H. B. EARLING.

RAILWAY ROAD BED GRADING APPARATUS.

APPLICATION FILED JULY 16, 1908.

913,109.

Patented Feb. 23, 1909.

5 SHEETS—SHEET 1.

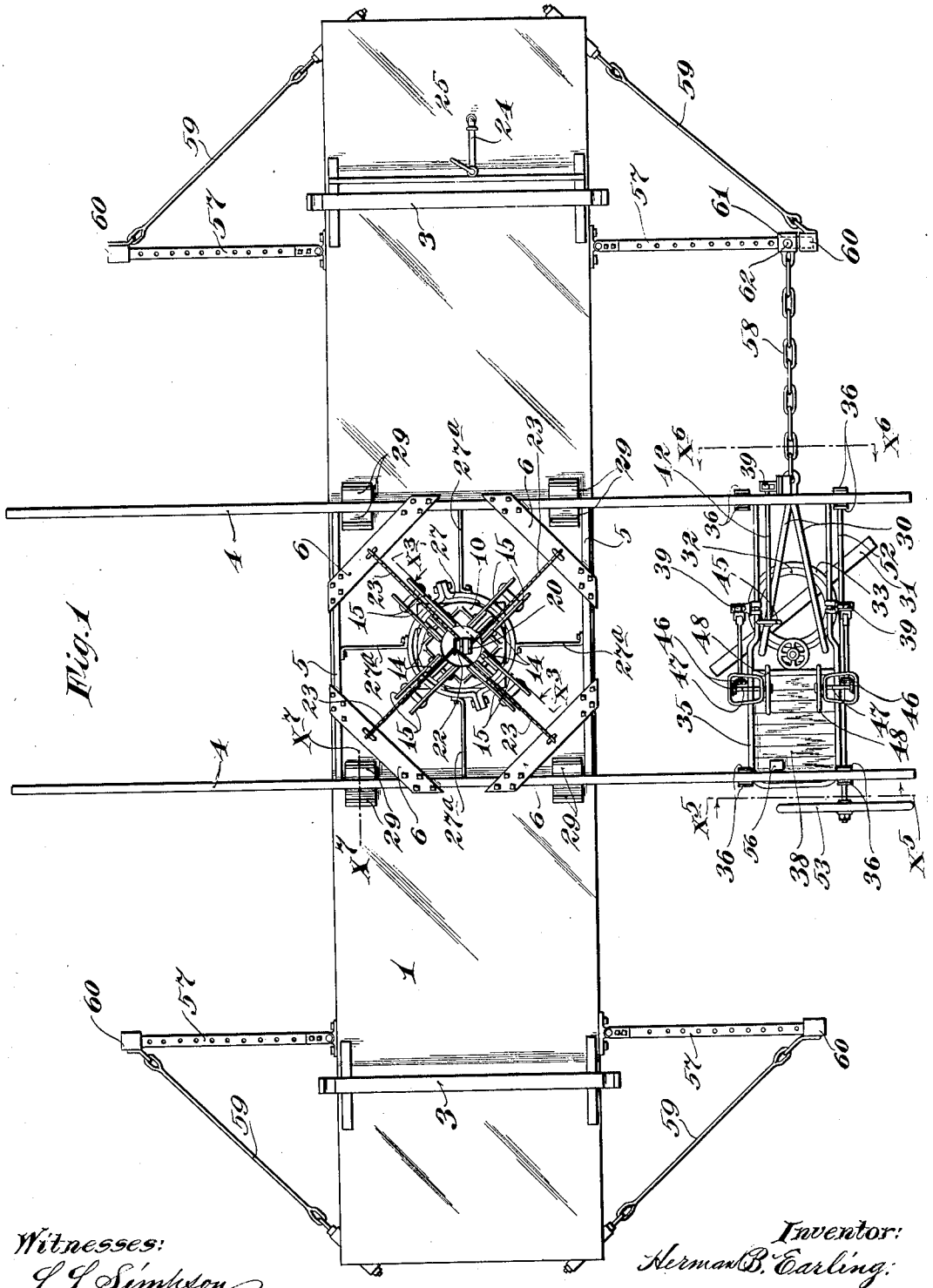


Fig. 1

Witnesses:
L. L. Simpson,
W. H. Souba.

Inventor:
Herman B. Earling.
By his Attorneys:
Williamson Hudson

H. B. EARLING

RAILWAY ROAD BED GRADING APPARATUS.

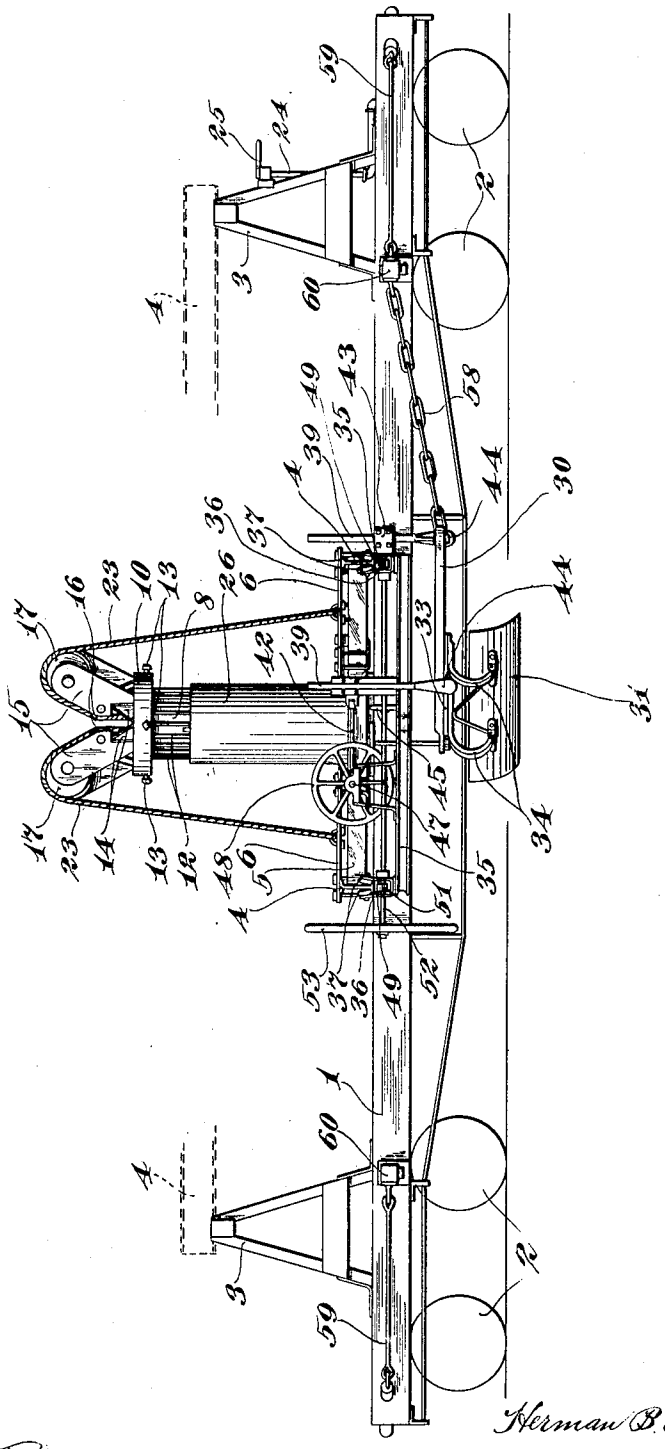
APPLICATION FILED JULY 16, 1908.

913,109.

Patented Feb. 23, 1909.

5 SHEETS—SHEET 2.

Fig. 2



Witnesses:

L. L. Simpson

W. H. Soubq.

Inventor:

Herman B. Earling

By his Attorneys:

Williamson & Merchant

H. B. EARLING.

RAILWAY ROAD BED GRADING APPARATUS.

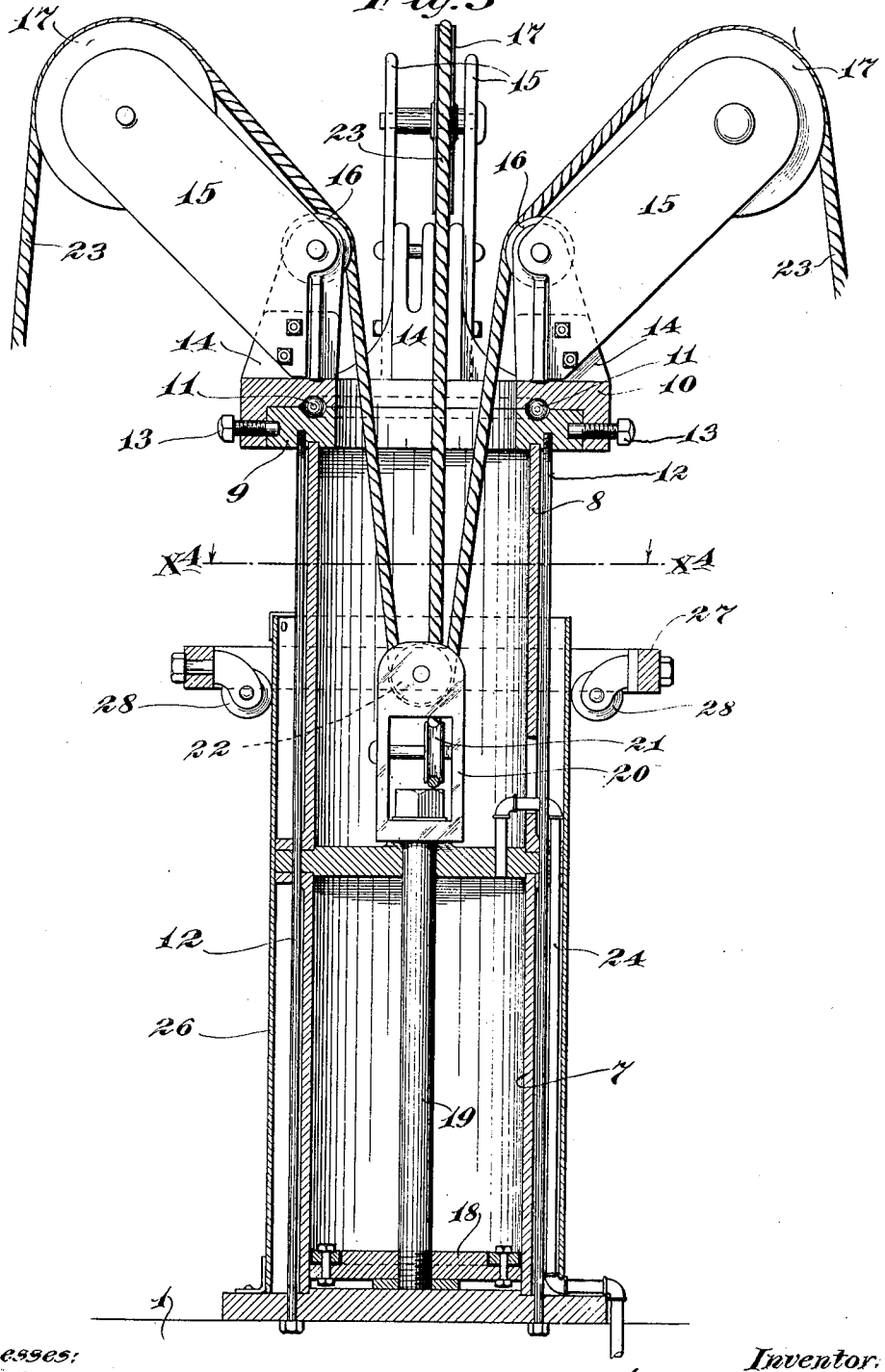
APPLICATION FILED JULY 16, 1908.

913,109.

Patented Feb. 23, 1909.

5 SHEETS—SHEET 3.

Fig. 3



Witnesses:

L. L. Simpson,

W. H. Souba.

Inventor.

Herman B. Earling

By his Attorneys:

Williamson & Merchant

H. B. EARLING.

RAILWAY ROAD BED GRADING APPARATUS.

APPLICATION FILED JULY 16, 1908.

913,109. Patented Feb. 23, 1909.

5 SHEETS—SHEET 4.

Fig. 4

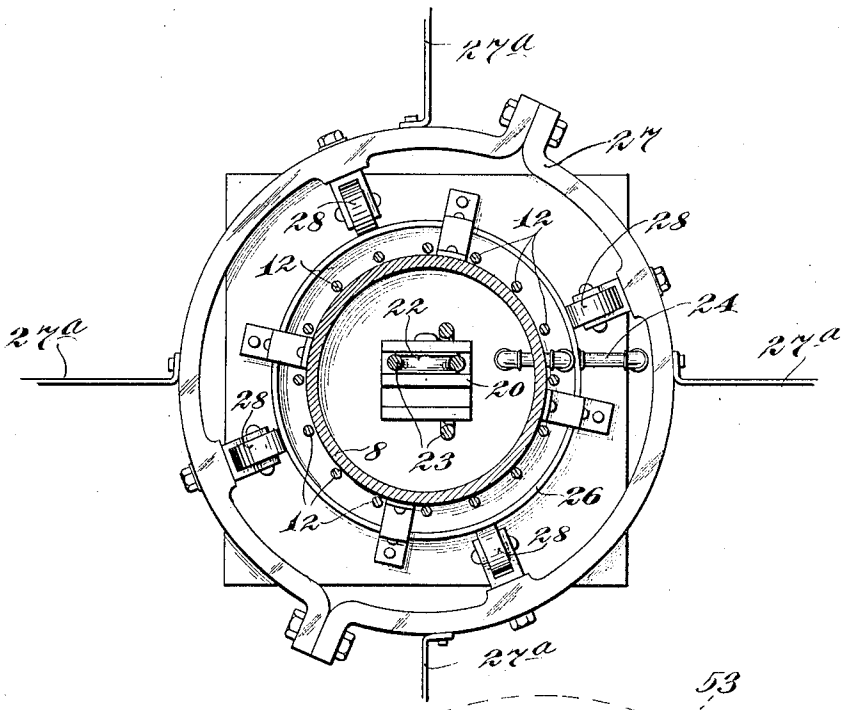
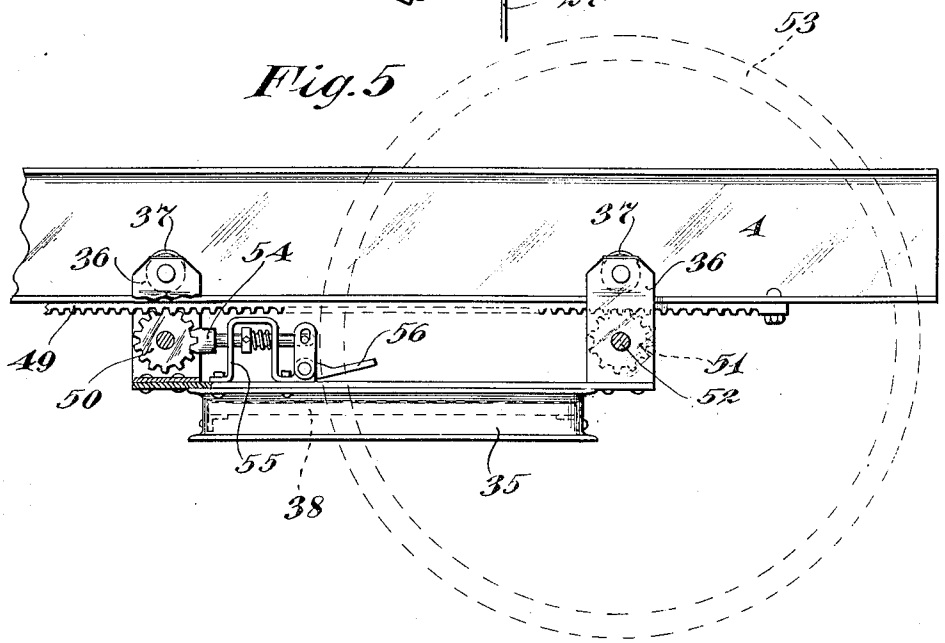


Fig. 5



Witnesses:
L. L. Simpson,
W. H. Bouba.

Inventor:
Herman B. Earling
By his Attorneys:
Williamson & Merchant

H. B. EARLING.

RAILWAY ROAD BED GRADING APPARATUS.

APPLICATION FILED JULY 16, 1908.

913,109. Patented Feb. 23, 1909.

5 SHEETS—SHEET 5.

Fig. 6

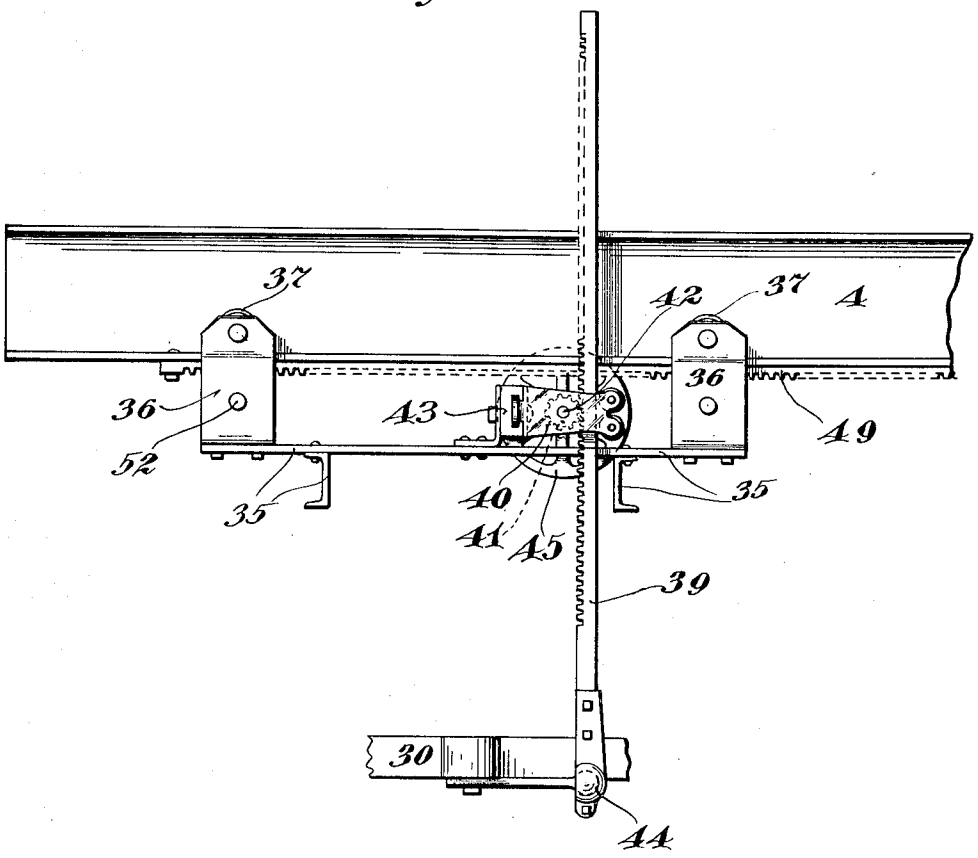
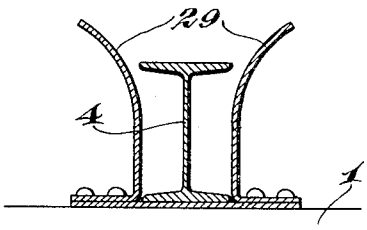


Fig. 7



Witnesses:
L. L. Simpson,
W. H. Souba.

Inventor:
Herman B. Earling
By his Attorneys:
Williamson Merchant

UNITED STATES PATENT OFFICE.

HERMAN B. EARLING, OF MINNEAPOLIS, MINNESOTA.

RAILWAY-ROAD-BED-GRADING APPARATUS.

No. 913,109. Specification of Letters Patent. Patented Feb. 23, 1909.

Application filed July 16, 1908. Serial No. 443,764.

To all whom it may concern:

Be it known that I, HERMAN B. EARLING, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Railway-Road-Bed-Grading Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its especial object to provide a highly efficient grading apparatus for use in connection with a car, for sloping or otherwise grading embankments and cuts of railway road-beds; and to this end it consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

As preferably constructed, the grading apparatus comprises a pair of graders that are independently mounted on the opposite ends of a long supporting frame, which latter is intermediately mounted on a flat car for both rotary and vertical movements. When the supporting frame is turned transversely of the car, the graders will be supported thereby, one on each side of the car; and the said graders are so connected to said support that they are capable of angular adjustments and vertical adjustments in respect to said supporting frame, and of movements toward and from the car. In this way the graders are supported so that they are capable of action on a very considerable area of an embankment or cut of the road-bed.

When the grader supporting frame is raised and turned longitudinally of the car body, the said support and graders will be located over the car body, so that the car, with the complete grading apparatus, will go through tunnels and bridges, and, in fact, may be moved any place where an ordinary car will run.

When it is desired to grade a section of the road-bed, by running the car up and down the track, the two graders may, just before the direction of travel of the car is changed, be shifted from one side to the other of the car, by vertical movement and by a half rotation of said supporting frame.

For quickly imparting vertical movements to the rotary supporting frame, an air or steam hoist, including a large cylinder and piston, is preferably applied between the car body and the supporting frame.

Any suitable grading device having a scraper blade or plow may be used in connection with the rotary and vertically movable supporting frame, but in practice I have found it convenient to use a grading machine known to the trade as the "Western reversible road grading machine".

In the accompanying drawings which illustrate the improved grading apparatus applied to a flat car, like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a plan view, showing the grading apparatus, including the car, but with one of the graders removed from the rotary supporting frame. Fig. 2 is a side elevation of the parts shown in Fig. 1. Fig. 3 is a vertical section taken approximately on the oblique line x^3 x^3 of Fig. 1. Fig. 4 is a horizontal section taken on the line x^4 x^4 of Fig. 3. Fig. 5 is a view partly in elevation and partly in section on the line x^5 x^5 of Fig. 1. Fig. 6 is a detail view in elevation, looking rearward at the parts shown in the vicinity of the line marked x^6 x^6 on Fig. 1; and Fig. 7 is a detail section on the line x^7 x^7 of Fig. 1.

Of the parts of the flat car, it is only desirable for the purposes of this case to particularly note the platform or body 1 and the wheels 2, the latter being shown in diagram only. On the end portions of the car body 1 are strong horse or frame supporting rests 3.

The rotary grader supporting frame is made up of a pair of long, parallel, so-called track beams 4 (as shown and preferred, in the form of I-beams) that are rigidly tied together at their intermediate portions, preferably by laterally spaced tie bars or spreaders 5 and by oblique brace plates 6.

Rigidly secured to the central portion of the car body 1, in an upright position, is a large and heavy cylinder 7, to the upper head of which is secured a cylinder extension 8. To the upper end of the cylinder extension 8 is rigidly secured the lower member 9 of a turn table 9—10, both of which members are of annular form, and between which anti-friction bearing balls 11 are interposed. As shown, the cylinder 7, cylinder extension 8 and lower member 9 of the turn table are rigidly connected by long bolts 12, as best shown in Fig. 3. The member 10 has a depending flange that carries

set screws 13, the ends of which work in an annular groove of the member 9, so as to prevent separation of the said members 9 and 10 while permitting free rotation of the said member 10. Both of the members 9 and 10 are of annular form, and said member 10 carries heavy lugs 14, to which, as shown, are bolted laterally spaced pairs of plates that constitute sheave-carrying arms 15. On each lug 14 is journaled a guide sheave 16, and on each sheave carrying arm 15 is journaled a guide sheave 17. Working in the cylinder 7 is a piston 18 having a rod 19 that works through the head of said cylinder and is provided with a swiveled head 20. This swiveled head 20 is bifurcated and is provided with guide sheaves 21 and 22 set in planes at right angles to each other. Two cables 23 are run over the alined sheaves 16 and 17 and under the cooperating sheaves 21 that are alined with said sheaves 16 and 17, and the ends of said two cables are attached one to each of the four brace plates 6 of the vertically movable and rotatively mounted grader supporting frame. With this hoisting device it is evident that when the piston 18 is moved downward the grader supporting frame will be raised; and conversely, when the said piston is moved upward the said supporting frame will be lowered; and it is further evident that when the said supporting frame is raised so that the graders will clear the car body, said frame may be rotated on its ball bearing, under which movement the swiveled head 20 will rotate with the movable member 10 of the turn table, without causing the piston to rotate.

For supplying the motive fluid to the upper end of the cylinder 7, a pipe 24 is extended therefrom to a suitable source of supply, not shown, but which may be assumed to be a compresser on the car or on the engine; or if steam be employed it may be from the boiler of the engine. As shown in Figs. 1 and 2, this pipe 24 is provided with a three-way valve 25 for controlling the supply of motive fluid to the cylinder and the exhaust thereof from the cylinder.

To center the grader supporting frame for pivotal or rotary movements around the axis of the cylinder 7, while permitting vertical movements of said frame, a quite heavy metal cylindrical jacket 26 is rigidly secured around the said cylinder and around a portion of the cylinder extension 8; a centering ring 27 (which, as shown, is divided) is rigidly secured to the track beams 4 and tie bars 5 of the said supporting frame by radial bars 27^a and caster wheels 28 are applied to said centering ring 27 and are arranged to run on the outer surface of said cylindrical jacket 26.

On the car body 1 are four frame locking devices which serve to hold the grader supporting frame against rotation when it is turned at a right angle to the car body and lowered onto the car body. Each of these lock devices, as shown, comprises a pair of laterally spaced brackets 29, the upper ends of which diverge, and the lower ends of which are rigidly secured to the car body. When the grader supporting frame is lowered as above described the track beams 4 are dropped between the brackets 29 and thus the frame is locked against rotation, as above stated. By reference to Fig. 1 it will be noted that when the supporting frame is lowered onto the car body and its beams 4 engaged and held by the lock devices 29, the entire transverse intermediate portion of the car body serves as a base of support for the said supporting frame.

As shown, each grader comprises or includes what may be designated as a draw frame or bar 30, a scraper blade 31, and an annular bearing, one member 32 of which is rigidly secured to the draw frame 30, and the other member 33 of which is rigidly connected, by arms 34, to the scraper blade 31, so that said scraper blade is capable of angular adjustments in a horizontal plane but is secured for adjustments in a vertical direction with the said draw frame 30. The customary or any suitable means for imparting horizontal angular or rotary adjustments to the scraper blade 31 and for securing the same in different set positions may be employed. The frame made up of the drag bar 30 and bearing ring or member 32 is suspended, by three independently adjustable hangers, from a traveling grader carriage, which latter is mounted for lateral adjustments on the projecting ends of the track beams 4 of the rotary grader supporting frame. More specifically described, each grader frame 35 has four wheel brackets 36 equipped with wheels 37 arranged to run on the lower flanges of the I-beams or so-called track beams 4; and each such carriage has a platform 38 on which an operator may stand.

Each scraper supporting hanger comprises a rack bar 39 that works vertically through a guide bracket 40 and meshes with a pinion 41 on a shaft 42, one end of which is journaled in the coöperating bearing bracket 40. Each guide bracket 40 is connected to a bearing 43 on the frame 35, by a swivel joint which permits lateral oscillations of the coöperating rack bar 39.

In Fig. 6 the hanger which connects the front end of the drag frame or bar 30 to the carriage frame 35 is shown, but all three hangers, in so far as above described, are of the same construction. The rack bar 39 in this forward hanger is attached by a ball and socket connection 44 to the front end of said frame 30, while the lower ends of the other two rack bars are connected, by simi-

lar ball and socket joints, to the opposite sides of the annular bearing member 32, which latter is rigidly secured to said frame 30.

The shaft 42, from the front hanger, is extended rearward and provided with a hand-wheel 45, while the shafts 42 of the laterally spaced rear hangers are connected by miter gears 46 and shafts 47 to operating hand wheels 48, all of which hand pieces 45 and 48 are within reach of the operator on the platform 38.

As is evident, by independent adjustments of the rack bars 39 of the three hangers, the scraper blade 31 may be inclined either toward or from the car, and may be given any desired forward or rearward pitch, so that the said scraper blade may be set for all conditions of work.

The scraper blade of the graders may be adjusted bodily on the supporting frame toward or from the car, by movements of the grader carriage on the track beams of said support. To readily accomplish this adjustment rack bars 49 are secured to the lower edges of the I-beams 4, and spur pinions or gears 50 and 51 journaled in the wheel brackets 36 are in mesh with said racks. The gears 51 are secured on an operating shaft 52, which at one end has a hand wheel 53 within reach of the operator on the platform 38. The gear 50 (see Fig. 5) is normally engaged and locked by a spring-pressed lock bolt 54 mounted in a bearing 55 on the carriage and subject to a foot-actuated releasing lever 56, shown as pivotally connected to said bracket 55. As is evident, when the lock bolt 54 is engaged with the gear 50, the grader carriage is locked against movement on the supporting frame. When said lock bolt is released from said gear and the gears 51 are rotated by turning the hand wheel 53, the entire grader proper will be caused to travel bodily on the I-beams 4, either toward or from the car, according to the direction of rotation of said hand wheel 53.

In order that there may be a straight-ahead pull on the scrapers, drag arms 57 are pivoted to the opposite sides of the car, near each end thereof, and the arms that are ahead of the respective scrapers are connected, preferably by chains 58, to the forwardly extended ends of the corresponding draw bars or frames 30. These arms 57 are adapted to be turned into inoperative positions against the sides of the car body, but when extended into operative positions, they are tied to the ends of the car body by brace rods 59 having, at their outer ends, caps 60 that detachably engage with the free ends of the respective arms. The chains 58, at their free ends, are provided with heads 61 arranged to slide in the arms 57 and to be adjustably secured thereto by pins 62, said arms having perforations through which the pins may be passed. By adjustments of the heads 61 the line of draft on the scraper may be varied; and, furthermore, movements of the scrapers toward and from the car body will require different adjustments of the said heads 61 in order to give the desired draft on the scraper.

The grading apparatus above described may be used for correcting the slope of embankments and cuts, for gathering loose stone, gravel, or earth, close to the ends of the ties, for tamping purposes, or for throwing the same away from the track, as the conditions of work may require. It is also efficient for use to form or to clean ditches through cuts. In fact, it is capable of use for doing various kinds of grading of a road-bed which hitherto has been done by manual labor.

In practice the improved grading apparatus has been put into actual use and has been found highly efficient for the purposes had in view. By its use the cost of grading a road-bed has been very greatly reduced through the elimination of numerous laborers hitherto required to do the work.

Instead of the device usually designated as a grader proper, I propose, in some instances, to support by the novel means above described a mowing attachment for mowing the right of way as far out from the track as permitted by the swinging support. In this instance an ordinary sickle bar may be suspended from the ends of the so-called grader support and the sickle can be operated by means of compressed air, steam, or by a mechanism transmitting power from the car wheels. In any case the sickle bar will be so mounted that it could be raised or lowered at either end to fit the contour of the ground.

What I claim is:—

1. The combination with a car, of a grader support, carried by and extended transversely beyond the body thereof, a grader carried by said support at one side of the car, and means for adjustably securing said grader to said support and for positively holding same against both vertical and lateral movements in respect to said car support and the car body.

2. The combination with a car and a grader support carried by said car and extended transversely beyond the body thereof, means for adjustably securing said grader to said support and for positively holding the same against both vertical and lateral movements, a drag arm projecting from the side of the car body, and a drag connection between said arm and said grader.

3. The combination with a car, of a grader support carried by the car and projecting beyond the sides thereof, and a pair of graders carried by said support, one on each side of the car.

4. The combination with a car, of a grader support having track beams projecting from the opposite sides of the car, and a pair of graders adjustably mounted on said track beams, and located one on each side of the car.

5. The combination with a car, of a grader support carried by said car and projecting from the opposite sides thereof, drag arms projecting at the opposite sides of the car, graders mounted on said support, connected to said drag arms, and located one on each side of the car and means for adjusting said graders on said support and for positively holding the same in different adjustments.

6. The combination with a car, of a grader support having track beams projecting at both sides of the car, drag arms projecting outward from each side of the car, and graders adjustably mounted on said track beams and adjustably connected to said drag arms, said graders being located one on each side of the car.

7. The combination with a car, of a grader support rotatively mounted on said car and arranged to be turned transversely thereof, with its ends projecting on opposite sides of the car, and a pair of graders mounted on the opposite ends of said support and adapted to be carried onto the car body, by rotation of said support.

8. The combination with a car, of a grader support mounted to rotate and move vertically on the body of said car, and a grader carried by said support and movable thereby, from an operative position at one side of the car into an inoperative position on top of the car body, and vice versa.

9. The combination with a car, of a grader support pivotally connected at its intermediate portion to the car body, means for moving the said grader support vertically on the car body, and graders carried by the opposite ends of said support and adapted to be moved thereby from operative positions on opposite sides of the car, into inoperative positions on top of the car body, and vice versa.

10. The combination with a car, of a grader support intermediately pivoted to the car body for horizontal rotary movements, and graders carried by the opposite ends of said support, and which graders, by movements of said support, are adapted to be simultaneously carried from one side to the other of said car.

11. The combination with a car, of a grader support intermediately pivoted to the car body, for horizontal rotary movements, a power device for raising and lowering said support bodily, and graders applied to the projecting ends of said support.

12. The combination with a car, of a grader support intermediately pivoted to the car body for horizontal rotary movements, a cylinder and piston for moving said support vertically in respect to the car body, and graders carried by the ends of said support.

13. The combination with a car, of a cylinder secured in an upright position on the car body, a grader support mounted to move vertically and to rotate around said cylinder, a piston working in said cylinder and connected to said support, for raising and lowering the latter, and graders carried by the ends of said support.

14. The combination with a car, of an upright cylinder secured on the car body, a grader support mounted to move vertically and to rotate around said cylinder, cable guides supported above said cylinder, a piston working in said cylinder, cables extending over said cable guides, attached to said support and subject to said piston, and suitable valve mechanism for controlling the supply of motive fluid to said cylinder.

15. The combination with a car, of a grader support mounted to move vertically and to rotate on the said car body, graders carried by the ends of said support, and locking devices and rest devices on the car body, the former serving to lock said grader support against rotation when turned transversely of the car and lowered, and the latter serving to hold said grader support in an elevated position when the latter is turned longitudinally of the car.

16. The combination with a car, of an upright cylinder secured on the car body, a grader supporting frame mounted to move vertically and to rotate around said cylinder, a piston in said cylinder having connections for raising and lowering said supporting frame, said supporting frame having parallel track beams, lock devices on the car body with which the track beams of said supporting frame are engageable when said frame is turned transversely of the car and lowered, graders adjustably mounted on the opposite ends of said track beams, and rest devices on the opposite end portions of the car body adapted to support said frame and the graders in elevated positions when the said supporting frame is turned longitudinally of the car.

17. The combination with a car body and a grader supporting frame intermediately pivoted thereon, of folding drag arms normally projecting outward from the sides of the car, graders supported by said frame on the opposite sides of the car, drag connections between said graders and drag arms and means for independently adjusting said graders on said supporting frame.

18. The combination with a car, of a grader supporting frame having track beams extending transversely of the car, graders mounted to move bodily on said track beams toward and from the car body, the said graders having adjustable scraper blades and

drag connections, and drag arms projecting outward from the sides of the car body and to which said drag connections are adjustably attached.

19. The combination with a car and a grader supporting frame extending transversely thereof, of graders adjustable bodily on the ends of said supporting frame, toward and from the car, said graders having adjustable scrapers with forwardly extended draw bars, means for adjusting the free ends of said draw bars vertically, and drag arms applied to the sides of the car body, and drag connections between the said draw bars and coöperating drag arms.

20. The combination with a car and a grader supporting frame intermediately pivoted to the intermediate portion of the car body, for horizontal rotary movements, of graders carried by the ends of said supporting frame, folding drag arms applied to both sides and both end portions of the car body, and drag connections for connecting said graders to the drag arms, located in front thereof, in respect to the direction of travel of the car.

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

HERMAN B. EARLING.

Witnesses:

HARRY D. KILGORE,

F. D. MERCHANT.