H. B. NICHOLS.

GRINDING MACHINE.

APPLICATION FILED DEC. 22, 1910. RENEWED APR. 20, 1912.

1,035,131.

Patented Aug. 6, 1912.

7 SHEETS-SHEET 1.

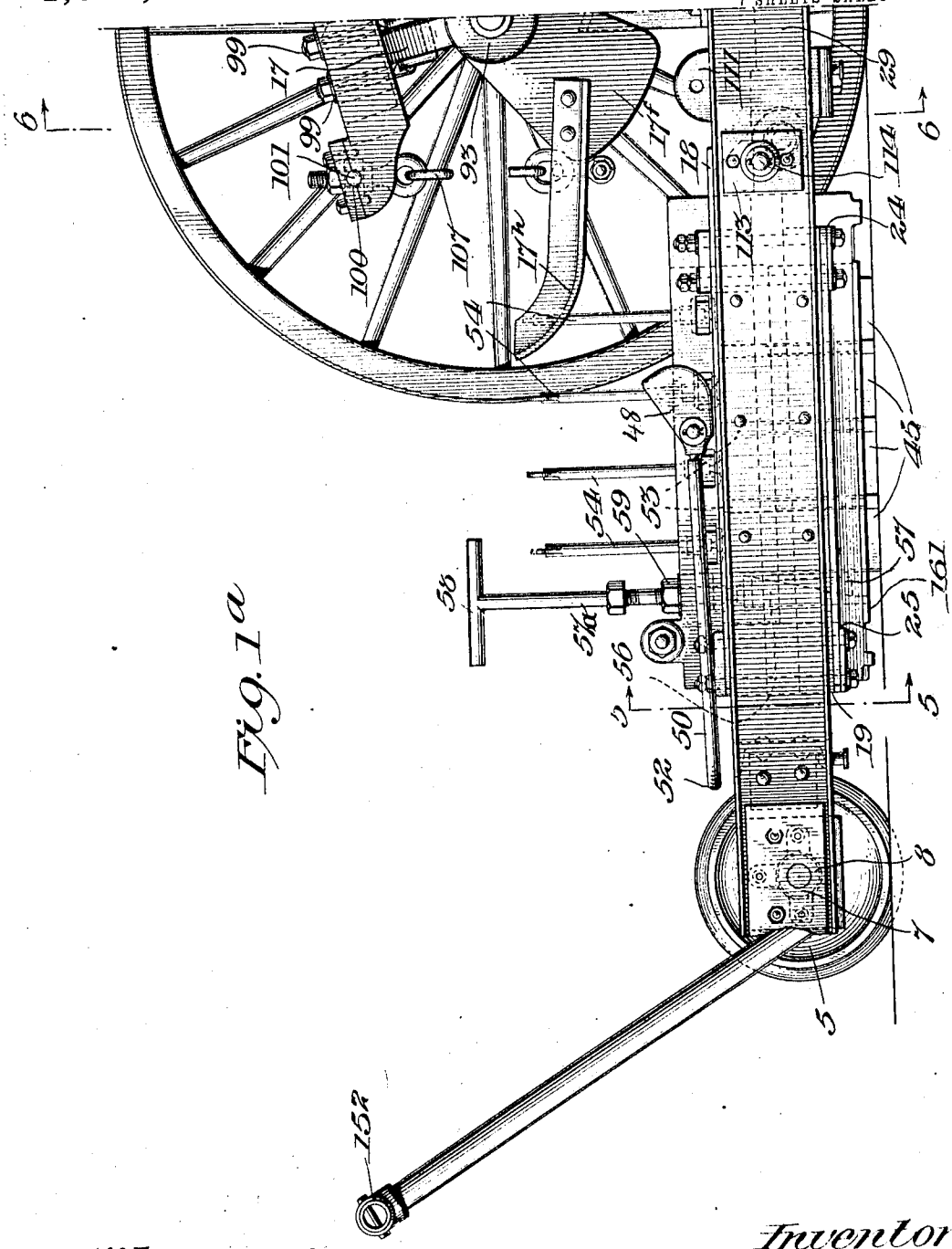

Fig. 1a

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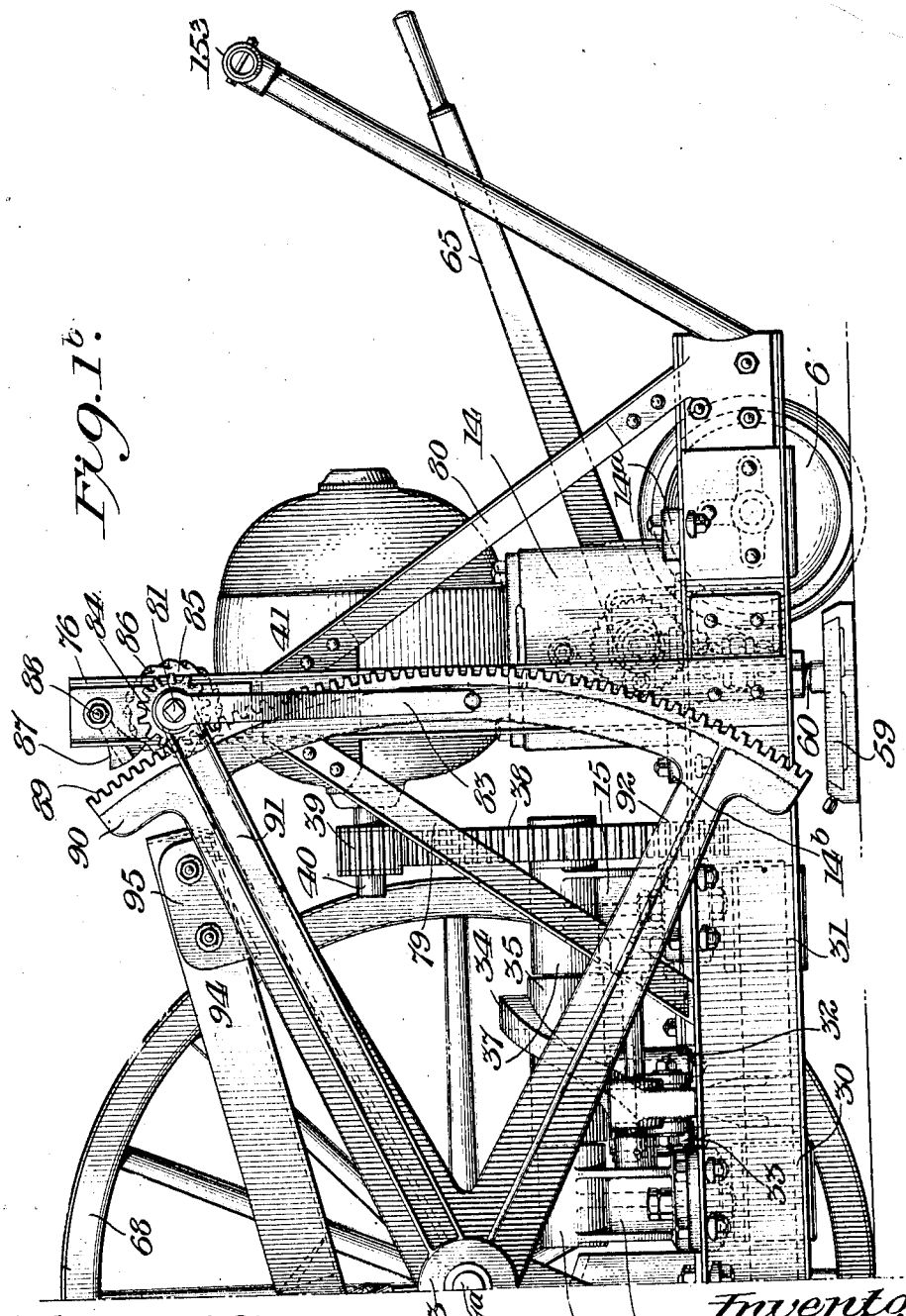
7 SHEETS—SHEET 2.

Fig. 1b.



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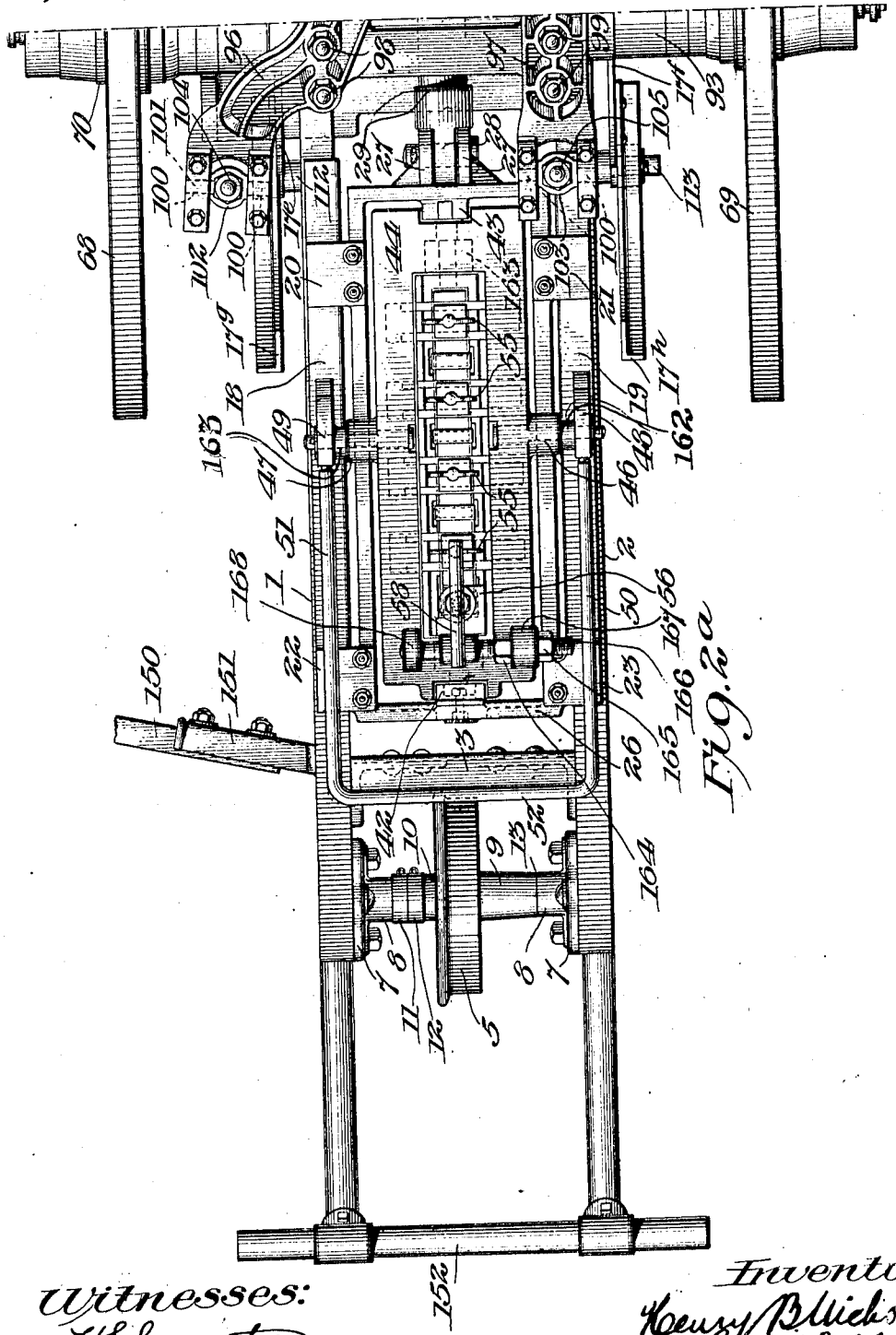

Fig. 2a

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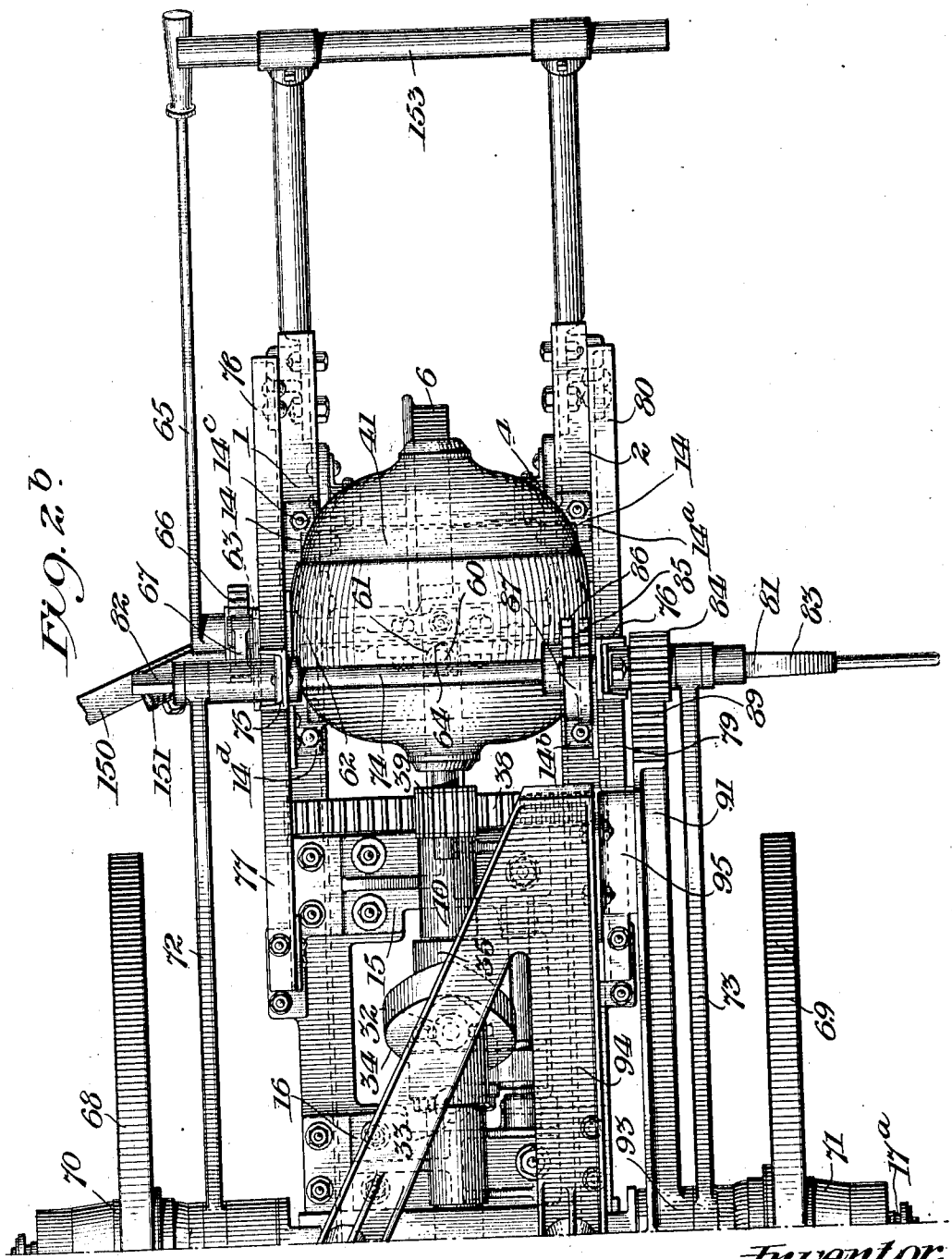
7 SHEETS—SHEET 4.

Fig. 2b.



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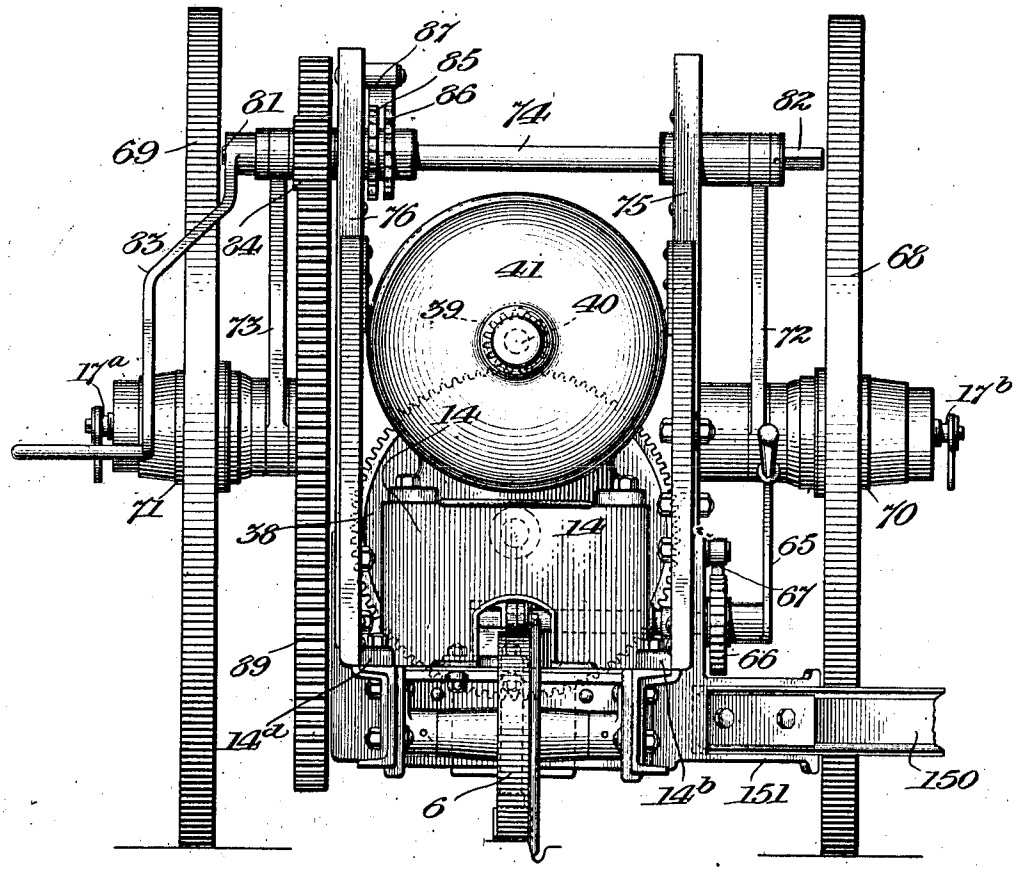
7 SHEETS—SHEET 5.

Fig. 3.



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7 SHEETS—SHEET 6.

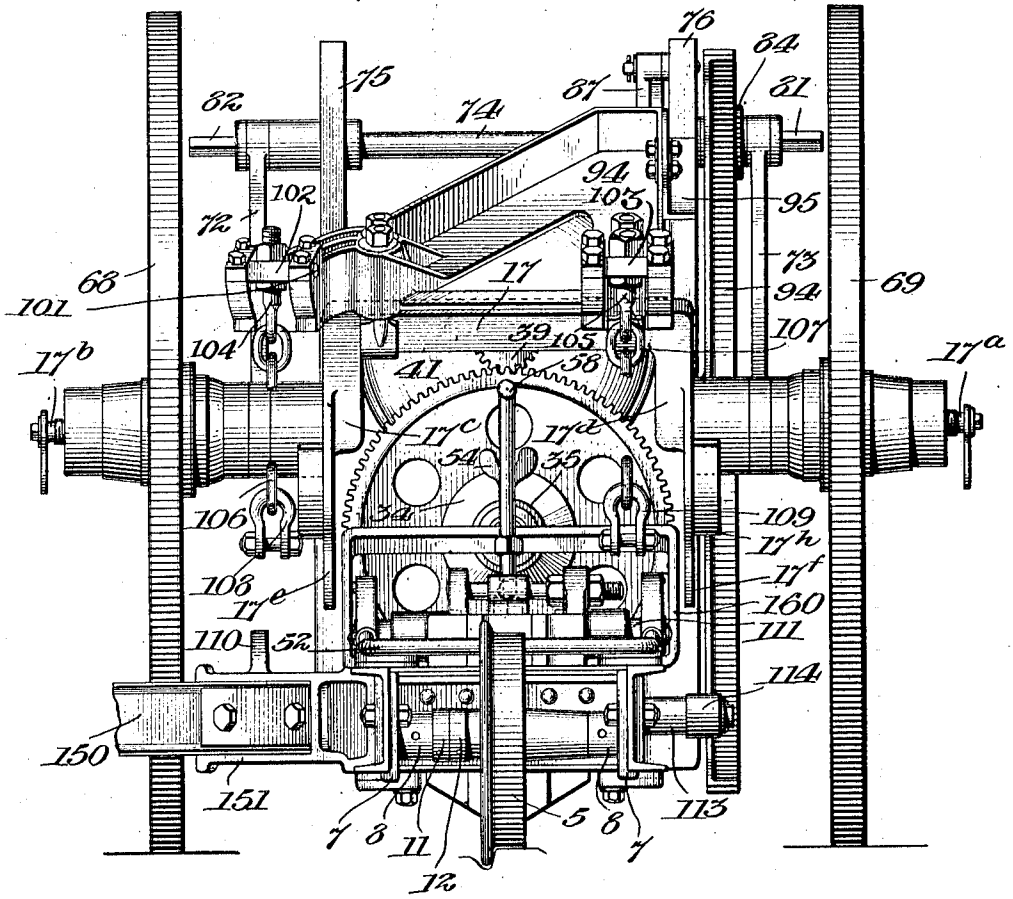

Fig. 4

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1,035,131. Patented Aug. 6, 1912.

7 SHEETS—SHEET 7.

Fig. 5

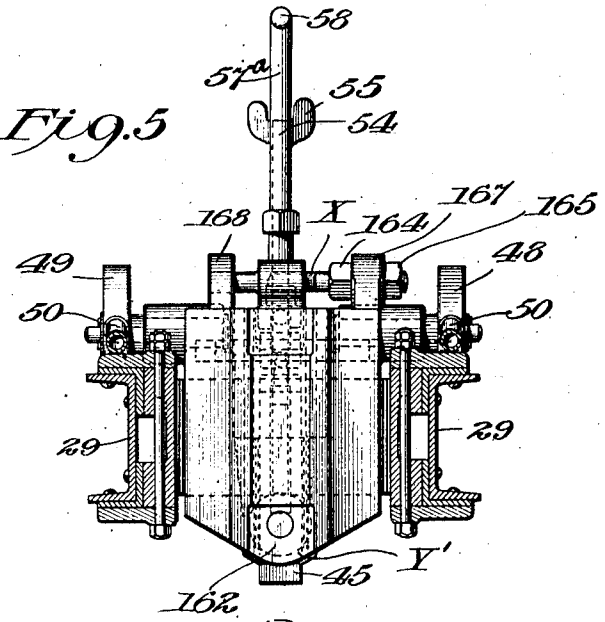
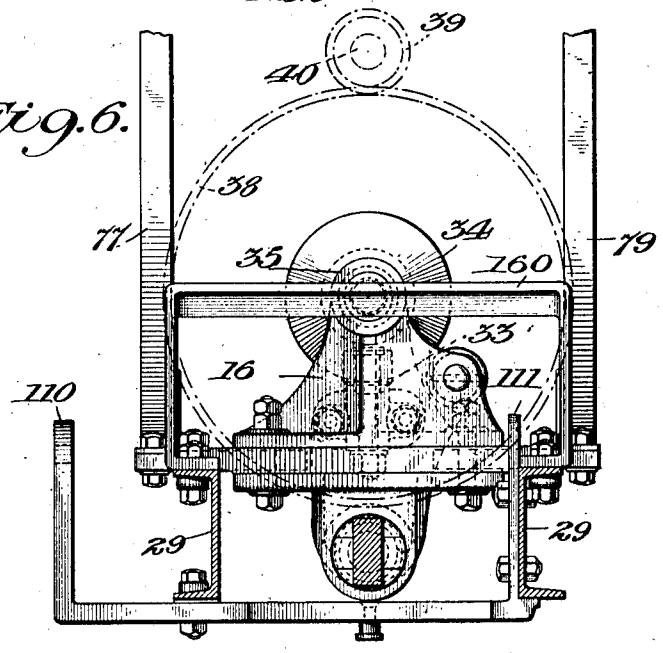


Fig. 6.



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UNITED STATES PATENT OFFICE.

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GRINDING-MACHINE.

1,035,131. Specification of Letters Patent. Patented Aug. 6, 1912.

Application filed December 22, 1910, Serial No. 598,840. Renewed April 20, 1912. Serial No. 692,211.

To all whom it may concern:

Be it known that I, HENRY B. NICHOLS, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Grinding-Machines, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to grinding machines and particularly to such machines as are used for grinding railway rails in place, and constitutes in effect an improvement over the machines for which Letters Patent of the United States were granted to me December 21, 1909, No. 944,147. The machine described in said Letters Patent comprises a truck frame carrying a motor and a reciprocating grinder driven by the motor through the medium of a cam drum and connecting rod. The grinding is accomplished by means of bricks set in a self-weighted holder, having vertical motion in slides on a carriage fitted for horizontal motion in the truck frame.

In the present case I shall describe and claim a machine of the same general type as that in the aforesaid Letters Patent, but differing therefrom in a number of important points.

It comprises a truck frame having tandem wheels, flanged to run upon the ordinary railway rail, and serving to aline the truck frame thereover, one or both adjustable laterally, for curves, a motor mounted on the frame, a jack shaft carrying a cam-drum and geared to the motor, a reciprocating carriage traveling on longitudinal slides in the frame and having a brick holder traveling on vertical slides in the carriage, a connecting rod with a pair of posts carrying friction rollers engaging the opposite sides of the rib or cam on the drum, means for raising and lowering the brick holder in the carriage, a track brake for anchoring the entire machine on the rails while grinding, and a pair of auxiliary wheels with means for raising and lowering the entire machine so that in a very few seconds its weight may be transferred from the tandem wheels to the auxiliary wheels, which are made with plain rims so as to run upon ordinary street paving, the flanged wheels being at the same time removed from the rails, and the machine thereby rendered free for progress in any desired direction. The importance of this last feature will be appreciated when it is reflected that the ordinary city schedule on a business street calls for the passage of cars at intervals of about two minutes, and that the intervals in night schedules are rarely more than fifteen minutes. Moreover it is on the busy lines that this machine is most needed, hence it is highly important that it should be made sufficiently mobile so that it may be quickly removed from the track to permit the passage of a car and as quickly replaced for the immediate resumption of grinding during the brief interval before the next car may be expected.

My invention is illustrated in the accompanying drawings in which—

Figures 1ª and 1ᵇ taken together constitute a side elevation of the complete machine. Figs. 2ª and 2ᵇ taken together constitute a plan view. Figs. 3 and 4 are opposite end views of the complete machine. Fig. 5 is a section on the line 5—5 of Fig. 1ª, and Fig. 6 is a section on the line 6—6 of Fig. 1ª, in both cases looking in the direction of the arrow heads.

Referring to the drawings, in the present case as in my patented machine above referred to, I employ a truck frame 1, 2, 3, 4, with tandem wheels 5 and 6, journaled between the ends of the side members 1—2. These tandem wheels are flanged to run upon the ordinary railway rail, and serve to aline the entire machine over the rail while it is being ground. The method of mounting these wheels involves some points of novelty as follows: On the inner face of each of the side channels 1 and 2, I bolt a base plate 7 carrying a projecting journal box 8, which may be merely a closed collar receiving the end of the stub axle, or a through-bolt extending through the steel hub and both bearings, and constituting a fixed axle for the wheel. In either case, the wheel has a hub projecting on opposite sides from its web as indicated at 9—10.

The projection 9 is long enough to engage the outer face of the bearing box 8 when the wheel is centered. The projection 10 however is cut off shorter, so as to leave the space between it and the box 8, which is filled by dropping into place one or more filling rings or distance blocks 11 and 12. These may be constructed in any suitable manner, but as I have employed them, they are simply disks of metal, each having a slot cut from one edge into the center of a width sufficient to fit over the axle or through-bolt. When it is desired to make lateral adjustment of the wheel, as for example in grinding around curves, one of these spacers or distance blocks is lifted off, the wheel and the other spacer pushed over, and the detached spacer dropped into the then open space 13 between the hub 9 and the box 8. Still greater displacement of the wheel can be secured by shifting both the spacers from one side to the other, and if more then two are employed, by shifting any desired number of them. While I have shown these spacers as of considerable thickness, it is quite evident that if desired they can be replaced by a number of thinner rings, even sheet metal punchings being possible of employment where very fine adjustments of the wheel are desired for any reason.

In my patent above referred to, the tandem wheels were mounted within the length of the frame, with an overhang at one or both ends. In fact, I therein described and claimed an extension of the frame forming guides for the grinding element. In the present case it will be observed I journal the wheels in the extreme ends outside of everything else. By so doing I gain several advantages. In the first place the alinement is better, in the second place resistance to lateral displacement by any force exerted between the wheels on the frame, is increased, in the third place the side channels 1 and 2 are made perfectly straight thereby gaining in rigidity, and are brought closer to the track throughout, and finally the wheels themselves and the bearings are rendered accessible for adjustment, repairs and replacement, when required.

The side members are connected by the end channels 3 and 4, secured in position by angle brackets riveted in place as usual. Intermediate of these end pieces, the frame is connected at several other points by bridges carrying the motor, the bearings for the cam shaft and the axle of the side wheels. These are designated as 14, 15, 16 and 17 respectively. These bridges all tend to stiffen the frame, beside subserving their several individual functions. In proximity to the wheel 5, the upper and lower flanges of each of the side members are provided with smooth slides 18 and 19, upon which rest the guides 20, 21, 22, 23, 24, 25 and two others not shown, attached to the carriage 26, which forms the reciprocating element of the machine and has at one end a pair of ears 27 to receive the pivotal end 28 of the connecting rod 29, which is journaled to reciprocate in bearings 30 and 31 beneath the bridges 15 and 16, and which carries a pair of studs carrying vertical friction rollers 32 and 33 engaging opposite sides of the male cam rib 34 on the cam drum 35 which is carried on a rotary spindle journaled in bearings 36 and 37 cast on the bridges 16 and 15 respectively, these bearings being preferably ball bearings. On the end of the cam spindle or shaft is secured a gear wheel 38, meshing with a pinion 39 preferably of raw hide to reduce the noise of operation as much as possible. This pinion is secured on the shaft 40 of the motor 41, bolted to the cast box or bridge 14, which in turn is bolted by means of lugs 14^a and 14^b, 14^c and 14^d, to the top flanges of the side channels 2 and 1.

Returning to the reciprocating carriage 26, this is fitted with vertical end slides 42 and 43, which enter guide slots formed vertically in the ends of a heavy block or brick holder 44. This block is an iron casting and is purposely made massive so as to exert heavy pressure upon the grinding surface in operation. It is free to slide up and down in the carriage, its weight being normally supported entirely on the grinding bricks 45 as they rest upon the rail. In order to raise it out of engagement with the rail when the machine is to be moved or for purposes of inspection, the brick holder is provided with trunnions 46 and 47, upon which are pivoted a pair of cams 48 and 49, secured to and operated by a pair of connected levers 50 and 51, whose return bar or handle 52 constitutes in effect a bail which normally lies flat as shown in Fig. 1^a, across the top of the end piece 3 of the frame, where it is entirely out of the way. On lifting up the bail however, the cams 48 and 49 are turned upon the trunnions 46 and 47, and lift the block 44 together with the grinding bricks and other attachments thereon, and when the bail is thrown over past center, the cam rests on its reverse face, so that the block will be held up automatically as long as desired.

The block 44 is cast with a rectangular opening extending through it from top to bottom, and an enlarged opening or a longitudinally pivoted swinging brass box containing openings extending into it from beneath for the reception of the grinding bricks 45. These bricks are spaced apart by shims or distance pieces 53, are adjustable by and receive pressure through wing bolts 54 threaded into bridges 55; and they are all locked into position when adjusted by

means of a movable wedge 56 coöperating with a fixed wedge 57, between the end brick and the inner face of the end of the holder, the movable wedge being forced down into locking position by the bolt 57ª having a T-handle 58 and lock-nut 59.

The motor 41 is of the inclosed type, and is supplied with current through flexible conductors which may conveniently be brought into connection with a trolley wire by means of a hand pole or the like. The motor controller and switch may conveniently be housed within the box or bridge 14 but as it forms no direct part of the present invention I have not deemed it necessary to illustrate it.

While the machine is in operation, it is sometimes desirable to anchor the truck upon the rails, for which purpose I provide the track brake 59. This brake is supported on a vertical stem 60, sliding in central bearings 61 in a bridge 62 extending across and bolted to the side members 1 and 2. Across transversely from side to side of the frame is a brake shaft 63, carrying a short crank arm 64 pivotally secured to the top of the brake step 60. On its projecting end outside the frame, the shaft 63 carries a lever 65 by means of which the brake can be controlled, and a ratchet and pawl 66 and 67 for holding the same set during grinding when desired.

The brass box or frame containing the bricks is indicated at 161 in Fig. 1ª, and is pivoted on massive trunnions shown at 162 and 163 in Fig. 2ª, in bearings in the block 44. It is canted for oblique grinding, by means of the two nuts 164 and 165 threaded on a bolt 166 passing through the bosses 167 and 168. The bricks can thus be set at any angle, as the frame is rocked on its trunnions. This canting mechanism, is not however, claimed in this application, being made the subject of a divisional application, Serial No. 668,323 filed December 28, 1911.

It remains to describe the means for removing my machine from the track and for transporting it from place to place. These means are the large wheel 68 and 69, constructed of wood by preference, and journaled on opposite ends of the bent axle 17 (Fig. 4). The construction and arrangement of this axle and its coöperating parts constitute an important feature of my invention. The axle itself may be a steel forging casting or in one piece, or it may be made with the central bridge 17 and the two end members or spindles (which in effect they are), separate pieces bolted together. The spindles receive not only the hubs 70 and 71 of the wheels 68 and 69, but also the bearing ends of a pair of links 72 and 73, which at their opposite ends have eyes through which pass the opposite ends of a transverse shaft 74 journaled in bearings in two upright channels 75 and 76, which are riveted to the side members 1 and 2 of the frame and supported by opposite diagonal braces 77, 78, 79 and 80. At one end, 81, the shaft 74 is squared to receive the crank 83, and may be so squared also at the other end 82, as shown in Figs. 2ᵇ and 3. Near the end 81 a pinion 84 is rigidly secured upon the shaft, outside of the vertical post 76, and inside of said post it carries a pair of ratchet wheels 85 and 86 with oppositely inclined teeth, adapted to be engaged alternately by one or the other edge of a double nosed pawl 87 pivoted at 88 on the post 76, so that it can be swung either way. This ratchet and pawl mechanism enables the shaft 74 to be locked against rotation in either direction at will, for a purpose to be presently described.

The pinion 84 meshes with the teeth 89 of an arc-shaped rack on the heavy cast segment 90. This segment has a pair of radial arms 91 and 92 converging to an integral hub 93 journaled on one end of the axle 17, between the frame and the link 73. It will be observed that the toothed segment 90 and the wheels 68 and 69 have a common axis which by means of the links 72, 73 is always maintained at the same fixed distance from and in parallelism with the shaft 74.

Mounted longitudinally above the frame of the machine is the heavy flanged jack lever 94, formed in V shape, with its pointed end bolted to a projecting flange 95 on the arm 91, and with its divergent ends or legs 96 and 97 extending across and bolted to the upper or bridge portion of the axle 17, as indicated at 98 and 99 in Figs. 1ª and 2ª. Each end is bifurcated and provided with bearings 100 for gudgeons 101 on the swivel-heads 102 and 103, carrying eye-bolts 104 and 105, from which depend the chains 106 and 107. At their lower ends these chains carry clevises 108 and 109, by which they are attached to ears 110 and 111 on the side members 1 and 2 of the frame. The ear 110 shows in Fig. 4, and the ear 111 in Fig. 1ª, but in the other figures one or both of these are partly obscured by other portions of the mechanism.

The bent axle 17 is best shown in Fig. 4, and in said figure it will be observed that the two right angle members 17ᵉ and 17ᵈ have formed upon them extended flanges 17ᵉ and 17ᶠ, the latter appearing in side elevation in Fig. 1ª, and both flanges or plates appearing in plan in Fig. 2ª. Riveted to these two plates are curved and flanged bearing shoes 17ᵍ and 17ʰ, which coöperate under certain conditions with the lateral projecting studs 112 and 113, secured on base plates bolted to the side channels 1 and 2. To prevent undue friction between

each shoe and its stud, I use loose collars or friction rollers 114, only one of which is shown, in Fig. 4.

The operation of my machine thus described is as follows:

(1.) For normal grinding on a straight rail, the machine stands as shown in Figs. 1 and 2, it being specially noted however that the arc 90 by which the lifting jack is worked should be in a reversed position, that is to say in such position that the chains 106 and 107 will be slack enough to permit the full weight of the machine to rest upon the flanged track wheels 5 and 6 and the auxiliary wheels will be lifted clear of the pavement. The brake 59 is set firmly against the track rail by lifting up on the lever 65. The bricks 45, having been vertically adjusted so that all make fair and even contacts with the rail surface while the wedge 56 is loose, are locked by turning the T-handle 58. The motor 41 being then started, the cam drum 35 is rotated by power communicated to its shaft through the gears 38 and 39, and the shaft 29 is reciprocated by the continuous travel of the friction rollers on their studs, 32 and 33, on opposite surfaces of the cam rib 34. The reciprocation of the shaft 29 produces a corresponding movement of the carriage 26, and thereby of the entire grinding element, the slides 20, 21, 22 and 23 working back and forth on the ways 18 and 19, and the bricks rubbing over the surface of the rail under pressure due to their own weight and the weight of the holder 44 resting upon them. As the friction between the bricks and the rail tends to move the machine even against the resistance of the track brake, I have found it advantageous to increase the total inertia by adding the weight of the wheels 68 and 69 to that of the body of the machine, throwing over the pivoted pawl 87 to engage the ratchet 85, and then turning the crank 83 in a clockwise direction to throw up the segment 90 until the shoes 17^g and 17^h strike their studs 112 and 113, after which continued turning of the crank will lift the axle and the wheels on the studs as fulcra, the axle being constrained by the links 72 and 73 to rotate upwardly around the shaft 74, and the shoes 17^g and 17^h sliding on the studs. Thus, with the arc 90 raised into its uppermost position, so that its lower end is in proximity to the gear 84, the ends of the shoes 17^g and 17^h will rest upon the studs, while the weight of the wheels, the axle, and all the connected parts, will be superimposed on the frame of the truck through the media of studs 112 and 113 and posts 75 and 76. The forked ends of the jack lever are lowered into proximity with the frame members 1 and 2, and the chains 106 and 107 hang down in slack loops. To maintain the equilibrium of the machine when thus unsupported by the large wheels 68 and 69, I provide an outrigger similar to that disclosed in my Patent No. 944,147, hereinbefore referred to. This is not shown in full in the present drawings, as its construction and mode of operation will be fully understood after reading the patent, but in Figs. 2^a, 2^b, 3 and 4 I have shown the ends of the outrigger frame at 150, bolted to short projecting channels 151 secured to the side channel 1 of the truck. The outrigger may thus be detached for packing or storing, while the channel sockets 151 maintain it in proper alinement when in use.

(2.) When about to remove the machine from the track, the brick holder 44 is raised on its slides in the carriage 26 by throwing up the bail 52 and thereby turning down the cams 48 and 49.

(3.) For removing the machine from the track, or for transporting it from place to place, the brake is released, the pawl 87 is reversed (the crank 83 being firmly held in so doing), and the crank handle rotated in a counter-clockwise direction. This lowers the arc 90 and therefore the axle 17 until the wheels 68 and 69 strike the ground, after which continued rotation of the crank handle and falling of the segment 90 raises the shoes 17^g and 17^h clear of their studs, and elevates the forked ends of the jack lever 94 until the chains 106 and 107 are taut and lift the weight of the entire machine, including the outrigger, from the rails, transferring it through the lever 94 to the axle 17 and the large wheels 68 and 69. This condition is reached with the segment 90 in substantially the position shown in Fig. 1^b, and the entire device becomes in effect a two-wheeled loaded truck with handle bars 152 and 153 at its opposite ends, for moving it in any direction desired. As already stated, I preferably throw up the bail 52 and lift the bricks and their holder out of their grinding position when about to move the machine.

(4.) For grinding curves, the machine is placed in position the same as for straight rail grinding, but the wheels 5 and 6 may be shifted by removing the spacing rings 11 and 12 and replacing them on the opposite sides of the hubs. When suspended on wheels 68—69 for transportation, the cheek plates 17^e and 17^f engage opposite sides of the frame 160 (Figs. 4 and 6) and prevent lateral oscillation.

In closing this specification, two important features should be pointed out, which are the size and general arrangement of the large side wheels, and the balanced suspension of the machine therefrom during transportation. It is necessary in practice that the wheels used for transportation should have a diameter much greater than

that of the ordinary track wheels for the reason that the weight of the machine would render it impossible to carry it on small wheels over the inequalities in ordinary pavement or roadway surface without the expenditure of a very large amount of power and the practical certainty of wrecking the machine. The balanced suspension, which is attained in the present case by the use of chains secured to properly located eye-bolts on the frame, is also necessary, because without this some other means would have to be provided for supporting a portion of the weight in transportation. For example, if a rigid support were employed by means of levers or the like, the center of gravity would shift out of the line of support with every change in the inclination of travel, not only in ascending or descending grades, but in passing over slight obstacles or depressions. Consequently the support would never be perfect and complete, and the difficulties met would be fully as great as those flowing from the use of small wheels. It will be observed that with the flexible suspension herein described, a perfect balance and complete support are always obtained during transportation, regardless of changes in grade or directions in travel, the weight of the machine adjusting itself fore and aft with respect to the axle, and undue strains being prevented by the lateral bearing faces on the frame and the coöperating projections on the axle. By the flexible suspension the present machine is very easily adjusted on the track rails when it is lowered for grinding.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. A rail grinding machine comprising a truck frame, a grinding element, flanged wheels on the frame adapted to support the same over the rail to be ground, auxiliary wheels, hoisting means for vertically shifting the weight of the machine from the flanged wheels to the auxiliary wheels while the latter remains stationary, means for applying power in multiplied ratio to said hoisting means, and means for maintaining the weight in its shifted relation.

2. A rail grinding machine comprising a truck frame, a grinding element, flanged wheels on the frame adapted to support the same over the rail to be ground, auxiliary wheels, hoisting means for vertically shifting the weight of the machine from the flanged wheels to the auxiliary wheels while the latter remains stationary, multiplying gears adapted to apply power in an increased ratio to said hoisting means, and a locking device to prevent retrograde movement thereof.

3. A rail grinding machine comprising a truck frame, a grinding element, track wheels on the frame adapted to support the grinding element over the rail to be ground, auxiliary wheels, an axle for said wheels overlying the truck frame, means connected with said axle for lifting the truck frame, and means on said frame for lifting the axle, together with means for applying power to the axle in one direction to lift the truck frame, and in a different direction to lower the frame and lift the wheels.

4. A rail grinding machine comprising a truck frame, a grinding element, track wheels on the frame adapted to support the grinding element over the rail to be ground, auxiliary wheels, an axle for said wheels overlying the truck frame, means connected with said axle for lifting the truck frame, a bearing on the frame adapted to take the thrust of the axle, and means to apply power to the axle in one direction to remove its thrust from said bearing and lift the frame, and to apply power to the axle in a different direction to lower the frame and engage the frame bearing to lift the axle and its wheels.

5. A rail grinding machine comprising a truck frame, a grinding element, track wheels on the frame adapted to support the grinding element over the rail to be ground, auxiliary wheels, an axle for said wheels, guides for said axle secured to the frame, a lifting connection between the axle and the frame, and means for applying power to turn the axle in one direction to lower the axle on the guides and lift the frame, and in the other direction to lower the frame and lift the axle and wheels on the guides.

6. A rail grinding machine comprising a truck frame, a grinding element, track wheels on the frame adapted to support the grinding element over the rail to be ground, auxiliary wheels, an axle for said wheels, guides for said axle secured to the frame, a lifting connection between the axle and the frame, a power shaft, and gearing connecting the same to the axle to turn said axle in one direction to lower it on the guides and lift the frame, and in the other direction to lower the frame and lift the axle and wheels on the guides.

7. A rail grinding machine comprising a truck frame, a grinding element, track wheels on the frame adapted to support the same over the rail to be ground, auxiliary wheels, an axle for said wheels overlying the truck frame, a jack lever secured to said axle, and a connection from one end of said jack lever to the truck frame, whereby the application of power to the other end of said lever will transfer the weight of the machine from the track wheels to the auxiliary wheels.

8. A rail grinding machine comprising a truck frame, a grinding element, track wheels on the frame adapted to support the same over the rail to be ground, auxiliary

wheels, an axle for said wheels overlying the truck frame, a jack lever secured to said axle, a connection from one end of said jack lever to the truck frame, means for applying power to the other end of said lever to lift the machine clear of the track, and means for maintaining the same in lifted position, with its weight supported on the auxiliary wheels.

9. A rail grinding machine comprising a truck frame, a grinding element, track wheels on the frame adapted to support the same over the rail to be ground, auxiliary wheels, an axle for said wheels overlying the truck frame, a jack lever secured to said axle, a connection from one end of said jack lever to the truck frame, a gear member secured to the other end of said lever, and a pinion meshing therewith carried on the frame, with means to turn said pinion so as to force down the jack lever and lift the machine clear of the track rail.

10. A rail grinding machine comprising a truck frame, a grinding element, track wheels on the frame adapted to support the same over the rail to be ground, auxiliary wheels, an axle for said wheels overlying the truck frame, a jack lever secured to said axle, a connection from one end of said jack lever to the truck frame, a segmental gear secured to the other end of said lever, a pinion intermeshing therewith journaled in bearings on the truck frame, means for applying power to said pinion, and a pawl and ratchet detent connected to the pinion to prevent reverse rotation thereof.

11. A rail grinding machine comprising a truck frame, a grinding element, means to support the frame with the grinding element in working proximity to a rail to be ground, auxiliary means carried by the truck for transportation, and means to balance the entire weight of the machine on said auxiliary means at will.

12. A rail grinding machine comprising a truck frame, a grinding element at one end thereof, driving mechanism and lifting mechanism carried near the other end thereof, and a track brake acting against the weight of said mechanism as well as that of the frame.

13. A rail grinding machine comprising a truck frame, a grinding element, track wheels on the frame adapted to support the grinding element over the rail to be ground, auxiliary wheels, an axle for said wheels overlying the truck frame, a jack lever secured to said axle, a link connection from one end of said lever to the frame for lifting the latter, a bearing on the frame for the same end of the lever, and means for applying power to the other end of the lever in either direction, toward or away from the frame, whereby the machine may be lifted from the rail and supported on the auxiliary wheels or the auxiliary wheels may be lifted from the ground and supported on the truck, at will.

14. A rail grinding machine comprising a truck frame, a grinding element, track wheels adapted to support the grinding element over the rail to be ground, auxiliary wheels for transportation, a jack lever connected to the auxiliary wheels, bearing shoes connected to the end of said jack lever, a bearing for each shoe on the frame, a segmental gear on the other end of the lever, a pinion on the frame intermeshing with said gear, and means to apply power to said pinion to raise the auxiliary wheels and superimpose their weight on the truck.

15. A rail grinding machine comprising a truck frame, a grinding element, track wheels adapted to support the grinding element over the rail to be ground, auxiliary wheels, an arched axle therefor overlying the frame, a jack lever connected to said axle above the arch, a link connection between one end of said lever and the frame for lifting the latter, a pair of bearing shoes secured to the axle and the same end of the lever and constituting continuations thereof, bearings for said shoes on the frame constituting fulcra for the lever for lifting the axle and wheels, a segmental gear on the opposite end of the lever, a pinion intermeshing therewith journaled in bearings on the frame, means for applying power to rotate said pinion, a double ratchet wheel with oppositely pointed teeth connected to the pinion, and a reversible double nosed pawl adapted to engage with either ratchet, whereby the application of power in opposite directions may be caused to either raise the machine from the rail and hold it suspended on the auxiliary wheels, or raise the auxiliary wheels and hold them suspended on the truck frame, as desired.

16. A grinding machine for railway rails comprising a truck frame, a grinding element, a pair of tandem wheels adapted to support the grinding element over the rail to be ground, an outrigger to maintain the machine in upright position while grinding, and a pair of auxiliary wheels on opposite sides of the truck, with means for lifting the entire machine and suspending it from the auxiliary wheels.

17. A grinding machine comprising a truck frame, a grinding element, and laterally adjustable track wheels adapted to support the frame over the rail to be ground, with means to positively hold the same when adjusted.

18. A grinding machine comprising a truck frame, a grinding element, and track wheels on opposite ends of the frame, with detachable distance pieces or washers between the hubs of the wheels and the side bearings in the frame.

19. The combination of a frame, bearings fixed thereon, an axle journaled in said bearings, a wheel secured to rotate on said axle, bearing faces on the frame parts on either side of the wheel, and adjustable distance pieces therebetween.

20. A grinding machine comprising a wheeled truck frame adapted when grinding a curve to form a chord of the arc, a grinding element on the frame, and means for alining the same over the rail comprising a laterally adjustable track wheel on the frame, together with means to positively hold the same when adjusted.

21. A portable grinding machine having a frame, a grinding element and working supports thereon, auxiliary wheels for transportation, means for suspending the frame from said wheels, and means carried by the wheels to prevent swaying the machine while suspended.

22. A portable grinding machine having a frame, a grinding element and working supports thereon, auxiliary wheels for transportation, means for suspending the frame from said wheels, and a pair of projections on the axle of the wheels engaging opposite bearing faces on the frame of the machine to prevent swaying thereof while suspended.

23. A rail grinding machine comprising a frame, a grinding element, means for supporting the frame with the grinding element in working position over the rail, wheels adapted to carry the entire weight of the machine, and means to suspend the machine from said wheels for purposes of transportation.

24. A rail grinding machine comprising a frame, a grinding element, means for supporting the frame with the grinding element in working position over the rail, wheels adapted to carry the entire weight of the machine, and flexible means to suspend the machine from said wheels for purposes of transportation.

25. A rail grinding machine comprising a frame, a grinding element, means for supporting the frame with the grinding element in working position over the rail, wheels adapted to carry the entire weight of the machine, flexible suspension means attached to said wheels and to the frame, and means to apply power to raise the machine so that it will hang freely from the wheels during transportation.

26. A grinding machine comprising a frame, track wheels arranged for longitudinal travel along the rails, a pair of auxiliary wheels, a pair of lever arms each having a pivotal connection to the frame and each extending from one of said wheels to a common point in proximity to the frame, and means to apply power from the frame to said lever arms at said common point to force down said wheels and lift the weight of the machine thereon.

27. A grinding machine comprising a truck frame, track wheels and a grinding element thereon, a plurality of auxiliary wheels pivotally connected to the frame and adapted to be raised and lowered thereon, and means carried on the frame common to said wheels, connected thereto and adapted to apply power so as to force down the wheels and lift the frame thereon for purposes of transportation.

28. A grinding machine comprising a truck frame, track wheels, a grinding element and means to drive the same, a lever pivoted on the frame, and auxiliary wheels controlled by said lever, together with means for applying power to the lever to lift the truck frame upon the auxiliary means for transverse travel.

29. A rail grinding machine comprising a truck frame, a grinding element, track wheels on the frame adapted to support the same over the rail to be ground, auxiliary wheels, an axle therefor, a lever secured to said axle, a connection from one end of said lever to the truck frame, means for applying power to the other end of said lever to lift the machine clear of the track, by superposing its weight upon the auxiliary wheels, and means for maintaining the machine in lifted position with its weight supported on the auxiliary wheels.

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

HENRY B. NICHOLS.

Witnesses:
JAMES S. CLIFFORD,
WM. B. GOODALL.