

Jan. 15, 1924.

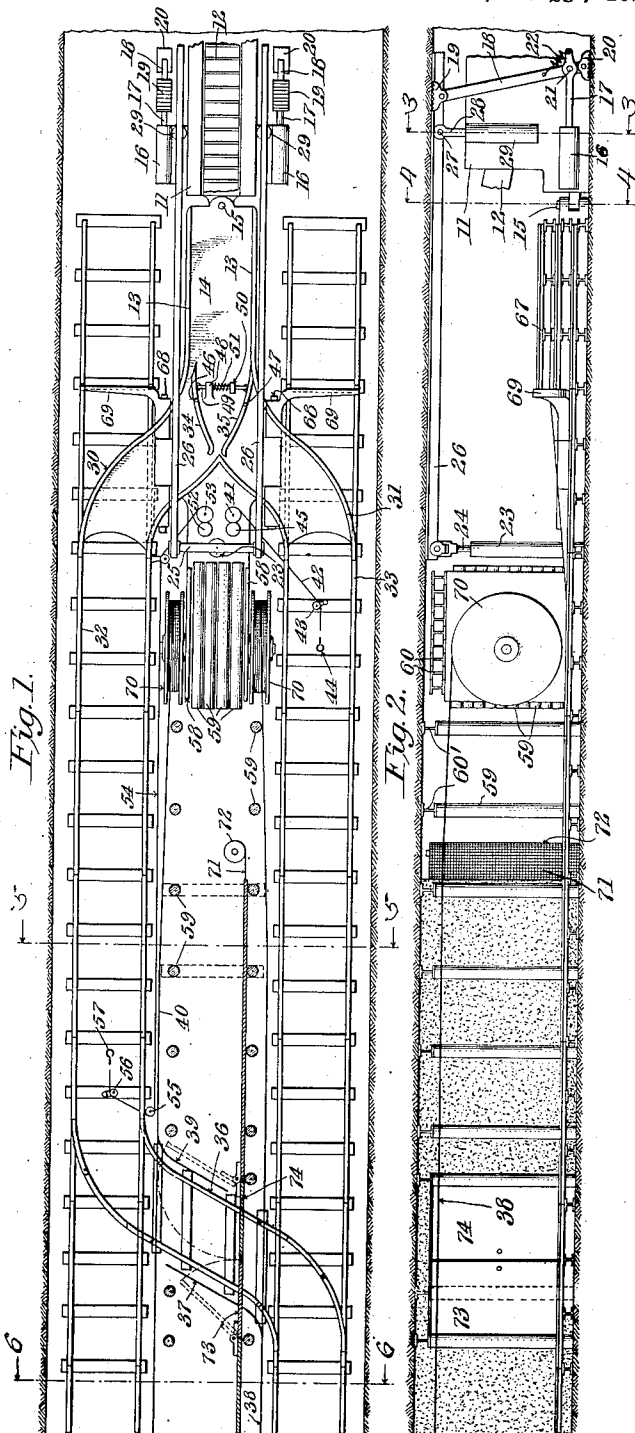
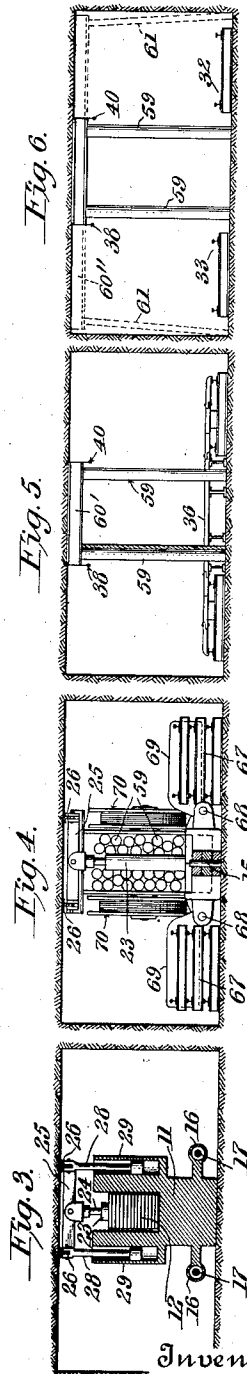
E. C. MORGAN

1,480,733

SYSTEM AND APPARATUS FOR MINING COAL

Filed April 28, 1920

2 Sheets-Sheet 1



Witness.
L. E. Fischer.

By Brown Nisen, his Attorney

Inventor

Edmund C Morgan

Jan. 15, 1924.

1,480,733

E. C. MORGAN

SYSTEM AND APPARATUS FOR MINING COAL

Filed April 28, 1920

2 Sheets-Sheet 2

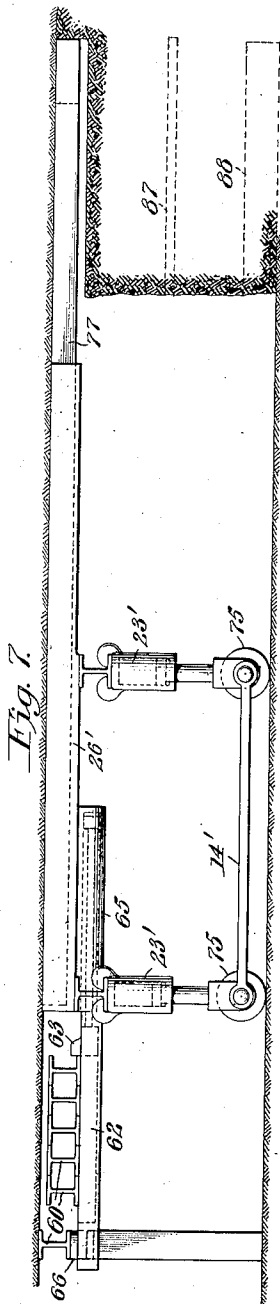


Fig. 7.

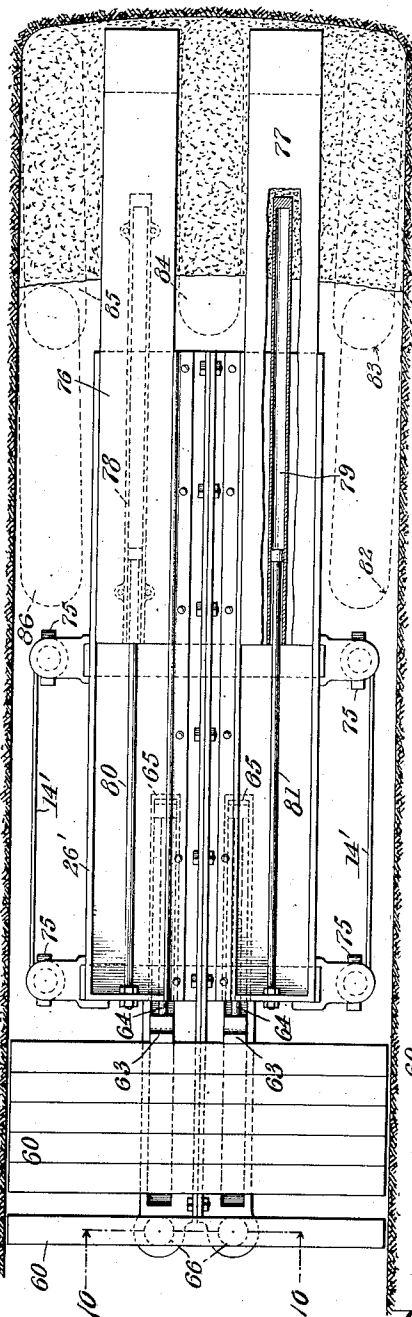


Fig. 8.

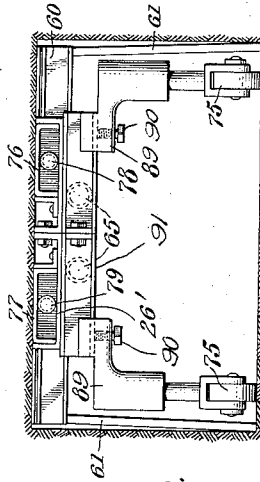


Fig. 9.

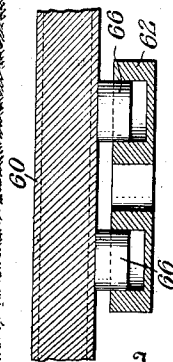


Fig. 10.

Inventor

Edmund C Morgan

By Brown & Nissen, his Attorney

Witness
L. E. Fischer

UNITED STATES PATENT OFFICE.

EDMUND C. MORGAN, OF NEW YORK, N. Y.; OLIVE EUGENIE MORGAN EXECUTRIX OF SAID EDMUND C. MORGAN, DECEASED.

SYSTEM AND APPARATUS FOR MINING COAL.

Application filed April 28, 1920. Serial No. 377,415.

To all whom it may concern:

Be it known that I, EDMUND C. MORGAN, a citizen of the United States, and residing in New York city, county of New York, and State of New York, have invented certain new and useful Improvements in Systems and Apparatus for Mining Coal, of which the following is a specification.

My invention relates to a system and apparatus for mining material, and is particularly adapted for the mining of coal. One of the objects of my invention is the provision of apparatus for facilitating the mining and loading of material, particularly coal, in a mine.

A further object of the invention is the provision of apparatus for facilitating the loading of mined material and the transportation thereof out of the mine chamber where the mining is proceeding.

Another object of the invention is the provision of a system of mining in which the roof is supported as the mining proceeds and in which the mine tracks are extended in accordance with the progress made by the mining operation. It is also the object of the present invention to provide means for supporting compactly, roof-propping material.

Another object of my invention is the provision of an improved extensible ventilating partition.

A further object of the invention is the provision of means for carrying electric trolley wires for mine cars, in such a manner that as the mining proceeds and the mine tracks are extended, such trolley wires may be accordingly extended.

It is also the object of my invention to provide a system and apparatus for facilitating the handling of material received from a combined mining and loading machine, or otherwise dislodged as by means of mining mechanism not combined with loading apparatus.

A further object of the invention is the provision of a method of mining in which spaced-apart parallel entries are driven and the roofs thereof supported by my improved apparatus while the material therefrom is removed, and then removing the intervening rib or pillar while also gradually removing the roof-supporting apparatus,

leaving the roof free to subside, and afterward driving another entry a short distance from the space where the material has been removed as just described, propping up such new entry while being made until a single pillar is left between the new entry and such space which has been cleared as described. The mining of the said single pillar is then carried out while gradually removing the roof-propping mechanism in such new entry, thereby enlarging the space from which all roof-propping mechanism has been removed or enlarging the space over which the roof is free to subside. This method is thus carried on with the use of my apparatus until all the desired material has been mined, loaded and transported to places where it can be taken out of the mine.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

Referring to the accompanying drawing, Fig. 1 represents a plan view of my improved apparatus in a system of handling coal received from a combined mining and loading machine;

Fig. 2 is an elevational view of Fig. 1;

Fig. 3 is a sectional end elevation of Fig. 2 on the line 3—3 of Fig. 2 looking in the direction of the arrows;

Fig. 4 is a sectional elevation taken on the line 4—4 of Fig. 2 looking in the direction of the arrows;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 1 looking in the direction of the arrows;

Fig. 6 is a sectional elevational view on the line 6—6 of Fig. 1 looking in the direction of the arrows;

Fig. 7 is a side elevation of a modification of the structure shown in Fig. 1 and Fig. 2, and is particularly adaptable to the support of weak roofs and for cooperation with mining mechanism not combined with loading apparatus;

Fig. 8 is a plan view of Fig. 7;

Fig. 9 is a front elevational view of the mechanism shown in Fig. 7; and

Fig. 10 is a rear sectional elevational view taken on the line 10—10 of Fig. 8 looking in the direction of the arrows.

Referring to Figs. 1 and 2 of the accompanying drawings, I have diagrammatically illustrated a portion of a mining and loading machine having a supporting frame 11, and a conveyer 12 which is adapted to extend upwardly toward the rear so as to deliver the mined material into a mine car resting on the rails 13 of the frame 14 which is hinged or pivotally connected at 15 to the rear end of the supporting frame 11. At the sides of the mining and loading machine supporting frame is a pair of horizontal fluid pressure motors 16 having forwardly extending piston rods 17 connected to a roof-jack which comprises a pair of upright rearward extending bars 18, each pivotally connected to roof and floor shoes 19 and 20, respectively. The piston rod 17 is pivotally connected at 21 to the upright rod 18 at each side of the mining and loading machine. Preferably a spring 22 is connected between the rod 18 and the outermost end of the piston rod 17, at both sides of the mining and loading machine frame 11, as shown in Fig. 1.

When the spaced-apart fluid pressure motors 16 are operated so as to move forward the piston rod 17 relatively to the mining and loading machine frame 11 while the latter is stationary or resting on the floor of the mine chamber, the shoes 20 and 19 will be automatically released from the floor and roof respectively, but the roof shoes will be dragged along the roof because the springs 22 are of sufficient strength to maintain the rods 18 in their upright position. Now when the fluid pressure motors 16 are so operated as to tend to draw the rods 17 rearwardly, or to the left as viewed in Fig. 2, the shoes 19 and 20 will automatically grip the roof and floor and hold the rods 18 very firmly against rearward movement, thereby forming very effective abutments or anchorages for the piston rod 17 so that the said motors 16 may move the entire mining and loading machine forward, and by reason of pivotal connection 15, drag along with the mining and loading machine the frame 14 and the parts connected thereto and described hereinafter.

At the rear portion of the frame 14 is a central vertical fluid pressure motor 23 having a piston rod 24 connected to a transverse bar 25 which carries at its ends the longitudinal roof supporting bars 26 which are spaced apart, as shown in Fig. 1, and are connected at their forward portions at 27 to vertical piston rods 28 extending into vertical spaced-apart fluid pressure motors 29 mounted at the sides of the mining and loading machine frame 11. It will thus be seen that since the frames 11 and 14 rest on the floor of the mine chamber, the fluid pressure motors 23 and 29 may be made effective to project the longitudinal spaced-apart

bars 26 against the roof of the mine chamber to support the latter while the mining and loading operation is taking place. When it is desired to shift the mining and loading machine to a new position the fluid pressure motors 23 and 29 are so operated as to release the roof supports 26 until the frames 11 and 14 reach their new positions, after which the roof supports 26 are again forced against the roof and held there while the mining and loading operation proceeds.

It will also be seen by referring to Fig. 1 that the frame 14 is provided with switch tracks 30 and 31 extending from the track 13 to the spaced-apart mine tracks 32 and 33. Switching rail sections 34 and 35 are mounted on a frame 14, as shown in Fig. 1, for the purpose of directing cars from the track 13 on to either of the switches 30 or 31, or from either of the latter to the track 13. In the positions of the sections 34 and 35 shown in Fig. 1 a mine car may be directed from the track 32 along the switch 30 on to the central track 13 into a position where it can be loaded with material from the conveyer 12. If desired a communicating track 36 may be located as shown in Fig. 1 so that a car may be transferred from one of the tracks 32 or 33 to the other whenever desired. However, this arrangement is desirable particularly to enable an electric locomotive to bring into the mine chamber along the track 33 a series of empty mine cars and leave them on the track 33 while the locomotive is moved across the communicating track 36. Its trolley pole being shifted from the trolley wire extension 37 extending from trolley wire 38, to the extension 39 on the other side of the track 36 and which is connected to the trolley wire 40 adjacent to track 32. After the electric locomotive reaches the track 32 it is in readiness to be connected to filled mine cars or those loaded with mined material so that the latter may be transported along the track 32 out of the mine chamber in which the mining operation is taking place.

To facilitate movement of the empty mine cars along the track 33 to the switch 31 rope winding mechanism may be provided comprising a rope drum 41 and a rope 42 suitably guided on a pulley 43 and connected at its free end to a hook 44 which may be attached to an empty mine car. By starting the motor diagrammatically illustrated at 45 in Fig. 1, a pull is exerted on the rope 42 to move the empty mine car along the track 33 to the switch 31, and along the latter to the track 13. It should be noted that the track sections 34 and 35 are pivoted respectively at 46 and 47 to the frame 14 and provision is made for normally holding the section 35 in contact with rail 13. Through a bracket 48 extending from the frame 14 passes a bar 49 on which is a

collar 50 engaged by a spring 51 which also engages the bracket 48. When a car passes along the switch 31 the flanges of its wheels on one side of the car move the section 35 on a pivot 47 against the action of the spring 51 and at the same time the rod 49 pushes the other section 34 on a pivot 46 against the other rail 13. When the car passes the switch mechanism, the latter automatically replaces itself in the position shown in Fig. 1 and when the car, after being loaded, is moved rearwardly, it will pass along the switch 30 on to the track 32.

In order to facilitate the movement of the loaded mine cars along the track 32 so that they can be more easily connected to the electric locomotive to form a train, I have provided additional rope winding mechanism comprising a motor 52, a winding drum 53, a rope 54, guide pulleys 55 and 56 and a hook 57.

At the rear end of the frame 14 there is a platform at the lateral edges of which are located vertical-spaced apart longitudinal plates 58 which form an open-ended trough for receiving a considerable number of roof props previously cut to predetermined lengths so as to be adapted to be placed in the mine chamber either directly between the floor and roof in suitable spaced-apart positions to serve as roof props or to be placed between the floor and transverse I-beams as shown in Fig. 2, and also in Fig. 5. A plurality of such I-beams may be carried on the upper edges of the spaced-apart plates 58 as shown at 60 in Fig. 2. The roof props may be spaced-apart as desired depending upon the character of material being mined and the tendency of the roof to subside. In some instances the I-beams may be of the length indicated by 60' in Fig. 5, but if greater supporting effect is desired, such I-beams may be extended to the full width of the entry or mine chamber as shown at 60'', and the ends of the I-beams provided with additional upright props shown in dotted line 61, Fig. 6.

In the system shown in Figs. 1 and 2, the apparatus is such that the I-beams 60 must be taken from their support 58, 58 and placed manually between the vertical roof props 59 and the roof. In Figs. 7 and 8 I have shown mechanism by means of which this work may be done by fluid pressure power. The I-beams 60 may be supported by the vertical plates 58 as before but are provided with an additional support 62 so that they will be in a position to be engaged by the plungers 63 which are connected to piston rods 34 of fluid pressure motors 65. The support 62 may also be provided with vertical fluid pressure motors 66 in position to engage the underside of one of the I-beams 60 and force it against the roof until spaced-apart props 59 are put in position beneath

the transverse I-beams 60. Obviously the I-beams 60 may be moved back step by step as occasion requires, and the said beams forced against the roof at intervals for the setting of the roof props, as described above.

It should also be noted that the spaced-apart side tracks 32 and 33 may be provided with a plurality of extensions 67 stacked on top of each other as illustrated at 67 in Fig. 2. Pivotally connected at 68 on both sides of the frame 14 on longitudinal horizontal spaced-apart parallel axes are laterally extending push plates 69 adapted to engage the stacks of track extensions 67 on the forward ends of the tracks 32 and 33 which have already been laid on the floor of the mine chamber. It will thus be seen that when the mining and loading machine, together with the frame 14, are moved forwardly the push plates 69 will also be moved forwardly and the track extensions 67 will finally be moved off the tracks 32 and 33 which will permit the lowermost track extension to drop down into position to form a continuation or extension of the track previously laid. This takes place at both sides of the mine chamber.

At any desired intervals, additional track extensions may be stacked up on the ends of the tracks 32 and 33 and so also at such intervals additional I-beams 60 and additional roof props 59 may be placed in the receiver 58. However, the supply of track extensions and the supply of I-beams and roof props may be replenished at any time even during continuance of the mining, loading and transporting of the coal from the mine chamber.

At the sides of the vertical plates 58 are mounted reels 70 for carrying the trolley wires 38 and 40. As the mining operations progress the trolley wires are paid out from the reels and suspended from the ends of the I-beams 60' by means of suitable insulating mine hangers. This is illustrated diagrammatically in Figs. 5 and 6.

When desired advantage may be taken of the presence of the roof props, particularly when the latter are of timber, to form ventilating chambers by unrolling a sheet of wire gauze or reinforcing metal 71 from a roll 72 as shown in Fig. 1, and securing such reinforcing material to the roof props between the floor and roof of the mine chamber to form a partition between the lateral walls thereof and extending longitudinally. A cement gun may then be used to entirely cover the gauze partition so as to provide a wall of a thickness of about an inch or more. Doors may be provided in such a cement wall wherever desired. For instance, I have shown in Fig. 1 two hinged doors 73 and 74 adjacent the cross track 36. These doors may be swung to the dotted line positions when the mine locomotive is to be

transferred from the track 33 to the track 32, for the purpose of taking back a train of loaded cars after having brought up on track 33 a train of empty cars.

5 In addition to the mechanism for using fluid pressure power to place the heavy iron I-beams 60 in proper position to receive the spaced-apart wooden roof props, I have shown in Figs. 7 and 8 extensible roof sup-
10 porting mechanism adapted to project forwardly along the roof of the mine chamber where mining mechanism is located. The frame 14' is mounted on rollers 75 and fluid pressure motors 23' are located between the
15 frame 14' and the roof supporting frame 26'. The latter is provided with two forwardly projecting extensions 76 and 77, each provided with a fluid pressure motor 78 and 79 respectively. These motors have
20 piston rods 80 and 81 which are fixed rigidly at their rear ends to the frame 26' as shown in Fig. 8. The extension 76 and 77 are channel beams as shown in Fig. 9 and fit in longitudinal troughs so as to slide along the lat-
25 ter. If an elongated cutter bar of a roof cutting mining machine is initially in the position shown by the dotted lines 82 and fed forward to the position shown by the dotted lines 83 and then fed laterally to the
30 position shown by the dotted lines 84, it is desirable that the roof shall be supported in some instances before the cutter reaches the position illustrated by the dotted lines 85. The structure shown in Fig. 8 is there-
35 fore such that the motor 79 can be operated independently of the motor 78 by well known mechanism for controlling fluid pressure motors. In this respect the illus-
40 tration of the motors 78 and 79 is diagrammatic; in other words, mechanism for controlling separate fluid pressure motors independently of each other is well known and detailed illustration thereof is deemed to be unnecessary.

45 When the roof kerf cutter reaches the position illustrated by the dotted line 84, the extension 77 may be thrust forward by the motor 79 and the motors 23' on the adjacent side of the frame 26' operated to force the
50 roof support 77 upwardly into roof propping position and held there during continued feeding movement of the kerf cutter. When the latter reaches the position illustrated by the dotted lines 85 the other exten-
55 sion 76 may be thrust forward by the motor 78 and then the motors 23' on the corresponding side of the frame 26' may be operated to force the extension 76 into roof propping position. It should also be noted
60 that the space available will permit the withdrawal of the kerf cutter to the position illustrated at 86 in Fig. 8. The dotted lines 87 in Fig. 7 indicate a drill hole which may be made by the mining machine so that
65 the cut material may be blasted down. The

dotted lines 88 indicate an under kerf which the mining machine may make to facilitate the dislodgement of the material when it is blasted, and to provide a smooth floor for the laying of the tracks 32 and 33 and for a
70 movement of the frames 14 and 14' along the mine chamber between the side tracks.

In my improved method of mining which may be carried out with the apparatus shown and described, two parallel spaced-
75 apart entries are first made to leave a pillar or rib between such entries. Both entries will then have their roofs propped up and supported in the manner illustrated in Figs. 1 and 2. The mining and loading machine
80 having a frame 11 may then be disconnected at 15 from the frame 14 and used to mine and load material from the pillar. As this pillar is removed from its rear end toward the main entry at right angles to the afore-
85 said entries, the apparatus in both entries is gradually removed including the roof supporting apparatus. When the entire pillar has been removed from the space between the butt entries the roof will be free to sub-
90 side. After this space in the mine which may be in width about equal to three times the width of the entry shown in Fig. 1, has been mined out, another butt entry is formed in accordance with the system herein de-
95 scribed leaving a pillar between such new entry and the mined out space. The mining and loading machine may then again be disconnected at 15 and used to remove such
100 new pillar while the apparatus in the butt entry is being gradually removed as this pillar mining proceeds from the rear end of the butt entry to the main entry. Suc-
105 cessive entries are formed in the same way and pillars similarly removed whereby the mined space gradually becomes larger and larger and wherein the roof is free to sub-
side if all of the roof props are removed.

It should be noted that the bracket arms 89 as shown in Fig. 9 are adjustable later-
110 ally. By means of set screws 90 the bracket arms 89 may be secured in adjusted position on the cross beams 91.

It should also be noted that, as shown in Fig. 1, the switches 30 and 31 together with
115 the arms 69 are pivoted at 68 so that said arms and switches may be swung upwardly off the mine tracks into folding position relative to the intermediate frame 14 so as to
120 permit passage of mine cars and locomotives along the mine track 32 and 33 whenever desired.

Having thus disclosed an embodiment of of my invention what I wish to have secured
125 by Letters Patent of the United States is:—

1. In a system of mining, the combination with a mine track extending longitudinally along a mine chamber, of a plurality of track extensions in stacked relation and
130 mounted directly on the forward portion of

said track, and means for sliding said stack of track extensions beyond the end of said track to effect the laying of said track extensions one after another beyond the end of said track and in continuation thereof to extend the length of said track longitudinally along the mine chamber.

2. In a system of mining, the combination with a mine track, of a track section mounted on the forward portion of said track and extending rearwardly of the front end of said track, and means for sliding said track extension of said track beyond the end thereof to drop by gravity into position to register with said track to form a continuation or extension thereof.

3. In a system of mining, the combination with a pair of parallel spaced-apart mine tracks, of two stacks of track extensions one stack on each forward end portion of said mine tracks, and means for moving said stacks of track extensions forward to drop by gravity into positions to extend said tracks step by step.

4. In a system of mining, the combination with a mine track, of a frame adapted to travel along a path parallel to the mine track, a track extension mounted on the forward portion of mine track, and an arm extending from said frame across said track in position to engage said track extension to move the latter off the end of said track to form a continuation or extension of said track when said frame is moved forwardly along said path.

5. In a system of mining, the combination with a frame adapted to move along a mine chamber, of a magazine for roof props at the rear end of said frame movable bodily therewith, a track at the forward end of said frame adapted to receive a mine car in position for loading mined material into the latter, a mine track parallel to the path of travel of said frame, and a switch permanently connected to said first-named track and adapted to slide along said mine track.

6. In a system of mining, the combination with parallel spaced-apart mine tracks, of an intermediate frame having a track on the forward end thereof, switch tracks branching from the intermediate track to the side tracks and in sliding engagement with the latter, and a cross communicating track between said side tracks to permit the transfer of a mine locomotive from one track to the other.

7. In a system of mining, the combination with a mine track, of a frame adapted to travel along a path parallel to said track, the side track on said frame, a switch movable with said side track and continuously in registry with said mine track, a reel mounted on said frame and adapted to carry a trolley wire extension, the trolley wire being paid out as said frame is moved forward along

said track, and roof supporting mechanism adapted also to support the trolley wire adjacent to the mine track.

8. In a system of mining, the combination with spaced-apart mine tracks, of two stacks of extensions, one stack on the forward portion of each of said mine tracks, a frame movable along a path between said mine tracks, arms extending from said frame for engaging said stacks, an intermediate track on said frame, switches between said intermediate track and the mine tracks, trolley wires adjacent to said mine tracks, reels mounted on said frame for carrying extensions of said trolley wire, said reels being adapted to pay out said trolley wires as said frame with its switches are moved along said mine tracks, a connecting track between said mine track, rope winding mechanism for pulling empty cars along one of the mine tracks to one of the switches, and additional rope winding mechanism for pulling loaded cars from the other switch along the other mine track.

9. In a system of mining, the combination with a frame adapted to rest on the floor of the mine chamber, of spaced-apart fluid pressure motors mounted on opposite sides of said frame and extending in general horizontal directions, and automatic roof and floor engaging mechanisms connected to said motors at opposite sides of said frame in position to move freely along the floor and roof when the motors are operated in one direction and when operated in the opposite direction to automatically grip the floor and roof to effect anchorage and supporting of the roof and cause said frame to move in a predetermined direction.

10. In a system of mining, the combination with a main frame, of a supplemental frame pivotally connected to the rear end of said main frame, a fluid pressure motor at the rear end of said supplemental frame, a pair of fluid pressure motors on said main frame, and parallel spaced-apart roof supporting bars mounted on said fluid pressure motors.

11. In a system of mining, the combination with a frame adapted to move along in a mine chamber, of a plurality of I-beams supported on said frame transversely of said mine chamber, and power operated mechanism for moving said I-beams into position at the roof of the mine chamber to receive vertical roof props beneath the same.

12. In a system of mining, the combination with a frame, of a multiple roof support, each having an independent extension, separate fluid pressure motors for operating said extensions, and means for moving the roof support against the roof after said extensions are moved successively into kerfs successively formed at the roof.

13. In a system of mining, the combination with spaced-apart mine tracks, of a

frame adapted to move longitudinally along the space between said tracks, a magazine for roof-propping material connected to said frame at the rear portion thereof to move
 5 bodily therewith, said roof-propping material being adapted to be located in roof-supporting position back of said magazine as soon as said frame is advanced along said space, an intermediate track on the forward
 10 portion of said frame for supporting mine cars while being loaded with mined material, and switches extending from said intermediate track to said mine tracks during the various forwardly extended positions of said
 15 frame.

14. In a system of mining, the combination with a pair of spaced-apart mine tracks, of an intermediate track, switches between said intermediate track and said mine tracks,
 20 track extensions on the forward portions of said mine tracks, arms extending from said frame for engaging said track extensions, and means for pivotally connecting said arms and said switches to said frame to
 25 permit folding of said arms and said switches on to said frame away from said mine track for the passage of cars or locomotives along said mine tracks beyond said frame.

30 15. In a system of mining, the combination with spaced-apart mine tracks, of a frame adapted to travel along the space between said tracks, an intermediate track on said frame, switches extending from said
 35 intermediate track to said mine tracks, a magazine for roof propping material at the rear end of said frame, trolley wire reels at the rear end of said frame in position adapted to pay out trolley wire as said frame
 40 proceeds along said mine tracks, and means for supporting the trolley wires from the roof supports to permit locomotives to move cars along said mine tracks for switching on to and off of said intermediate tracks.

45 16. In a system of mining, the combination with a pair of spaced-apart mine tracks extending longitudinally along a mine chamber, of two stacks of track extensions mounted respectively on the forward portions
 50 of said tracks, and means for moving said track extensions beyond the ends of said tracks to effect the laying of said track extensions one after another beyond the ends of said tracks and in continuation thereof to
 55 extend the lengths of said tracks longitudinally along the mine chamber.

17. In a system of mining, the combination with a mine track, of a stack of track extensions mounted on the forward end portion
 60 of said track, and means for moving the stack forwardly off the forward end of said track to effect the laying of another section to extend said track.

18. In a system of mining, the combination with a mine track, of a frame adapted

to travel along a path parallel to the mine track, a track extension on the forward portion of the mine track, and an arm pivoted to said frame in position to swing down
 70 across said mine track back of said extension to engage said extension when said frame is moved forwardly.

19. In a system of mining, the combination with a frame adapted to move along a mine chamber, of a track at the forward end
 75 of said frame adapted to receive a mine car in position for loading mined material into the latter, and roof-supporting mechanism connected to said frame and movable forwardly therewith into position for supporting
 80 the roof during the loading of said mine car.

20. In a system of mining, the combination with a frame adapted to move along a mine chamber, of a track at the forward end
 85 of said frame, a mine track parallel to the path of travel of said frame, and a switch permanently connected to said first-named track and adapted to slide along said mine track.

21. In a system of mining, the combination with an auxiliary track for supporting a mine car during the loading thereof adjacent the space where mining operations
 90 are proceeding, of a switch track for directing such mine car onto a mine track, and roof-propping mechanism above said auxiliary track for supporting the roof over the space where the material has been mined.

22. In a system of mining, the combination of a track for supporting a mine car during the loading thereof adjacent the place where mining operations are proceeding, and roof-supporting mechanism adapted to be located adjacent said track and extending forward beyond the forward end
 100 of said track in position to support the roof of the mine chamber adjacent such place where the mining operations are proceeding.

23. In a system of mining, the combination of a portable track for supporting a mine car during the loading thereof adjacent a place where mining operations are proceeding in a mine chamber, and roof-supporting mechanism located above said
 105 track and extending beyond the forward end thereof in a space from which the material is being mined.

24. In a system of mining, the combination with spaced-apart mine tracks adapted to extend along a mine entry, of an intermediate frame having a track for supporting a mine car in loading position, and switch tracks for connecting said spaced-apart tracks to said loading track.
 120

25. In a system of mining, the combination with spaced-apart mine tracks adapted to extend along a mine entry, of a cross track between said spaced-apart tracks rearwardly of the forward ends of the latter, an
 130

extensible ventilating partition, and doors for normally maintaining the continuity of said partition but permitting a mine locomotive and mine cars to travel over said cross track.

26. In a system of mining, the combination with spaced-apart mine tracks adapted to extend along a mine entry, of an intermediate frame having a track for supporting a mine car in loading position, switch tracks for connecting said spaced-apart tracks to said loading track, a cross track between said spaced-apart tracks and rearwardly of the forward ends of the latter, and a ventilating partition having doors at said cross track to permit the passage of mine cars from one of said spaced-apart tracks to the other through such ventilating partition.

27. In a system of mining, the combination with spaced-apart mine tracks extending along a mine entry, of a series of spaced-apart roof props between said tracks, cross beams between the upper ends of said roof props and the roof, and trolley wires suspended from the ends of said cross beams adjacent said track mechanism in position to cooperate with mine locomotives adapted to travel along said tracks.

28. In a system of mining, the combination with two rows of spaced-apart roof props, of I-beams spaced-apart and connected across between the upper ends of opposite roof props and the roof of the mine chamber, spaced-apart trolley wires suspended from the ends of said I-beams outside of the space between the roof props, and spaced-apart tracks outside of such space adapted for carrying mine locomotives on said tracks in position to use said trolley wires.

29. In a system of mining, the combination with a forward portable frame, of power-operated roof-supporting mechanism connected to said frame and extending forwardly therefrom, spaced-apart rows of spaced-apart roof props back of said frame, and a magazine connected to said frame for carrying additional roof props for erection back of said frame as the latter is moved forward together with said magazine.

30. In a system of mining, the combination with a portable frame, of roof-supporting mechanism extending forwardly from said portable frame, a magazine on said portable frame for carrying a plurality of roof-props for erection at intervals as said frame is moved forward, and a partition extensible in accordance with the forward movements of said frame and the erection of the roof-props rearwardly thereof.

31. In a system of mining, the combination with a portable frame, of a trolley wire reel connected to said portable frame and movable bodily therewith to pay out the

trolley wire as said frame is moved forwardly, and a magazine carried by said frame for supporting roof props and I-beams to form roof-supports back of said frame and to afford supports at the ends of the beams for the trolley wire.

32. In a system of mining, the combination with a portable frame, of a carrier connected to said frame and comprising spaced-apart plates to form an upright longitudinal trough for carrying a stack of roof-props and also for carrying a plurality of beams across the upper edges of said plates, trolley-wire reels mounted on the outer sides of said plates, and means for supporting said trolley-wires at the outer ends of said beams after the latter are placed across the upper ends of spaced-apart roof-props to form spaced-apart roof-supports rearwardly of said frame.

33. In a mining system, the combination with a portable frame adapted to rest on the mine floor and move along a path parallel to a mine track, of a loading track on said frame, and a switch track on said frame to move therewith into position to slide along the mine track and continually connect said loading track with said mine track.

34. In a system of mining, the combination with an auxiliary track for supporting a mine car during the loading thereof adjacent the space where mining operations are proceeding, of a switch track for directing such mine car onto a mine track, and elongated roof-supporting mechanism extending from the rear portion of said frame toward the space where mining operations are proceeding.

35. In a system of mining, the combination with a portable track adapted to support a mine car while being loaded in a mine from the space where mining operations are proceeding, and roof-supporting mechanism above such portable track and parallel thereto by extending from a position rearwardly of the loading position of said mine car to a position in advance thereof.

36. In a system of mining, the combination of a portable track adapted to support a mine car in position for loading from a space where mining operations are proceeding, and elongated roof-supporting mechanism adapted to extend forwardly along the roof over the loading position of said mine car.

37. In a system of mining, the combination with a portable frame, of a loading track thereon, a loading machine frame, and roof-supporting mechanism having its rear portion mounted on said portable frame and its forward portion mounted on said loading machine frame.

38. In a system of mining, the combina-

- tion with a portable frame, of a loading track thereon, a loading machine frame hitched to said portable frame, roof-supporting mechanism mounted partly on said portable frame and partly on said loading machine frame, and means mounted on the latter together with said portable frame and said roof-supporting mechanism.
39. In a system of mining, the combination with a portable frame, of a loading track thereon, a loading machine frame connected to said portable frame, roof-jack mechanism mounted on said frames, and spaced-apart parallel beams connected to said roof-jack mechanism for movement against the roof to support the latter over the loading track and anchor both of said frames.
40. In a system of mining, the combination with a portable frame, of a loading track thereon, a loading machine frame, a pair of spaced-apart roof jacks on said loading machine frame, an additional roof jack rearwardly of said loading track, and a pair of spaced-apart parallel beams mounted on said roof jacks in position to anchor both of said frames and support the roof over said loading track.
41. In a system of mining, the combination with a portable loading track, of a loading machine frame connected to said track to drag the latter with said loading machine frame, and a pair of automatic roof and floor-engaging mechanisms mounted on opposite sides of said loading machine frame for advancing the latter step by step and hauling said track therewith.
42. In a system of mining, the combination with a loading track, of a loading machine frame pivotally connected thereto, a pair of fluid pressure motors mounted on opposite sides of said loading machine frame, parallel spaced-apart roof-supporting bars, and connections between said bars and said motors to cause said bars to be moved into roof-supporting positions when said motors are operated in one direction and to cause said bars to be released and moved forward freely into new positions when said motors are operated in the opposite direction.
43. In an extensible system for loading and handling mine cars in a mine chamber being continuously lengthened, the combination with spaced-apart mine tracks, of a portable loading track comprising a portable frame movable along the space between said tracks, switch tracks connected to said loading track and movable therewith to connect said mine tracks to said loading track, track extension mechanism for the mine tracks operable upon the forward movement of said portable frame, roof-supporting mechanism on said frame and extending from the rear portion thereof over the space occupied by a mine car during loading, rope-winding mechanism on said frame back of said loading track and comprising a rope having its free end adapted to be connected to a mine car for movement to or from one of said switch tracks, a magazine for roof prop mechanism at the rear end of said portable frame to permit the supporting of the roof back of said frame immediately after being moved forward, and a trolley wire reel supported on said frame for paying out the trolley wire upon forward movement of said frame for support on said roof prop mechanism after the latter is in roof-supporting position.
44. In an extensible system for loading and handling mine cars, the combination with a portable frame, of a loading track thereon, a switch track adapted to be connected to a mine track and move along the same, and means adapted to be connected between said frame and anchorage mechanism in the mine for hauling said frame and said switch track along said mine track.
45. In an extensible system for loading and handling mine cars, the combination with a portable frame, of a loading track thereon, a switch track adapted to connect said loading track to a mine track, roof-supporting mechanism mounted on said frame for bodily movement therewith, car-hauling mechanism mounted on said frame, and means for moving said frame along said mine track while said loading track, switch track, roof-supporting mechanism and car-hauling mechanism remain in predetermined compact relation in readiness to perform their functions as soon as said frame is adjusted to its new forward position.
46. In an extensible system for loading and handling mine cars in a mine chamber which is being continuously lengthened, the combination with a portable frame, of a loading track thereon, a switch track on said frame adapted to connect said loading track to a mine track, track extension mechanism adapted to be operated upon forward movement of said frame along said mine track to extend the latter, roof-supporting mechanism carried by said frame for bodily movement therewith, mine car hauling mechanism mounted on the rear portion of said frame for bodily movement therewith, a magazine for roof props at the rear end of said frame for bodily movement with the latter, and means for moving said frame along the mine track while the parts mounted on said frame remain in predetermined compact relation in readiness for performing their functions immediately after adjustment of said frame to its new forward position along said mine track.
47. In an extensible system for loading and handling mine cars in a mine chamber which is being continuously lengthened, the

combination with a portable frame, of a loading track thereon, a switch track mounted on said frame to connect said loading track to a mine track, and means for moving said frame along a path parallel to said mine track together with all of the parts mounted on said frame.

48. In a system of mining, the combination with spaced-apart mine tracks adapted to extend along a mine entry, of an intermediate frame having a track to hold a mine car in loading position, switch tracks for connecting said spaced-apart tracks to said loading track, a magazine of roof props connected to said frame and movable therewith, reels at the sides at the rear end of said frame for carrying and paying out trolley wires for locomotives of trains of cars adapted to travel on said spaced-apart tracks, an extensible ventilating partition, a cross-track between said spaced-apart tracks, doors for normally maintaining the continuity of said partition but permitting a locomotive and cars to travel over said cross-track, and a series of roof props located between said spaced-apart tracks behind said frame.

49. In a system of mining, the combination with mine track mechanism extending along a mine entry, of a series of spaced-apart roof jacks adjacent said track mechanism, cross-beams between the upper ends of said roof jacks and the roof, and a trolley wire suspended from ends of said cross-beams outside of the space between said roof jacks, said track mechanism in position to cooperate with a mine locomotive adapted to travel along said track mechanism outside of such space.

50. In a system of mining, the combination with two rows of spaced-apart roof props, of I-beams spaced-apart and connected across between the upper ends of opposite roof props and the roof of the mine chamber, spaced-apart trolley wires suspended from the ends of said I-beams outside of the space between said roof props, and spaced-apart tracks adapted outside of such space for carrying locomotives on said tracks in position to use said trolley wires.

51. In a system of mining, the combination with track mechanism comprising a forward portable frame, of spaced-apart rows of spaced-apart roof props, spaced-apart cross-beams between opposite roof props and the roof, and a magazine connected to said portable frame for carrying additional roof props arranged longitudinally therein and additional cross-beams arranged transversely thereon in readiness for erection back of said frame as the latter is moved forward together with said magazine.

52. In a system of mining, the combination with spaced-apart parallel extensible tracks, of a portable frame movable along the space between said tracks, two series of

roof props spaced apart in the space between said tracks, spaced-apart cross-beams at the upper ends of the spaced-apart props, means for suspending trolley wires at the ends of said cross-beams adjacent the spaced-apart tracks, and spaced-apart reels mounted on said portable frame in position to carry trolley wires and pay out the same as said portable frame is advanced and as said tracks are advanced.

53. In a system of mining, the combination with spaced-apart extensible tracks, switch mechanism comprising an intermediate portable frame, a carrier connected to the rear end of said frame and comprising a longitudinal trough for carrying a stack of roof props and also for carrying a plurality of beams across the upper edges of said trough, trolley wire reels mounted on the outer sides of said trough, and means for supporting said trolley wires adjacent said spaced-apart tracks for use by mine locomotives on said tracks.

54. In a system of mining, the combination with a track, a switch comprising a portable frame, draft mechanism carried by said portable frame and comprising a rope adapted to be connected to a car for moving the same along said track.

55. In a system of mining, the combination with spaced-apart tracks, of an intermediate track, a portable frame for said intermediate track, switch mechanism for directing a mine car from one track to said intermediate track and from the latter to the other track, and draft mechanism mounted on said portable frame and comprising ropes adapted to be connected to mine cars on said tracks to move such mine cars toward and from said switch mechanism.

56. In a system of mining, the combination with spaced-apart extensible tracks, of an intermediate track, switch tracks extending from said side tracks to said intermediate track and slidable over the top of the extensible tracks, a portable frame for supporting said intermediate track and said switch tracks, and haulage apparatus for moving empty and loaded cars respectively toward and from said intermediate track.

57. In a system of mining, the combination with spaced-apart parallel mine tracks adapted to be extended for advancing mining operations, of switch track mechanism comprising an intermediate loading track mounted on a portable frame, two series of spaced-apart roof props in the space back of said frame each series being parallel to the mine tracks, spaced-apart cross-beams at the upper ends of said roof props, spaced-apart trolley wires suspended from the ends of said cross-beams adjacent said tracks for transmitting power to electric locomotives operating on said tracks, spaced-apart reels at the rear end of said frame for carrying the trol-

ley wires and paying out the same as said switch track mechanism is advanced and as more roof props and cross-beams are placed in position back of said frame, and draft mechanism for moving empty cars onto said loading track and load cars from said loading track, said draft mechanism being adapted for use beyond the range of the operation of the electric locomotives.

58. In a system of mining, the combination with a frame adapted to move over the floor of a mine chamber, of spaced-apart motors mounted on opposite sides of said frame, and automatic roof and floor-engaging mechanism connected to said motors at opposite sides of said frame in position to be dragged along the floor and roof when the motors are operated in one direction and to automatically grip the floor and roof to effect anchorages and roof support and to cause said frame to be moved in a predetermined direction when said motors are operated in the opposite direction.

59. In a system of mining, the combination with supporting framework adapted to move over the floor of a mine chamber, of roof-propping mechanism mounted on said framework and transportable bodily therewith, of automatic roof and floor-engaging mechanism, and operating means for said last-named mechanism to drag said engaging mechanism along the floor and roof when said roof-propping mechanism is anchored and to cause said roof and floor-engaging mechanism to automatically grip the floor and roof to form an anchorage and roof support and to move the frame together with said roof-propping mechanism over the mine floor when said roof-propping mechanism is released.

60. In a system of mining, the combination with a frame movable over a mine floor, of roof-propping mechanism mounted thereon to move bodily therewith, spaced-apart motors mounted on said frame, and automatic roof and floor-engaging mechanism connected to said motors in position to be dragged along the floor and roof when said roof-propping mechanism is in anchoring position and when said motors are operated in one direction and to automatically grip the floor and roof when said motors are operated in the opposite direction while said roof-propping mechanism is released.

61. In a system of mining, the combination with parallel spaced-apart mine tracks extending longitudinally along the mine chamber, one for empty mine cars and the other for loaded mine cars, of loading track mechanism associated with said spaced-apart tracks and comprising branching switch tracks slidable along said mine tracks and continually establishing communication with said mine tracks, and haulage apparatus extending from said loading track mechanism

to move empty cars into loading position and loaded cars from loading position.

62. In a system of mining, the combination with spaced-apart mine tracks extending along a mine entry, of a parallel series of spaced-apart roof-props between said tracks leaving a longitudinal space between the series of roof-props adjacent one track and the series of roof-props adjacent the other track, cross-beams between the upper ends of the roof-props, each cross-beam being supported by a pair of roof-props one located near one track and the other located near the other track, said cross-beams spanning the space between the tracks, and trolley wires suspended from said cross-beams outside of the series of roof-props and above the inner edges of the tracks.

63. In a system of mining, the combination with a mine track extending along a mine wall, of a series of spaced-apart roof-props adjacent that side of the mine track distant from the mine wall, another series of roof-props spaced from said first named series and more distant from the mine track, cross-beams extending between the two series of spaced-apart roof-props and spanning the space between said series of roof-props which space extends parallel to the mine track distant from the mine wall, and a trolley wire suspended from the cross-beams between the series of roof-props adjacent the mine track.

64. In roof-supporting apparatus, the combination with roof-jack mechanism, of an elongated roof-engaging shoe having free and unobstructed space beneath the same, and an extension for lengthening said shoe for location in the kerf at the roof above a coal vein to be mined.

65. In a system of mining, the combination with a frame, of a multiple roof support each having an extension over an unobstructed space beneath the same, fluid pressure motor mechanism, and means operated by said motor mechanism for varying the length of said extensions.

66. In roof-supporting apparatus, the combination with roof-jack mechanism, of means mounted on said roof-jack mechanism in position to extend along the roof and engage the same when said roof-jack mechanism is in anchored position, an elongated extension located at the roof and having an unobstructed space beneath the same, and means for projecting said extension along the roof to vary the position of said extension.

67. In roof-supporting apparatus, the combination with roof-jack mechanism, of a frame carried thereby and adapted to support a transverse beam, means for shifting said beam transversely of itself along said frame into adjusted position, and mechanism on said frame for engaging said beam

to move the same upwardly into roof-engaging position to receive vertical roof-props beneath the same.

68. In roof-supporting apparatus, the combination with roof-jack mechanism, of a frame extending therefrom adjacent the roof of a mine chamber, said frame being adapted to support a transverse beam, fluid pressure motor mechanism for shifting said beam transversely of itself along said frame into adjusted position, and additional fluid pressure motor mechanism on said frame for projecting said beam into engagement with the roof of the mine chamber to receive vertical roof-props beneath the same.

69. In roof-supporting apparatus, the combination with roof-jack mechanism comprising an elongated roof-engaging shoe extending over an unobstructed space, an extension for said shoe adapted to be projected along the roof of the mine chamber into a kerf above a mine vein to be mined,

and fluid pressure motor mechanism for operating said extension to move the same into such kerf and to retract the same relatively to said roof-engaging shoe.

70. In roof-supporting apparatus, the combination with roof-propping mechanism adapted to extend forwardly along the roof of a mine chamber, of an auxiliary frame supported by said roof-propping mechanism in position to carry cross-beams near the roof of the mine chamber, means on said frame for anchoring a cross-beam against the roof to permit roof props to be placed under such cross-beam independently of said frame, and means on said frame for moving the cross-beams into position to be acted upon by said anchoring means.

In testimony whereof I have signed my name to this specification on this 23d day of April, A. D. 1920.

EDMUND C. MORGAN.