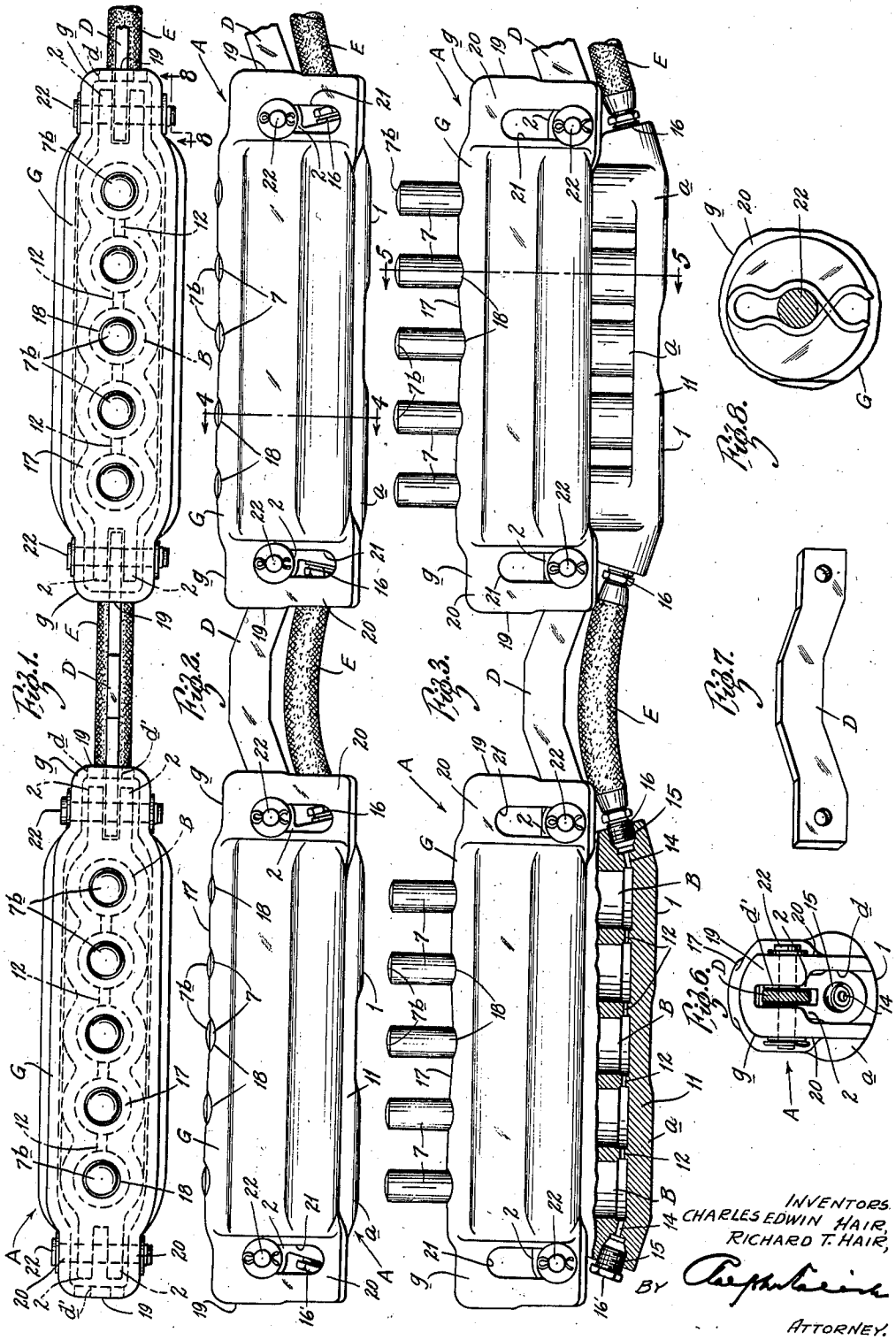
April 18, 1944. C. E. HAIR ET AL 2,346,677

COAL MINING MACHINE

Filed June 15, 1942 3 Sheets-Sheet 1



INVENTORS
CHARLES EDWIN HAIR,
RICHARD T. HAIR,
BY
ATTORNEY.

April 18, 1944. C. E. HAIR ET AL 2,346,677

COAL MINING MACHINE

Filed June 15, 1942 3 Sheets-Sheet 2

Fig. 4.

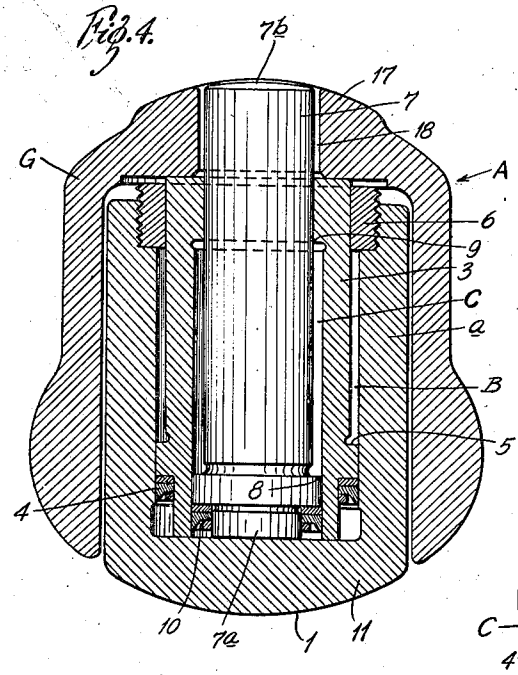


Fig. 5.

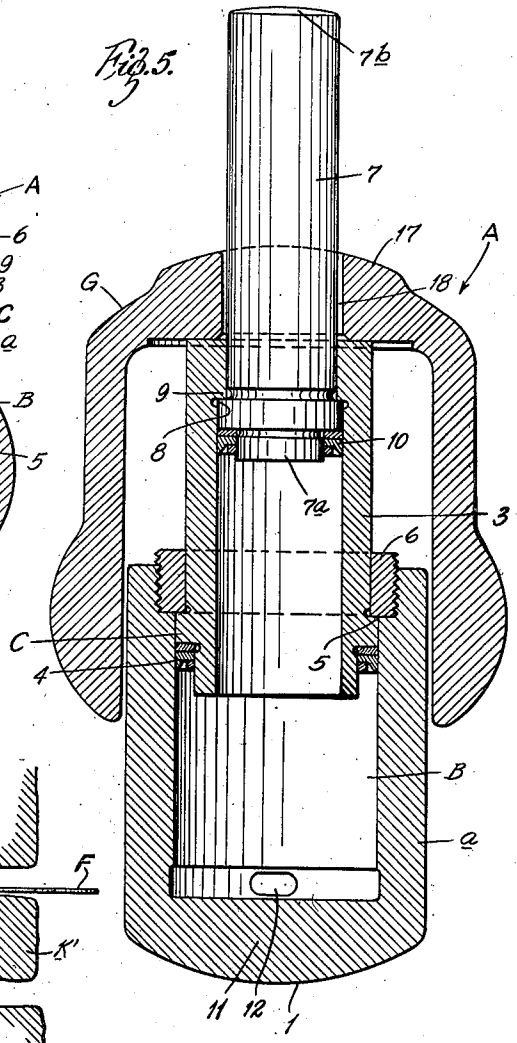


Fig. 9.

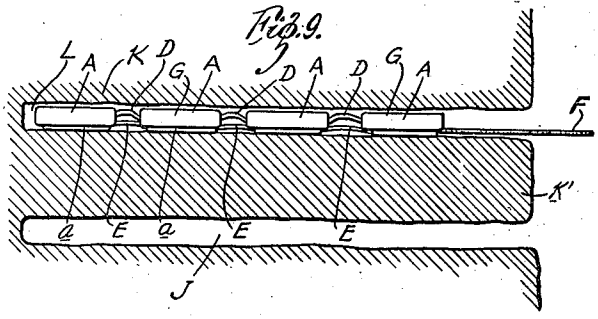
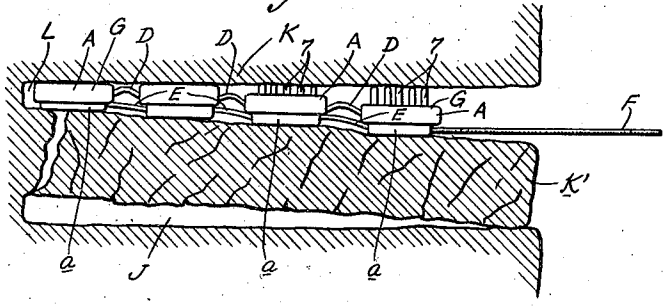


Fig. 10.



INVENTORS.
CHARLES EDWIN HAIR,
RICHARD T. HAIR,
BY
ATTORNEY.

April 18, 1944. C. E. HAIR ET AL 2,346,677

COAL MINING MACHINE

Filed June 15, 1942 3 Sheets-Sheet 3

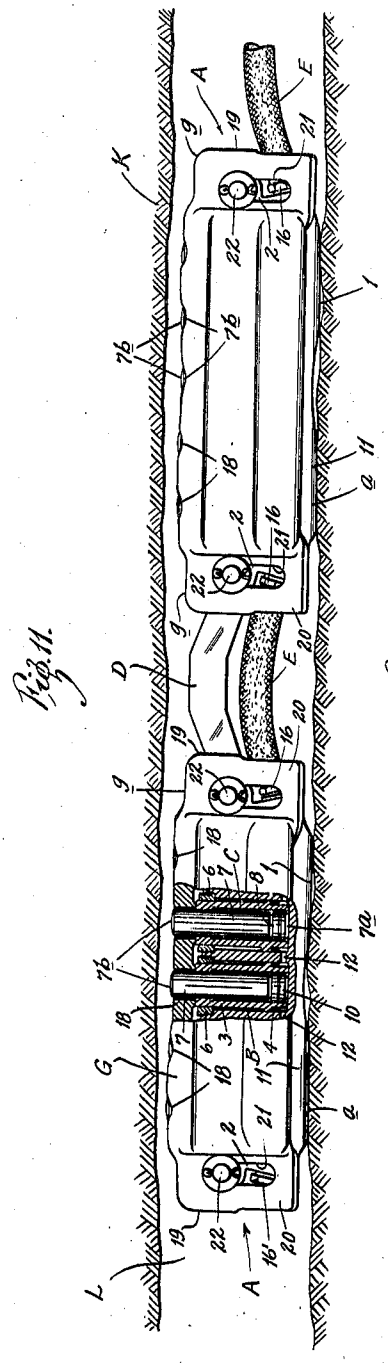


Fig. 11.

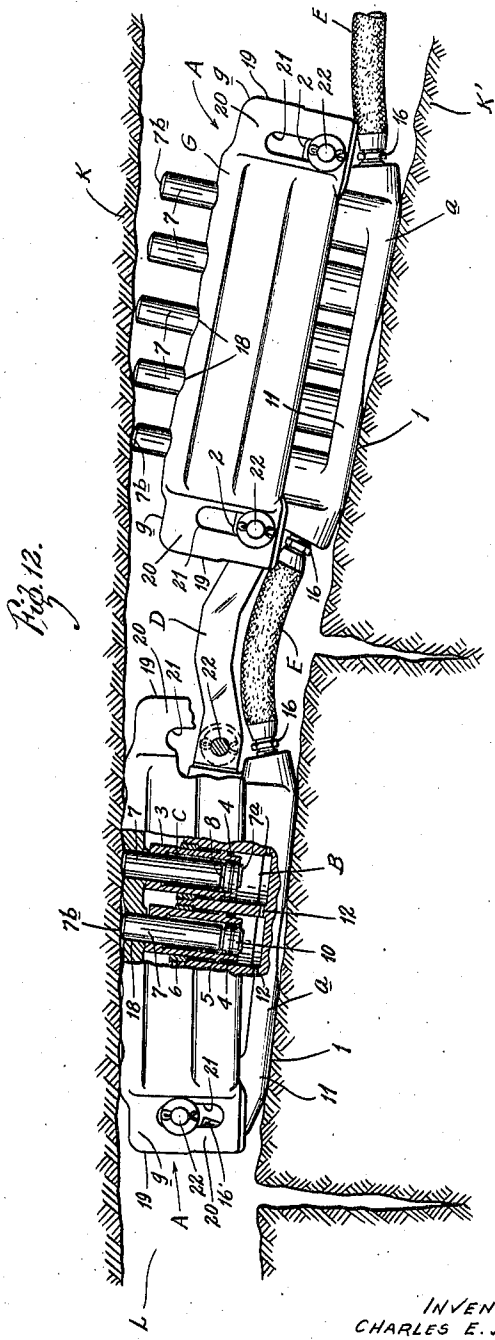


Fig. 12.

INVENTORS:
CHARLES E. HAIR,
RICHARD T. HAIR,
BY Ralph Stevens
ATTORNEY.

Patented Apr. 18, 1944 2,346,677

UNITED STATES PATENT OFFICE

2,346,677

COAL-MINING MACHINE

Charles Edwin Hair and Richard T. Hair,
Benton, Ill.

Application June 15, 1942, Serial No. 447,052

14 Claims. (Cl. 262—12)

This invention relates generally to mining machines and, more particularly, to a certain new and useful improvement in machines of fluid-actuated expansion type especially, though not exclusively, adapted for use in coal-mining.

Our invention has for its chief object the provision of a coal-mining machine of the class stated which includes a selected plurality of so-called jack-units, each unit, in turn, comprising a selected plurality of co-operable cylinders and pistons, and the several units being pivotally or hingedly joined or connected in such manner as to enable ready installation and manipulation of the machine and also permit automatic displacement of the several units one relatively to the other for compensating for unevenness in the supporting coal-floor either prior to any coal dislodging action of the machine or resulting or occurring as the coal-body is by the machine disrupted, dislodged, or broken down.

Our invention has for a further object the provision of a machine of the type and for the purpose stated, which may be readily manufactured, which is sturdy, strong, and durable, which is conveniently usable, and which is efficient in the performance of its intended functions.

And with the above and other objects in view, our invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawings (three sheets):

Figure 1 is a plan view of a coal-mining machine constructed in accordance with and embodying our invention;

Figure 2 is an elevational view of the machine with its several pistons in normal or contracted condition;

Figure 3 is an elevational view of the machine, partly broken away and in section, illustrating the machine with its several extensible pistons in fully elongated condition;

Figure 4 is an enlarged transverse sectional view through one of the jack-units of the machine taken approximately on the line 4—4, Figure 2;

Figure 5 is a similar view taken approximately on the line 5—5, Figure 3;

Figure 6 is an end view of one of the machine-units in normal condition, as in Figure 2;

Figure 7 is an elevational view of one of the unit coupling-members or links of the machine;

Figure 8 is an enlarged detail sectional elevation of the machine taken approximately on the line 8—8, Figure 1;

Figure 9 is a reduced elevational view of the machine as disruptingly or dislodgingly disposed in a coal wall or body;

Figure 10 is a similar view, illustrating some of the units of the machine in successively piston-elongating condition for the breaking down of the coal wall or body;

Figure 11 is an elevational view of the machine, with one unit partly broken away and in section, as disruptingly or dislodgingly disposed, as in Figure 9, in a coal-wall or body; and

Figure 12 is a similar view showing adjacent units of the machine in successively piston-elongated condition, as in Figure 10, in the breaking down of the coal-wall or body.

Referring now in more detail and by reference characters to the drawings, which illustrate a preferred embodiment of our invention, the machine, briefly outlined, includes a series of jack-units A, each unit including a hood-encased and protected selected plurality of co-operable cylinders B and pistons C pivotally or hingedly joined or connected in an integrated, articulated, aligning series by means of interposed coupling-members or links D.

Each unit A, more precisely, includes a suitably elongated generally oblong-rectangular block *a* preferably transversely rounded or of arcuate contour on its under face, as at 1, suitably cored in the provision of a selected plurality of parallel chambers or cylinders B, and, for purposes presently appearing, formed preferably integrally at its opposite ends with longitudinally outwardly presented oppositely disposed pairs of ears 2.

Working in each respective cylinder B of a unit A, is a preferably two-part extensible or telescopic plunger or piston C, which includes a tubular base-portion 3 circumferentially reduced at its lower end for acommodating suitable cylinder-engaging or sealing rings 4, and also counter-bored for providing an annular shoulder, as at 5, for engaging a ring 6 thread-seated in the upper end of the particular cylinder B for limiting the upward or elongating or extending travel or movement of the piston-portion 3, all as best seen in Figures 4 and 5.

Telescopically co-operable with the piston-portion 3, is a complementing rod-portion 7 annularly enlarged and thereby provided adjacent its lower end with an annular shoulder, as at 8, for engagement with an annular abutment shoulder 9 formed in the upper end of the companion piston-member 3 for similarly limiting elongating or expanding movement of the piston-rod 7 with respect to its cylinder B and companion

member 3, the rod 7 having a reduced lower-end extension 7a for for accommodating suitable cylinder engaging or sealing rings 10, all also as best seen in Figures 4 and 5.

It might be here mentioned that a cylinder B and piston C are so relatively proportioned and sized as to be completely nested when in normal or contracted condition, as best seen in Figures 2 and 4, and to have a stretch of approximately three inches when in abnormal or fully elongated or extended condition, as best seen in Figures 3 and 5, each piston-rod 7 being preferably rounded, as at 7b, on its upper face. It may also be here mentioned that each unit A has a length of approximately one foot and embodies five pairs of companion or co-operable cylinders B and pistons C.

Formed longitudinally in the base-wall 11 of each block *a*, is a hydraulic or other suitable fluid passage or channel, as at 12, adapted for communication with the interior of each cylinder B of the unit A, as shown. The channel or passage 12 has a preferably obliquely upwardly and outwardly presented continuation 14 and an annular enlargement 15 at each end of the particular block *a* for accommodating a nipple or the like 16 for communicating connection, as by means of respective flexible hose or tubular sections E, with adjacent units A, it being understood that the machine as a whole may include any selected number of units A disposed in suitably spaced end-to-end aligning relation and the tubular sections E being of such unique flexible or yielding structure as to permit the respective units A to shift one relatively to the other, the channel-continuation 14 of the last or rear-end unit A of a particular machine being, of course, equipped with a suitable closure-plug or the like 16' and the seated nipple 16 in the first or front-end unit A being adapted for communicating connection through and by a suitable flexible hose or pipe F with any suitable source of hydraulic or other fluid supply.

Loosely fitting for movement over and upon each respective block *a* and its projecting ears 2 and forming a part of a particular unit A, is a so-called hood G, which is generally of substantially inverted U-shape in transverse section, as best seen in Figure 5, with opposite end-portions *g* slightly or somewhat reduced in width, as best seen in Figure 1, each hood G including a bight-wall 17 having a series of openings 18 suitably spaced for accommodating the plungers 7 and opposite end-walls 19 cut-away, as at *d*, for accommodating respective nipples 16 and their connected tubular sections E, and slotted in communication, as at *d'*, for accommodating the end-portions of the unit-connecting links D.

Each hood G, in the opposite side walls 20 of its reduced end-extensions *g*, is also provided or formed with transversely disposed registering closed-end slots 21 for shiftably accommodating the outwardly presented ends of transversely disposed pivot-pins 22 engaging the ears 2 of the embraced unit A and the end of the interposed link or coupling member D, as best seen in Figure 1, whereby, as will be evident, one unit A may hingedly shift or articulate relatively to its adjacent unit A in a coal dislodging operation, each machine preferably including one unit A for every three feet of under-cut.

Accordingly, in use and operation, an under-cut or kerf, as J, is suitably formed or produced in or adjacent the bottom level of the particular wall or body K of coal being mined, and in suitably spaced relation upwardly from the under-cut J as desired plurality of suitably spaced and elongated annular holes, as at L, are formed in the coal-body K. One or more machines of our invention are then lengthwise disposed in selected holes L, as indicated in Figure 9, with the several pistons or plungers C of the respective units A thereof in upstanding normal or contracted condition, as in Figure 9.

The hose or pipe F of the end unit A of the particular machine is suitably connected with a source of hydraulic or other fluid supply, and the fluid in sufficient volume or amount led into the successive cylinders B of the successive units A. Hence, as the pistons C of a unit A are thus successively hydraulically elongated or extended, that portion, as at *k'*, of the wall K intermediate the kerf or under-cut J and the several holes L is, under the relatively great pressure exerted upon the coal wall or body K by the elongating pistons C and the hoods G, successively disrupted and dislodged and its removal from the mine thereby conveniently facilitated, as is indicated in Figure 10.

In such a dislodging operation, the coupling links or members D readily permit a hingedly shifting movement between the respective units A, with the result that, as the coal shifts under the disrupting pressure exerted thereon by the hoods G and the successively expanding pistons C of each successive unit A, any one or more of the units A may readily move either arcuately or obliquely to a different flat or inclined plane with respect to the remaining units, as indicated in Figure 10. Hence the machine augments, instead of retards, shifting movement of the dislodged coal and at the same time the relative flexibility of the units A eliminates and obviates breaking of the machine in or by shifting movement of the disrupted coal, the respective arcuate faces 1 and 7b of the respective blocks *a* of the several units A and of the several plunger-rods 7 and the pivotally shifting movement of the links D facilitating engagement of the machine with the coal-body, as well as subsequent movement of the respective units A under the shifting movement of the disrupted coal.

We may add that, of course, on a draining back of the motive fluid, the several pistons C of each respective unit A will automatically return to normal contracted condition, when the machine may be easily removed for successive like operations, and during and throughout such coal disrupting operations, the several hoods G pivotally shift with their respective units A, as well as also shift vertically, as it may be said, with the pistons C thereof relatively to the embraced block *a* during a portion of the travel of the several pistons and thus function, when the pistons are traveling in expanding direction, in exerting breaking or dislodging pressure upon the engaged coal. It is to be noted further that the several telescopic pistons of each unit, by reason of the accommodating hood-bight apertures, are adapted to also travel, during a portion of their stroke, independently of the particular hood, the pistons, in such latter portion of their travel, moving successively and in different amounts or through different distances within the limits of their stroke, for coal-engagement.

It is to be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the machine may be made and substituted for those

herein shown and described without departing from the nature and principle of our invention.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. In a mining-machine, a jack-unit comprising a block including a selected plurality of parallel cylinders, extensible pistons working in the several cylinders of the block, and a hood fitting over the block and having spaced openings for accommodating movement therethrough of portions of the pistons, the hood being shiftable with the pistons with respect to the block during a portion of their travel.

2. In a mining-machine, a pair of jack-units each comprising a block including a selected plurality of parallel cylinders, extensible pistons working in the several cylinders of each of the units, means comprising a link joining the units one to the other in endwise spaced relation for relative movement, and hoods fitting over, and having spaced openings for accommodating partial movement therethrough of the pistons of, the respective blocks, each hood being shiftable with the respective pistons during a portion of their travel with respect to the particular block.

3. In a mining-machine, a pair of jack-units each comprising a block including a selected plurality of parallel cylinders and having a longitudinally outwardly presented ear at an end, extensible pistons working in the several cylinders of each of the units, hoods fitting over and upon, and having spaced openings for accommodating partial movement therethrough of the pistons of, the respective blocks, the hoods being slotted in their end walls and also having registering slots in their side walls, and means connecting the units for articulation, said means comprising a link disposed intermediate, and projecting endwise through the slots in the end walls of, the hoods, and a pin projecting through the side wall slots of the hoods and engaging the link and ears of the embraced blocks, the side wall slots permitting movement of the hoods with the pistons during a portion of their travel relatively to the enclosed blocks.

4. In a mining-machine, a jack-unit comprising a block including a selected plurality of parallel cylinders, pistons working in the several cylinders of the block, and a hood fitting over the block and co-operable with the pistons in a dislodging operation, the hood being shiftable relatively to the block with the pistons for a portion of their travel and having spaced openings for permitting independent movement of the pistons relatively thereto.

5. In a mining-machine, a jack-unit comprising a block including a selected plurality of parallel cylinders, pistons working in the several cylinders of the block, and a hood of inverted U-shape in transverse section fitting over the block and shiftable relatively to the block by and with the pistons during a part of the travel of the pistons, the hood having openings in its bight for permitting independent movement of the pistons relatively thereto.

6. In a mining-machine, a pair of jack-units each comprising an elongated block, a series of spaced parallel cylinders in the block, and reciprocatory pistons working in and relatively to the cylinders, the block having a fluid-flow passage for communicating its several cylinders, means comprising a link pivotally joining the units one to the other for articulation, and means including a flexible pipe-section disposed lengthwise in spaced relation under the link and having communicating connection with the passages of said blocks for joining the units for fluid communication for piston actuation.

7. In a mining-machine, a pair of jack-units each including an elongated block, a series of spaced parallel cylinders in the block, reciprocatory pistons working in and with respect to the cylinders, each block having a fluid-flow passage communicating its several cylinders, a slotted ear projecting longitudinally from an end of the block, and a hood of inverted U-shape in transverse section fitting over the block and apertured in its bight for accommodating piston movement therethrough, the hood being movable by the pistons relatively to the block and having a slotted end-extension registering with said ear, means comprising a pin disposed transversely through the respective slots of the ear and extension and a link having connection with the pin for joining the units for articulation, and means having connection with said passages for joining the units for fluid communication for piston actuation.

8. In a mining-machine, a jack-unit comprising an elongated block, a series of spaced parallel cylinders in the block, pistons reciprocatory in and with respect to the cylinders, each piston including telescopically related inner and outer members, a hood fitting over the block and resting on the outer members of the respective pistons, the hood having apertures for accommodating movement therethrough of the inner members of the respective pistons and being shiftable relatively to the block with the pistons for a portion of their travel, and fluid-pressure means for actuating the pistons and hood.

9. In a mining-machine, a jack-unit including an elongated block, a series of spaced parallel cylinders in the block, extensible pistons reciprocatory in and with respect to the cylinders, each piston including telescopically related sections, a hood of inverted U-shape in transverse section fitting for movement over the block and having apertures in its bight for accommodating movement therethrough of sections of the respective pistons, the hood being shiftable with the pistons during a portion of their travel, fluid-pressure means for actuating the piston-sections to extended position, and means for limiting movement of the sections of the respective pistons to extended position.

10. In a mining-machine, a jack-unit comprising an elongated block, a series of spaced parallel cylinders in the block, reciprocatory pistons working in the several cylinders, each piston having telescopically related inner and outer members, and a hood fitting over the block and co-operable with the pistons in a dislodging operation, the hood being shiftable relatively to the block with the outer members of the pistons in a dislodging operation and having spaced openings for permitting additional movement of the inner members of the pistons relatively to the block in such dislodging operation.

11. In a mining-machine, a jack-unit comprising an elongated block, a series of spaced parallel cylinders in the block, reciprocatory pistons working in the several cylinders, a hood of inverted U-shape in transverse section fitting over the block, the hood having spaced openings in its bight for accommodating movement therethrough of portions of the pistons and relatively to the block being shiftable with the pistons through a portion of their stroke, the hood be-

ing provided at each end with a pair of registering slots in its side walls and the block having ears projecting intermediate the slots of each pair, and pins having connection with the block at said ears and engaging the hood at said slots for movably connecting the hood and the block.

12. In a mining machine, a pair of jack-units each including an elongated block, a series of spaced parallel cylinders in the block, telescopic pistons reciprocatory in and with respect to the cylinders, and a hood of inverted U-shape in transverse section movably disposed over the block and shiftable with portions of the pistons during their travel, the hood having apertures in its bight for permitting independent movement of other portions of the pistons, and a link having pin-and-slot connection with the blocks and hoods of the respective units for endwise joining the units one to the other for articulation.

13. In a mining machine, a pair of jack-units each including an elongated block, a series of spaced parallel cylinders in the block, telescopic pistons reciprocatory in and with respect to the cylinders, and a hood of inverted U-shape in transverse section movably disposed over the block and shiftable with portions of the pistons during their travel, the hood having apertures in its bight for permitting independent movement of other portions of the pistons, a link having pin-and-slot connection with the blocks and hoods of the respective units for endwise joining the units one to the other for articulation, and fluid pressure means joining the blocks for piston and hood actuation.

14. In a mining machine, a jack-unit comprising an elongated block, a series of spaced parallel cylinders in the block, telescopic pistons reciprocatory in and with respect to the cylinders, and a hood of inverted U-shape in transverse section movably disposed over the block and shiftable with portions of the pistons during their travel, the hood having apertures in its bight for permitting independent movement of other portions of the pistons, and fluid pressure means for actuating the pistons and hood in expanding direction, said piston-other-portions, when traveling in expanding direction, being successively operable and through different distances for coal-engagement.

CHARLES EDWIN HAIR.
RICHARD T. HAIR.