Dec. 1, 1931. F. A. HALLECK 1,834,587

LOADING MACHINE

Filed Nov. 1, 1927 2 Sheets-Sheet 1

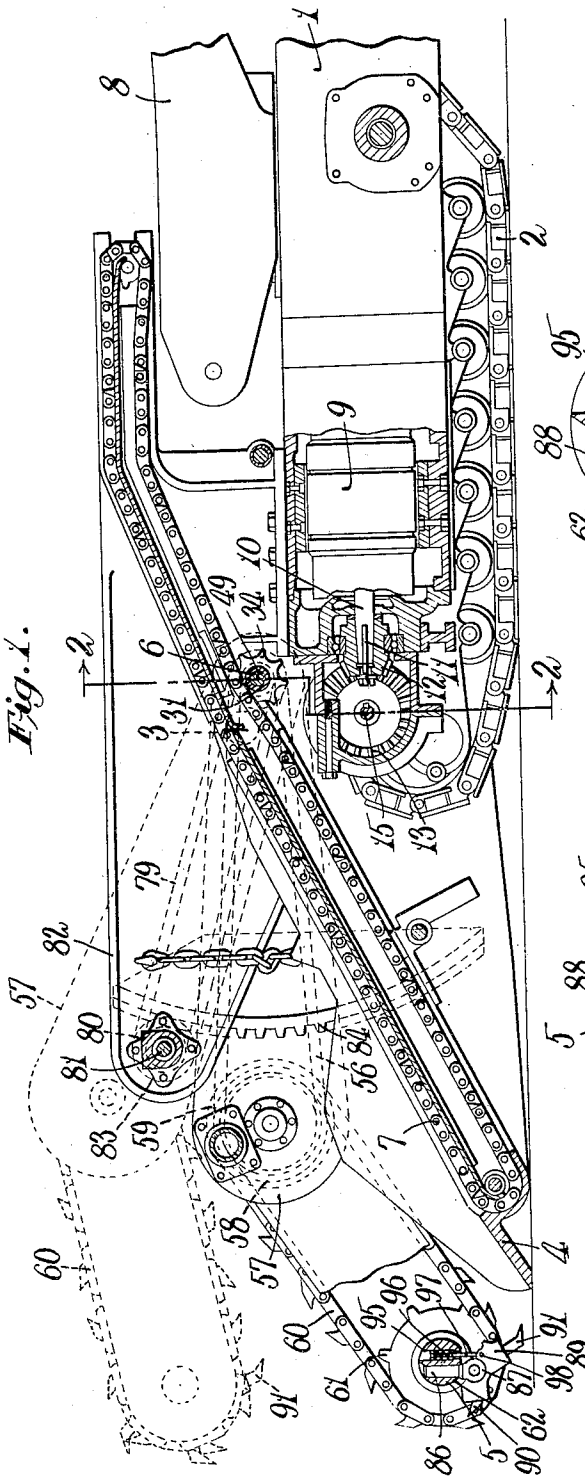


Fig. 1.

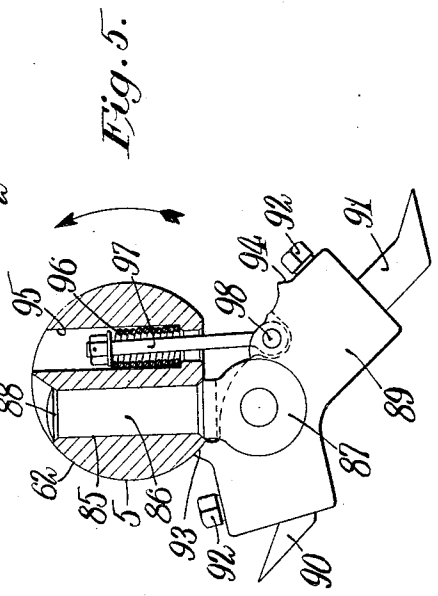


Fig. 5.

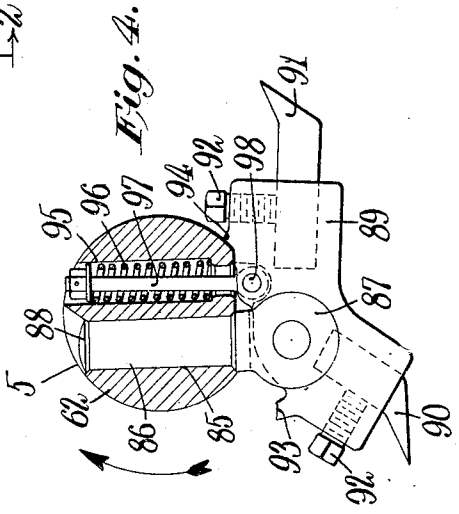


Fig. 4.

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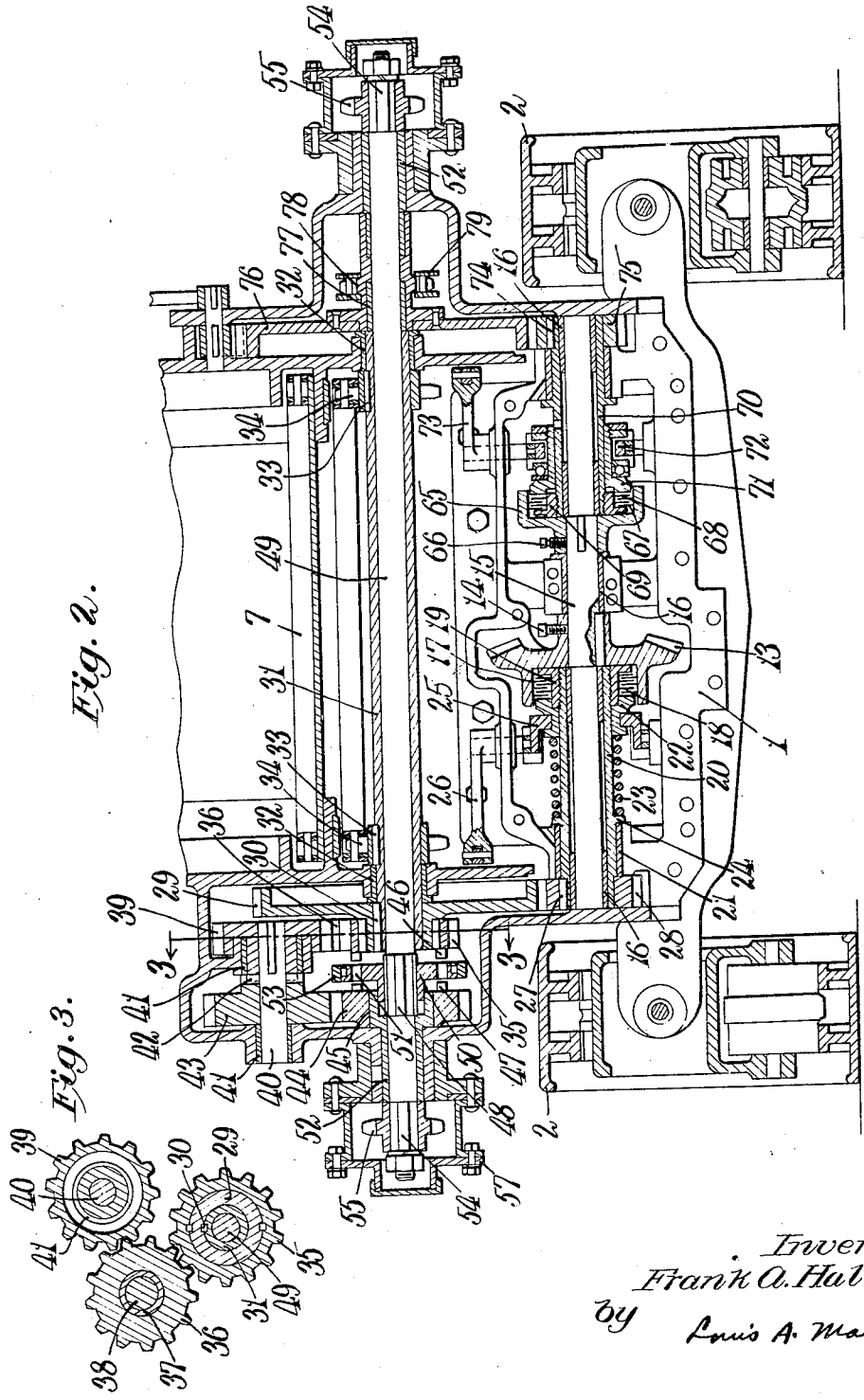


Fig. 2.

Fig. 3.

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Patented Dec. 1, 1931 1,834,587

UNITED STATES PATENT OFFICE

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LOADING MACHINE

Application filed November 1, 1927. Serial No. 230,334.

This invention relates to loading machines, and more particularly, but not exclusively, to machines for loading loose coal or other similar material in mines.

An object of this invention is to provide an improved coal loading machine. Another object is to provide an improved loading machine whereby the "shot" or standing coal at the face may be broken down and loaded in an improved manner. Still another object is to provide a coal loading machine having a toothed roller of improved construction for raking down the coal onto the gathering conveyor. Another object is to provide an improved coal loading machine having a reversible toothed roller of improved construction, the roller being rotatable in one direction to rake down the loose coal onto the gathering conveyor and rotatable in the reverse direction to undermine the coal when large blocks or standing coal are encountered. Yet another object is to provide an improved, reversible toothed roller having improved, resilient, pivotal mountings for the reversible teeth. These and other objects and advantages of this invention will, subsequently more fully appear as the description proceeds.

In the accompanying drawings I have shown for purposes of illustration, one form which my invention may assume in practice.

In these drawings,—

Fig. 1 is a central, longitudinally extending, vertical sectional view taken through a coal loading machine equipped with the improved reversible roller, parts of the machine being shown in elevation.

Fig. 2 is a transverse vertical sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a detail sectional view taken on line 3—3 of Fig. 2.

Figs. 4 and 5 are detail views, partially in section, illustrating the improved reversible toothed roller.

In this illustrative embodiment of the invention there is shown a coal loading machine of the general type described in my copending application, Serial No. 197,951, filed June 10, 1927, now matured into Patent No. 1,811,927, patented June 30, 1931. The improved machine generally comprises a frame 1 mounted on and propelled by endless traction treads 2. Pivotally mounted on the frame 1 at 3 is a shovel 4, while cooperating with this shovel is a reversible toothed roller 5 of improved construction pivotally mounted at 6 on the frame 1. This roller is adapted to rake the loose coal downwardly onto the shovel 4. Guided on the shovel 4 and frame 1 is an endless front gathering conveyor 7 which is adapted to move the coal rearwardly from the shovel and discharges the coal onto a usual rear or loading conveyor 8.

The mechanism for swinging and rotating the toothed roller 5 is substantially the same as that described in my copending application mentioned above, and comprises a motor 9, herein preferably an electric motor, housed within the frame 1 and having its armature shaft 10 horizontally disposed and extending longitudinally of the machine. As shown in Fig. 1, fixed to the forward end of the armature shaft at 11 is a bevel pinion 12 which meshes with a large bevel gear 13 (see also Fig. 2) secured by a set screw 14 to a horizontally disposed shaft 15 extending transversely of the machine and journaled in bearings 16. The bevel gear 13 carries a series of clutch plates 17 which are interleaved with a corresponding series of clutch plates 18 carried by a clutch member 19 threadedly connected to a sleeve 20, the latter surrounding the shaft 15 and being journaled in a bearing 21. Slidably mounted on the sleeve 20 is a clutch applying member 22 which is normally maintained in its applied position by means of a coiled spring 23 encircling the sleeve 20 and reacting against a flange 24 on the latter. The member 22 is adapted to be released against the tension of the spring

23 by means of a shipper yoke 25 pivotally mounted on the machine frame and having suitable operating means including an operating lever 26. In accordance with this illustrative embodiment of the invention, the sleeve 20 has keyed thereto at 27 a spur pinion 28 which meshes with a large spur gear 29 fixed at 30 to a horizontally disposed hollow shaft 31 extending transversely of the machine parallel with and above the shaft 15. The shaft 31 is journaled in bearings 32 suitably carried by the machine frame and has fixed thereto at 33 chain sprockets 34 which are adapted to drive the front conveyor 7. Fixed to the hub of the spur gear 29 is a spur gear 35 which meshes with an intermediate gear 36 (see Fig. 3) journaled at 37 on a stub shaft 38 suitably fixed to the machine frame 1. The gear 36 meshes with a spur gear 39 fixed to a shaft 40 and journaled in bearings 41. Connected to the gear 39 as by a dental clutch 42 is a spur gear 43 meshing with a spur gear 44 rotatably mounted in a bearing 45 on the machine frame. As clearly shown in Fig. 2, the spur gears 35 and 44 have clutch teeth 46 and 47 respectively formed on their inner faces, while splined at 48 to a shaft 49 is a jaw clutch member 50 having sockets 51 adapted to selectively receive the teeth 46 and 47. The shaft 49 is disposed coaxially with and extends through the hollow shaft 31 and is journaled in bearings 52. Cooperating with the clutch member 50 is a suitable shipper member 53 having an operating lever (not shown) conveniently located at the side of the machine. As illustrated, fixed by keys 54 to the ends of the shaft 49 are chain sprockets 55 engaging endless chains 56 housed within hollow parallel supporting arms 57 on the outer end of which the toothed roller 5 is mounted. The chains 56 engage sprockets 58 rotatably mounted on the supporting arms 57. These chain sprockets 58 have secured thereto and rotatable therewith chain sprockets 59 connected through endless chain connections 60 with chain sprockets 61, the latter being suitably fixed to each end of the roll or drum 62 of the toothed roller 5. It is accordingly evident that when the friction clutch 17, 18 is applied and when the clutch member 50 is suitably connected, the toothed roller 5 may be connected in driving relation with the motor 9 to rotate in one direction or the other as desired. In this instance the roller 5 rotates at the same speed in both directions, but it is obvious that the speed of roller rotation may be varied, it being desirable under certain conditions to rotate the roller at a higher speed in one direction than in the other.

The mechanism for swinging the toothed roller 5 comprises a clutch housing 65 (see Fig. 2) fixed by a key and set screw 66 to the shaft 15. The clutch housing 65 carries a series of clutch plates 67 which are interleaved with a corresponding series of clutch plates 68 carried by a clutch member 69 threadedly connected to a sleeve 70 surrounding the shaft 15 and rotatably mounted thereon. Mounted on the sleeve 70 and slidable axially relative thereto is a clutch applying member 71 with which a pivoted shipper yoke 72 cooperates. The yoke 72 has suitable operating means including an operable lever 73. The sleeve 72 has fixed thereto at 74 a spur gear 75 meshing with a large spur gear 76 journaled at 77 on the shaft 49 and having secured thereto a chain sprocket 78. As illustrated, the sprocket 78 is connected through an endless chain connection 79 to a chain sprocket 80 suitably fixed to a horizontally disposed shaft 81 extending transversely of the machine and supported on forwardly projecting brackets 82 suitably carried by the machine frame 1. The shaft 81 has suitably fixed thereto at the opposite ends thereof spur pinions 83 which mesh with the teeth of gear segments 84 suitably rigidly secured to the inner sides of the roller supporting arms 57. From the foregoing description it will be evident that when the clutch 67, 68 is applied, the toothed roller 5 may be swung by power upwardly or downwardly as desired. The machine frame 1 has housed therein a plural speed transmission mechanism driven from the rear end of the motor 9 and this mechanism is adapted to drive the traction treads 2 forwardly at a slow loading speed and at a fast forward moving speed, and also rearwardly at fast moving speed. The rear conveyor 8 is also driven from the rear end of the motor 9. As the driving connections for the traction treads 2 and the rear conveyor 8 are clearly described in my copending application, Serial No. 160,486, filed Jan. 11, 1927, and do not enter into this invention, further description of the same is herein considered unnecessary.

In the improved reversible roller construction the roll or drum 62 is traversed by a series of staggered openings or bores 85 which receive pins 86 each having at one end thereof a bifurcated eye portion 87. The other end of each of the pins is headed over as at 88 to rigidly secure the same to the roll. Pivotally mounted on the eye portion 87 of each of the pins is a tooth carrying block or tool holder 89. This block or tool holder has formed therein angularly disposed recesses which receive teeth or tools 90 and 91 of different length, these tools being rigidly held in the block by means of set screws 92. Formed on the inner side of the blocks are abutments or stops 93 and 94 having arcuate surfaces which are adapted to alternatively engage the periphery of the roll 62 when the block is swung into its different operative positions. Formed in the roll 62 and ar-

ranged parallel with the bores 85 are recesses 95 and disposed in each of these recesses is a coiled spring 96 engaging a bolt 97 pivotally connected at 98 to the block 89. These springs normally maintain the blocks in the position shown in Fig. 4.

In the operation of the improved loading machine, the latter is moved up to the working face at a high speed under the propulsion of the traction treads 2. When the working face is reached, the clutch 67, 68 is applied and the toothed roller 5 is thrown upwardly to the dotted line position shown in Fig. 1. The machine is then fed forwardly until the penetrating edge of the shovel 4 moves beneath the coal a sufficient distance. The operator then shifts the clutch member 50 into engagement with the clutch teeth 46 on the gear 35 and consequently the toothed roller 5 is rotated in a counterclockwise direction (see Figs. 1 and 5). Simultaneously the front conveyor 7 is rapidly circulated within its guides. The toothed roller 5 is then swung downwardly under the control of the friction clutch 67, 68, the rotating roller raking the loose coal downwardly and inwardly onto the shovel 4 where it is picked up and moved rearwardly by the front conveyor 7. As the teeth 91 engage the loose coal during the raking operation, the reaction of the same against the coal causes the blocks or tool holders 89 to swing outwardly to the position shown in Fig. 5, the abutments 93 limiting the outward swinging movement of the blocks. As the blocks swing outwardly, the springs 96 are compressed, and the teeth 90 move inwardly to the position shown in Fig. 5. By reason of the resilient mountings for the teeth 91 a yielding pulling action rather than a rigid chisel action is obtained and the coal is pulled down instead of being powdered. In instances where the coal at the face which has been undercut by the coal cutter is not shattered by the "shots" sufficiently to permit the toothed roller 5 to rake down the coal, the coal merely sagging by its own weight in large blocks or lumps to the mine floor, the operator throws out the clutch 17, 18 and shifts the clutch member 50 into engagement with the gear 44, and consequently the toothed roller is rotated in a reverse or clockwise direction (see Figs. 1 and 4). The toothed roller 5 is then lowered to the position indicated by full lines in Fig. 1 and the machine is fed forwardly at a slow speed, the toothed roller digging beneath the block of standing coal, breaking down the coal at the face and moving the coal in large lumps or blocks onto the shovel 4. During the undermining operation, the teeth 90 are active while the teeth 91 are held in their inoperative positions, as shown in Fig. 4, by the coiled springs 96, these springs holding the abutments 94 on the blocks or holders 89 against the roll 62; and as a result a more positive action with more powerful leverage is obtained at this time. It is obvious that if desired the toothed roller may be rotated in a counterclockwise direction as viewed in Fig. 1 during the undermining operation, and after the roller has been fed beneath the coal a suitable distance, the roller may be reversed to break down the coal onto the front conveyor 7. The roller 5 is not adapted to undercut the solid coal, but merely digs beneath the coal subsequent to the shooting of the coal from the solid. It is further obvious that during both directions of rotation the teeth not in use are moved inwardly out of the way and as a result all dragging action of the teeth on the coal is eliminated. Moreover, it will be evident that by providing the improved resilient mounting for the blocks it is possible to rake down the loose coal onto the gathering conveyor in an improved manner, the springs yielding upon engagement of the teeth 91 with the coal, and as a result, breakage of the coal is reduced to a minimum. These and other uses and advantages of the improved reversible roller will be clearly apparent to those skilled in this art.

While I have in this application specifically described one form which my invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a loading machine, material gathering means including a reversible toothed roller and resilient pivotal mountings for the teeth on said roller each including a pivoted holder carrying oppositely directed teeth.

2. In a loading machine, material gathering means including a reversible toothed roller, and resilient pivotal mountings for the teeth on said roller each including a pivoted holder carrying oppositely directed teeth and spring means acting on said holders.

3. In a loading machine, material gathering means including a reversible roller, and tooth holders pivotally mounted on said roller and each carrying oppositely directed teeth operating in a generally vertical direction, said tooth holders being adapted by engagement of the teeth with the work to swing about their pivots upon rotation of said roller in one direction to vary their effective operating position and having abutment elements engageable with the cylindrical surface of the roller in their two positions.

4. In a loading machine, material gathering means including a reversible roller, tooth holders pivotally mounted on said roller and each carrying oppositely directed teeth, and resilient means for maintaining said holders

in operative position during roller rotation in one direction.

5. In a loading machine, material gathering means including a reversible roller, tooth holders pivotally mounted on said roller and each carrying oppositely directed teeth, and resilient means for maintaining said holders in operative position during roller rotation in one direction, said resilient means being adapted to yield upon roller rotation in a reverse direction.

6. In a loading machine, material gathering means including a roller rotatable in opposite directions, teeth carried by said roller and operating in a generally vertical direction, and resilient mountings for said teeth whereby different teeth are operative to engage the material to be loaded during roller rotation in opposite directions.

7. In a loading machine, material gathering means including a roller rotatable in opposite directions, a plurality of members pivotally connected to said roller, and oppositely extending teeth carried by each member and operating in a generally vertical direction, said teeth being arranged on said pivoted members at different distances from their pivots and certain of said teeth being operative to engage the material to be loaded during roller rotation in one direction while other teeth are operative during reverse rotation of said roller.

8. In a loading machine, material gathering means including a reversible roller having teeth operating in a generally vertical direction and pivotal mountings for said teeth, said teeth being arranged on said mountings at different distances from their pivots and said mountings being adapted to swing about their pivots to bring different teeth into engagement with the material to be loaded upon roller rotation in opposite directions.

9. In a loading machine, material gathering means including a reversible toothed roller, teeth therefor operating in a generally vertical direction, and pivotal mountings for the teeth on said roller and having tooth carrying arms of different lengths, certain of said teeth being adapted by engagement thereof with the work to swing outwardly away from said roller upon rotation of said roller in one direction.

10. In a loading machine, material gathering means including a reversible toothed roller, and pivotal mountings for the teeth on said roller, certain of said teeth being adapted by engagement thereof with the work to swing outwardly away from said roller upon rotation of said roller in one direction while said teeth are disposed inwardly toward said roller upon rotation of said roller in the reverse direction, and resilient means for maintaining said mountings in said latter position.

11. In a loading machine, material gathering means including a reversible roller, and tool holders having a plurality of operating positions and each carrying reversely positioned tools operating in a generally vertical direction, said holders being adjustably mounted on said roller and movable into one or the other of their operating positions automatically in accordance with the direction of roller rotation to render operative different tools upon engagement of the tools with the work, certain of said tools moving about the axis of said roller in an orbit substantially larger than the orbit of the other tools upon engagement of the latter with the material.

12. In a loading machine, material gathering means including a reversible roller, tools therefor operating in a generally vertical direction, and tool holders having a plurality of operating positions and pivotally mounted on said roller for movement automatically by engagement of the tools with the work in one or the other of their operating positions to change the operating position of the tools in accordance with the direction of roller rotation, certain of said tools moving about the axis of said roller when said holders are in one position in an orbit substantially larger than the orbit of the other tools when said holders are in their other position upon engagement of the latter tools with the material.

13. In a loading machine, material gathering means comprising a reversible roller, tools therefor, and resiliently mounted pivoted tool holders on said roller swingable about their pivots upon engagement of the tools with the work automatically in accordance with the direction of roller rotation to render operative different tools.

14. In a loading machine, material gathering means comprising a reversible reversely toothed roller, and resilient pivotal mountings for the teeth on said roller whereby different sets of teeth by engagement thereof with the work are rendered automatically active in accordance with the direction of roller rotation.

15. In a loading machine, material gathering means comprising a material engaging element movable in an orbit about a substantially horizontal line, actuating means therefor, and means for resiliently supporting said element by said actuating means.

16. In a loading machine, material gathering means including a material engaging element, means for supporting said element for movement in a generally vertical direction, and means whereby said element is adapted to engage material with a movement outwardly toward the material, said means normally tending to hold said element in its innermost position.

17. The combination set forth in claim 16 further characterized in that the means whereby said material engaging element is

movable outwardly toward the material includes a resilient mounting.

18. In a loading machine, material gathering mechanism including material engaging means, and means for supporting and actuating said engaging means for movement in either direction in a closed path about a substantially horizontal line, said latter means having a spring mounting whereby said material engaging means is adapted to have forward movement toward the material and away from said line during the forward and downward movement thereof.

19. In a loading machine, material gathering mechanism comprising actuating means, and material engaging means driven thereby and adapted, when actuated in one direction and upon engagement with the material, to have movement in a non-circular closed path about a substantially horizontal line, and to have a different closed path of movement while remaining in operative engagement with the material upon reversed operation.

20. In a loading machine, material gathering means including a roller, tools thereon operating in parallel vertical planes along the length of said roller, pivotal mountings on said roller having arms of different lengths for receiving said tools whereby upon rotation of said roller in one direction one set of tools is rendered operative to engage the material, while upon rotation of said roller in the opposite direction the other set of tools engages the material, and motor operated devices for effecting rotation of said roller in either of opposite directions.

21. In a loading machine, material gathering means including a roller, tools thereon operating in a generally vertical direction in closed orbits, and adjustable mountings for the tools on said roller whereby automatically one set of tools upon engagement of the material during rotation of said roller in one direction move in orbits of one size and upon rotation of said roller in the reverse direction the other set of tools upon engagement with the material move in orbits of a different size.

22. In a loading machine, material gathering mechanism including a rotary gathering device having material engaging means moving in a generally vertical direction, and an adjustable mounting on said gathering device for said material engaging means whereby automatically said material engaging means upon engagement with the material moves in an orbit, and upon reversal of said gathering device said material engaging means upon engagement with the material moves in a different orbit.

23. In a loading machine, material gathering means including a rotary gathering device disposed on a substantially horizontal axis, material engaging means including oppositely directed material engaging elements arranged at different distances from the center of the rotary device and moving in a generally vertical direction, and adjustable mountings for said material engaging elements whereby automatically upon rotation of said gathering device in one direction one set of engaging elements is active to engage the material, while upon rotation of said gathering device in the reverse direction another set of material engaging elements is rendered active to engage the material.

In testimony whereof I affix my signature.

FRANK A. HALLECK.