Sept. 26, 1933. H. G. WEINLAND 1,928,145

GRINDING MACHINE

Filed Dec. 28, 1931 6 Sheets-Sheet 1

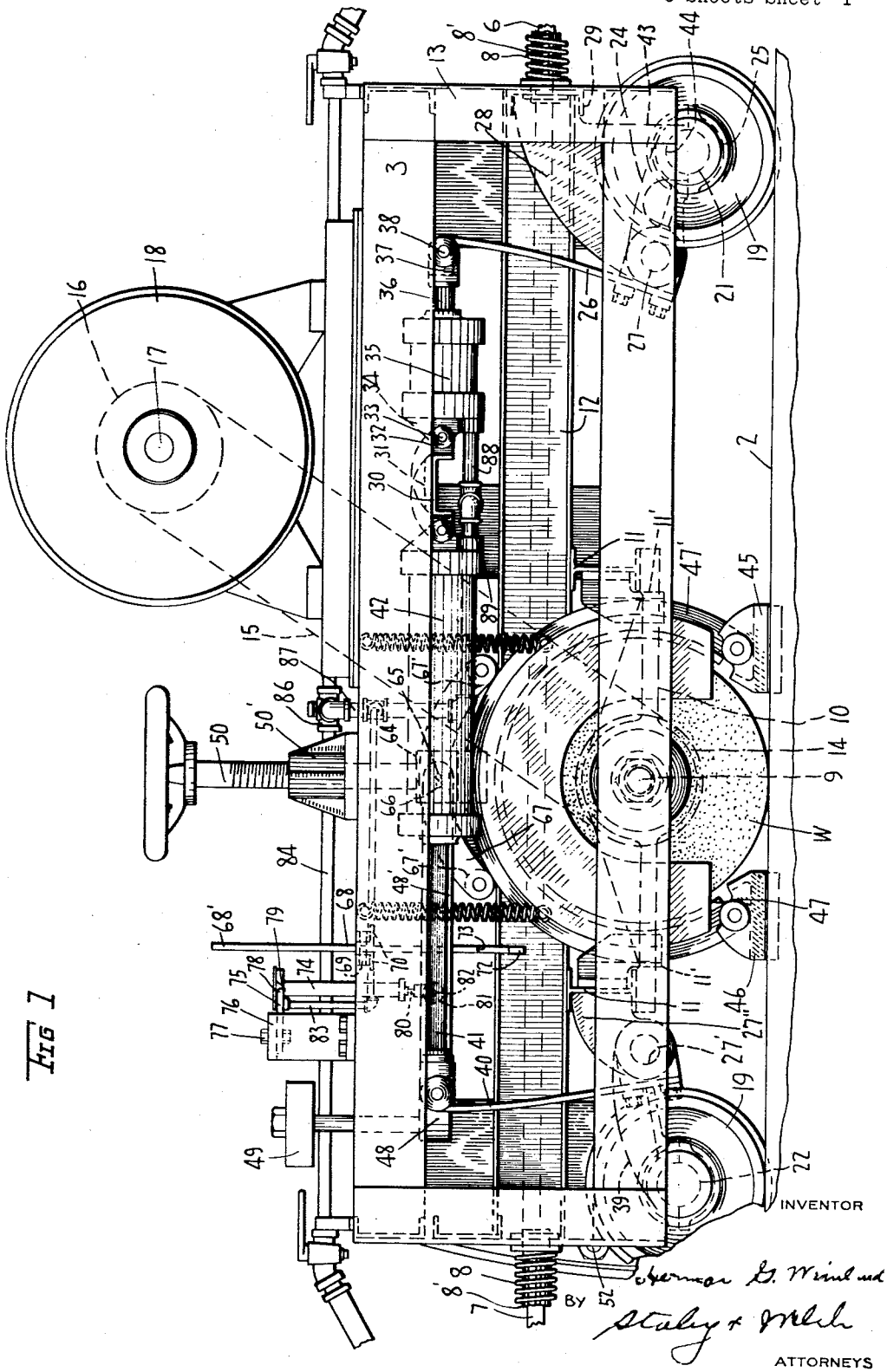


FIG 1

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GRINDING MACHINE

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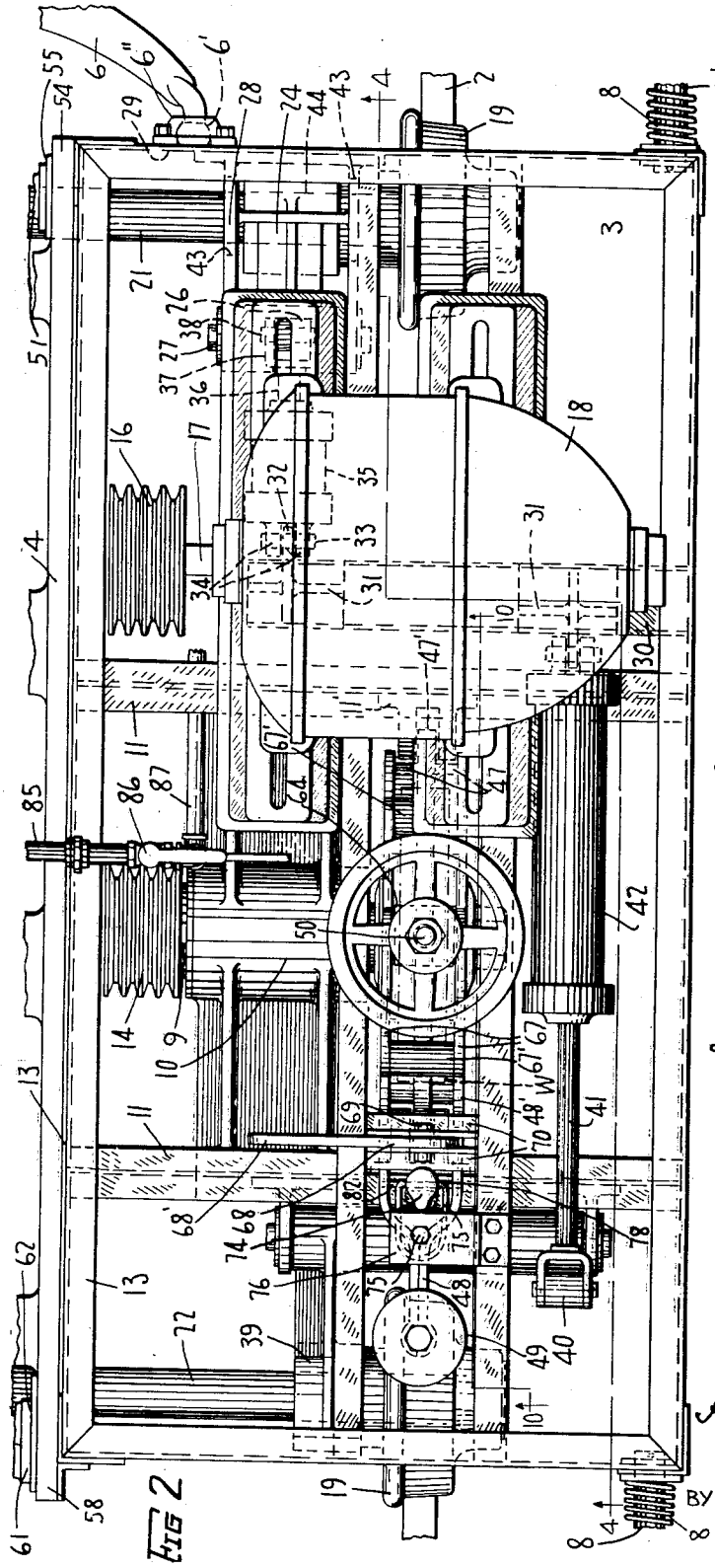


FIG 2

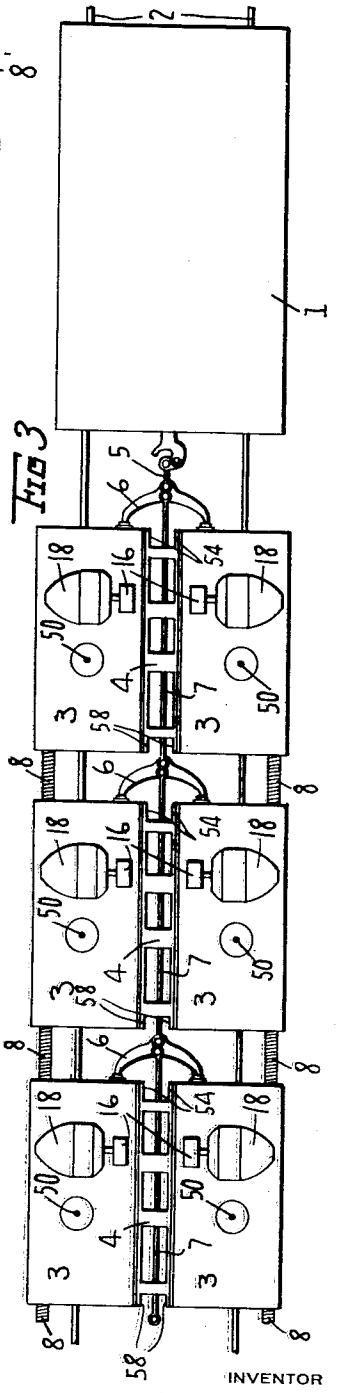


FIG 3

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Sept. 26, 1933. H. G. WEINLAND 1,928,145

GRINDING MACHINE

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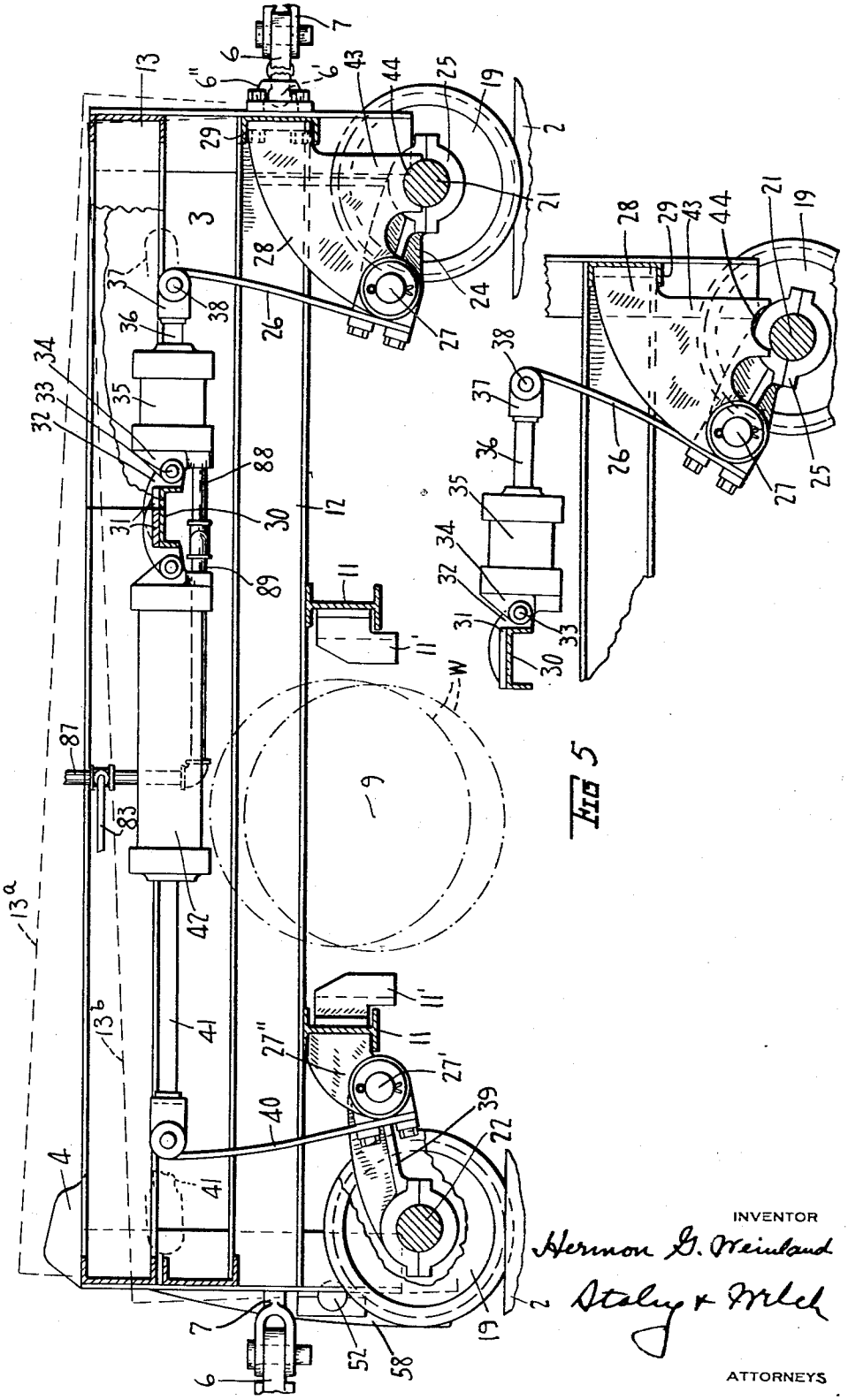


FIG 4

FIG 5

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GRINDING MACHINE

Filed Dec. 28, 1931 6 Sheets-Sheet 4

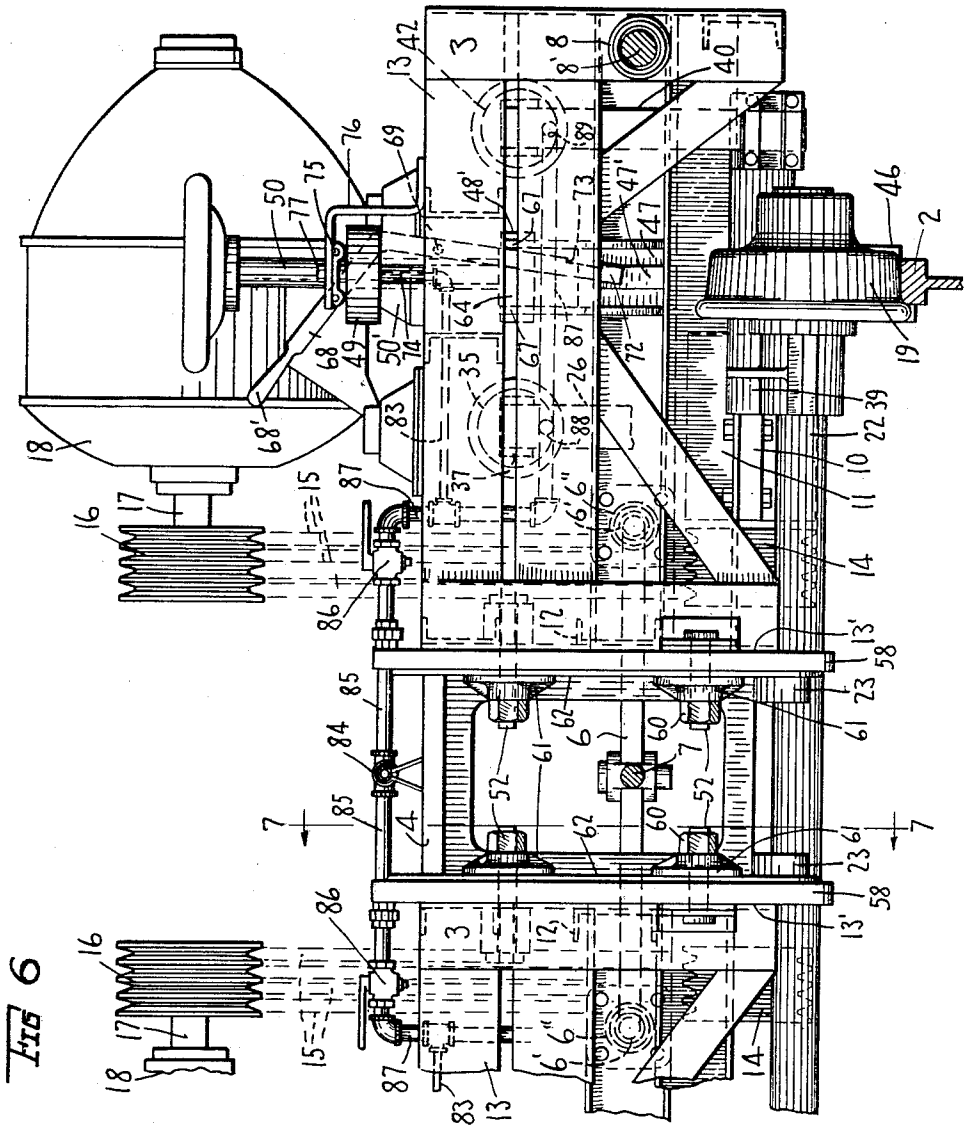


FIG 6

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Sept. 26, 1933. H. G. WEINLAND 1,928,145

GRINDING MACHINE

Filed Dec. 28, 1931 6 Sheets-Sheet 5

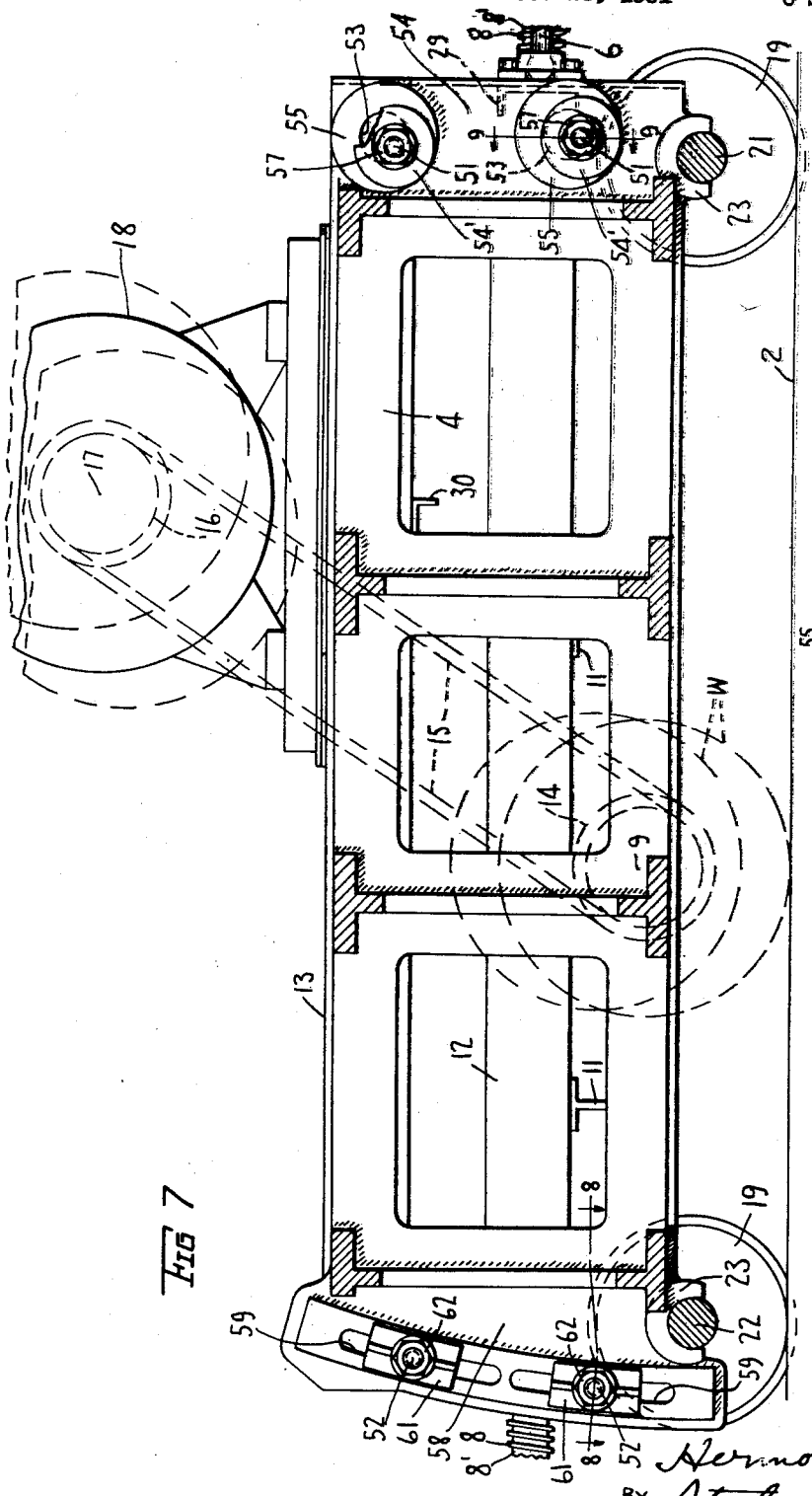


FIG 7

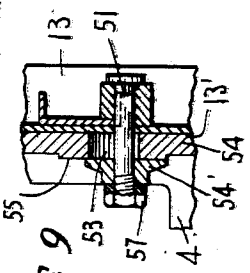


FIG 9

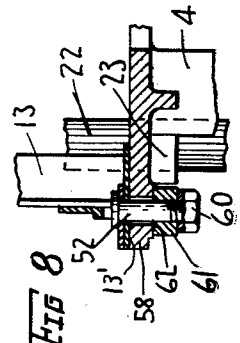


FIG 8

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GRINDING MACHINE

Filed Dec. 28, 1931 6 Sheets-Sheet 6

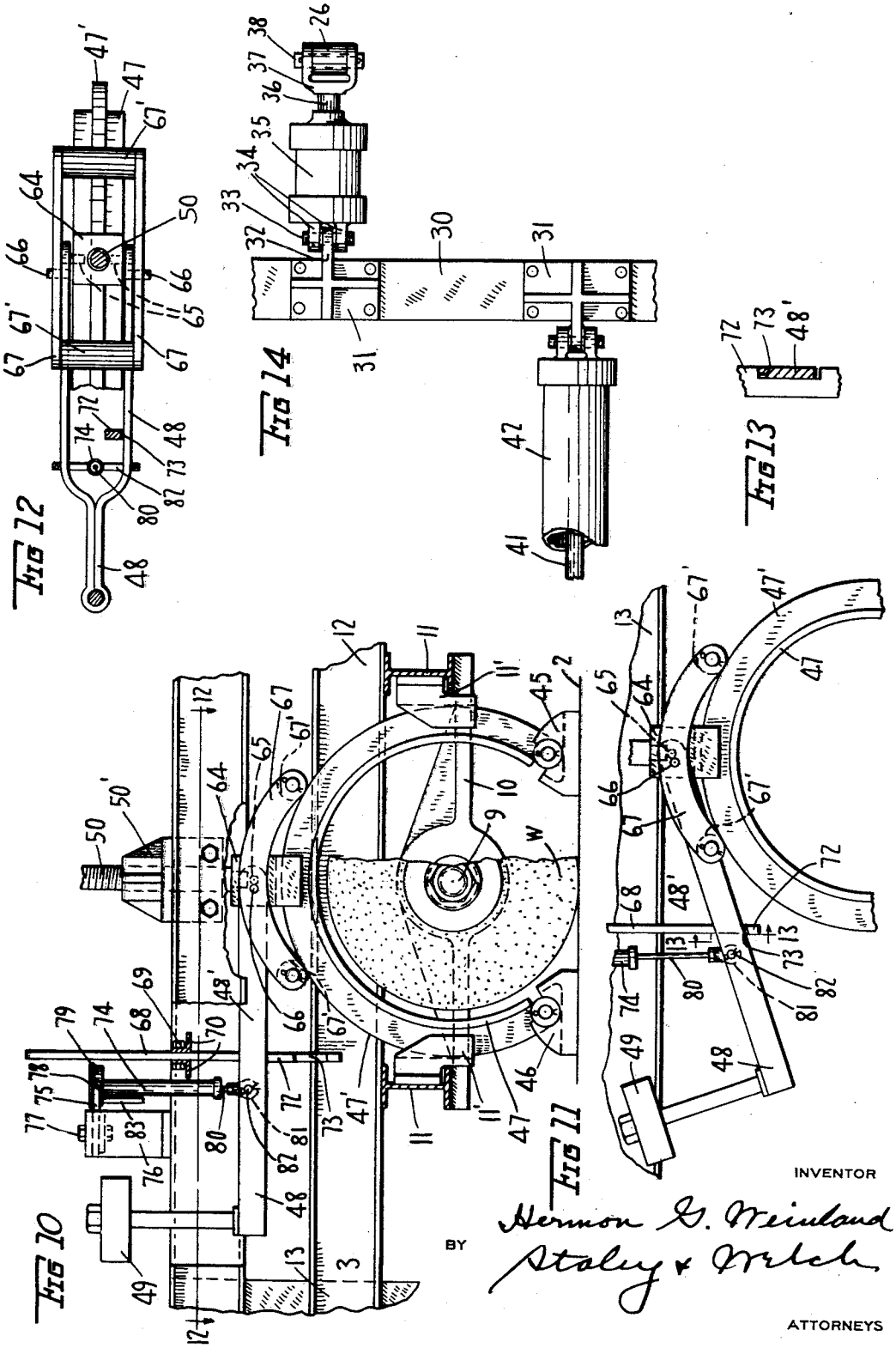


FIG 12

FIG 14

FIG 13

FIG 11

FIG 10

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Patented Sept. 26, 1933 1,928,145

UNITED STATES PATENT OFFICE

1,928,145

GRINDING MACHINE

Hermon G. Weinland, Springfield, Ohio, assignor to The Safety Grinding Wheel & Machine Company, Springfield, Ohio, a corporation of Ohio

Application December 28, 1931
Serial No. 583,473

21 Claims. (Cl. 51—178)

This invention relates to grinding machines, particularly machines of the type in which the grinding element moves over the work, it more especially relating to improvements upon the machines described in the co-pending applications of Howard W. Lanyon, Serial No. 583,452, filed December 28, 1931, and William A. Goering, Serial No. 583,574, filed December 28, 1931.

One of the objects of the invention is to provide improved means for elevating the main frame and parts carried thereby including the grinding wheel, for transportation purposes and for positioning said frame and the grinding wheel in operative working relation with the work.

Another object of the invention is to provide means for automatically holding the main frame and grinding wheel in elevated position after such parts have been elevated due to an undue obstruction or condition in the work.

Another object of the invention is to provide a simple and effective arrangement for connecting two grinding units in pairs to form a structure which will independently operate upon the two sides of a railway track.

A further object of the invention is to provide improved means for connecting a plurality of such pairs of grinding units in a series.

Other objects of the invention will appear from the accompanying description.

In the accompanying drawings:

Fig. 1 is a side elevation of one unit of the improved rail grinding machine in which the principles of my invention, and the inventions referred to as well, are shown embodied.

Fig. 2 is a top plan view of the unit shown in Fig. 1.

Fig. 3 is a diagrammatic illustration of a plurality of units made into a train and drawn by a tractor car.

Fig. 4 is a longitudinal section on the line 4—4 of Fig. 2 for the purpose of more clearly showing the manner of employment of elevating and lowering mechanism.

Fig. 5 is a fragmentary view similar to Fig. 4, of parts employed in the elevating devices in the forward portion of a unit, showing a different working arrangement thereof.

Fig. 6 is a fragmentary end view of one of the plurality of unitary structures employed in the train of grinding machines.

Fig. 7 is a longitudinal section on the line 7—7 of Fig. 6.

Fig. 8 is a fragmentary horizontal section on the line 8—8 of Fig. 7.

Fig. 9 is a fragmentary vertical section on the line 9—9 of Fig. 7.

Fig. 10 is a fragmentary longitudinal section on the line 10—10 of Fig. 2.

Fig. 11 is a fragmentary view similar to Fig. 10 but with the parts in different working position.

Fig. 12 is a fragmentary horizontal section on the line 12—12 of Fig. 10.

Fig. 13 is an enlarged fragmentary vertical section on the line 13—13 of Fig. 11.

Fig. 14 is a fragmentary plan view of the parts as seen from the line 14—14 in Fig. 1.

The train of grinding machines constructed according to the principles as disclosed in the following specifications and having incorporated therewith the elements of the Lanyon and Goering inventions referred to, is particularly adapted to the partial or complete removal of the track-rail surface defects known as "corrugations", which were fully discussed in the Goering application, not only as to their prevalence, but their effect as well.

In the present invention, the grinding-wheel is moved over the work and preferably in the direction in which the most efficient grinding operation is obtained, i. e., the direction of rotation of the contact side of the wheel is in the same direction as is the movement of the wheel over the work being ground. Since the total amount of metal to be removed may at times be too large for removal during a single passage of the wheel, I prefer to employ a series of wheels operating in sequence, each wheel removing only a comparatively small portion of the total amount, whereby the same result is obtained as when a single wheel is successively moved to-and-fro over the work, but with the elimination of those passages during which an inefficient grinding operation is taking place.

Therefore, better results are obtained by collecting into a train, a plurality of grinding units allowing the efficient grinding of each rail of a track simultaneously. The work required of an individual wheel is small, being limited to the mere furthering of the work of a preceding wheel, whereby when an ample number of wheels is so employed, the track surface is often materially improved by a single passage of the train. This is advantageous, as corrugations are more prevalent in heavily traveled surface street car-lines on which the time allowable for the grinding operation is necessarily limited.

A secondary function of the machine is that of grinding rail joints, or a portion of the rail surface that has been "built up", as by the common

welding process. These are grinding operations of a local character, there seldom being more than five or six feet of surface involved, as compared to the operation of grinding corrugations, which is very much more extensive. For this local grinding, better results are obtained by the reciprocation of a single wheel accompaned by suitable elevation or lowering of the wheel at each reciprocation in order to provide that the grinding is done under the more efficient circumstance. This is especially true when grinding rail joints as these are invariably staggered with respect to each other. Reciprocation of an individual wheel may be accomplished by reversals of the tractor car either coupled to a single unit or to the train, the latter arrangement being preferred, as the power required to manipulate the entire train is comparatively low. Necessary suitable manual adjustments of the wheel in order to provide increasing depths of cut are made during this type of grinding operation.

Referring to the drawings, 1 represents a tractor-car which may be provided with the usual trolley construction, motors, air compressor, air-control apparatus, none of which is shown in the present case; 2 represents the rails of the track over which it operates; and 3, right and left hand units of a plurality of grinding machines arranged in pairs (Fig. 3). The right and left hand units 3 of each pair are connected to each other by a connector casting 4 adapted to permit the elevation or lowering of any unit 3 without interfering with the mating unit, a more complete description of which is to follow.

In Fig. 3 the forward units of the train are shown coupled to the tractor-car by a link 5 having a pivotal connection with a horizontally disposed yoke 6, each end of which is connected to one of the forward pair of units 3 by any suitable universal connection, preferably of the ball and socket type, each end of the yoke having a ball 6′ fitted in a socketed member 6″ secured to the frame of the unit. The succeeding grinding machines in the train are similarly constructed and each is also provided with a yoke 6, coupling being effected by means of a reach-rod 7 pivotally connected to a forward central portion of a rear yoke to the rear central portion of the yoke in advance. Between each of the right, and each of the left hand units, a large coiled spring 8 is interposed, the purpose of which is to provide a tightly coupled train, an explanation of the advantage of which follows. Each spring is placed about a short rod 8′ (Fig. 2), the ends of which are loosely inserted through the end frame members of adjacent units and held in position by cotter pins.

Lost motion between the units is eliminated by the use of the coiled springs between the various units. When the train is in the coupled relation, these coiled springs are interposed between the units in a comparatively highly compressed state, and any shock incident to quick stoppage or unevenness of draw-bar pull is absorbed or dampened out, since in a train thus tightly coupled, vibrations set up at any particular point are quickly dampened out due to the inertia of the remainder of the train.

By this coupling arrangement, no interference with an efficient grinding operation is offered by any variations in the track curvature or profile, and as the frames are comparatively short, the inevitable lateral shift of the grinding wheels when the machines are negotiating curves is reduced to a minimum. Another advantage obtained by the use of this coupling method is that of providing that each grinding unit is free to rise or fall independently of the coupling arrangement, and since the connections of the yokes 6 with the frames is comparatively closely adjacent the level of the mounting of the forward axle, the tendency to elevate the rearward portion of the frame by draw-bar pull is minimized.

These grinding machines preferably receive the current for the motors which drive the grinding wheel spindles from the power car 1 by electric cables (not shown) and also receive compressed air which is employed for various functions on the individual units in a manner which will be described later whereby the power car operator is enabled to have a major portion of the control of the train. Other details of the work may be assigned to attendants who walk along the train for close inspection of the work.

A description of an individual unit will now be taken up, it being understood that the mating unit is exactly identical but of opposite hand construction. The abrasive wheel is indicated at W. This is mounted on one end of a horizontally disposed spindle 9 rotatably carried in bearings in a bracket 10 secured to the under sides of I-beam members 11 which are in turn secured to the members 12 of the frame. The frame is a box-like structure composed of variously formed structural steel members such as angles, channels and I-beams according to the selection of the designer, and the frame will be indicated hereafter in general as 13. On the inner end of the spindle 9 is a pulley 14, in the present case it being a grooved pulley in connection with which a plurality of small endless V-belts are employed and indicated conventionally only as at 15 in several of the views. In alignment with this pulley 14 is a driving pulley 16 mounted on one end of a shaft 17 of an electric motor 18 which is suitably supported on the upper surface of the frame 13 so that a major portion of its weight is directly over the rail 2 whereby a better balance of the machine is secured.

On the vertical side 13′ of the frame 13 (Fig. 6) adjacent the track center is mounted one side of a connector casting 4 previously mentioned and to the opposite side of the casting is connected the mating unit 3 in an exactly similar manner. The connector member 4 is here shown as a one-piece metallic casting, the center of which is over or in the vertical plane of the track center. Its width therefore determines the gauge of the grinding machine, and it will be clear that by the use of narrower or wider connector members, in connection with corresponding changes in the length of the axles, the unitary structure comprising a pair of units 3 and a connector 4 may be varied to suit different track gauges. Preferably, although not shown in the present application, a runway is secured to the connector members 4 for the purpose of allowing attendants to walk along the train.

The flanged wheels 19 are utilized primarily for transportation to the point at which the grinding operations are to be performed, a secondary function being to guide the machines during the grinding operation, the grinding wheel W being necessarily positioned in alignment with the track wheels 19. The elevation and lowering of the machine for transport or grinding positions is secured by the use of lever arrangements located in the forward and rear portions of the frame in connection with compressed air cylinders mounted within the frames. The axles 21 and 22 are

front and rear axles respectively, these being dead axles in the sense that the flanged wheels 19 are revolubly mounted thereon in place of provision of rotation of the axles. These axles extend from side to side of the unitary structure comprising a grinding machine as suggested in Fig. 6 and on them at their central portions rests the connector member 4, Fig. 7 there being semi-cylindrical grooved extending hubs 23 in both forward and rearward extremities of this connector adapted to seating on the axle.

Referring to the axle 21, Figs. 2 and 4, it will be noticed that there is a bent lever which has one arm 24 thereof attached to the shaft by a cap 25 at some suitable point adjacent the inner side of the forward flanged wheel 19, the shaft constituting the fulcrum point. The other arm of the lever is indicated at 26 and is in the nature of a flat spring-leaf for a purpose to be described later. The lever is loosely mounted on a pin 27 horizontally supported in a casting 28 which is secured to the channel member 29 of the frame 13.

At 30 is shown an inverted channel member secured to the under sides of the upper frame members. On the upper surface of the member 30 is fixed a casting 31 having a forwardly vertically disposed projecting ear 32. A pivot pin 33 is inserted in this ear and pivotally supports by the rearwardly extending parallel ears 34, a comparatively short air cylinder 35. The piston (not shown) of this air cylinder 35 is connected to the piston rod 36 which terminates at its outer end in the forked end 37 which straddles the upper end of the arm 26 and is pivotally connected therewith by a cross pin 38 passing through the eye of the arm 26. Therefore, if compressed air is admitted to the air cylinder 35 to the rearward side of the piston, the arm 26 will be caused to move forwardly which results in a raising of the pivotal point of the lever and a consequent raising of the frame. Since the flanged wheel 19 is in position on the rail, said forward movement of the arm 26 results in an elevation of the frame, comparison of Figs. 4 and 5 showing the effect of the movement.

In a similar manner the rear portion of the frame is elevated or depressed by the use of a bent lever pivotally mounted on the pin 27' carried by a bracket 27'' projecting from the frame member 11. One arm 39 of this lever is connected with the axle 22 and the other arm 40 is pivotally connected to the piston rod 41 of an air cylinder 42, this arm 40 being of spring-leaf construction. This air cylinder 42 is also pivotally connected to the frame member 30 in a manner similar to that described with reference to the air cylinder 35.

Admission of compressed air to the forward side of the piston (not shown) in the air cylinder 42 results in a rearward movement of the arm 40 and a resultant elevation of the rearward portion of the frame, whereby with the simultaneous admission of compressed air to the cylinders 35 and 42, the machine is placed in the transport position.

The pressure of the compressed air is exerted indirectly against the springing tendency of the spring-leaf arms 26 and 40 whereby a resilient mounting is secured for the purpose of providing a machine of improved riding qualities, both for the comfort of the attendants and to reduce vibration and consequent damage to parts of the apparatus, and also to provide for a less noisy operation in transport.

Referring to Figs. 4 and 5 especially, it will be noticed that the member 28 which carries the forward bent levers 24 and 26 has integrally attached thereto a depending portion 43 terminating in a semi-cylindrical recess 44 known as a chair, in such position as to descend upon and rest on the upper side of the forward axle 21 when the air pressure is exhausted from the cylinder 35. The object of this feature is to provide a fixed point at the forward end about which the frame is swung in a vertical plane when making adjustments during the grinding operation. Since the seat 44 of the chair 43 is semi-cylindrical, movements of the frame in a vertical plane about the center of the chair stated easily take place.

Release of the pressure in the cylinder 42 similarly allows the rearward portion of the frame to settle downwardly. The further downward movement of the frame is arrested upon contact of the flanged shoes 45 and 46, being front and rear shoes, respectively, which are pivotally attached to the lower ends of a semi-circular ring 47 suitably positioned in the vertical central plane of the rail 2. The shoes 45 and 46 and the ring 47 together with certain other associated parts form the subject-matter of the Goering application referred to in the early part of the specification and are fully described both as to the construction and advantages in that application, it being sufficient to state here that this ring and the shoes have the weight of the major portion of the frame and its parts when the frame is thus lowered.

In the present construction, however, the weight of the frame is brought upon the supporting ring in a manner somewhat different from the manner explained in the Goering application in order that the grinding wheel may yield upwardly when meeting undue obstructions, this arrangement being one of the features of this invention and will be explained later.

There will be noticed also a lever 48 on whose free end is secured the weight 49, the combination of which lever arrangement with the devices of Goering is fully described in the Lanyon application previously referred to. While the rear axle and its wheels merely rest upon the rail due to their own weight they are of further assistance in guiding the machine. Adjustment of the grinding wheels to the rail is obtained by the screw-threaded rod 50 as explained in the Goering application.

Inasmuch as one individual grinding-wheel may wear to a greater extent than another provision is made to accommodate adjustment of one unit irrespective of the adjustments of its mating unit. This is provided for in the manner of connecting the units of a machine.

Provision is made for so connecting the frames of each pair of units with the connector 4, that the frames may rise and fall independently of each other.

Referring to Fig. 7, it will be seen that the connector member 4 is secured in an interposed position between the grinding units 3 by means of bolts 51 at the forward end, and 52 at the rearward end. The bolts 51 pass through enlarged openings 53 in the forwardly extending webs 54 of the connector, there being one of these webs on each side of the forward end of the connector, 55 being raised flat-surface bosses over which moves a collar 54' interposed between nuts 57 and the surface of the boss 55. In the same manner at the rearward end in the extended web portions 58 (see Fig. 6) the bolts 52 pass through elongated slots 59 concentrically disposed with the axis of the forward axle 21. Interposed between the nuts 60 on the bolts 52 are shoes 61 which

slide over the surface 62 surrounding the slots 59. All of the bolts 51 and 52 on either side are secured in any suitable manner to the frame work 13 of that unit on that side as shown in Figs. 8 and 9, and the proper adjustment of the nuts 57 and 60 is to allow a freely sliding arrangement of the frames 13 with respect to the connector member 4.

When the grinding machines are placed in the transport position by an application of compressed air to the cylinders 35 and 42, the frames are elevated to a position shown by the broken line 13*a* (Fig. 4). In preparing for the grinding operation, the air pressure is released from all cylinders causing the unit to be lowered to the position shown in Fig. 1 which position it should be stated is due both to the fact that the chair 43 is resting upon the front axle and a full sized grinding wheel has been mounted upon the spindle. As the wheel wears and reduces in diameter, the adjustment is altered accordingly and the position assumed by the frame with the wheel reduced to the smallest diameter is shown by the broken line 13*b*, Fig. 4. Therefore, it should be clear that as the rearward portion of the frame moves through a greater angular movement and about a fixed center point such as is carried by the axle 21, the slots 59 must be of ample length and preferably concentrically disposed with reference to the center with the axle 21. In view of the smaller angular movements at the forward end the enlarged openings 53 may be circular as shown.

Referring now to Figs. 10, 11 and 12, there is illustrated an arrangement for permitting the grinding-wheel to yield when meeting undue obstruction such as an abnormally high place on the rail or any other undue obstruction which the wheel many encounter, in connection with my improved device for latching the grinding-wheel in inoperative position when such a condition occurs. It has been explained that when in operation, the major portion of the frame is supported by the semi-circular ring 47 and its shoes 45 and 46. The present construction, as in the Goering application, employs a screw 50 which is threaded in a nut 50′ fixed to the main frame, the lower end of which bears on a block 64. The lower end of the screw is preferably reduced and extends loosely in an aperture in the block and the shoulder thus formed rests upon the upper surface of the block. The lower portion of the block is bifurcated and straddles the circular rib 47′ of the ring 47 to act as a guide for the ring; the ring being further guided by guides 11′ fixed to the frame 11.

As in the Goering application, there is employed an arch bar 67 having anti-friction rollers 67′ which bear upon the rib 47′ of the ring 47, but instead of securing this arch bar rigidly to the block as in the Goering application, there is shown the means of the Lanyon application for transmitting the weight of the frame to the arch bar by devices which permit the grinding wheel to rise and fall, which devices will now be described, in connection with my improved device for retaining the grinding wheel out of operative position.

There is provided a forked lever 48 which extends upwardly and straddles the block 64, the lever being pivotally connected to the block by pins 65 inserted in opposite sides of the block. The lever 48 is also pivotally connected by means of pins 66 to each of the pair of arch bars 67. The free end of the lever has mounted thereon the weight 49. The weight of the frame is thus brought upon the ring 47 through the nut 50′, screw 50, block 64, pins 65, lever 48, pins 66 and arch bars 67, the weight 49 serving to partly counterbalance the weight of the frame and parts carried thereby to permit the more ready elevation of the grinding-wheel when meeting undue obstructions.

My improved means for holding the grinding-wheel in inoperative position when it has been raised when meeting an obstruction consists of a bent lever 68 pivotally mounted on a bolt 69 passed through the upturned legs of a pair of parallel angle arms 70. The lever 68 is so situated that it swings on the pivot bolt 69 and is substantially at right angles to the swing of the lever 48, while the weight of the handle 68′ of this lever causes the lower end 72 to bear against the inside of one of the forks 48′ of the lever 48. At a suitable location in the side of the lower portion 72 of the lever 68 adjacent the arm 48′ is a notch 73 so that when a swing of the lever 48 occurs, of an extent such as is shown in Fig. 11, the weighted end 68′ of the lever 68 causes the lower end 72 thereof to engage the lever 48 by means of the notch 73. The release of the lever 48 is accomplished by an attendant raising the handle end 68′ of the lever 68, but preferably after investigation has been made and any obstruction that caused the upward movement of the wheel removed. An attendant may also elevate the wheel by downward pressure upon the lever 48 by manual means.

I have also provided means whereby the wheel may be lifted from the rail surface through the lever arrangement just described by devices under control of the operator of the tractor car.

Pivotally connected to the lever 48 is a small air cylinder 74 which is pivotally supported by the U-shaped members 75, Figs. 2 and 10. The U-shaped member is clamped to a bracket 76 by a bolt 77 and is provided at its outer end with inturned portions to form trunnions 78 which are inserted in oppositely positioned openings in the base 79 of the air cylinder 74. The piston rod 80 has at its lower end an eye 81 through which is inserted a cross-pin 82 passing through openings in the arms 48′ of the lever 48. A pipe 83 conducts the air under pressure from piping connected to the cylinders 35 and 42 and upon admission of compressed air to these cylinders, the lever 48 is depressed. The construction of the air cylinder 74 is such that a limit to an upward swing of the lever 48 is offered by contact of the piston rod with the upper head of the cylinder in order to prevent undesired contact of the grinding wheel with the track rail such as might occur if the lever 48 were free to swing beyond the point necessary to properly position the grinding wheel with relation to the work.

The air is exhausted from the cylinders by means of a common valve (not shown) on the tractor-car. This valve controls the admission of compressed air to a train line 84 (Figs. 1 and 6) which extends throughout the train and is connected by any well known type of air hose between the various units. A lateral branch 85 (Figs. 2 and 6) is provided on each unit terminating in an air-cock 86 which is normally in open position and beyond which the pipe 87 (Figs. 1 and 6) branches to form the piping 88 and 89 (Figs. 1 and 6) to conduct the air to the cylinders 35 and 42 respectively and also to the cylinder 74 by means of the pipe 83 previously mentioned.

In operation, air is supplied to the cylinders 35,

42 and 74 which raises the main frame and parts carried thereby and also depresses the lever 48 and causes it to become engaged with the detent lever 68 (Fig. 11). The apparatus can then be readily transported to the place where the grinding operation is to take place. At that point, the air in each of the three cylinders is exhausted which allows the main frame and parts carried thereby to descend until the weight thereof is carried by the front axle and the supporting ring 47. The lever 48, however, is still engaged with the lever 68 so that the grinding wheel is maintained in slightly elevated position with relation to the work to an extent of about 1/64". In practice, however, the screw 50 has been initially adjusted so that the grinding wheel will be elevated to a greater extent with relation to the work. The operator then releases the lever 68 and thereby allows the grinding wheel to descend to the extent noted, the proper positioning of the grinding wheel with relation to the work being thereafter secured by adjustment of the screw 50.

The release of the levers 48 causes them to assume a substantially horizontal position, it being assumed that the weight 49 is just sufficient to permit this horizontal position. As the wheel wears away, it may be advisable to vary slightly the balancing weight 49 by the removal of a portion thereof. The downward settling of the unit due to the release of the lever is of a gentle nature, due to the utilization of the air-cushioning property of the air-cylinder 74.

Adjustments for depth of cut should at all times be made while the train is in the slow forward grinding speed in order to prevent "cupping", which will occur if the wheel is allowed to "dwell" for any length of time. On reaching a point which requires no grinding or an enforced stop due to other traffic, the grinding wheels should be elevated before the train is brought to a stop, the elevation being accomplished by the admission of air to the train-line 84 by use of the tractor-car operator's valve. In this way, the car operator, being in a position to observe other traffic, has control over the movements of the train and simultaneous elevation of the grinding wheels, while the attendant may independently elevate any wheel by manually depressing the lever 48.

When it is desired to grind a comparatively short section of rail surface such as a built-up place or a rail joint, the preferable method is to utilize one wheel only, alternately reversing the movements of the train. The remainder of the grinding wheels are elevated to the non-contacting or transport position, and contact of the wheel in use is permitted only on the forward movement of the train.

The units not in use are elevated by air-pressure as just explained after which each of the respective air-cocks 86 are closed, the entrapped air in the cylinders retaining them in this position, while the train-line remains charged with compressed air during a grinding operation of this type. The wheel in use is adjusted for a cut of the desired depth by the attendant on a forward movement of the train, and on passing beyond the surface to be ground, is elevated by the opening of its individual air-cock 86 by the attendant, after which the tractor-car operator stops and reverses the train, the operation being repeated until the grinding at this point is completed. In grinding rail-joints, since these are usually staggered, the train merely moves up, the attendant utilizing a wheel on the opposite side of the train.

Having thus described my invention, I claim:

1. In a grinding apparatus for track rails, a plurality of grinding apparatuses arranged in series to run upon the track rails, and means for connecting the forward end of a trailing apparatus with the forward end of a preceding apparatus, said means extending from end to end of the preceding apparatus.

2. In a grinding apparatus for track rails, a plurality of grinding apparatuses arranged in series to run upon the track rails, and means for connecting the forward end of a trailing apparatus with the forward end of a preceding apparatus, said means including a reach rod which extends from the forward end of one apparatus to the forward end of the other.

3. In a grinding apparatus for track rails, a plurality of grinding apparatus arranged in series to run upon the track rails, and means for connecting the forward end of a trailing apparatus with the forward end of a preceding apparatus, said means including a reach rod which extends from the forward end of one apparatus to the forward end of the other, and means for universally connecting the ends of said reach rod respectively to said apparatuses.

4. In a grinding apparatus for track rails, a plurality of grinding apparatuses in series to run upon the track rails, and means for connecting the forward end of a trailing apparatus with the forward end of a preceding apparatus, said means including a reach rod which extends from the forward end of one apparatus to the forward end of the other, a yoke-shaped member pivotally connected with each end of said rod, and universal means for connecting said yokes respectively with the forward ends of said apparatuses.

5. In a grinding apparatus for track rails, a plurality of grinding apparatuses arranged in series to run upon the track rails, each apparatus consisting of a pair of side-by-side connected units, and means for connecting the forward end of a trailing apparatus with the forward end of a preceding apparatus, said means extending between the units of the preceding apparatus.

6. In a grinding apparatus for track rails, a plurality of grinding apparatuses arranged in series to run upon the track rails, each apparatus consisting of a pair of side-by-side connected units, and means for connecting the forward ends of the units of a trailing apparatus with the forward ends of the units of a preceding apparatus, said means extending between the units of the preceding apparatus.

7. In a grinding apparatus for track rails, a plurality of grinding apparatuses arranged in series to run upon the track rails, each apparatus consisting of a pair of side-by-side connected units, and means for connecting the forward end of a trailing apparatus with the forward end of a preceding apparatus, said means including a reach rod which extends from the forward end of one apparatus to the forward end of the other.

8. In a grinding apparatus for track rails, a plurality of grinding apparatuses arranged in series to run upon the track rails, each apparatus consisting of a pair of side-by-side connected units, and means for connecting the forward ends of the units of a trailing apparatus with the forward ends of the units of a preceding apparatus, said means including a yoke-shaped member universally connected with the forward ends

of the units of each apparatus and a reach rod pivotally connecting the yokes.

9. In an apparatus for grinding track rails, a pair of grinding machines arranged side-by-side, front and rear axles, a pair of wheels for each axle arranged to run upon the rails, a connector member directly supported by said axles, and means for movably connecting each machine to said connector to permit the rise and fall of each machine independently of the other.

10. In an apparatus for grinding track rails, a pair of grinding machines arranged side-by-side, front and rear axles, a pair of supporting wheels for each axle arranged to run upon the track rails, each machine when in working position being pivotally supported by one of said axles, additional means for supporting each machine when in working position from one side of the track, a connector member between said machines directly supported by said axles, and means for connecting said machines to said connector member to permit the rise and fall of each machine independently of the other.

11. In a grinding apparatus for track rails, a pair of grinding machines arranged side-by-side, front and rear axles, a pair of wheels for each axle arranged to run upon the track rails, means for supporting one end of each machine by one of said axles such as to permit the machine to swing upon the arc of a circle, a connector member between said machines supported by said axles, and loose connections between said machines and said connector member to permit the rise and fall of each machine independently of the other, the connections between one end of each machine and said connector member consisting of bolts on said machines extending through arcuate slots on said connector.

12. In a grinding apparatus for track rails, a supporting frame, a grinding wheel mounted on said frame, a support for said frame adapted to slide on the rail, means for adjusting the relation between said support and frame to properly position the grinding wheel with relation to the rail, front and rear axles, wheels for supporting said axles from the track rails, a bent lever pivotally connected with each end of said frame, the pivotal point being located intermediate the ends of said lever, one end of each lever being adapted to be fulcrumed upon one of said axles, and fluid-pressure means connected with the other end of each lever to raise and lower said frame.

13. In a grinding apparatus for track rails, a supporting frame, a grinding wheel mounted on said frame, front and rear axles, wheels supporting said axles from the track rails, a bent lever at each end of said frame pivoted thereto at a point intermediate the ends of said lever, one arm of each of said levers being adapted to be fulcrumed upon one of said axles, the other arm of each of said levers being formed of resilient material, and a fluid-pressure cylinder for each of said levers mounted upon said frame and having its piston rod pivotally connected with the resilient arm of said lever.

14. In a grinding apparatus for track rails, a supporting frame, a grinding wheel mounted on said frame, a support for said frame adapted to slide on the rail, means for adjusting the relation between said support and frame to properly position the grinding wheel with relation to the rail, front and rear axles, wheels for supporting said axles from the track rails, a bent lever pivotally connected with each end of said frame, the pivotal point being located intermediate the ends of said lever, one end of each lever being adapted to be fulcrumed upon one of said axles, and fluid-pressure means connected with the other end of each lever to raise and lower said frame, the fluid-pressure cylinders being of different lengths whereby one end of said frame will be elevated higher than the other.

15. In a grinding apparatus for track rails, a supporting frame, a grinding wheel mounted on said frame, a support for said frame adapted to slide on the rail, means for adjusting the relation between said support and frame to properly position the grinding wheel with relation to the rail, front and rear axles, wheels for supporting said axles from the track rails, and means for raising said frame with relation to said axles consisting of a lever at each end of said frame pivotally carried thereby, each lever being fulcrumed on one of said axles on one side of the pivotal point thereof, a fluid-pressure cylinder for each lever, and a pivoted connection between the other end of said lever and the piston rod of said cylinder.

16. In a grinding apparatus for track rails, a supporting frame, a grinding wheel supported on said frame, front and rear axles, wheels for supporting said axles from the track rails, means for raising said frame with relation to said axles consisting of a lever at each end of said frame pivotally carried thereby, each lever being fulcrumed on one of said axles on one side of the pivotal point thereof, a fluid-pressure cylinder for each lever, a pivoted connection between the other end of said lever and the piston rod of said cylinder, means for supporting one end of said frame by one of said axles when said frame is lowered, and additional means for supporting said frame from said rails when lowered other than the remaining axle, said additional supporting means being adapted to slide on the rail, and adjustable means to alter the relation of the said additional supporting means and the frame to properly position the grinding wheel with relation to the rail.

17. In a grinding machine of the character described, a grinding wheel, a main frame upon which said wheel is mounted, a wheeled support for one end of said frame, a second support for said frame movably positioned on the work, said frame being capable of being elevated with relation to said second support, means for partly counterbalancing the weight of said frame and wheel, including a lever fulcrumed upon said support, said frame being supported by said lever upon one side of the fulcrum point thereof, a weight connected with said lever on the other side of said fulcrum point, and a detent automatically engageable with said lever to hold said frame and wheel in raised position.

18. In a grinding machine of the character described, a grinding wheel, a main frame upon which said wheel is mounted, a wheeled support for one end of said frame, a second support for said frame movably positioned on the work, said frame being capable of being elevated with relation to said second support, means for partly counterbalancing the weight of said frame and wheel, including a lever fulcrumed upon said support, said frame being supported by said lever upon one side of the fulcrum point thereof, a weight connected with said lever on the other side of said fulcrum point, and a fluid-pressure cylinder having its piston pivotally connected with said lever to raise said frame and grinding wheel.

19. In a grinding machine of the character described, a grinding wheel, a frame upon which said wheel is mounted, a support for said frame movably positioned on the work, said frame being capable of being elevated with relation to said support, means for partly counterbalancing the weight of said frame and wheel, including a lever fulcrumed upon said support, said frame being supported by said lever upon one side of the fulcrum point thereof, a weight connected with said lever on the other side of said fulcrum point, a fluid-pressure cylinder having its piston pivotally connected with said lever to raise said frame and grinding wheel, and a detent automatically engageable with said lever to hold said frame and wheel in raised position.

20. In a grinding machine, a main frame, a wheeled support at one end of said frame upon which said frame is pivotally supported, a second support for said frame having two points of contact with the track, a grinding wheel supported by said main frame between said two points of contact, said main frame and grinding wheel being capable of elevation independently of said support, means for partly counterbalancing the weight of said main frame and wheel, said means including a lever fulcrumed on said support on one side of the fulcrum of which said frame is mounted, a weight connected with the lever on the other side of the fulcrum thereof, and a detent automatically engageable with said lever to hold said frame and wheel in raised position.

21. In a grinding machine, a main frame, a wheeled support at one end of said frame upon which said frame is pivotally supported, a second support for said frame having two points of contact with the track, a grinding wheel supported by said main frame between said two points of contact, said main frame and grinding wheel being capable of elevation independently of said support, means for partly counterbalancing the weight of said main frame and wheel, said means including a lever fulcrumed on said support on one side of the fulcrum of which said frame is mounted, a weight connected with the lever on the other side of the fulcrum thereof, and a fluid-pressure cylinder having its piston rod pivotally connected with said lever to raise said frame and grinding wheel, and a detent engageable with said lever to hold said frame and wheel in raised position.

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