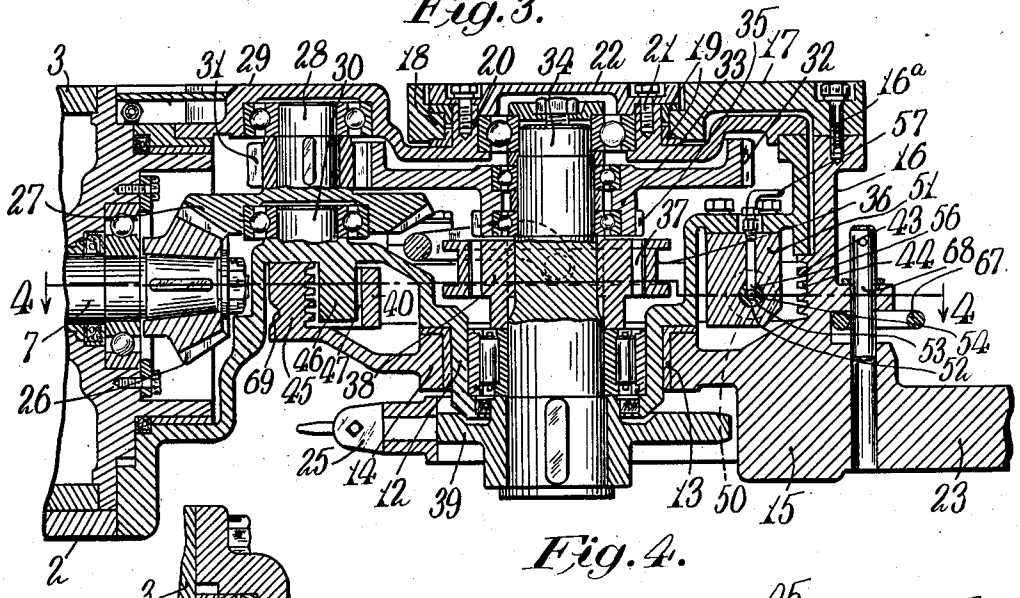


Fig. 4.

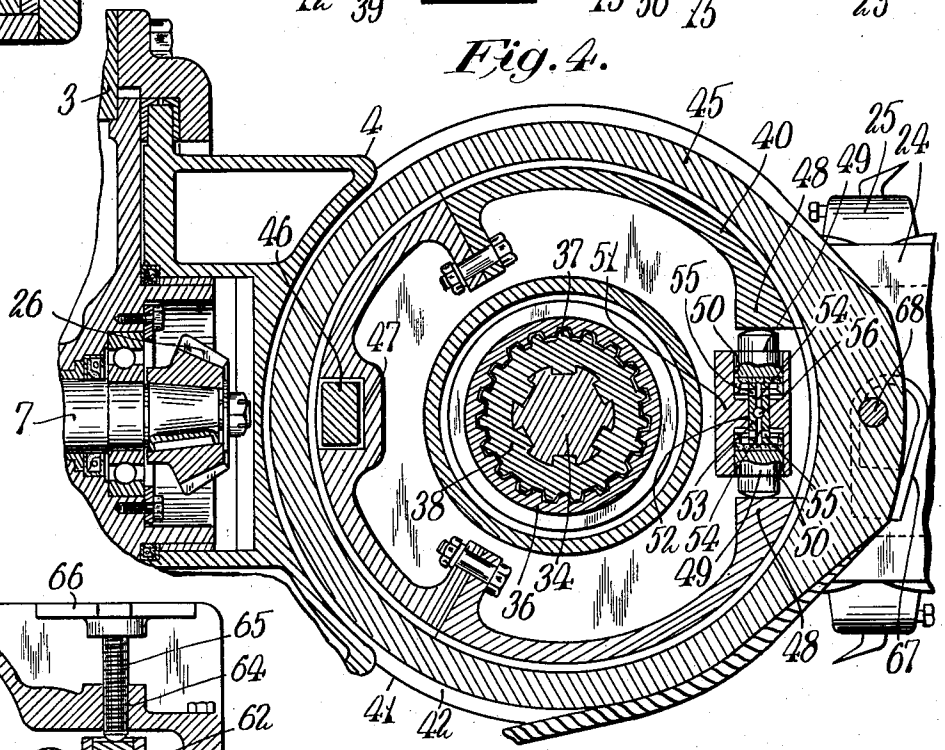


Fig. 5.

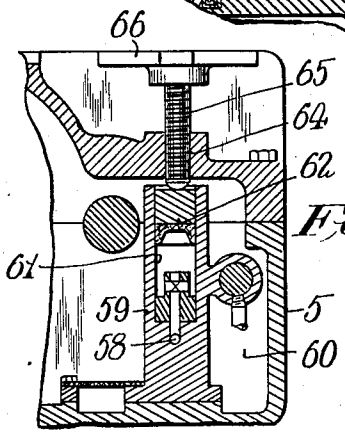
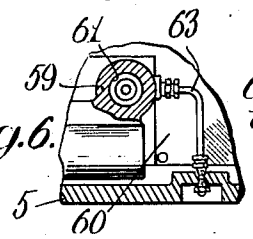


Fig. 6.



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MINING MACHINE

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Original application March 30, 1936, Serial No. 71,654. Divided and this application August 30, 1937, Serial No. 161,571

10 Claims. (Cl. 262—30)

This invention relates to mining machines, and more particularly has reference to improvements in the kerf cutting mechanism of a coal mining machine of the combined room and pillar and longwall, flexibly fed, floor cutter type.

An object of this invention is to provide an improved coal mining machine having improved kerf cutting mechanism. Another object is to provide an improved pivotal mounting structure for the kerf cutter of the kerf cutting mechanism of a coal mining machine of the longwall type. A further object is to provide an improved pivotal mounting structure for the kerf cutter of the kerf cutting mechanism of a coal mining machine of the combined room and pillar and longwall, flexibly fed, floor cutter type. A still further object is to provide an improved kerf cutting mechanism having an improved pivotal mounting for the kerf cutter and improved means for locking the kerf cutter in its adjusted position about its pivot. Yet another object is to provide an improved frictional lock for a kerf cutter and having improved hydraulically operated means for actuating said lock. Other objects and advantages of the invention will, however, hereinafter more fully appear.

This application is a division of our copending application Serial No. 71,654, filed March 30, 1936.

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 a coal mining machine having embodied therein an illustrative form of the invention.

Fig. 2 is a side elevational view of the mining machine shown in Fig. 1.

Fig. 3 is an enlarged view in longitudinal vertical section taken substantially on line 3—3 of Fig. 1.

Fig. 4 is a horizontal sectional view taken substantially on line 4—4 of Figs. 2 and 3.

Fig. 5 is an enlarged detail vertical sectional view taken substantially on line 5—5 of Fig. 1.

Fig. 6 is a horizontal sectional view taken substantially on line 6—6 of Fig. 2, showing the liquid supply connection for the hydraulic cylinder.

In this illustrative embodiment of the invention, the improved kerf cutting mechanism is shown embodied in a coal mining machine of the combined room and pillar and longwall, flexibly fed, floor cutter type, although it will be evident that various features of the invention may be embodied in mining machines of various other types.

The mining machine disclosed herein generally comprises a low, compact machine frame 1 having a plane bottom surface 2 and adapted to rest upon and slide in any direction over the mine floor. The machine frame comprises a motor frame section 3, a cutter frame section 4 and a feed frame section 5, the motor frame section 4 being arranged intermediate the cutter and feed frame sections, and the sections rigidly secured together, thereby providing a rigid machine frame which is extremely vertically compact. The motor frame section 3 houses a motor 6 having its power shaft 7 horizontally disposed and extending longitudinally of the machine. The machine may be fed bodily on its own bottom over the mine floor by flexible feeding means comprising relatively rotatable cable winding drums 8 and 9 mounted within the feed frame section 4 on parallel vertical axes, and cooperating respectively with feeding and controlling cables 10 and 11. As clearly described in the above mentioned copending application, Serial No. 71,654, these cables may be extended from their respective drums around usual guide sheaves on the machine to suitable anchors extraneous to the machine for effecting maneuvering of the machine with respect to the coal face, and for feeding the machine relative to the coal face during the cutting operation, and may be connected to the kerf cutter to effect swinging of the latter about its pivot, all in the manners well understood by those skilled in the art.

Referring more particularly to the kerf cutting mechanism, it will be noted that the cutter frame section 4 is mounted on the motor frame section 3 to rock relative thereto about an axis extending longitudinally of the machine frame in the manner clearly described in our copending application, Serial No. 71,654, mentioned above. The kerf cutter is pivotally mounted on the cutter frame 4, and the pivotal mounting for the kerf cutter, as disclosed herein, comprises a cylindrical bearing support 12 formed integrally with the lower portion of the cutter frame 4 and supporting a bearing sleeve 13 on which is journaled a cylindrical bearing 14 integral with a hanger frame 15. Projecting upwardly from the hanger frame at the outer end of the cutter frame 4 is an upstanding arm 16 secured, as by bolts 16a, to a top bearing plate 17 overlying the top surface of the cutter frame, and having a cylindrical bearing portion 18 journaled on bearing sleeves 19 supported by a cylindrical bearing support 20

projecting upwardly from the upper portion of the cutter frame 4. Secured, as by screws 21, to the bearing support 20, is a top retaining plate 22 for maintaining the bearing portion 18 and its cooperating bearing sleeves in position on the cylindrical bearing support 20, in the manner clearly shown in Fig. 3. It will thus be seen that the hanger frame 15 is journaled for pivotal movement at both the lower and upper portions of the cutter frame 4, thereby to provide an extremely rugged pivotal mounting for the hanger frame. Supported by a projecting arm 23 formed integrally with the hanger frame 15 is an elongated, horizontal, plane cutter bar 24 having guided for circulation about its margin an endless cutter chain 25.

Now referring to the cutter chain driving means, it will be noted that keyed to the adjacent end of the motor power shaft 7 is a bevel gear 26 meshing with a bevel gear 27 integrally formed with a vertical shaft 28. This shaft is journaled at its upper end within a ball bearing supported by a detachable cover plate 29 of the cutter frame 4, and at its lower end on a ball bearing seated within the recessed lower face of the bevel gear 27 and supported on a vertical shaft 30 secured to the cutter frame. Keyed to the shaft 28 above the bevel gear 27 is a spur gear 31 meshing with a large spur gear 32 having its hub 33 journaled on ball bearings supported by a vertical shaft 34. The shaft 34 is arranged on the cutter frame in advance of the vertical shaft 28, and is journaled at its upper end within a ball bearing supported within the cylindrical bearing support 20 of the cutter frame, and near its lower end within a roller bearing supported within the cylindrical bearing support 12 of the cutter frame. Formed on the hub 33 of the gear 32 are clutch teeth 35 connectible by a sliding clutch member 36 to clutch teeth 37 formed on a clutch member 38 keyed to the shaft 34. Keyed to the lower end of the shaft 34 is a chain sprocket 39 for engaging and driving the endless cutter chain 25. As the operating means for the clutch member 36 does not per se enter into this invention, and is clearly described in the copending application above referred to, the description thereof herein is considered unnecessary. When this clutch is connected, the cutter chain may be rapidly circulated about the margin of the cutter bar from the motor power shaft 7 through the bevel gearing 26, 27, shaft 28, spur gearing 31, 32, shaft 34 and the cutter chain drive sprocket 39.

The improved hydraulically operated locking means for the cutter bar for locking the latter against swinging movement about its pivotal axis relative to the cutter frame comprises an expansible locking member or shoe 40, herein composed of three parts suitably bolted together, having tooth-like projections 41 provided with frictional locking surfaces 42 engageable with frictional locking surfaces 43 on similar tooth-like projections 44 on an annular flange 45 integral with the hanger frame 15. The intermediate portion of the locking member or shoe 40 is supported and positioned by a projecting lug 46 formed integral with the cutter frame and extending within a groove 47 in the member 40, as shown in Fig. 3, and engaging the ends 48 of the expansible locking member 40 are plungers 49 guided in bores 50 formed in a cylinder block 51 rigidly secured to the cutter frame 4. Arranged in a bore 52 connecting the cylinder bores is a conduit 53 having passages 54 communicating through radial ports 55 with the cylinder bores at the inner sides of the pistons. The passages 54 also communicate with a transverse passage 56 connected through a flexible tube 57 with a passage 58 formed in a cylinder block 59 secured within the gear chamber 60 of the feed frame 5. Formed in the cylinder block 59 is a piston chamber 61 containing a piston 62, and this piston chamber is adapted to contain a liquid, preferably oil, herein supplied thereto through a connection 63 at the side of the feed frame (see Fig. 6). Threadedly engaged at 64 within the upper portion of the feed frame is an adjusting screw 65 engaging the upper surface of the piston 62 and having an operating handle 66. It will thus be seen that when the handle 66 is rotated to move the screw axially in a downward direction, the piston 62 is moved downwardly to force the liquid contained in the piston chamber through the passage 58, flexible pipe 57, passage 56, passages 54 and ports 55 to the cylinder bores 50 to force the pistons 49 outwardly to expand the locking member 40 into frictional engagement with the frictional surfaces on the annular flange 45 integral with the cutter bar hanger 15, thereby frictionally locking the cutter bar hanger frame against pivotal movement with respect to the cutter frame 4. It will thus be seen that the cutter bar may be locked in any desired angular position about its pivot with respect to the cutter frame.

It will be noted that either of the feeding and controlling cables 10, 11 on the cable winding drums 8 and 9 respectively may be extended along the side of the machine frame, and the free end of each cable is provided with an eye 67 connectible by a detachable pin 68 to the cutter bar hanger frame 15 so that when the cable is wound in by the drum and the cutter bar lock is released, the cutter bar may be swung about its pivot in either direction, as desired. For guiding the cables during swinging of the cutter bar, the annular flange 45 integral with the bar hanger frame 15 is formed with a peripheral guiding groove 69 for receiving the cables and for guiding the latter during swinging of the cutter bar, and usual guide sheaves are provided for guiding the cables as the latter are extended in various manners with respect to the cable winding drums, as is well understood by those skilled in the art.

The general mode of operation of the mining machine is as follows: When the machine is cutting in accordance with the longwall method of mining, one or the other of the cables 10, 11 may be connected to the cutter bar hanger by the pin and eye connection 67, 68, and when the cutter bar lock 41, 44 is released and the cable is wound in by its cable winding drum, the cutter bar may be swung about its pivot from the full line position shown in Fig. 1 in one direction or the other to a right angle position at one side of the machine frame, or any desired intermediate position, thereafter the cutter bar being locked by its locking means to the machine frame. The cable may then be detached from the cutter bar hanger and the feed cable may be extended from its winding drum along the coal face to a suitable anchor jack located at the face in advance of the machine, and as the cable is wound in by its drum, the machine is fed bodily over the mine floor to move the cutter bar to cut a horizontal kerf beneath the coal face. During the operation of the machine in accordance with the room and pillar system of mining, a

hanger frame 70 for a front guide sheave 71 may be attached to the machine at the advancing side thereof, as indicated in dotted lines in Fig. 1, and the feeding cable 10, likewise indicated in dotted lines in that figure, may be extended from the feeding drum 8 forwardly along the advancing side of the machine and around the front guide sheave 71 to a suitable anchor jack located at the face, while the controlling cable 11 on the controlling drum 9 may be extended forwardly along the receding side of the machine to a suitable anchor jack located at the right hand rib. With this arrangement of parts, the cutter bar is locked by its locking means in the full line position shown in Fig. 1, and as the cables are wound in by the drums, the machine is fed bodily toward the coal face to sump the cutter bar beneath the coal, the controlling cable guiding the machine during this sumping operation. The feeding cable is then detached from the anchor jack at the face and extended around the front guide sheave 71 transversely along the coal face to a suitable anchor jack located at the left hand rib, and as the feeding cable is wound in by its drum, the machine is fed transversely across the coal face to cut a horizontal kerf thereunder. During the transverse cutting operation, the controlling cable 11 guides the machine. Upon completion of the transverse cutting operation, the feed cable is extended rearwardly of the machine to an anchor jack located at the rim, and the feeding cable is wound in by its drum, moving the machine rearwardly with respect to the coal face to withdraw the cutter bar from beneath the coal. In accordance with either the room and pillar or longwall systems of mining, the cutter bar may be swung about its pivot during the cutting operation under the frictional control of the locking means, and the cutter bar lock may be partially released to allow the same to slip during feeding of the machine to cause the cutter bar to swing about its pivot in the manner clearly described in our copending application, Serial No. 71,654, mentioned above.

As a result of this invention, it will be noted that an improved coal mining machine is provided having an improved pivotal mounting for the kerf cutter and improved means for locking the kerf cutter against swinging movement about its pivot. It will further be noted by the provision of the frictional lock for the kerf cutter, the kerf cutter may be locked in any desired position about its pivot and the lock may be partially released during operation of the machine to permit slippage thereof, thereby causing swinging of the kerf cutter about its pivot, thereby facilitating the cutting operation. It will still further be evident that by the provision of the hydraulic operating means for the frictional lock, a powerful locking pressure may be applied to the lock with comparative ease. Further uses and 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 we claim as new and desire to secure by Letters Patent is:

1. In a mining machine, a support, a hanger frame swivelled on said support and having an annular flange surrounding the swivel axis thereof, said support and hanger frame cooperating to provide an annular chamber, a kerf-cutter carried by said hanger frame, and means for locking said hanger frame to said support comprising a frictional locking band arranged wholly within said chamber and engageable with an annular frictional locking surface on said hanger frame flange and means within said chamber for operating said locking band.

2. In a mining machine, a support, a hanger frame swivelled on said support and having an annular flange surrounding the swivel axis thereof, said support and hanger frame cooperating to provide a chamber, a kerf-cutter carried by said hanger frame, and means for locking said hanger frame to said support comprising a frictional locking band arranged within said chamber and engageable with an annular frictional locking surface on said hanger frame flange and means within said chamber for operating said locking band, said operating means comprising a cylinder having a bore, a piston reciprocable in said bore and engaging said locking band and means for supplying actuating fluid to said cylinder bore.

3. In a mining machine, a support, a hanger frame swivelled on said support and having an annular flange surrounding the swivel axis of said hanger frame, said flange having an internal annular frictional locking surface, said hanger frame cooperating with a portion of said support to provide an internal chamber, a kerf-cutter carried by said hanger frame, and means for locking said hanger frame to said support comprising an expansible frictional locking band arranged in said chamber within said annular flange and engageable with said internal annular flange surface and means within said chamber for expanding said locking band into frictional locking engagement with said flange surface.

4. In a mining machine, a support, a hanger frame swivelled on said support and having an annular flange surrounding the swivel axis of said hanger frame, said flange having an internal annular frictional locking surface, said hanger frame cooperating with a portion of said support to provide an internal chamber, a kerf-cutter carried by said hanger frame, and means for locking said hanger frame to said support comprising an expansible frictional locking band arranged in said chamber within said annular flange and engageable with said internal annular flange surface and means within said chamber for expanding said locking band into frictional locking engagement with said flange surface, said expanding means including a cylinder secured to said support and projecting downwardly into said chamber within said annular flange, said cylinder having a bore containing a reciprocable piston, said piston engaging said locking band for expanding the latter, and means for supplying actuating fluid to said cylinder bore.

5. In a mining machine, a support, a hanger frame swivelled on said support and having an annular flange surrounding the swivel axis of said hanger frame, said flange having an internal annular locking surface, said hanger frame cooperating with a portion of said support to provide an internal chamber, a kerf-cutter carried by said hanger frame, and means for locking said hanger frame to said support comprising a split expansible frictional locking band and engage-

able with said internal flange surface, a lug projecting downwardly from said support within said annular flange and engaging said locking band intermediate the ends of the latter for holding said band against substantial rotative movement relative to said support and means arranged within said chamber and engaging the ends of said band for expanding the latter into frictional locking engagement with said annular flange surface.

6. In a mining machine, a support, a hanger frame swivelled on said support and having an annular flange surrounding the swivel axis of said hanger frame, said flange having an internal annular locking surface, said hanger frame cooperating with a portion of said support to provide an internal chamber, a kerf-cutter carried by said hanger frame, and means for locking said hanger frame to said support comprising a split expansible frictional locking band and engageable with said internal flange surface, a lug projecting downwardly from said support within said annular flange and engaging said locking band intermediate the ends of the latter for holding said band against substantial rotative movement relative to said support, and means arranged within said chamber and engaging the ends of said band for expanding the latter into frictional locking engagement with said annular flange surface, said band-expanding means including a cylinder secured to said support and projecting downwardly into said chamber within said annular flange, said cylinder having bores containing oppositely acting pistons engaging said band ends and means for supplying actuating fluid to said cylinder bores.

7. In a mining machine, a support having a bottom cylindrical projection, a hanger frame swivelly mounted on said bottom projection and having an annular flange cooperating with a portion of said support to provide an internal annular chamber, a kerf-cutter carried by said hanger frame, and means for locking said hanger frame to said support comprising a locking band arranged wholly within said chamber and engageable with an annular frictional locking surface on said hanger frame flange and means arranged within said chamber for operating said band.

8. In a mining machine, a support having top and bottom cylindrical bearing projections, a hanger frame having spaced bearing projections swivelly mounted on said cylindrical bearing projections and a concentric annular flange surrounding a portion of said bottom bearing projection and cooperating with a portion of said support to provide an internal chamber, a kerf-cutter carried by said hanger frame, and means for locking said hanger frame to said support comprising a frictional locking band arranged within said chamber and engageable with an annular frictional locking surface on said hanger frame flange, and means arranged within said chamber for operating said locking band.

9. In a mining machine, a support having a cylindrical bearing projection, a hanger frame swivelled on said bearing projection and having an annular flange surrounding the swivel axis of said hanger frame and cooperating with a portion of said support to provide an internal chamber, a kerf-cutter carried by said frame and having cutting means, means for driving said cutting means including a driven member arranged externally of said support, a driving member arranged internally within said support and a transmission member extending through said bearing projection for connecting said driven member in driving relation with said driving member, said chamber surrounding a portion of said bearing projection and said transmission member, and means for locking said hanger frame to said support including a locking band arranged wholly within said chamber and partially surrounding a portion of said bearing projection and said transmission member, said locking band engageable with an annular frictional locking surface on said hanger frame flange, and means within said chamber for operating said locking band.

10. In a mining machine, a frame having a cylindric bearing support, a hanger frame swiveled on said bearing support and having an outer circular flange surrounding the swivel axis of said hanger frame and spaced outwardly from said bearing support, said flange having an internal annular locking surface, a kerf cutter carried by said hanger frame, an expansible frictional locking band arranged within the space surrounded by said annular flange and engageable upon expansion thereof with said annular locking surface for locking said hanger frame to said first mentioned frame, said frames cooperating to provide a chamber, and means arranged in said chamber for expanding said locking band.

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