Jan. 2, 1923.

1,440,378

K. DAVIS.

MEANS FOR TRANSPORTING LOOSE MATERIAL.

FILED JUNE 23, 1919.

7 SHEETS-SHEET 1

Fig. 1.

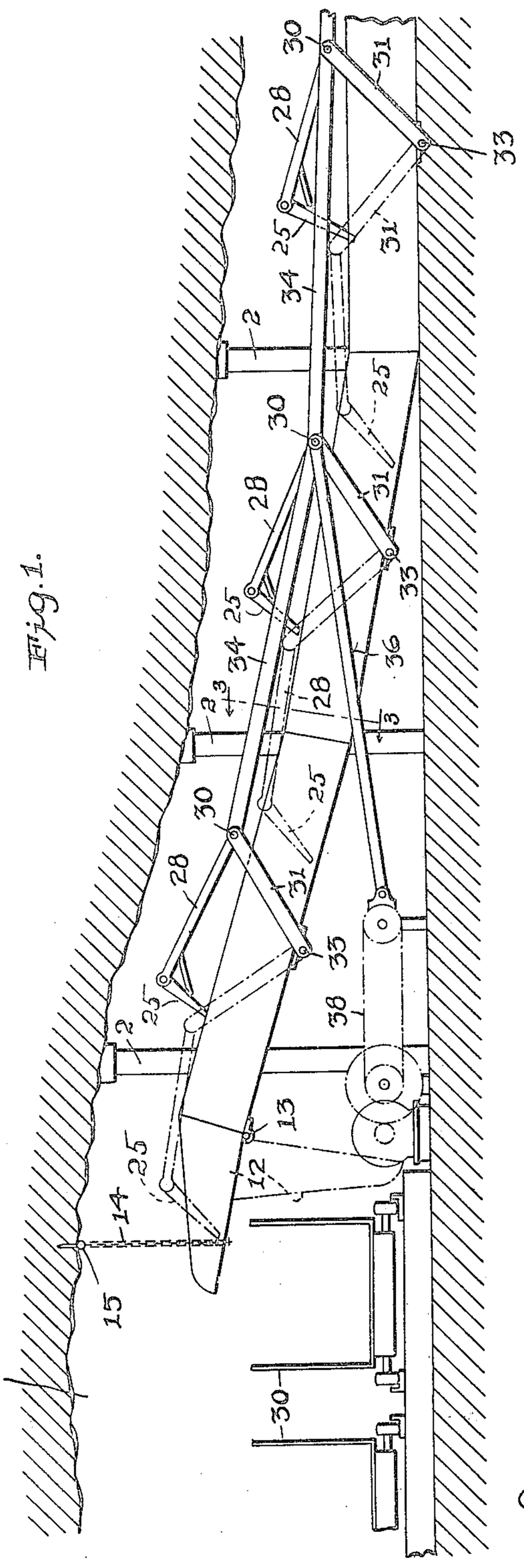
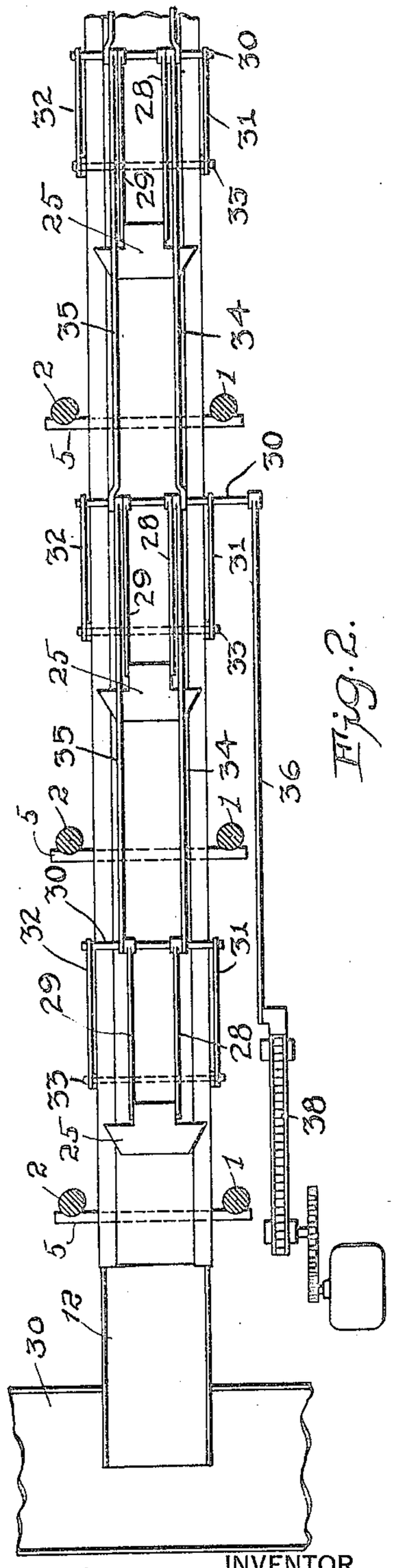


Fig. 2.



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7 SHEETS-SHEET 2

Fig. 3.

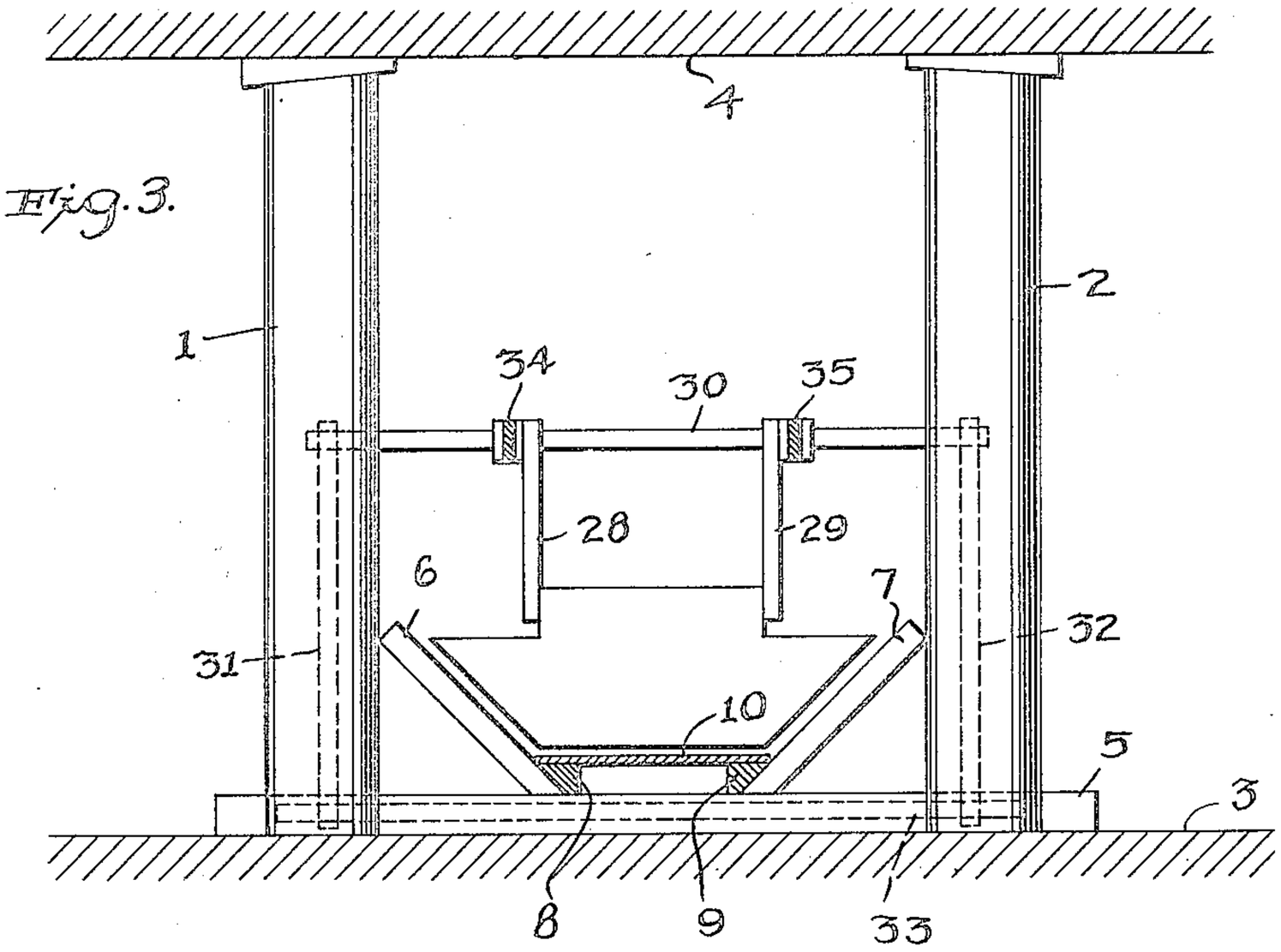
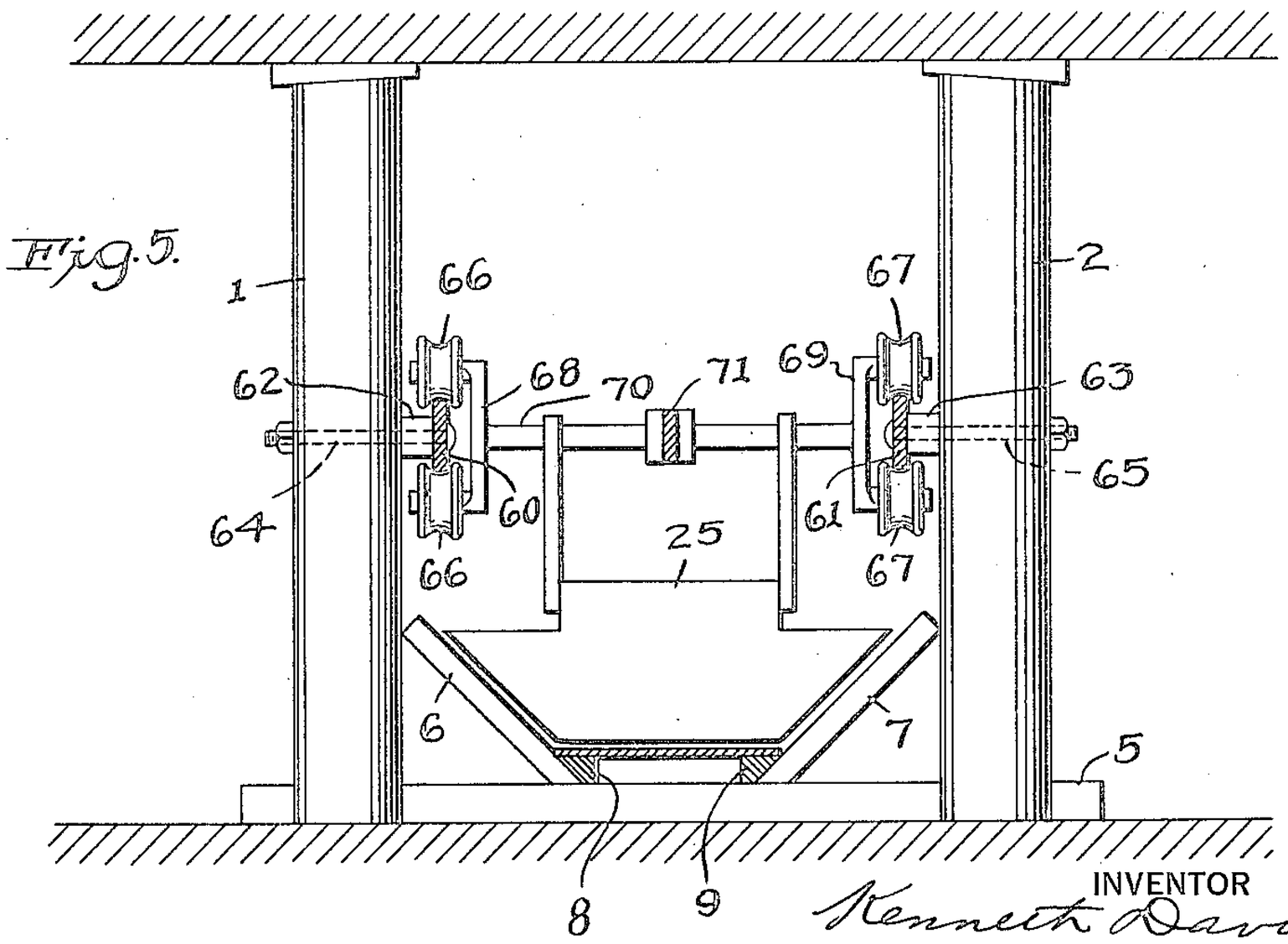


Fig. 5.



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7 SHEETS-SHEET 3

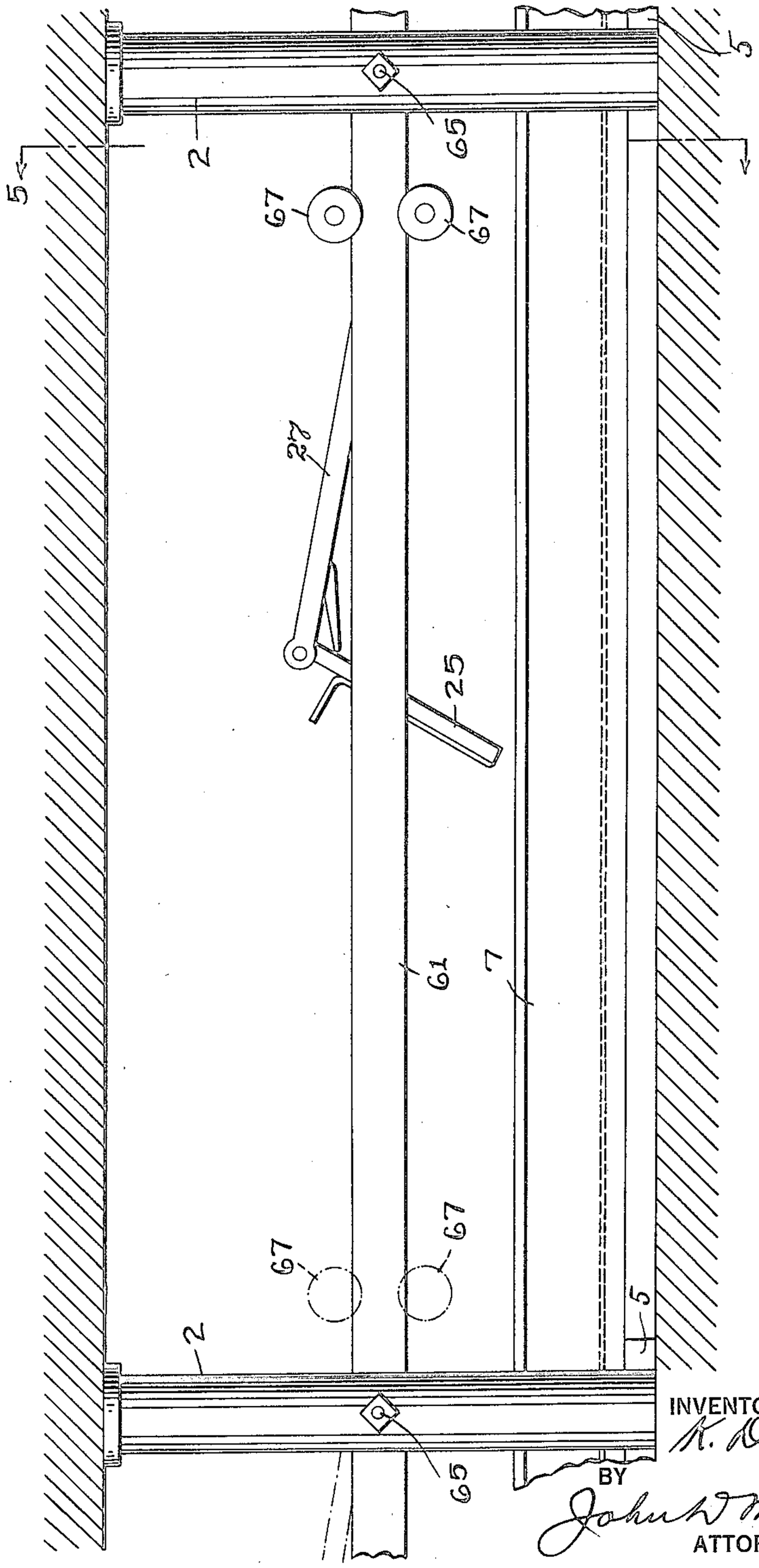

Fig. 4.

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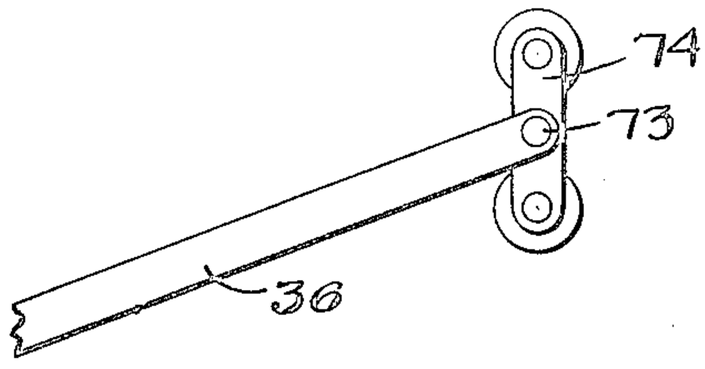
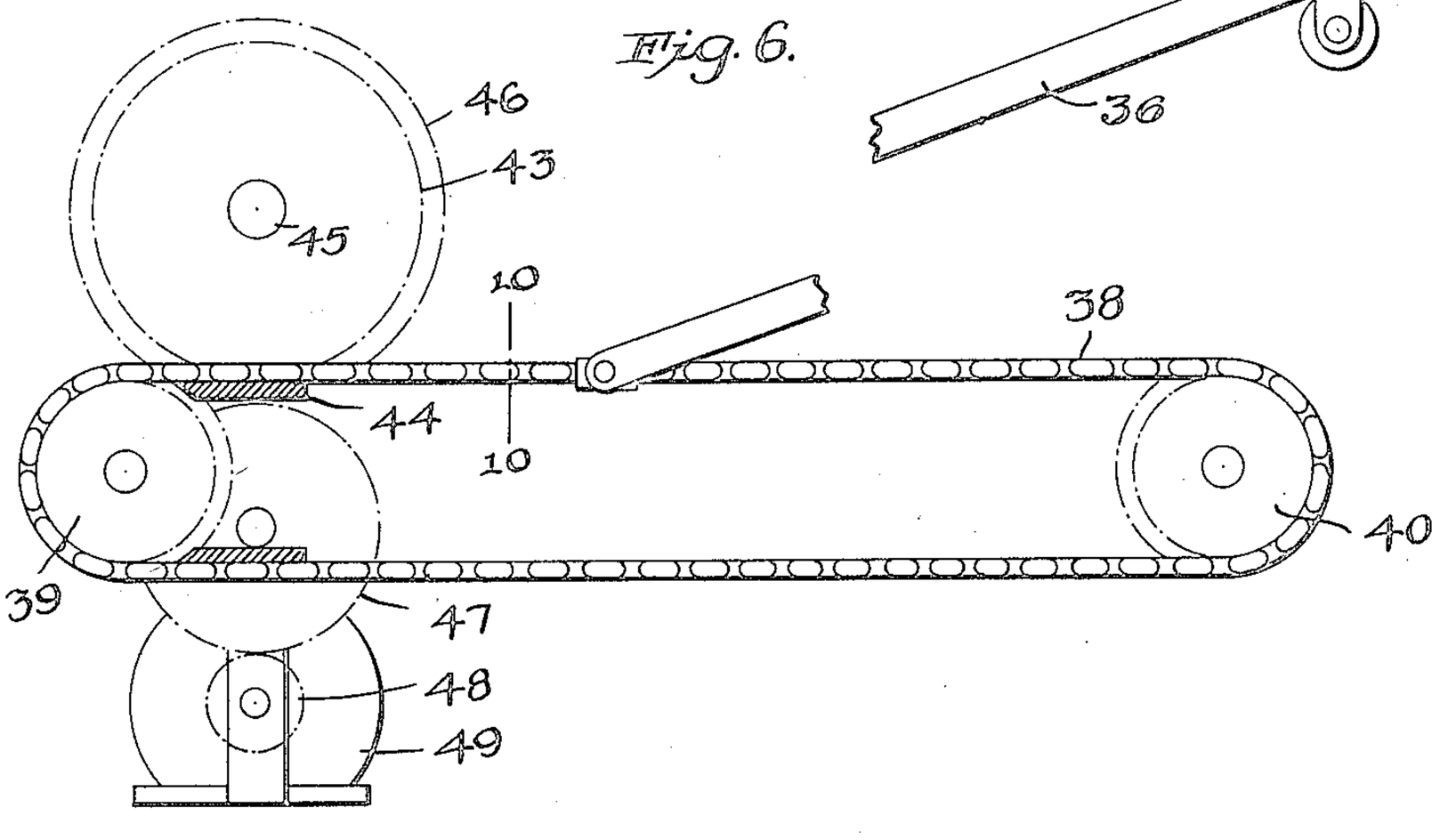


Fig. 6.



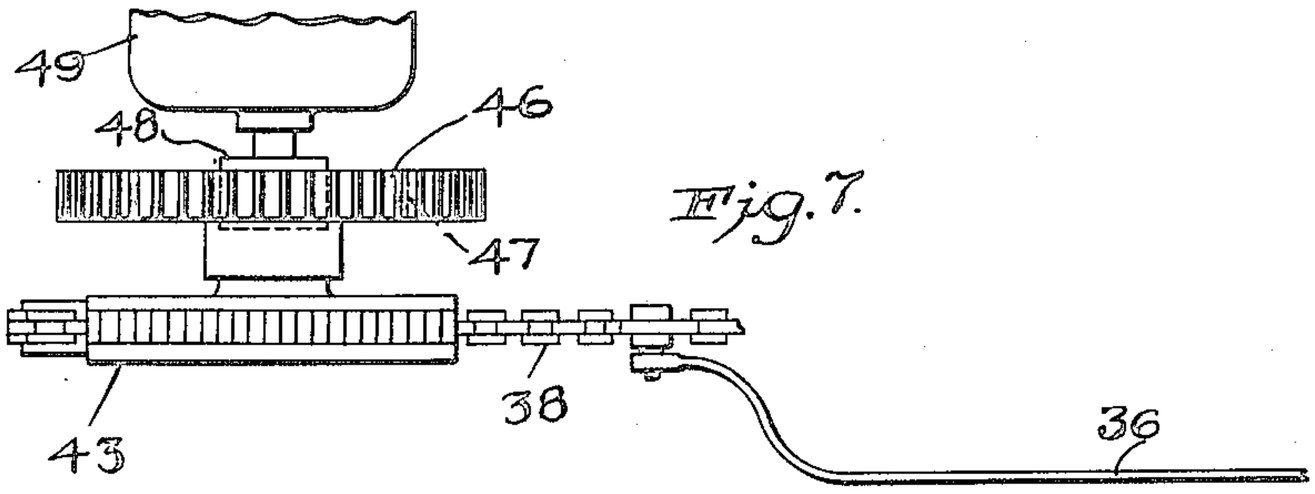


Fig. 7.

Fig. 8

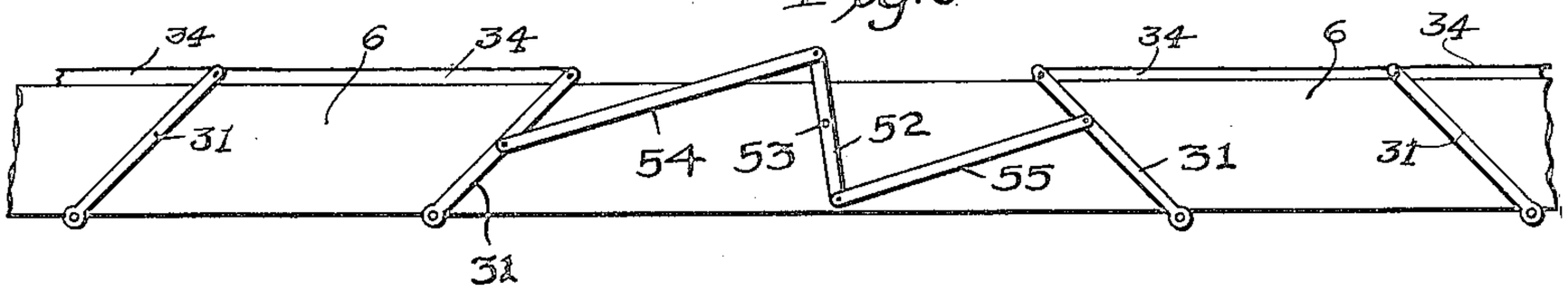


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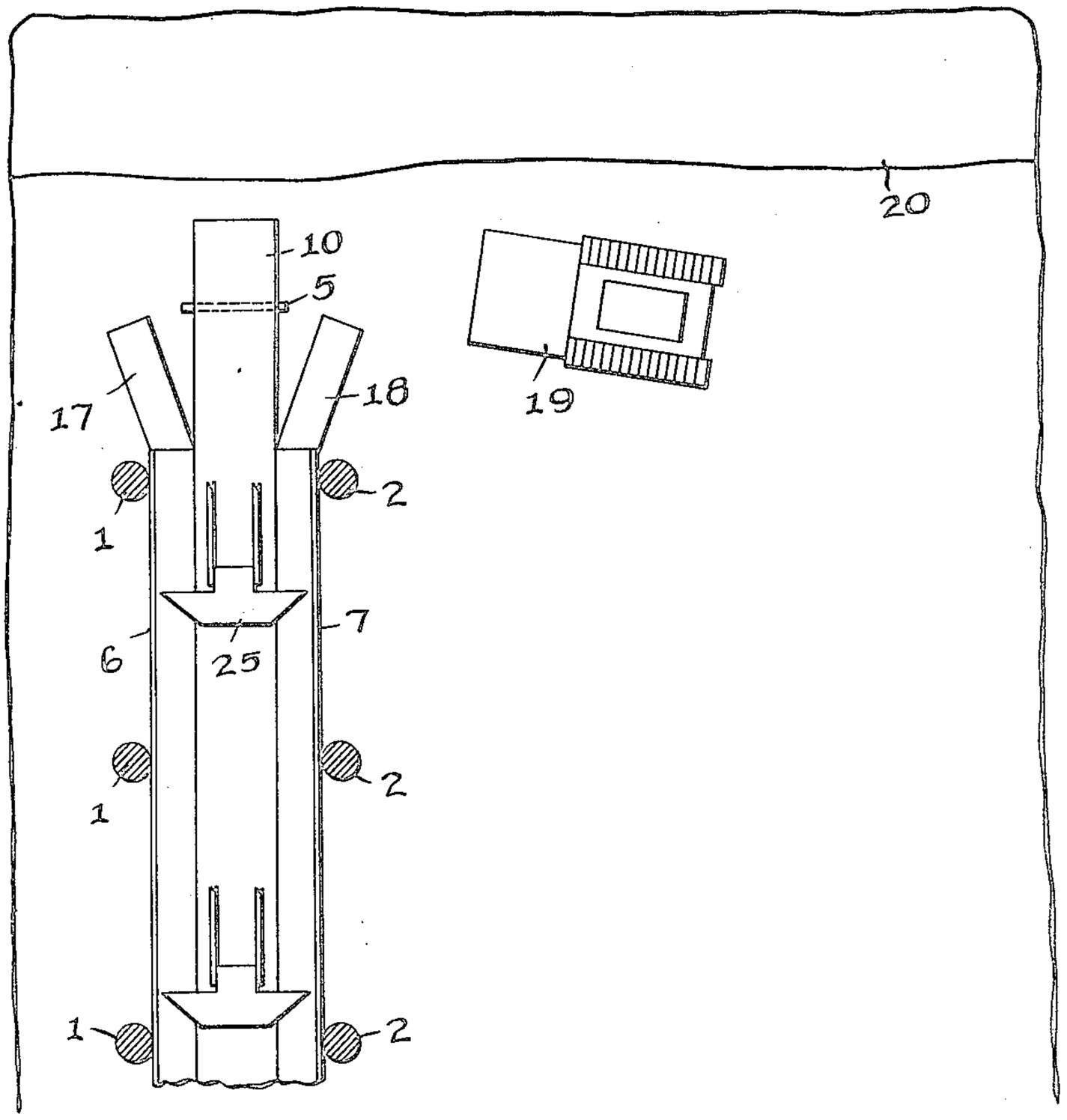
Fig. 11.



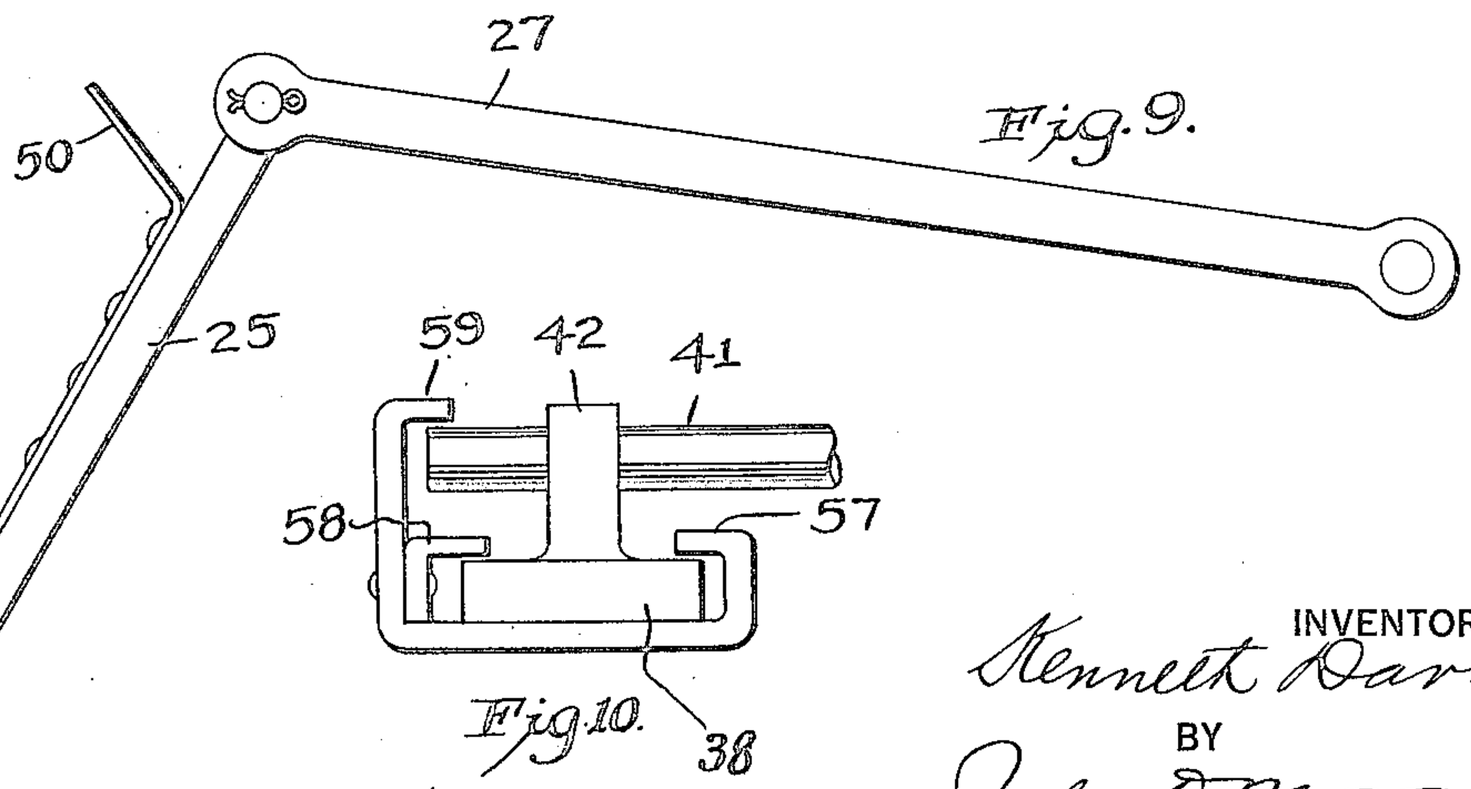


Fig. 9.

Fig. 10.

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7 SHEETS-SHEET 6

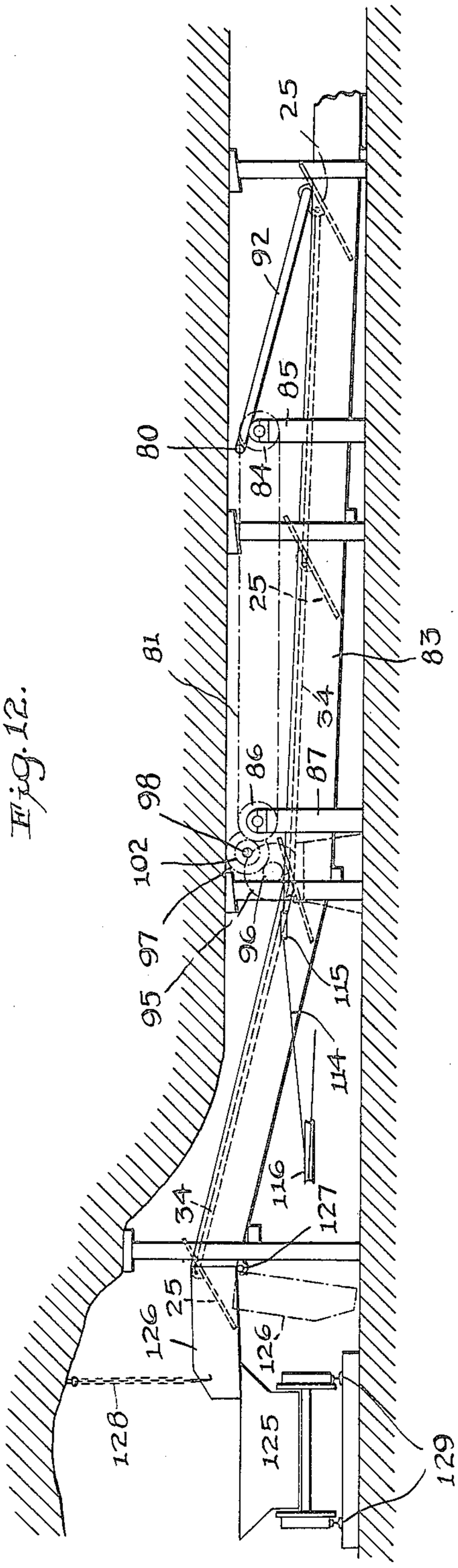

Fig. 12.

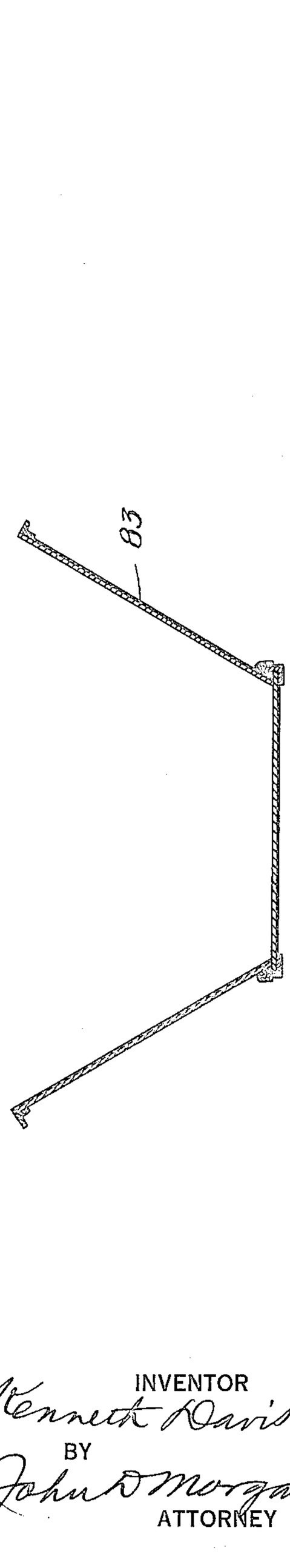

Fig. 14.

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7 SHEETS-SHEET 7

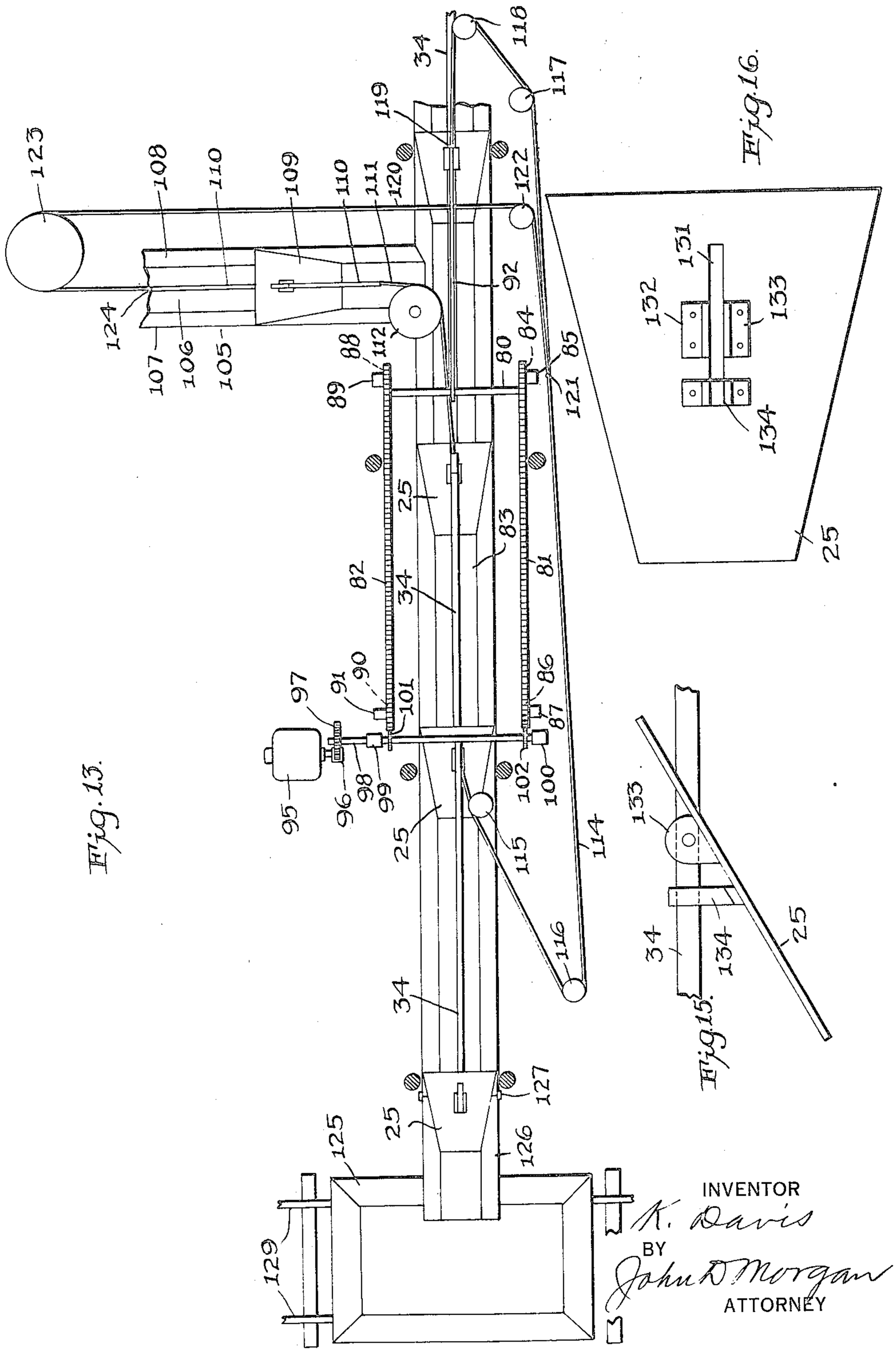

Fig. 13.

Fig. 16.

Fig. 15.

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Patented Jan. 2, 1923. 1,440,378

UNITED STATES PATENT OFFICE.

KENNETH DAVIS, OF ST. BENEDICT, PENNSYLVANIA, ASSIGNOR TO REMBRANDT PEALE, OF ST. BENEDICT, PENNSYLVANIA.

MEANS FOR TRANSPORTING LOOSE MATERIAL.

Application filed June 23, 1919. Serial No. 306,155.

To all whom it may concern:

Be it known that I, KENNETH DAVIS, a citizen of the United States, and a resident of St. Benedict, Pennsylvania, have invented a new and useful Improvement in Means for Transporting Loose Material, of which the following is a specification.

The invention relates to a machine for transporting and loading loose material, such as coal and the like, and in certain of its aspects the invention relates more particularly to such a machine adapted to transport coal from the face of rooms or other workings into cars or other conveying or transporting means in the entry or heading.

The objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom or may be learned from practice with the invention; the same being realized and attained through the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate one embodiment of the invention, and together with the description, serve to explain the principles of the invention.

Of the drawings:—

Fig. 1 is a side elevation of the outer or discharge end of a mechanism constructed in accordance with the invention, showing a room mouth and a receiving car or other device in the entry;

Fig. 2 is a top plan corresponding to Fig. 1;

Fig. 3 is a transverse vertical section taken on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged fragmentary side elevation, showing a somewhat different form or embodiment of parts of the mechanism;

Fig. 5 is a transverse section taken on the line 5—5 of Fig. 4;

Fig. 6 is an enlarged fragmentary elevation of the driving mechanism;

Fig. 7 is a top plan corresponding to Fig. 6;

Fig. 8 is a side elevation of the general device showing connections whereby the transporting operation is rendered continuous;

Fig. 9 is an enlarged detail of one of the pushing or transporting devices;

Fig. 10 is an enlarged, fragmentary sections on the line 10—10 of Fig. 6;

Fig. 11 is a view, largely diagrammatic, in plan, showing the inner end of the mechanism at a room face, and showing a loading machine cooperating therewith;

Fig. 12 is an elevation, generally similar to Fig. 1, but showing a different construction and arrangement of the material transporting means;

Fig. 13 is a top plan corresponding generally to Fig. 12, but also showing a tributary conduit feeding into the main conduit;

Fig. 14 is a detached vertical section, on an enlarged scale, of the conduit showing an all metal construction;

Fig. 15 is a fragmentary elevation, on an enlarged scale, of a modified form of material pusher blade and the connection between it and the actuating rods; and

Fig. 16 is a detached plan view, on an enlarged scale, of the pusher blade shown in Fig. 15.

Referring to the accompanying drawings, illustrating by way of example one embodiment of the invention, a conduit or guideway is shown, comprising suitable bottom and sides for confining and directing the coal or other conveyed material from the place where it is mined or dislodged to the place for loading, as for instance, in the case of coal, from the room face to the entry at the room mouth. In the embodied form thereof, the conduit is shown constructed in connection with the mine timbers which support the roof within the room or other workings.

In connection with the conduit is provided means for transporting or progressing the loose material, such as coal, therealong. The embodied form thereof comprises a plurality of material engaging and progessing members traveling to and fro over a relatively short path within the conduit, the material being thus progressed from one such member to the next adjacent and by their cooperation is transported in a moving column or stream toward the place of discharge. Both the conduit and the cooperating material transporting means are of simple and sturdy construction and consist of relatively few and simple parts, which are interchangeable, and may be readily

added to as a room or other working is advanced and may be quickly and simply dismantled and set up again as needed in a new working. Other features of the invention will be set forth in detail hereinafter and others will be learned from practice with the invention.

As exemplified, two approximately alined and parallel rows of posts or timbers 1 and 2 are shown, wedged in the usual manner vertically between the mine floor 3 and the mine roof 4, and the conduit structure is connected therewith. In the conduit or guideway structure, supporting cross pieces 5 are fastened across from the bottoms of the posts in row 1 to the bottoms of the posts in row 2, and resting upon the mine bottom. Laid or disposed lengthwise within or between the two lines of posts 1 and 2 are the sides 6 and 7 of the conduit or guideway for the coal or other material. These sides are shown in Figs. 2, 3 and 5, as being upwardly and outwardly inclined. To support the conduit bottom, as embodied, within the lower sides of the members 6 and 7 are longitudinally disposed stringers or sills 8 and 9 laid upon and extending from one cross-piece 5 to and along the succeeding and adjacent cross pieces, these sills being preferably fastened to the cross-pieces and to the sides 6 and 7. The bottom 10 of the guideway rests upon the sills 8 and 9, the bottom being formed preferably of sheet or galvanized iron. The conduit is preferably constructed in sections bearing a definite relation to the size and distance of travel of the pusher blades, as shown in Fig. 1. In said figure the sections of the conveyor units are shown of the same length as the sections of the individual pusher mechanisms, this definite relation of lengths of the said parts being of great convenience in extending the conveyor as the face of the work is advanced.

In Fig. 1 of the drawings the device or mechanism is shown employed in a relatively thin seam of coal, say about 30 inches or 3 feet in thickness, the entry 11 being excavated or "shot down" at the top to make head-room. In such case the exterior end of the device is inclined upwardly and outwardly, longitudinally, so as to gain sufficient height to discharge or empty from above into the car or other receptacle in the entry. Where the entry is excavated or "shot out" at the bottom instead of at the top, the upward longitudinal inclination of the device at the room mouth (as shown in Fig. 1) will not be required.

In Fig. 1 a hinged chute 12 is shown pivoted to the outer end of the device at 13, and supported in discharging or loading position by chains 14, which are fastened at 15 to the entry roof. The chute 12 can be swung downwardly into the dotted line position shown in Fig. 1, by unfastening the chains 14, and thereby the entry is left unobstructed when loading from the particular room is not in progress.

In Fig. 11, the inner end of the device, that is, the material receiving end, is shown, in a partially diagrammatic form, with the sides ending in outwardly flaring portions 17 and 18, and the bottom 10 extending therebeyond. The device is adapted to transport a relatively large volume of coal or other material and the inner end as shown in Fig. 11 is designed with this in view. The best means for supplying the mined coal in sufficient quantity for the capacity of the transporting mechanism is a power or automatic loader or shoveler. Such a cooperating loading machine is shown in its general form at 19 in Fig. 11, and may be of the kind or construction shown in my co-pending application Serial Number 247,240, filed July 29, 1918. The loose or dislodged coal is shown at 20, and the loading machine is adapted to convey it to and deliver it within the forwarding mechanism at the inner end thereof, the coal or other material being then transported along and out of the room and delivered into the car or other receiving device at the room mouth or entry.

The embodied form of forwarding means operating within and along the conveyor comprises a plurality of reciprocating members or instrumentalities, traveling to and fro over a path of limited length with respect to the length of the conduit or guideway. In the form shown in Fig. 1, a plurality of propelling members or blades 25 are provided operating within the conduit or guideway and positioned about as far apart as the path of travel of each blade, the various blades being adapted to engage with the loose material in the guideway and to push it therealong into the field or range of action of the next succeeding blade and toward the outer end or room mouth.

In the embodied form of supporting and actuating means for the propelling members or blades 25, shown in Figs. 1, 2 and 3, each pushing or propelling blade 25 is mounted between a pair of arms 28 and 29, which arms are pivotally carried upon a cross-rod 30, extending across and above the conduit or guideway. The cross rod 30 is supported and mounted at or near its outer ends in the outer or upper end of a pair of arms 31 and 32, which arms extend upwardly at either side of the conduit. At their bottom ends said arms are pivotally supported upon a cross-rod 33, which rod extends across beneath and is supported from the bottom of the guide-way. Thus as each pair of arms 31 and 32 are rocked, in the backward direction, their blade 25 is drawn backwardly over the coal or other material, and as they

rock in the opposite direction their blade sinks into and pushes the coal before it along the conduit bottom into the reach of the next preceding blade or pusher 25. To convey motion from one of the pushing or forwarding devices to another, the embodied form of means comprises pairs of arms 34 and 35, pivotally mounted at one end on one cross-rod 30 and pivotally mounted at their other ends upon the next adjacent cross-rod 30.

Suitable actuating mechanism is provided, and in the embodied form thereof such actuating mechanism is adapted to operate the pushing or forwarding devices for the entire unit, or there may be provided two or more such devices working either together or separately for different portions of the length of the entire forwarding mechanism. In the embodied form thereof, the driving means is shown located beneath the conduit in Fig. 7, and in Fig. 2 the driving means is shown at one side of the conduit. In either case, as embodied, an arm 36 is pivotally connected at one end to one of the cross rods 30 and at the other end to an endless sprocket or other chain 38, which chain runs over suitable supporting and guiding wheels 39 and 40. A suitable pivotal connection between the arm or arms 36 and 37 and the actuating chain 38 is provided such as a wrist pin 41 supported on the stud 42, fastened to a link of the chain. Means are provided for preventing side play or thrust on the actuating or driving mechanism, and as embodied guiding and holding flanges 57 and 58 are provided for the chain, and a similar flange 59 for the wrist pin structure.

Suitable driving means are provided for the chain 38, and in the embodied form thereof and as at present preferred the driving means is separate from the guiding wheels 39 and 40. As embodied a driving sprocket 43 engages with the chain, preferably working opposite to a bearing plate 44, which keeps the chain to the wheel. Fixed to the shaft 45 of the sprocket wheel 43 is a gear 46, meshing with an idler 47, which in turn meshes with a pinion 48 on the shaft of a motor 49.

Thus for each revolution or complete cycle of travel of the chain 38, in the present embodiment, each pair of arms 31, 32, has oscillated to and fro between the full and dotted line positions in Fig. 1, and the pushers have likewise traveled to and fro between the full and dotted line positions. In going backwardly, that is, to the right in Fig. 1, the pusher blades 25 will pass over the top of the loose coal, but in the reverse direction of travel the blades sink immediately downwardly through the coal or other material to the bottom 10 of the guide-way and push the loose material before them for practically the entire length of their stroke in that direction, the material thus flowing along the conduit from one pusher to another. A suitable baffle plate 50 may be employed upon the pusher to prevent the loose material crowding back thereover. With all the pushers operated together, the loose material is kept moving forwardly throughout the entire length of the conduit or guideway with each stroke of the mechanism. The stroke or travel of the blades 25 is greater than the distance between them, so that there is no piling of the coal at the end of the stroke of the pusher blades.

Where desired or found advantageous, one or more reversing devices may be employed between groups of the pushers, whereby the motor or other driver is continuously under load, while the pushers still all operate in the same direction, but those in one group operate or take their load on the opposite stroke from those of another group. This may be effected by employing one or more reversing devices between different groups of the pusher mechanisms. As embodied and shown in Fig. 8, the reversing mechanism comprises an idle lever 52, pivoted at 53, and suitably supported upon the guideway structure or otherwise. At one end thereof the idle lever 52 is pivotally connected to a connecting rod 54, the other end of rod 54 being connected to a lever arm 31. At its other end, idle lever 52 is pivotally connected to a rod 55, the other end of which rod is pivotally connected to a lever arm 31. These arms 31 are parts of individual pusher mechanisms such as have already been described. Thus it will be seen that the group of pusher devices to the right of the lever arm 52, Fig. 8, will be moving forward in the load or material pushing position or direction on one half of a cycle or complete revolution of the actuating or driving device, while the pusher mechanisms to the left of the idle lever 52 will be moving in the load or material pushing direction on the other or opposite half of the cycle or revolution of the driving device. Thus the load is practically uniformly distributed throughout the entire stroke or cycle of the actuating device or mechanism.

In Figs. 4 and 5 of the drawing a somewhat different form of actuating means for the pusher mechanisms is shown. In such embodied form, two guide rails 60 and 61 are longitudinally and horizontally disposed above the guideway, and are conveniently supported from and along the two series of approximately alined and parallel posts 1 and 2. Backing blocks 62 and 63 are conveniently provided, with bolts 64 and 65 passing respectively through the guide rails, the blocks, and posts 1 and 2. Pairs of grooved rollers 66 and 67 mounted at the opposite sides of each pusher mechanism,

run respectively upon the upper and lower edges of the guides 60 and 61. The pulleys or rollers of each of said pairs 66 and 67 are rotatably carried upon respective yokes 68 and 69, to the central part of which yokes are fixed a cross-rod 70, corresponding in function to the cross-rods 30 previously described. The various rods 70 are connected together, as embodied, by rods 71 extending horizontally therebetween and pivotally connected at either end to two adjacent cross-rods 70. The actuating means may be connected thereto in any suitable manner, and in Figs. 6 and 7 the ends of the rods 36 and 37 are shown pivotally connected at 73 to a plate 74, there being such a plate at either side of the mechanism, such plates carrying the outside ends of the pulley or roller axles, respectively, of the two yokes 68 and 69 of one of the pushing devices. The rod 36 is pivotally connected to one plate 74 and rod 37 to the other. The device in this form will travel to and fro along the guide rails 60 and 61, as shown in full and dotted lines in Fig. 4.

In the operation of the device in a mine, it will be extended inwardly as the workings advance, new bottom plates 10 and sides 6 and 7 being laid therefor, the timbers or posts 1 and 2 being also set up as they are needed to support the mine roof as well as for the structure of the material forwarding device. The pusher units having a short travel relatively to the length of the conduit, new pusher units can be added whenever the face of the work has advanced the required distance. Thus the inner end of the transporting mechanism may be kept relatively close to the advancing face of the room or other working. The conduit structure and the pusher units are of very simple construction and the parts are interchangeable. They may thus be constructed easily and rapidly and without requiring skilled labor. The construction may as easily be taken down and stored when the working is dismantled preparatory to being put up again in another working.

By the use of the mechanical loader, the dislodged coal or other mineral may be removed with great expedition, and a very large relative proportion of the time usually consumed in removing and loading the coal may be devoted to making new cuttings and in dislodging additional coal, thereby greatly increasing the output of the open workings and at the same time greatly reducing the cost of production and dispensing with shovelers, car pushers or haulers, and other non-skilled labor. The coal or other material is conveyed immediately away without piling and is delivered without further supervision or handling to the car or other receiving device in the entry.

In Figs. 12 and 13 is illustrated an embodiment of a plurality of cooperating transporting mechanisms or devices, wherein one conduit or guideway for the coal, or other transported material, is tributary to another, that is, the tributary or feeding conduit feeds or discharges into the other, which may be termed the main or receiving conduit. The tributary conduit or guideway is arranged transversely to the main or receiving conduit. The adaptability to different kinds of work, and the capacity, of an installation of the mechanism is thus greatly increased and enhanced. Such a tributary or feeding conduit could be laid across a room face, in cross-cut or "break-through" work, or laid across the face of long-wall work, or otherwise utilized as desired.

In the drawing the conduit or guideway feeding into the other, is shown arranged substantially perpendicularly to the main or receiving guideway or conduit, but it will be frequently found advantageous to arrange the feeding or tributary conduit at an acute angle to the receiving or main conduit.

In accordance with one feature of the invention, the transporting mechanism of one conduit or guideway is operated from that of the other conduit or guideway, and in the exemplified embodiment, the mechanism of the tributary or feeding conduit is operated from that of the main or receiving conduit.

In Figs. 12 and 13 there is also shown a different arrangement of the actuating devices for the transporting mechanism. Referring first in detail to this feature, a crosshead 80 is fastened at its ends to two endless sprocket chains 81 and 82, which are arranged at either side of, and just above, the conduit or guideway 83 for the material. Sprocket chain 81 runs over a sprocket wheel 84, which is journaled by a stub shaft in a bearing 85, and over a sprocket wheel 86, which is journaled by a stub shaft on a bearing 87.

Sprocket chain 82 runs over a sprocket wheel 88, which is journaled by a stub shaft on a bearing 89, and over a sprocket wheel 90, which is journaled by a stub shaft on a bearing 91. This construction and arrangement gives a free path for the cross head 80 to travel to and fro above the conduit as the chains travel over and about their sprocket wheels.

The means for propelling or forwarding the coal or other material along the guideway or conduit 83, is driven or actuated from the crosshead 80. The propelling or forwarding mechanism may be of the general structure already described, comprising the pusher or forwarding blades 25, which are mounted spaced apart on horizontally arranged rods or pairs or rods, but shown in these figures as a single rod 34, which to-

gether with the general structure and arrangement of the conduit or guideway itself, may be substantially as already described.

The cross head 80, as embodied, is connected by a connecting rod 92 to one of the cross rods 30 of the pusher mechanism. Thus as the sprocket chains 81 and 82 travel, the cross rod 80 will travel to and fro therewith, and through the connecting rod 90 will reciprocate the pusher mechanism to and fro in the conduit, thus propelling or forwarding the material therealong. A cable 114 (Fig. 12), which with its connections is described more in detail at a later point herein, is fastened at 113 to the horizontal rod 34, and passes about supporting and guiding sheaves 115, 116; 117 and 118, and at its other end is fastened to cross-head 80. This cable cooperates with the mechanism just described to pull the propelling blades 25 and the rods 34 in their reciprocatory path. Cable 114 is also utilized in the operation of the coal propelling mechanism of the tributary conduit, as later described.

The embodied form of means for driving the sprocket chains 81 and 82 is generally similar to that already described, and comprises a motor 95, having a pinion 96 fixed on its shaft, which pinion meshes with a gear wheel 97. Gear wheel 97 is fixed on a shaft 98, which shaft extends across above the conduit 83 and is journaled in bearings 99 and 100.

Fixed on shaft 98 is a sprocket driving wheel 101, meshing with sprocket chain 82, working against wheel 90. If desired, wheel 90 may have guiding flanges and a smooth periphery to hold the chain 82 in place while the teeth on wheel 101 engage the chain and drive it, the wheel 90 holding or supporting the chain to the drive. A similar sprocket driving wheel 102 is likewise fixed to shaft 98, and engages and drives sprocket chain 81, and operates like wheel 101, and need not be described in further detail. The motor 95, working through the described connections, drives the sprocket chains 81 and 82, cross-head 80 and connecting rod 92, and operates the material propelling or forwarding mechanism as already described in connection with Figs. 1 to 8.

Referring in detail to the embodied form of feeding or tributary conduit and of the mechanism for operating it from the main or receiving conduit, as stated, the tributary conduit is shown disposed or positioned perpendicularly to the main or receiving conduit, although in practice it will frequently be found desirable or convenient to arrange the tributary conduit at an acute angle with respect to the receiving conduit. It will be found advisable in certain cases also to have the bottom of the tributary or feeding conduit at a somewhat higher level than the bottom of the receiving conduit at the point of their juncture and discharge of the material into the receiving conduit.

The general structure of the tributary conduit 105 may be substantially the same as that of the main conduit, having a bottom 106 and inwardly and downwardly sloping sides 107 and 108. Pusher or propeller blades 109 are mounted on horizontally disposed reciprocable rods 110, and they work to and fro in the conduit or guideway to push or propel the coal therealong to discharge it into the main or receiving conduit.

In both conduits the pusher blades 25 and 109 travel a greater distance than the distance between the blades, thereby avoiding piling of the coal or other conveyed material at the ends of the reciprocatory paths of the respective blades. This also serves to deliver the coal fairly into the middle of the receiving conduit and to prevent undue piling thereof at that point.

The embodied form of means for operating the propelling or material forwarding mechanism of the tributary or auxiliary conduit from that of the main conduit comprises a cable 111, which is attached at one of its ends to the pusher blade carrying rod 110, and which is attached at its other end to the cross head 80 or to the adjoining structure. The cable 111 runs over a sheave 112 which supports and guides the cable.

Fixed at 113 to one of the horizontal reciprocable pusher plate carrying rods 34 of the receiving conduit, at some distance from the tributary or feeding conduit, is one end of a cable 114 (already referred to) which passes about guiding and supporting sheaves 115, 116, 117 and 118, and has its other end fastened at 119 to one of the rods 34 or to the adjacent structure. Another cable 120 has one end 121 thereof fastened to cable 114, cable 120 passing about sheave 122 and sheave 123, and having its other end attached at 124 to the reciprocable pusher plate carrying rod 110.

The operation of the mechanism just described is substantially as follows: Motor 95 drives cross head 80, which through connecting rod 92 reciprocates rods 34 and pusher plates 25, thereby forwarding the coal or other material in the main conduit, all as previously described. When rods 34 and pusher plates 25 are traveling to the left in Fig. 13, cable 111 draws rods 110 and therewith pusher plates 109 along the tributary conduit in the direction toward the receiving conduit, thereby forwarding the coal or other material along the feeding conduit 105 and delivering it to the receiving conduit.

When the rods 34 and pusher plates 25 are traveling to the right in Fig. 13, cable 114 draws the end 121 of cable 120 to the left, and rods 110 and pusher blades 109 are drawn along the feeding conduit 105 back-

wardly or away from the receiving conduit into position for the next feeding stroke. Thus the material forwarding or propelling mechanism operate together in their respective conduits, driven from the one motor and by means of a single reciprocating driving mechanism.

In practice it is usually found to be most efficient to arrange the pusher or propeller blades at a relatively acute angle to the bottom of the conduit, as thereby a large part of the propelled or forwarded coal or other material is carried or supported on the pusher blade and the friction between the blade and conduit bottom is very much less than that between the coal and the conduit bottom were the coal lying on the conduit bottom and merely pushed along by practically perpendicularly disposed blades.

A form of pusher blade 25 is shown in elevation in Fig. 15 and in plan in Fig. 16, having a slot 131 therein through which the rod 34 passes, the blade being pivoted to the rod by lugs 132 and 133. A stop 134 is provided to prevent the blade 25 maintaining too great an angle with the rod 34.

In Fig. 14 a section of an all metal conduit is shown, the bottom and sides being made of sheet metal, and being joined, supported and reenforced at the edges by angle strips.

In Fig. 12 the conduit is shown discharging into an ordinary mine car 125, running on a track 129. The apron or swinging chute 126 is hinged at 127 and supported by chains 128. The chute may be swung down to the dotted line position shown in Fig. 12, to leave the entry free except when loading from the conduit. In Fig. 1 the conduit is shown discharging the coal into a conveyor system 130 such as is shown and described in my copending application Ser. No. 306,154, filed June 23, 1919.

In Figs. 12 and 13, the propelling blades 25 and their connecting and actuating structures are shown without the guides and supports shown in Figs. 1, 2, 3, 4 and 5, and in many installations it will be found possible and practicable to so construct and operate them.

From all the foregoing it will be understood that mechanism and devices have been provided realizing the objects and advantages herein set forth, together with other objects and advantages. The invention in its broader aspects is not limited to the precise constructions shown and described, but changes may be made therein without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:—

1. A material transporting mechanism comprising a conduit for the transported material, a material advancing mechanism including a plurality of blades located at separated points along the conduit and above the material therein, the blades being forwardly inclined in the direction of advance of the material, and means for moving the blades to and fro along the conduit while permitting vertical movement of the blades, said means including a reciprocable support, and a series of arms extending forward horizontally therefrom, the blades being mounted directly on the forward ends of the corresponding arms.

2. A material transporting mechanism comprising a conduit for the transported material, a material advancing mechanism including a plurality of blades located at separated points along the conduit and above the material therein, the blades being forwardly inclined in the direction of advance of the material, means for moving the blades to and fro along the conduit while permitting vertical movement of the blades, said means including a reciprocable support and a plurality of arms pivoted thereon and extending forwardly therefrom, the blades being supported on the forward ends of the corresponding arms.

3. A material transporting mechanism comprising a continuous conduit for the transported material, a plurality of reciprocating pusher blades arvancing the material in a single direction in the conduit and returning over the material, connections between said blades whereby some of them are advancing the material while others are returning idle and common driving means therefor.

4. A material transporting mechanism including in combination a main conduit for the transported material, a transversely disposed tributary conduit discharging its material into the main conduit at an intermediate point in its length, and mechanism reciprocating in each conduit to advance the material in the conduits and to discharge the material from the tributary conduit into the main conduit.

5. A material transporting mechanism including in combination a main conduit for the transported material, a transversely disposed tributary conduit discharging its material into the main conduit at an intermediate point in its length, and mechanism reciprocating in each conduit to advance the material in the conduits and to discharge the material from the tributary conduit into the main conduit, and common actuating means for the advancing mechanisms of the two conduits.

6. A material transporting mechanism including in combination a main conduit for the transported material, a transversely disposed tributary conduit discharging its material into the main conduit at an intermediate point in the length, and material for-

warding mechanism including a plurality of reciprocating blades in each conduit to advance the material therealong and to discharge it from the tributary conduit into the main conduit.

7. A material transporting mechanism including in combination a main conduit for the transported material, a transversely disposed tributary conduit discharging its material into the main conduit at an intermediate point in its length, and material forwarding mechanism including a plurality of reciprocating blades in each conduit to advance the material therealong and to discharge it from the tributary conduit into the main conduit and actuating connections between the forwarding mechanisms whereby one is actuated from the other.

8. A material transporting mechanism including in combination a main conduit for the transported material, a transversely disposed tributary conduit discharging its material into the main conduit at an intermediate point in its length, a material forwarding mechanism including a plurality of reciprocating blades in each conduit to advance the material therealong and to discharge it from the tributary conduit into the main conduit and actuating connections including cables between the forwarding mechanisms whereby one is actuated from the other.

9. A material transporting mechanism including in combination a main conduit for the transported material, a transversely disposed tributary conduit discharging its material into the main conduit at an intermediate point in its length, a material forwarding mechanism including a plurality of reciprocating blades in each conduit to advance the material therealong and to discharge it from the tributary conduit into the main conduit and actuating connections including cables and sheaves between the forwarding mechanisms whereby one is actuated from the other.

10. A material transporting mechanism including in combination a conduit, a material forwarding mechanism including a plurality of reciprocable blades in the conduit, and actuating means therefor including an endless member and connections therefrom to the blades including a reciprocating mechanism above the conduit and an arm pivoted to the endless member and to said reciprocating mechanism.

11. A material transporting mechanism including in combination a conduit, a material forwarding mechanism including a plurality of reciprocable blades in the conduit, and actuating means therefor including an endless chain and connections including a reciprocating mechanism above the conduit and an arm pivoted to the endless member and to said reciprocating mechanism.

12. A material transporting mechanism including in combination a conduit, a material forwarding mechanism including a plurality of reciprocable blades in the conduit, and actuating means therefor including a pair of endless chains, a crosshead therebetween and connections therefrom to the blades including a reciprocating mechanism above the conduit and an arm pivoted to the endless member and to said reciprocating mechanism.

13. A material transporting mechanism including in combination a conduit, a material forwarding mechanism including a plurality of reciprocable blades in the conduit, rods extending between the blades, and means for reciprocating the rods, including an endless chain and a connecting rod therefrom to the rods between the blades.

14. A material transporting mechanism including in combination a conduit, a material forwarding mechanism including a plurality of reciprocable blades in the conduit, rods extending between the blades, and means for reciprocating the rods, including a pair of endless chains, a cross head therebetween, and a connecting rod from the cross head to the blade connecting rod.

15. A material transporting mechanism including in combination a conduit, a material forwarding mechanism including a plurality of reciprocable blades in the conduit, and actuating means therefor including a pair of endless chains, a cross-head therebetween arranged above the conduit, and connections therefrom to the blades.

16. A material transporting mechanism including in combination a conduit, a material forwarding mechanism including a plurality of reciprocable blades in the conduit, rods extending between the blades, and means for reciprocating the rods, including a pair of endless chains, a cross head therebetween arranged above the conduit, and a connecting rod from the cross head to the blade connecting rod.

17. A material transporting mechanism comprising a chute having a bottom and sides, and a material advancing mechanism including a series of reciprocating rods arranged above and along the chute, arms pivoted to and extending substantially horizontally and forwardly from said pivots and swingable to and fro vertically relatively to said reciprocating rods, and pusher blades carried at the forward ends of said arms.

18. A material transporting mechanism comprising a chute having a bottom and sides, and a material advancing mechanism including a series of reciprocating rods arranged above and along the chute, arms pivoted to and extending substantially horizontally and forwardly from said pivots and swingable to and fro vertically relatively

to said reciprocating rods, and pusher blades carried at the forward ends of said arms, said blades being pivotally mounted to swing forwardly relatively to their arms, and means preventing their swinging rearwardly relatively to their arms.

19. A material transporting mechanism comprising a chute having a bottom and sides, and a material advancing mechanism including a series of reciprocating rods arranged above and along the chute, arms pivoted to and extending substantially horizontally and forwardly from said pivots and swingable to and fro vertically relatively to said reciprocating rods, and pusher blades carried at the forward ends of said arms, and forwardly inclined from the vertical.

20. A material transporting mechanism comprising a chute having a bottom and sides, a material handling mechanism comprising a series of rods of equal length extending along the chute and connected together, a series of pusher blades spaced apart proportionately to the length of said rods, the chute and the rods being attachable and detachable in sections of equal and uniform length.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

KENNETH DAVIS.

Witnesses:

MARGARETE BEVERIDGE,

G. E. MOZGT.