

Oct. 30, 1934.

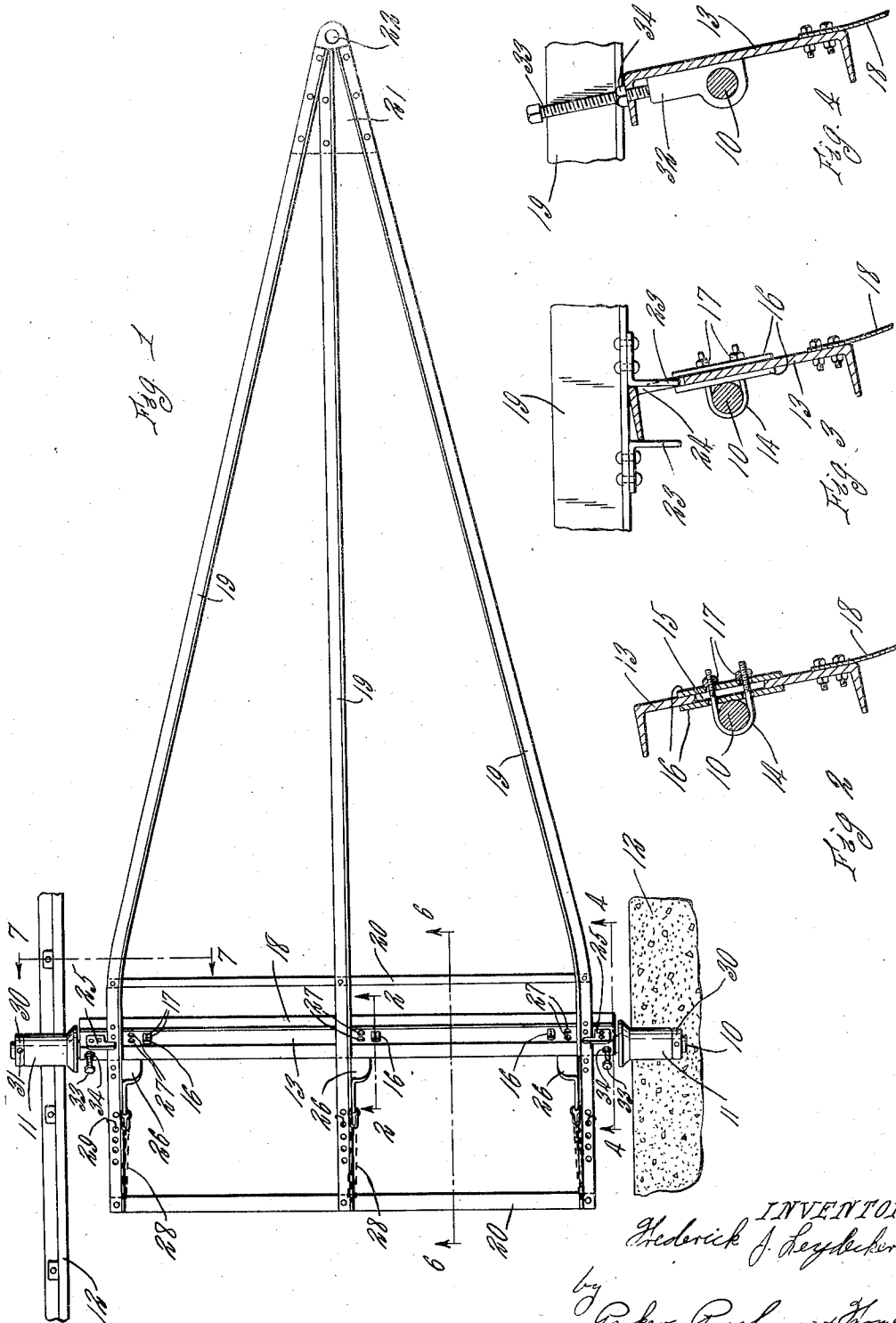
F. J. LEYDECKER

1,978,464

SUBGRADER

Original Filed Dec. 2, 1931

2 Sheets-Sheet 1



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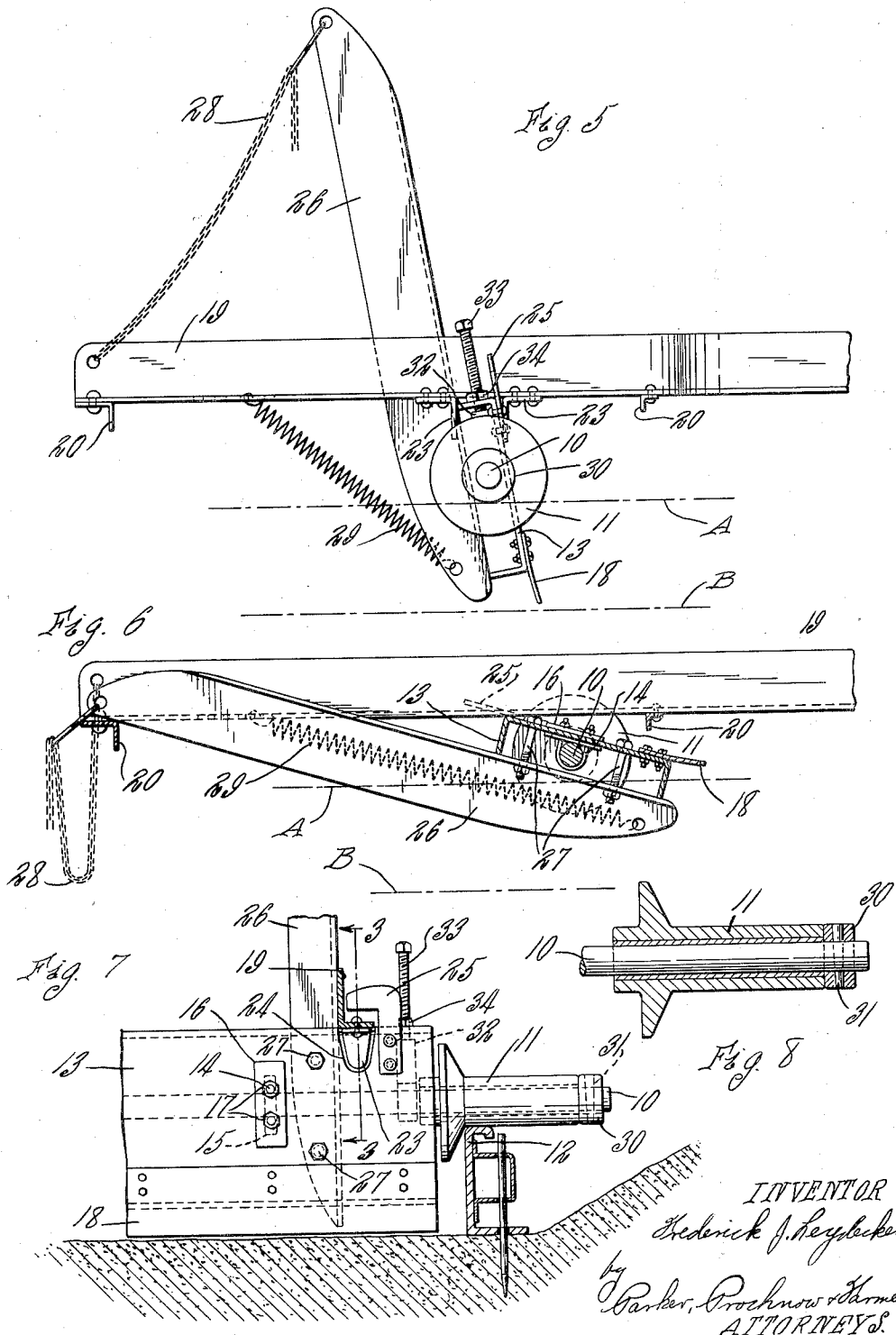
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UNITED STATES PATENT OFFICE

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SUBGRADER

Frederick J. Leydecker, East Aurora, N. Y.

Application December 2, 1931, Serial No. 578,495
Renewed July 3, 1934

25 Claims. (Cl. 37-108)

This invention relates to machines used in the construction of roads and pavements, and particularly to machines or devices for preparing the sub-grade or foundation on which the pavement is laid.

An object of the invention is to improve and simplify sub-grading tools.

Another object of the invention is to provide an improved sub-grader with which the sub-grade may be rapidly prepared for the pavement with a minimum of labor and expense; which may be easily adjusted for different thicknesses of pavement; which is relatively light and compact, so as to be easily transported to and from the jobs where it is to be used; and which will be relatively simple, light, practical and durable in construction, and relatively inexpensive.

Various other objects and advantages will appear from the following description of one embodiment of the invention, and the novel features will be particularly pointed out hereinafter in connection with the appended claims.

In the accompanying drawings:

Fig. 1 is a plan of a sub-grader constructed in accordance with this invention;

Fig. 2 is a transverse, sectional elevation of the same, with the section taken approximately along the line 2-2 of Fig. 1;

Fig. 3 is a sectional elevation through another part of the device, the section being taken approximately along the line 3-3 of Fig. 7;

Fig. 4 is another sectional elevation of the same, the section being taken approximately along the line 4-4 of Fig. 1;

Fig. 5 is a side elevation of the same, with the tool in operative position;

Fig. 6 is a sectional elevation of the same, with the section taken approximately along the line 6-6, but with the grading tool in inoperative position;

Fig. 7 is a transverse sectional elevation of part of the same, the section being taken approximately along the line 7-7 of Fig. 1; and

Fig. 8 is a sectional elevation through one of the supporting and guiding elements.

In the illustrated embodiment of the invention, the improved grader includes a rod or axle 10 extending crosswise of the roadway on which the pavement is to be laid. Flanged rollers or wheels 11 are rotatably mounted upon the ends of the rod or axle, and these wheels are supported upon and roll along the rails or forms 12 which define the side edges of the strip of pavement to be laid. The pavements are commonly laid of

standard widths, and the rails 12 along the sides of such widths serve as tracks to guide the wheels 11. A sub-frame 13 which may, for convenience, be a channel bar, extends lengthwise along the rod or axle 10.

U-shaped bolts 14 pass around the rod or axle and through transversely extending slots 15 in the channel bar, and serve to clamp the rod or axle adjustably to the channel bar. Washer plates 16 are preferably disposed over the slots 15 on both faces of the channel bar, and the arms of the U-shaped bolts 14 pass through apertures in the plates 16. The slots 15 extend transversely of the length of the channel bar, so that the bolts 14 may be adjusted vertically or transversely of the channel bar to some extent. The ends of the bolts 14 carry nuts 17 by which the bolts and axle may be clamped securely to the channel bar, in different positions of adjustment.

A grading tool 18 is removably secured to the lower edge portion of the sub-frame or channel bar 13, so as to depend below the lower edge thereof and perform the actual grading operation. This tool 18 may be any tool that is suitable for preparing the sub-grade, and in the particular example illustrated, is a scraper blade which levels off the sub-grade at the desired distance below the upper edges of the rails that determine the upper level of the pavement. The sub-frame 13 is normally used while in an upright or approximately vertical position, as shown in Figs. 1 to 5, and 7, and its upper edge serves as a rocking fulcrum or support for the main frame 19.

This main frame includes a plurality of angle bars arranged side by side but spaced apart and extending generally in the direction in which the grader moves as it travels along the rails 12. These angle bars are connected at their rear ends and at an intermediate point by cross bars 20. The outer bars of the frame forwardly of that intermediate point are bent toward one another, so as to converge for connection to one another and to a coupling plate 21 having an eye 22, by which the grader may be connected to a draft device, such as a tractor. The side bars of the main frame 19 are provided with pairs of depending spaced flanges 23 between which the upper edge of the sub-frame or channel bar is received, as shown in Figs. 3 and 5. These flanges 23, one pair on each side of the main frame, prevent displacement or translation of the channel bar lengthwise of the main frame while permitting the rocking of the corner edge of the channel bar against the under face of the main frame.

In order that the channel bar may swing upwardly and forwardly, it is positioned with its open face rearwardly, and the web of the channel bar is provided with apertures 24 in alignment with the forward flanges 23, so that those flanges may pass through those apertures as the lower edge of the channel bar swings upwardly and forwardly into the position shown in Fig. 6. The main frame thus rests upon the upper edge of the sub-frame or channel bar, and in order to prevent separation of the two frames, angular or L-shaped brackets 25 (Figs. 1, 5 and 7) are secured to the sub-frame or the channel bar, so as to extend upwardly therefrom and then laterally over the side bars of the main frame 19. These L-shaped angular brackets are spaced from the main frame somewhat when the sub-frame is in operative position, as shown in Figs. 1 to 5 and 7, so that the sub-frame may rock into the inoperative position shown in Fig. 6.

Arms 26 are secured, such as by bolts 27, to the rear face of the sub-frame or channel bar and extend upwardly therefrom through and above the main frame. The upper ends of these arms are connected adjustably, such as by chains 28, to the rear end of the frame. These chains limit the oscillation of the sub-frame from the inoperative, inclined position shown in Fig. 6 into the operative, approximately upright, position shown in Figs. 1 to 5, and 7. Helical springs 29 are connected to the lower ends of the arms 26, and to the main frame 19, so as to urge the sub-frame or channel bar yieldingly and resiliently into the operative position, shown in Figs. 1 to 5, and 7, until limited by the chains 28.

The rollers 11 may be removably confined on the ends of the rod or axle 10, by collars 30 which are removably secured to the ends of the rod or axle 10 by tapered pins 31 that pass transversely through the rod or axle and the collar. Each wheel or roller 11 may be provided with a brass or other bearing in the form of a lining sleeve, as shown in Fig. 8.

To facilitate the vertical adjustment of the sub-frame on the axle, I preferably place bearing blocks 32 on the rod or axle 10, at approximately the ends of the sub-frame and abutting the rear face of the latter. The rod or axle 10 is rotatable in these blocks, and the latter moves transversely of the sub-frame. Screws 33 are threaded through the upper flange of the channel bar 13, and abut at their lower ends in recesses in the bearing blocks 32. By turning the screws 33, they will be threaded through the channel bar flange, and will force the bearing blocks 32 downwardly, which is the equivalent of raising the channel bar since the axle is supported on the rails and therefore cannot descend. By turning screws 33, therefore, the grader tool 18 will be elevated, and if the screws 33 are turned different amounts at the opposite ends of the frame, the tool 18 may be leveled or given an inclination as desired.

In leveling or adjusting the tool 18 by the turning of the screws 33, it will be understood that nuts 17 should first be slightly loosened and the frame or channel bar 13 lowered to an extent greater than that desired. The nuts 17 are then tightened slightly so as to create some friction between the plates 16 and the web of the channel bar which will be sufficient to hold the axle and the channel bar against relative movement, but which may be overcome when the screws 33 are turned. The screws 33 are then turned to elevate the sub-frame relatively to the axle 10, until the lower edge of the tool is exactly

level or has a desired inclination, and is at the proper depth below the upper edges of the rails or forms 12 along which the wheels 11 roll. The nuts 17 are then tightened so as to clamp the axle and sub-frame securely together. The lock nuts 34 on the screws 33 may then be tightened against the upper flange of the channel bar, so as to lock the screws against accidental turning.

In the use of such a grading tool, the wheels 11 are disposed upon the pavement forms 12, so as to bridge the strip where the pavement is to be laid. After one strip has been laid, the inner edge of that strip serves as a form for the next adjacent strip, and therefore an edge of the pavement strip may function as rail along which one of the rollers 11 may travel. The tool 18 is adjusted to the proper depth in the manner explained above, and the forward end or coupling is attached to a truck or other device which draws the grader along the rails or pavement forms which define the limits of the strip of pavement to be laid. The springs 29 rock the sub-frame into its upright or operative position and the chains 28 limit movement beyond this operative position.

The level of support of the wheels 11 is shown in Fig. 5 by the dot and dash line A, and the level or depth of cut by the tool 18 is shown by the dot and dash line B in the same figure. If for any reason it is desired to elevate the tool into an inoperative position, the upper ends of the arms 26 are pulled rearwardly or downwardly and may be secured in that position by the chains 28, or by any other suitable means. When the sub-frame is shifted into this inoperative position, the springs 29 will be tensioned to a greater extent, and tend to return the sub-frame to its operative position when the arms 26 are released. The sub-frame may be considered as a hinged or pivoted section of the entire frame. The axle 10, wheels 11, sub-frame 13, and main frame 19 constitute a two wheel car or unit, and are referred to as such in the claims.

It will be obvious that various changes in the details, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

I claim as my invention:

1. A sub-grader comprising a frame, supporting means for said frame and including flanged wheels at opposite sides of said frame which with the frame form a two wheel car for operation upon the pavement defining forms as a track, and a sub-grader tool extending in a direction cross-wise of the track and approximately between said wheels, said frame having means mounting said tool for oscillatory swinging movement about a horizontal axis closely adjacent the wheels to carry the lower edge of the tool upwardly and downwardly, and for additionally and separately adjusting each end of said tool vertically with respect to said swinging axis and independently of the other end to change the inclination of the lower end of the tool.

2. A sub-grader comprising a frame, means supporting said frame, including a pair of flanged wheels at opposite sides of the frame, free to rotate at all times and forming a two wheel car for operation upon the usual pavement defining forms as tracks, said frame having a pivoted section movable about a horizontal axis that extends transversely of the pavement approximately at the wheels and also adjustable vertically with re-

spect to said wheels, and a sub-grader tool mounted on said pivoted section for oscillatory movement therewith between an operative position in which it depends below the tread level of the wheels and an inoperative position at a higher level, and means for limiting rearward oscillatory movement of said pivoted section.

3. A sub-grader comprising a frame, means supporting said frame, including a pair of flanged wheels at opposite sides of the frame, for operation upon the usual pavement defining forms as tracks, said frame having a pivoted section movable about a horizontal axis that extends transversely of the pavement, a sub-grader tool mounted on said pivoted section for movement between an operative position in which it depends below the tread level of the wheels and an inoperative position at a higher level, means yieldingly urging said pivoted section about its pivotal axis into said operative position, and means for limiting said pivotal movement beyond said operative position when moving away from said inoperative position.

4. A sub-grader comprising a frame, means supporting said frame, including a pair of flanged wheels at opposite sides of the frame, for operation upon the usual pavement defining forms as tracks, said frame having a pivoted section movable about a horizontal axis that extends transversely of the pavement, a sub-grader tool mounted on said pivoted section for movement between an operative position in which it depends below the tread level of the wheels and an inoperative position at a higher level, and means for adjusting said tool on said pivoted section to different levels below said wheels.

5. A sub-grader comprising a frame, means supporting said frame, including a pair of flanged wheels at opposite sides of the frame, for operation upon the usual pavement defining forms as tracks, said frame having a pivoted section movable about a horizontal axis that extends transversely of the pavement, a sub-grader tool mounted on said pivoted section for movement between an operative position in which it depends below the tread level of the wheels and an inoperative position at a higher level, and means for adjusting said tool on said pivoted section to different levels below said wheels, said adjusting means being operable to adjust opposite ends of said tool equal or different amounts.

6. A sub-grader comprising an axle extending in a direction crosswise of the length of pavement to be laid and having flanged wheels operable upon the pavement defining forms as tracks, a sub-frame mounted on said axle for oscillation about the axis of said axle, a main frame rockably connected to said sub-frame and formed at one end for attachment to a draft device, a grading tool mounted on said sub-frame for oscillation therewith between an inoperative, somewhat horizontal position, and a depending operative position, and means for limiting the oscillation of said sub-frame beyond said operative position.

7. A sub-grader comprising an axle, flanged wheels upon the ends of said axle and operable upon the pavement defining forms as tracks, with the axle extending transversely of said pavement forms, a sub-frame supported by said axle and oscillatable about the axis of said axle, a main frame rockably connected to said sub-frame for support therefrom, a grading tool mounted on said sub-frame so as to depend therefrom when the sub-frame is in one oscillatory position and movable upwardly into inoperative position upon

rocking of said sub-frame, means limiting the rocking of said sub-frame beyond said operative position when depending, and means for adjusting said sub-frame on said axle to position said tool at a desired depth and inclination.

8. A sub-grader comprising an axle, flanged wheels upon the ends of said axle and operable upon the pavement defining forms as tracks, with the axle extending transversely of said pavement forms, a sub-frame supported by said axle and oscillatable about the axis of said axle, a main frame rockably connected to said sub-frame for support therefrom, a grading tool mounted on said sub-frame so as to depend therefrom when the sub-frame is in one oscillatory position and movable upwardly into inoperative position upon rocking of said sub-frame, means limiting the rocking of said sub-frame beyond said operative position when depending, means for adjusting said sub-frame on said axle to position said tool at a desired depth and inclination, and means yieldingly urging said sub-frame into said operative position.

9. A sub-grader comprising a main frame having a pair of depending flanges at each side, the flanges of each pair being spaced forwardly and rearwardly of one another, a sub-frame disposed beneath said main frame so as to extend from side to side thereof and extending into the space between each pair of flanges, and upon which said main frame rests and rocks, said sub-frame having an open section clearing corresponding flanges of each pair to enable the sub-frame to be rocked from a depending position in a direction toward a horizontal position, an axle extending lengthwise of said sub-frame and crosswise of the main frame, flanged wheels mounted on the ends of said axle and operable upon the pavement defining forms as tracks, means securing said sub-frame, between its upper and lower edges, to said axle so as to oscillate about the axis of said axle, and means acting between said frames for limiting the rocking of said sub-frame in one direction beyond its depending, operative position.

10. A sub-grader comprising a main frame having a pair of depending flanges at each side, the flanges of each pair being spaced forwardly and rearwardly of one another, a sub-frame disposed beneath said main frame so as to extend from side to side thereof and extending into the space between each pair of flanges, and upon which said main frame rests and rocks, said sub-frame having an open section clearing corresponding flanges of each pair to enable the sub-frame to be rocked from a depending position in a direction toward a horizontal position, an axle extending lengthwise of said sub-frame and crosswise of the main frame, flanged wheels mounted on the ends of said axle and operable upon the pavement defining forms as tracks, means securing said sub-frame, between its upper and lower edges, to said axle so as to oscillate about the axis of said axle, means acting between said frames for limiting the rocking of said sub-frame in one direction beyond its depending, operative position, and means yieldingly urging said sub-frame in said one direction into its depending position.

11. A sub-grader comprising an axle extending crosswise of a pavement to be laid, flanged wheels on the ends of said axle and rolling upon the usual pavement defining forms defining the width of the pavement, a frame extending lengthwise of the axle and attached thereto, means for

adjusting said frame in directions laterally of said axle at different points along said axle, a grading tool mounted on said frame so as to depend below said axle, and means connected to said frame for holding it in operative position in which the tool depends therefrom, and for drawing said frame and axle along said pavement forms.

12. A sub-grader comprising an axle extending crosswise along the pavement to be laid, means carried by the ends of said axle and running upon the pavement forms which define the width of the pavement to be laid, a frame attached to said axle and adjustable laterally thereon, a grading tool carried by and depending from said flange, so as to be leveled or adjusted by the adjustment of said frame with respect to said axle, means connected to said frame for drawing it and said axle along said pavement forms and holding said frame in operative position with the tool depending therefrom.

13. A sub-grader comprising a main frame, a sub-frame depending beneath and having a rockable connection to said main frame, an axle carried by said sub-frame below said main frame and extending crosswise of the pavement to be laid, guide means at the ends of said axle coacting with the pavement forms that define the width of the pavement to be laid, to guide said axle in movement along said pavement forms, and means for limiting the rearward movement of said tool and sub-frame beyond an operative position in which the tool depends from the axle.

14. A sub-grader comprising a car unit extending crosswise of the pavement to be laid, and having at each side a single element guided by a pavement form which defines the width of the pavement to be laid, and a grading tool extending between said forms at said elements and depending below the upper edges of the forms, said unit having means by which said tool may be mounted and adjusted vertically at opposite ends with respect to said elements for leveling and determining the depth of the cut of said tool and swing forwardly and upwardly into inoperative position.

15. A sub-grader comprising a frame formed at one end for attachment to a draft device, means attached to said frame and cooperating with the pavement forms that define the width of the pavement to be laid, for guiding the frame along the pavement forms, a grading tool carried by said frame so as to depend below said frame and extend between said forms, said frame having an adjustable section which mounts the tool for shifting said tool from a depending operative position into an elevated position, and means for limiting the downward and rearward movement of said tool through the movement of said adjustable section of said frame.

16. A sub-grader comprising a rod extending crosswise of the pavement to be laid, means carried by the ends of said rod and guided and supported by the usual pavement forms defining the width of the pavement to be laid, a sub-frame extending along said rod, clamping means attaching said rod to said frame and having limited adjustment in a direction crosswise of said rod, whereby limited adjustment of said frame crosswise of said rod is possible, a grading tool attached to and depending from said frame, and means connected to said frame by which it may be drawn along said pavement forms.

17. A sub-grader comprising a rod extending crosswise of the pavement to be laid, means car-

ried by the ends of said rod and guided and supported by the usual pavement forms defining the width of the pavement to be laid, a sub-frame extending along said rod, clamping means attaching said rod to said frame and having limited adjustment in a direction crosswise of said rod, whereby limited adjustment of said frame crosswise of said rod is possible, a grading tool attached to and depending from said frame, means connected to said frame by which it may be drawn along said pavement forms, and a screw device acting between said frame and rod for causing relative lateral adjustment of said frame and rod, while said clamping means is slackened somewhat.

18. A sub-grader comprising a sub-frame, means attached to said sub-frame and running upon the pavement forms that define the width of the pavement to be laid, a tool carried by said frame, depending into the space between said pavement forms and extending approximately across the space between said forms along opposite side of the pavement which is to be laid, a main frame having a rockable connection to said sub-frame by which said tool may be oscillated from a depending operating position into raised inoperative position, and means limiting the rocking movement of said sub-frame beyond its operative depending position as said tool oscillates downwardly into operative position.

19. A sub-grader comprising a frame having guide means running upon the pavement forms that define the width of the pavement to be laid, said frame having a depending pivoted section between said guide means and adjustable vertically with respect to said guide means, a tool carried by said pivoted section and oscillatable into different depending positions below said frame, stop means for limiting downward and rearward movement of said tool with said section, and means yieldingly urging said pivoted section rearwardly and downwardly into any of said depending positions until stopped by said stop means.

20. A sub-grader comprising a frame having guide means running upon the pavement forms that define the width of the pavement to be laid, said frame having a depending pivoted section between said guide means, a tool carried by said pivoted section and oscillatable therewith downwardly and rearwardly into different depending positions below said frame, and adjustable means limiting the downward and rearward pivotal movement of said tool beyond an approximately vertical position, and having no restriction upon the upward and forward movement of said tool and section, whereby the tool is free to be quickly and easily elevated in a forward direction, and when released will descend rearwardly to a predetermined position.

21. A sub-grader comprising an axle, a pair of wheels on the ends of said axle and free to roll at all times upon the usual pavement defining forms as a track, a frame unit adjustable vertically upon and carried by said axle to form a two wheel car, and a tool extending approximately between and depending below said wheels and mounted by said car for movement therewith and swingable freely back and forth in an arc less than a complete rotation to elevate or lower its lower edge, and means for limiting rearward swinging of said tool beyond a selected position in which it depends below said wheels.

22. A sub-grader comprising a tool extending crosswise of and approximately between a pair of pavement, defining forms, and a car, with a

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- coupling at its forward end, operating along said forms as a track, and means for adjustably mounting said tool on said car to depend below the upper surfaces of said forms upon which the car runs, and for movement to vary the depth to which said tool depends below said upper surfaces, and to swing the lower edge of said tool forwardly and upwardly into an inoperative position. 80
23. A sub-grader comprising a tool extending crosswise of and approximately between a pair of pavement defining forms, a car, with a coupling at its forward end, operating along said forms as a track, and means for adjustably mounting said tool on said car to depend below the upper surfaces of said forms upon which the car runs, and for movement to vary the depth to which said tool depends below said upper surfaces, and for additional and separate movement to swing the lower edge of said tool forwardly and upwardly into an inoperative position, and adjustable means limiting the downward and rearward swing of said tool into operative position. 85
24. A sub-grader comprising a tool extending crosswise of and approximately between a pair of pavement defining forms, a car, with a coupling at its forward end, operating along said forms as a track, and means for adjustably mounting said tool on said car to depend below the upper surfaces of said forms upon which the car runs, and for movement to vary the depth to which said tool depends below said upper surfaces, and for additional and separate swinging movement to carry the lower edge of said tool forwardly and upwardly into an inoperative position, means for limiting the downward and rearward swing of said tool beyond a desired operative position, and means for urging said tool yieldingly to swing in a direction to carry said lower edge rearwardly and downwardly into operative position when released. 90
25. A grader comprising a car movable over a section to be graded, a frame hinged to said car for movement bodily therewith and depending therefrom, a grading tool carried by the lower edge of said frame and freely swingable with said frame from a depending operative position upwardly and forwardly with respect to its movement when in use for grading, into an elevated, inoperative position, and also downwardly and rearwardly back into operative, depending position, means for limiting such downward and rearward movement of the tool and frame and having no restriction upon the upward and forward movement of said tool, whereby the tool is free to be quickly and easily elevated in a forward direction, and when released will descend rearwardly to a predetermined operative position. 95
- FREDERICK J. LEYDECKER. 100

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