F. BILLINGS.

LOADING OR MINING AND LOADING MACHINE.

APPLICATION FILED SEPT. 3, 1912.

1,265,731. Patented May 14, 1918.

3 SHEETS—SHEET 1.

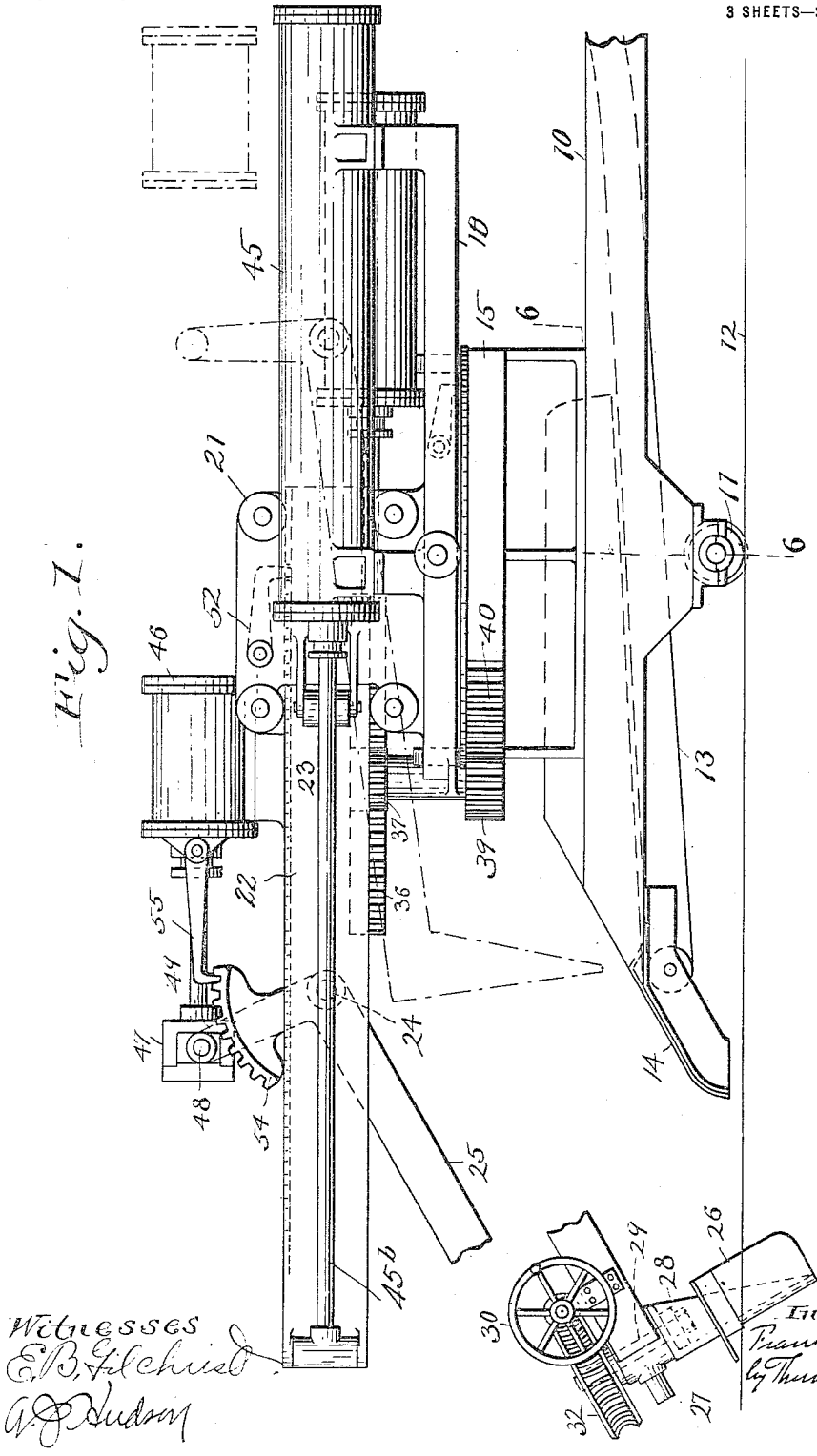


Fig. 1.

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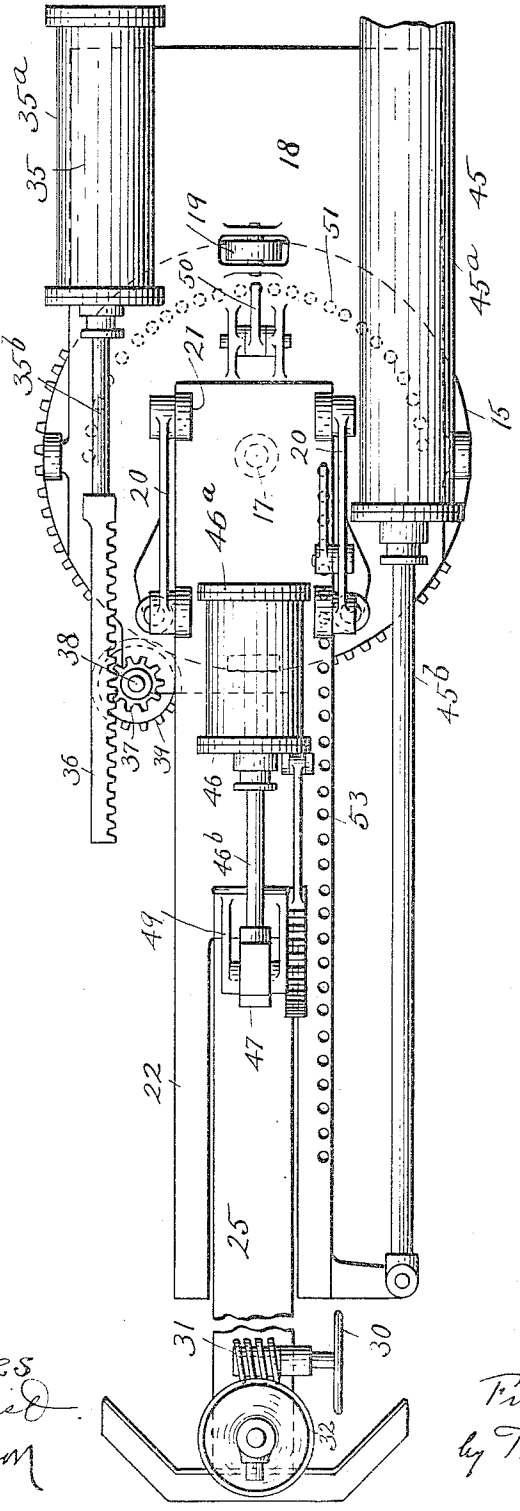


Fig. 2.

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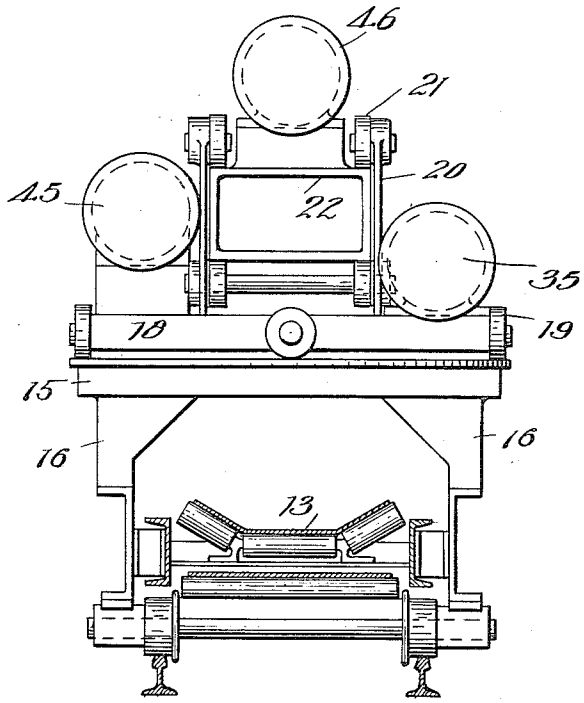


Fig. 3.

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UNITED STATES PATENT OFFICE.

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LOADING OR MINING AND LOADING MACHINE.

1,265,731. Specification of Letters Patent. Patented May 14, 1918.

Application filed September 3, 1912. Serial No. 718,194.

To all whom it may concern:

Be it known that I, FRANK BILLINGS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Loading or Mining and Loading Machines, of which the following is a full, clear, and exact description.

This invention relates to loading or mining and loading machines.

In a prior application, Serial No. 538,408, filed January 17, 1910, I have disclosed a loading machine which includes in addition to a frame and a conveyer, an operating tool holding member in the form of a forwardly projecting arm or ram which is adapted to be provided at its forward end with a working tool, and especially a hoe for scraping material rearwardly to the conveyer. This ram is supported from the frame for reciprocating movement forwardly and rearwardly, for swinging or rocking movement horizontally, and for swinging or rocking movement vertically. These various movements enable material in front of and to the side of the machine to be quickly and expeditiously moved back to the conveyer and loaded into suitable cars. In the embodiment of my invention disclosed in said application the ram is supported for reciprocating movement in a housing through which the ram is adapted to be shifted forwardly and rearwardly. This housing is mounted for rocking movement about a horizontal axis so that when the housing is rocked the ram is likewise rocked in a vertical plane. The housing in turn is mounted upon a turn table which is supported from the frame for swinging or rocking movement about a vertical axis, whereby horizontal swinging movement can be imparted to the housing and to the ram.

The invention shown and described and claimed in this application involves a mining and loading machine of a general type disclosed in my prior application, but modified in construction. In the present application there is disclosed a construction of the machine wherein the ram is given substantially the same movements as in the machine disclosed in my prior application, but is in this case supported and mounted upon moving parts which are specifically different in construction from those disclosed in my prior application. The machine here disclosed is nevertheless efficient and in some respects more efficient and satisfactory than my prior construction.

My invention may be here briefly summarized as consisting in certain novel details of construction and combinations and arrangement of parts which will be described in the specification and set forth in the appended claims.

In the drawings forming a part of this application, Figure 1 is a side view of the forward portion of a mining and loading machine construction in accordance with my invention. Fig. 2 is a top plan view of the same. Fig. 3 is a rear view of the same with the main frame and conveyer in section.

Referring now to the drawings, it will be seen that the machine includes a frame 10 supported on trucks 11 having wheels adapted to run upon a track 12. The frame is provided with a conveyer 13 here shown as an endless belt conveyer, and at the forward end of the frame is an inclined apron 14 up along which material is adapted to be moved so as to be discharged on the forward end of the conveyer. I have shown only forward portions of the frame and conveyer, as these parts may be of any suitable construction.

Above the forward portion of the frame there is provided a substantially circular horizontal support 15 which is supported from the side members of the frame by suitable brackets or equivalent supporting members 16, there being provided between the support 15 and the conveyer beneath sufficient space as to admit of large blocks or pieces of material being moved upwardly and rearwardly by the conveyer without interference by this upper support 15. Pivoted to the support 15 by a central king bolt 17 shown by dotted lines in Fig. 2 is a turn table 18 adapted to swing or rock horizontally about the vertical axis of the king bolt. This turn table is supported from the member 15 by a series of wheels or rollers 19 carried by the turn table and engaging the support 15 beneath. The turn table is provided with a pair of parallel upwardly extending standards 20 having rollers 21 which engage the top and lower sides of and thus support a reciprocable ram member 22. The standards 20 have also rollers 23 which engage the sides of the ram member 22. The forward portion of the ram member 22 is bifurcated, as shown, and between the forwardly projecting arms or jaws of this mem-

ber there is pivotally supported by means of a transverse pin 24 for rocking or swinging movement vertically a forward ram member 25, which, together with the member 22, constitutes a two part ram or working member, the forward pivoted part 25 being the tool holding part of the ram, as will be explained.

It will be seen, therefore, that the ram as a whole is capable of rectilinear reciprocating movement backward and forward by reason of the fact that it is mounted for reciprocating movement between the standards of the turn table, which, in turn, is mounted for a horizontal swinging or rocking movement upon the support 16; that it is capable of horizontal swinging movement by reason of the fact that the turn table which supports the ram, as above stated, is capable of such movement; and that the forward tool holding part 25 of the ram is capable of vertical swinging or rocking movement by reason of its pivotal connection with the ram member 22. The pivoted ram member 25 may be provided at its forward end with any suitable working tool for performing any one of the numerous function for which the machine is adapted.

In the drawings I have shown the forward end of the ram member 25 provided with a scraping hoe 26. which is adapted to scrape material rearwardly onto the conveyer. It may, however, be provided with other tools, such as picking, shoveling, hammering tools, and the like, for the ram is adapted to receive movements and power, as will be hereinafter explained which adapt it for all these and other purposes. The ram member 25 is provided at its forward end with what may be termed a universal tool head, which, in this case, includes a forwardly projecting boss 27 to which tools may be secured, and also includes an opening or passageway at right angles to the boss, and at the rear of the latter said passageway being adapted to receive the shank of a tool holding member. In the present case the hoe 26 is secured to a member 28 which, in turn, is secured to the shank of a stud or shaft 29 shown by dotted lines in Fig. 1.

To enable the hoe to scrape material sidewise as well as rearwardly, especially if the material is located to one side of the machine, I have provided means under the control of the operator for varying or adjusting the angle of the hoe so that the latter will face in a direction in which the material is to be moved. In the present case the adjusting mechanism includes a hand wheel 30, in this case mounted on the forward end of the ram member 25. The hand wheel is operatively connected with a worm 31 which engages the worm wheel 32 secured to the top of the bolt or shaft 29 carrying the hoe 26 and the intermediate member 28. By turning this hand wheel the hoe can be adjusted to any desired angle to meet the requirements occasioned by the location of material which may be a considerable distance to one side of the machine.

In the use of the machine for some of the numerous specific purposes for which it is adapted the ram is given powerful working strokes which cause the ram to be subjected to heavy blows and shocks. Accordingly the ram and the members which directly and indirectly support it are constructed so as to successfully resist the stresses in any direction incident to such use.

To give to the ram, and especially to the pivoted ram section 25 the various movements above described, and to impart to the ram power and working strokes for active work forwardly and rearwardly, up and down, or laterally to the right and left, and, in fact, to enable the ram to perform any and all of its intended functions by power applied to it at one or more points successively or simultaneously, I employ a plurality of fluid pressure motors, each for producing a character of movement different from that imparted by the others. I prefer to employ air motors of the reciprocating type, such as are shown in the drawings, and will now be described.

To rock or swing the turn table about the axis of the king bolt 17, and hence to give swinging or oscillating strokes to both parts of the ram horizontally to the right or to the left, I employ a reciprocating motor 35 including a cylinder 35^a which is supported by the turn table and a piston not shown connected to a forwardly projecting plunger 35^b to which is secured a rack 36 which meshes with a gear 37 secured to the upper end of a short vertical shaft 38 mounted upon the horizontal support 15. To the lower end of this shaft 38 is secured a larger gear 39 which meshes with a section of a circular rack 40 secured to the edge or periphery of the circular portion of the turn table support 15. When the piston, plunger and rack 36 are given a forward stroke the turn table and the parts supported by it are swung horizontally in one direction, and when the piston, plunger and rack are given a rearward stroke, the turn table and ram are swung horizontally in the reverse direction.

To move the ram, including the two sections 22 and 25 rectilinearly backward and forward, or to reciprocate the ram with reference to the turn table and other parts, I employ a fluid pressure reciprocating motor 45 including a cylinder 45^a, which is supported by the turn table and a piston, not shown, connected to a forwardly extending plunger 45^b which, at its forward end, is attached to the forward end of the rear ram section 22. Both the cylinders 35^a and 45^a

and the motors 35 and 45 are supported principally upon a part of the turn table which extends rearwardly beyond the circular turn table support 15. Thus, when the piston and plunger or motor 45 are moved or thrust forwardly the ram, as a whole, is given a forward stroke or movement, and when the movement of the piston is reversed, the ram, as a whole, is retracted or given a rearward stroke or movement.

To swing or rock the forward section 25 of the ram vertically or to impart to this ram section power for movement or work in a vertical plane, either up or down, I utilize a reciprocating fluid pressure motor 46 including a cylinder 46[a] which is supported on the rear ram section 22 at the rear of the point of attachment thereto of the relatively tilting or rocking section 25. This motor also includes a piston which is connected to a plunger 46[b], which extends forwardly and is provided at its forward end with a bearing box 47 engaging a transverse pin 48 carried by a pair of arms 49 projecting upwardly from the rear end of the ram section 25 at substantially right angles to the body or shank of said ram section. Thus, when the piston and plunger of motor 46 are given a forward stroke, the ram section 25 is tilted or rocked downwardly, and when the movement of the piston of the motor is reversed the ram section is rocked or swung upwardly.

In a machine of this character it may be desirable to lock the mechanism for producing movement of one character, while other movement or movements are imparted to the ram or tool holding portion thereof. To lock the ram against horizontal swinging movement with the ram at any angle with respect to the horizontal axis of the machine, I provide a locking mechanism consisting in this case of a pivoted latch 50 carried by the turn table, and provided at its free end with a portion adapted to be inserted in any one of a number of holes or openings 51 (see Fig. 2) provided in the top of the support 15 beneath the turn table.

To lock the ram against forward or rearward reciprocating movement with the ram extended to any desired position, I provide on one of the standards a pivoted latch 52, the free end of which is adapted to engage in any one of a series of openings 53 provided at the top of the rear ram section 22.

To lock the pivoted ram section 25 against swinging or rocking movement in a vertical plane and to hold this section of the ram in any desired elevated position I provide a locking mechanism which includes a toothed sector 54 which is secured to the pivotal pin 24 connecting the ram section 25 with the ram section 22. A pivoted latch 55 supported in this case on the frame of motor 46 is adapted to have its forward free end inserted between any two adjacent teeth of the sector.

For the control of the motors I prefer to employ four-way valves, one for the motor 35, one for the motor 45 and one for the motor 46, together with an arrangement of piping or system of control such as disclosed in one of my prior applications, Serial No. 631,902, filed June 8, 1911, and further disclosed in an application filed by me on the third day of September, 1912, Serial No. 718,191.

With the motors which I have provided for securing the movement or for doing active work in the directions in which the ram is capable of movement, and with the use of four-way valves, each controlling the admission and exhaust of air or other motive fluid to and from one of the motors for actuating the tool holding ram member, or for applying power thereto for work, said tool holding portion of the ram can be actuated or moved in any direction very quickly, especially as the ram will respond quickly to the movement of the valve. I am also enabled to secure quick reversal of movement and flexibility in speed, power and length of stroke imparted to the ram. Furthermore, I am enabled to apply to the ram simultaneously power from two or more of the motors so as to produce a combination of movements or to apply power in two different directions, such as is often required in the practical use of the machine for material loading or other purposes, such as loosening material in mines. Still further I am enabled to apply power to the ram in any position in which it may be in within the range of movement of the tool holding portion of the ram for movement or work up or down laterally to the right or left, or forwardly and rearwardly.

Having thus described my invention, what I claim is:

1. In a machine of the character described, a frame, an inclined apron at the lower front end of the frame and extending downwardly below the same, and means for moving material rearwardly along a level beneath the frame and thence up along said inclined apron, comprising a turntable supported on said frame for movement about a vertical axis, a ram mounted on said turntable for reciprocating movement forwardly and rearwardly, said ram being composed of two parts, the forward part being pivotally supported on the rear part for swinging movement vertically, and motive means for actuating the turntable, ram and the forward portion of the ram, the forward end of the ram being provided with a scraping tool having an unobstructed range of movement to the right or left of the axis of the machine, backwardly and forwardly toward and from the apron and vertically to

and from substantially the plane of the lower end of the apron.

2. In a machine of the character described, a frame, a conveyer extending longitudinally of the frame, an apron at the lower front end of the frame and extending upwardly and rearwardly from a level beneath the lower front end of the conveyer, a turntable supported on said frame above the conveyer, and a ram mounted on said turntable for reciprocating movement forwardly and rearwardly, said ram being composed of two parts including a pivoted front part adapted to be provided at its forward end with a working tool, and motive means for actuating the turntable, ram and the forward portion of the ram, the tool at the forward end of the ram having an unobstructed range of movement such that material located in front of the machine or at the right or left of the axis of the machine may be moved rearwardly along the level beneath the conveyer, and thence up said inclined apron.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

FRANK BILLINGS.

Witnesses:
A. J. HUDSON,
E. M. FREEMAN.