

April 3, 1928.

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1,664,634

ROAD SUBGRADING MACHINE

Filed March 19, 1927

2 Sheets-Sheet 1

Fig. 1.

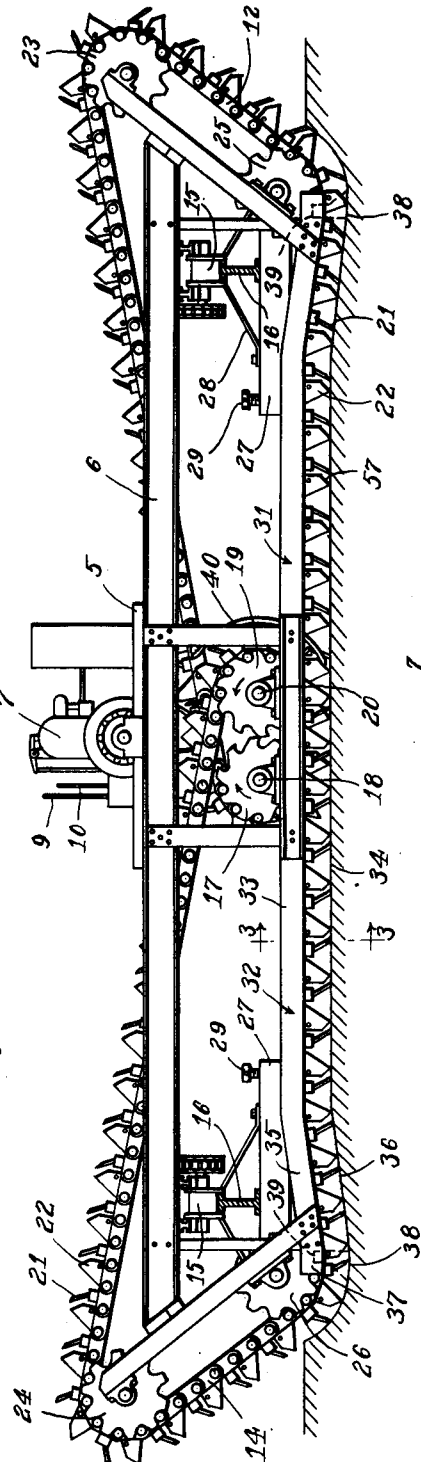
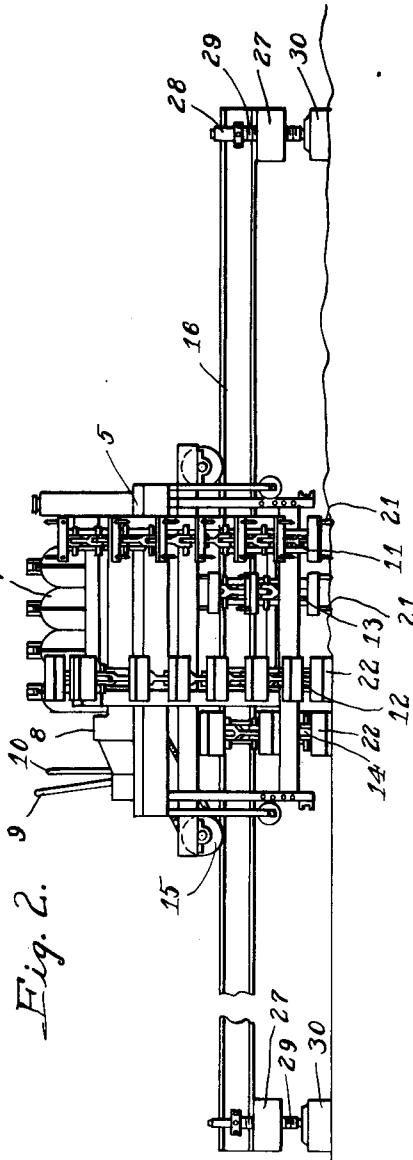


Fig. 2.



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2 Sheets-Sheet 2

Fig. 3.

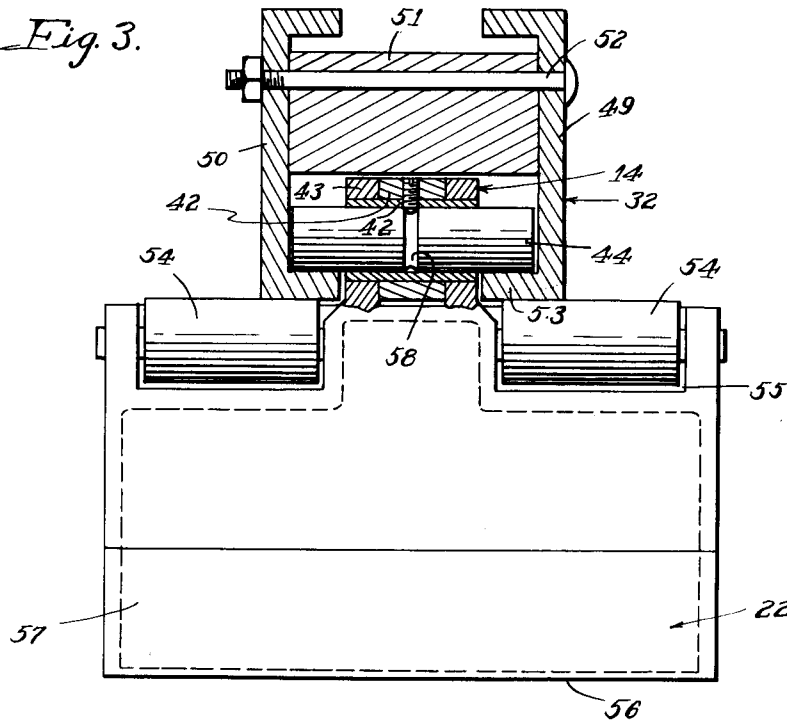
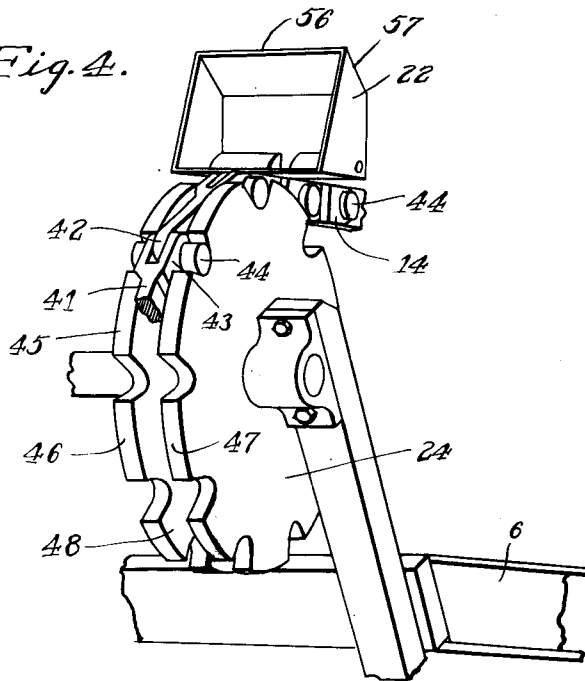


Fig. 4.



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ROAD-SUBGRADING MACHINE.

Application filed March 19, 1927. Serial No. 176,614.

This invention relates to a road subgrading machine, that is, a machine for cutting the sub-surface preparatory to the laying of the pavement.

Among the more important objects of my invention may be enumerated the following:

1. The provision of a machine for the purpose referred to which not only cuts the sub-surface to the desired crown with gutter dips but also cuts emplacements at the opposite sides of the road in a proper relationship to the gutter dips for the side form rails which have to be set there when the concrete is poured.

2. The provision in a machine of this type of a novel means for guiding an endless chain belt of ground cutting and scraping devices so that the sub-surface is cut precisely to a desired contour including the crown, the gutter dips at the sides, and the side rail emplacements alongside the gutter dips.

3. The provision of a machine of this type operating on a pair of track beams extending longitudinally at opposite sides of the road, the adjustment of which as to pitch and elevation determines both the grade and bank of the road as well as the depth of cut.

4. The provision of an improved type of endless linked chain belts for the purpose described together with an improved construction of idler and driving sprockets and guide frames therefor.

The foregoing and other objects of the invention will appear more clearly in the course of the following description in which reference is made to the accompanying drawings wherein—

Figure 1 is a rear view of a road subgrading machine constructed and used in accordance with my invention;

Fig. 2 is a side view taken from the right hand side of Fig. 1;

Fig. 3 is an enlarged sectional detail through one of the guide frames and showing one of the shovels in rear elevation, the view being taken on the line 3—3 of Fig. 1 looking in the direction of the arrows; and

Fig. 4 is a perspective detail of one of the idler sprockets showing how the endless linked chain belt engages the same and is thereby held against unthreading therefrom.

The same reference numerals are applied to corresponding parts throughout the views.

In the cutting of the sub-grade surface

for concrete roads it has heretofore been the practice to employ a ditching gang to provide proper emplacements for the side rails between which the concrete was later poured after the ground therebetween had, of course, been properly graded. This method involving, as it did, so much manual labor was both slow and costly. Furthermore, the cutting of the sub-grade surface was not done with as much an attempt at accuracy as would be consistent with the saving of concrete used in the filling in of the slabs. That is, little or no precaution was taken to have the sub-grade surface cut to a uniform depth and the thickness of the slab was apt to vary considerably from a stated specification, whereas if the low spots had been properly ascertained and filled during the cutting of the sub-grade surface this loss in material could have been avoided. According to the present invention these objections are practically entirely eliminated and the cost per foot of cutting the sub-grade surface is reduced practically to a minimum. This is by reason of the fact that the emplacements for the side rails for the concrete are made at the same time when the road sub-grade surface is cut, the entire surface being made by machine without any manual labor other than that required in the setting of the track beams to the desired pitch and elevation. Thus, the sub-grade surface is cut with the proper grade and the proper bank, the adjustment of the track beams in no way affecting the contour of the road sub-grade surface.

The machine, as appears in Figs. 1 and 2, comprises a supporting frame consisting of a platform 5 carried on cross rails 6 extending substantially the entire width of the road to be made. The platform 5 carries the engine 7, or other driving means, together with transmission mechanism 8 and control levers 9 and 10. One of these levers may be employed for the control of a clutch furnishing power to the endless chain belts 11 and 12 on the right hand side of the machine and endless chain belts 13 and 14 on the left hand side. The other lever may be employed for the control of a clutch furnishing power to a pair of wheels 15 by means of which the machine is fed lengthwise of a pair of track beams 16 extending longitudinally at opposite sides of the road. The

particular transmissions employed in the two instances referred to are not illustrated or described in detail inasmuch as they may partake of a variety of forms but, in so far as the driving of the pairs of endless linked chain belts is concerned, it will be noted that the one of a pair of sprockets 17 on the shaft 18 is indicated by an arrow as being driven in the opposite direction from the sprocket 19 which is also one of a pair of sprockets on another shaft 20. The purpose in this is to have the pair of belts 11—12 driven in the opposite direction from the pair of belts 13—14 and accordingly offset the side thrust of the one pair by that of the other to keep the machine from drifting sidewise. The machine operates from left to right, as viewed in Fig. 2, toward the forward ends of the track beams so that the belt 11 is in leading relation to the belt 12 and the belt 13 is in leading relation to the belt 14. The belts 11 and 13 have rooting or scarifying pins 21 thereon to cut and break up the ground so that it may be scraped or scooped up with little difficulty by the shovels 22 provided on the belts 12 and 14. The shovels and rooters operate from the opposite sides of the road inwardly toward the center and the ground picked up by the shovels on the lower flight of the belts is carried outwardly on the upper flight so as to be dumped at the sides of the road. The upper idler sprockets 23 and 24 are outwardly displaced with respect to the lower idler sprockets 25 and 26 in the manner shown so as to have the ground dumped clear of the machine. Provision may, of course, be made for the reception of the ground by trucks or wagons if desired.

The track beams 16 are provided of a suitable length, such as 50 feet or more, so that an appreciable stretch of road may be taken care of after each setting of the machine. The beams are fastened at their ends to cross pieces 27 and suitably braced, as indicated at 28. The cross pieces 27 have jacks screws 29 fitted therein at the opposite ends thereof. The latter will, of course, be rested on planks, or other suitable shims 30, so as properly to bear the weight imposed on the beams without appreciable settling and make it unnecessary to tamper with the jack screws once a setting has been made. Obviously, the jacking up of both beams to different elevations determines the depth of cut and where the soil is refractory and cannot be handled as readily as otherwise, the depth of cut may be graduated accordingly so that too much load will not be imposed on the engine and the chain belts. The elevation of one beam with respect to the other determines whether or not the road will be banked and the elevation of one end of both of the rails relative to the other end determines, of course, the extent

of the grade which will be cut. In other words, the entire machine is adjusted for the proper operation simply by adjusting the track beams and, as will presently appear, the adjustment for different grades or different degrees of banking does not affect the contour of the sub-grade surface which will be cut. The latter remains uniform.

The contour of the sub-grade surface which will be cut is predetermined by the conformation of the two sections 31 and 32 of a guide frame. The portions 33 determine the contour of the crown 34 of the road, while the portions 35 determine the contour of the gutter dips 36, and the portions 37 provide for flat emplacements 38 alongside the gutter dips at the opposite sides of the road. The emplacements 38, as previously stated, have to be provided for side form rails which are placed at the sides of the road for the filling in of the concrete slabs therebetween. The position of the rails is indicated in dotted lines in Fig. 1 at 39. The rooters 21 and the shovels 22 are guided along paths predetermined by the conformation of the sections of the guide frame. Manifestly, the depth of cut which will be made will be entirely uniform and, furthermore, any low spots will be evident while the cutting of the road bed is in progress and these places may be filled in by hand or otherwise. Of course, a certain amount of filling will be done by the shovels themselves scraping the ground from the deeper cuts at the sides of the road and conveying it toward the center of the road in a manner which is believed to be self-evident. Guards are preferably provided at 40 to retain the ground in the shovels in the passage thereof from the lower flight to the upper flight. I shall now describe the special construction of the guide frame sections and the endless chain belts which permit of this method of operation of the shovels and rooters along a predetermined path, and shall also describe the special construction of the sprockets which prevent the belts from running off the sprockets when the belts are placed under side thrust in the operation of the machine. It being evident that there will be a side thrust on the shovels and rooters as the machine is fed forward along the track beams during the operation thereof.

The endless chain belts 11—14 are all of a generally similar construction and comprise links 41 having plain ends 42 and forked ends 43 arranged to be pivotally connected by cross pins 44. The latter are of sufficient length to project a substantial amount at opposite sides of the chain, as appears in Figs. 3 and 4. These projecting ends are arranged to be received between the teeth 45 of the drive sprockets 17 and 19 and the idler sprockets 23—26. The

sprocket appearing in Fig. 4, numbered 24, is an idler sprocket. Each of the sprockets comprises a pair of sprocket gears 46 and 47 mounted in fixed spaced relation so as to provide a recess 48 therebetween for the reception of the chain belt. Obviously, so long as there is a proper amount of tension on the belt it is quite impossible for the same to run off the sprocket when subjected to side thrust since the chain belt in that case simply bears against the side of one of the sprocket gears. The projecting ends of the cross pins are also arranged to keep the chain belt on a certain predetermined path when running through the guide frame. The latter, the section 32 of which appears in Fig. 3, is formed of a pair of channel irons 49 and 50 mounted in fixed spaced relation, as by means of a spacer 51 and bolts 52, with the flanges 53 of the channel pieces projecting inwardly toward each other and sufficiently spaced to admit the chain belt therebetween. The cross pins 44 ride on top of the flanges 53 in the manner shown in Fig. 3. The shovels 22, which, by the way, are formed preferably integral with alternate links 41, may be arranged to ride in direct contact with the under side of the flanges 53 as on a track. However, I prefer to provide rollers 54 in recesses 55 in the rear wall of each shovel 22 to operate along the flanges 53 so as to minimize friction losses and make the machine smoother in its operation. The scraping edges 56 of the shovels are also preferably forwardly disposed with respect to the rollers 54 so that the thrust on the shovel in scraping is taken intermediate the forward and rearward cross pins of the link on which the shovel is mounted. The rear wall of the shovel is extended from the scraping edge on an incline, as shown at 57, so as to form a pocket in the shovel for the better scooping up of the ground. Manifestly, the cross pins 44 and the rollers 54 keep the chain moving in a definite path predetermined by the conformation of the flange 53. That is, the shovels and, of course, the rooters also, will operate in a straight line when passing through the portions 37 of the guide frame sections and will move upwardly on an incline when passing through the portions 35, and again on a substantially straight line when passing through the portions 33. The pins 44 are preferably arranged to have a certain amount of freedom for rotation in order to make the chain belts operate more easily and smoothly and for this purpose are annularly grooved in the middle thereof, as indicated at 58, to receive the end of a set screw 59 mounted in the end of one of the two links interconnected by the cross pin. This construction also permits the easy removal and replacement of cross pins in case they become seriously worn, or in case it

becomes necessary to dismantle a chain belt for the purpose of replacement or repair of shovels or rooters.

I claim:

1. In a machine of the character described, a supporting frame having driving means carried thereby, a pair of laterally spaced track beams on which said frame is supported and along which the same is arranged to be fed, means for adjusting said beams as to pitch and elevation so as to determine the grading or banking of the road, one or more endless chain belts having ground cutting and conveying means operating thereon transversely with respect to said beams crosswise of the road, and a guide frame providing guideways for said belts whereby to determine the conformation of the crown of the road produced.

2. A machine as set forth in claim 1 wherein the guide frames are conformed to a desired crown, and gutter dips for the road to be made, and also are conformed for flat emplacements alongside the gutter dips at the opposite sides of the road substantially as and for the purpose described.

3. In a machine of the character described, a supporting frame comprising beams extending substantially the width of the road to be made, a pair of longitudinal track beams disposed at the opposite sides of the road beneath the ends of the cross beams to support the same, said cross beams having means whereby to operate the supporting frame lengthwise of the track beams, means for adjusting the track beams individually both as to pitch and elevation to determine the grade and bank of the road to be produced, and endless chain belts having ground cutting and conveying means thereon mounted on and adjustable with the supporting frame and guided thereon along a predetermined path, said supporting frame having driving means thereon for operating said belts.

4. In a machine as set forth in claim 3 wherein right and left hand belts are provided operating on the right and left hand halves of the road, the provision of the guideways for said belts in guide frames provided for the right and left hand halves of the road and conformed to the desired crown and gutter dips so as to cause the chains to travel in predetermined paths according to the crown and gutter dips it is desired to produce.

5. In a machine as set forth in claim 3, the provision of the guideways for said belts in a guide frame-work disposed beneath the track beams and suspended from the cross beams, said frame work being conformed to a predetermined road crown with gutter dips for the sides of the road whereby a road of the desired contour is produced regardless of the grade or bank thereof caused by the

adjustment as to pitch and elevation of the track beams.

6. A machine as set forth in claim 3 wherein the means for adjusting the track beams as to pitch and elevation comprises cross members at the opposite ends thereof having jack screws for pitching the beams longitudinally or laterally or adjusting the elevation thereof as required for different road grades and banks.

7. In a machine of the character described, an endless linked chain belt having ground excavating means on the links thereof, the said links being pivotally connected by cross pins projecting at the opposite sides of the chain belt, and means for guiding a flight of the chain belt comprising a pair of angle members mounted in fixed laterally spaced relation with their flanges extending inwardly toward each other leaving a guideway therebetween for the operation of the chain belt therein, the cross pins of said chain belt having the ends thereof operating along one side of the flanges of said angle members, and the links having means engaging the other side of said flanges whereby the belt is guided for movement along a fixed path determined by the conformation of the aforesaid flanges.

8. In a structure as set forth in claim 7 wherein the last mentioned means comprises rollers operating in contact with the flanges as on a track and arranged to assume the thrust incident to the operation of the ground excavating means.

9. In a machine of the character described, an endless linked chain belt having scraping shovels mounted on the links thereof, the said links being pivotally connected at the opposite ends thereof by cross pins projecting laterally at opposite sides of the belt, and the shovels being mounted on the links between the cross pins, and means for guiding a flight of the chain belt comprising a pair of angle members mounted in fixed spaced relation with their flanges extending toward each other but sufficiently spaced to provide a guideway therebetween for the operation of the chain belt therein, the aforesaid cross pins being arranged to operate along the in-

ner face of the flanges to guide the links along a predetermined path according to the conformation of the flange, and the scraping shovels being provided at their rearward portions with rollers to operate on the outer faces of the flanges to assume the thrust incident to the operation of the shovels.

10. In a structure as set forth in claim 9, the provision of cross pins each of which has an annular groove therein, and means carried by one of the interconnecting links of the chain belt with which the pin is associated arranged to engage in said groove for removably retaining the pin in place while permitting a certain amount of turning of said pin in operation.

11. A structure as set forth in claim 9 wherein the scraping edge of each shovel is disposed intermediate the cross pins of the link on which the shovel is mounted whereby to dispose the same forwardly with respect to the rollers which assume the thrust in the operation of the shovel substantially as and for the purpose described.

12. In a machine of the character described, the combination with a portable frame, an endless linked chain belt on said frame carrying ground-working devices on the outer side of the links thereof, means for driving said frame forwardly or rearwardly on the road, and means for driving said belt transversely with respect to the direction of travel of the frame during the travel of the latter, of one or more guide and drive sprockets for the flight of the belt operating on the road, each of said sprockets comprising a pair of sprocket gears mounted in fixed laterally spaced relation for the reception of the belt therebetween whereby to hold the same against running off the sprockets under the lateral thrust thereon incident to the working thereof, the said belt having suitable projections arranged to be received between the teeth of the sprocket gears whereby the one or more drive sprockets is arranged to drive the same.

In witness of the foregoing I affix my signature.

HERMAN K. LEHMER.