J. W. KINCAID.

ROAD BUILDING MACHINE.

APPLICATION FILED JUNE 26, 1916.

1,244,505.

Patented Oct. 30, 1917.

4 SHEETS—SHEET 1.

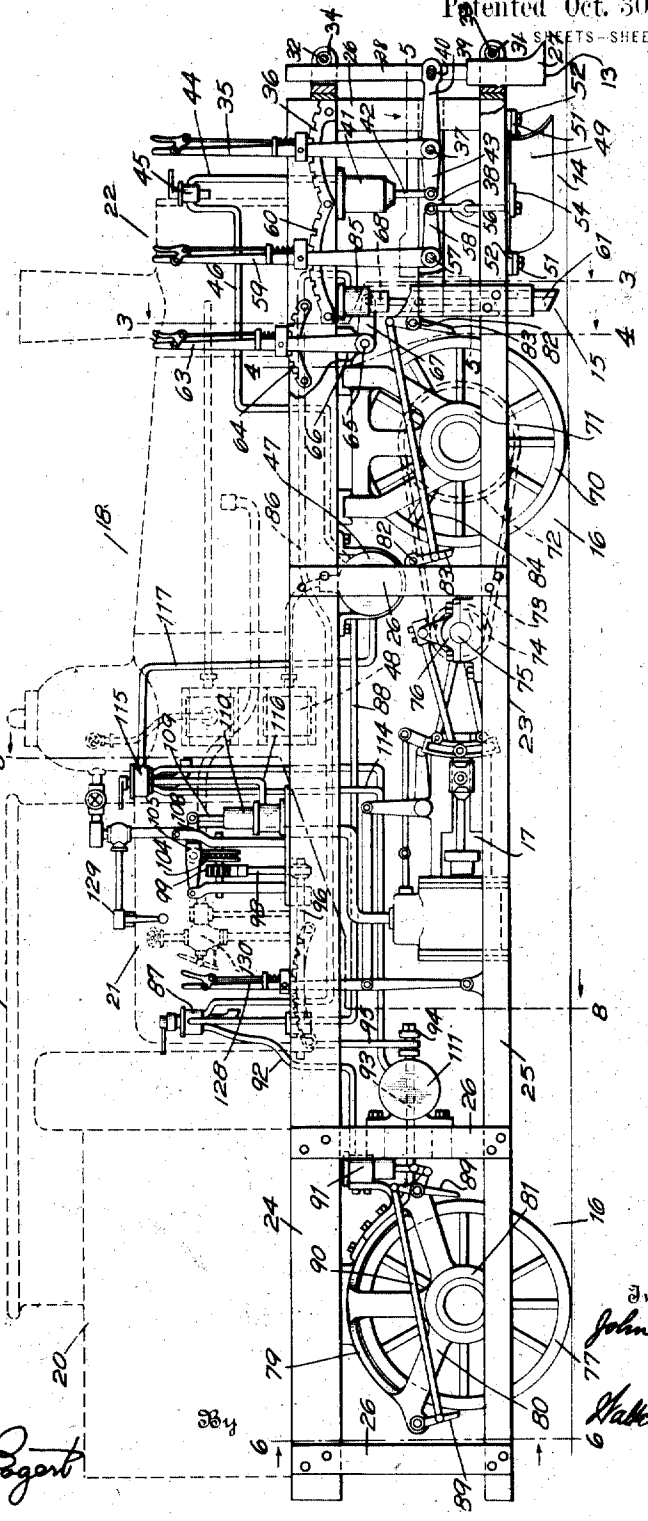


Fig. 1.

Witnesses:
F. E. Arthur.
W. Thornton Rogers

Inventor
John W. Kincaid
By Walker & Kinney
Attorney

J. W. KINCAID.

ROAD BUILDING MACHINE.

APPLICATION FILED JUNE 26, 1916.

1,244,505. **Patented Oct. 30, 1917.**

4 SHEETS—SHEET 2.

Fig. 2.

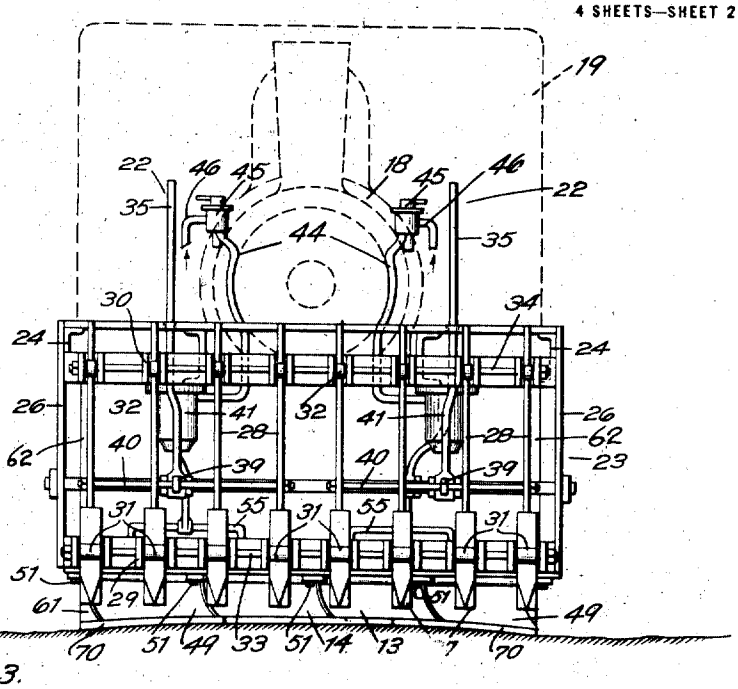


Fig. 3.

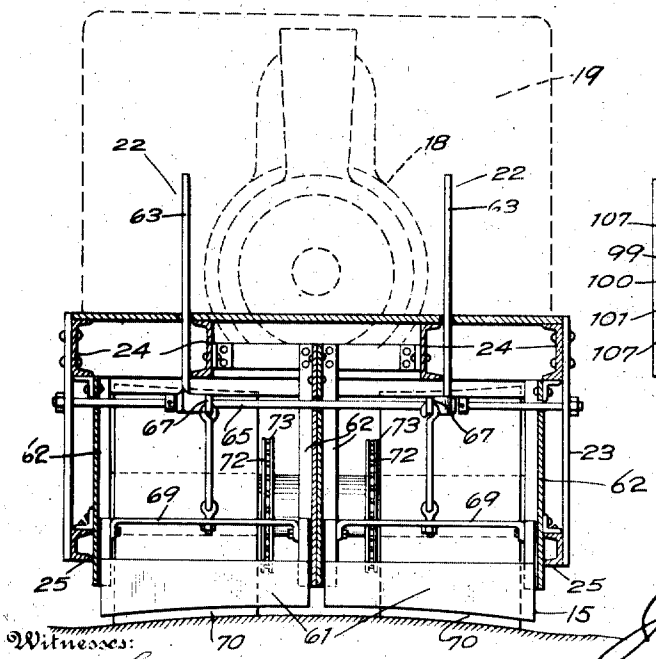
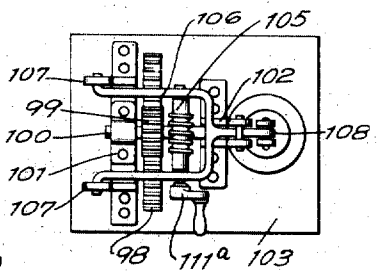


Fig. 9.



Witnesses:
F. E. Arthur,
W. Thornton Bogert

Inventor
John W. Kincaid
By Walter C. Murray
Attorney

J. W. KINCAID.

ROAD BUILDING MACHINE.

APPLICATION FILED JUNE 26, 1916.

1,244,505.

Patented Oct. 30, 1917.

4 SHEETS—SHEET 3.

Fig. 5.

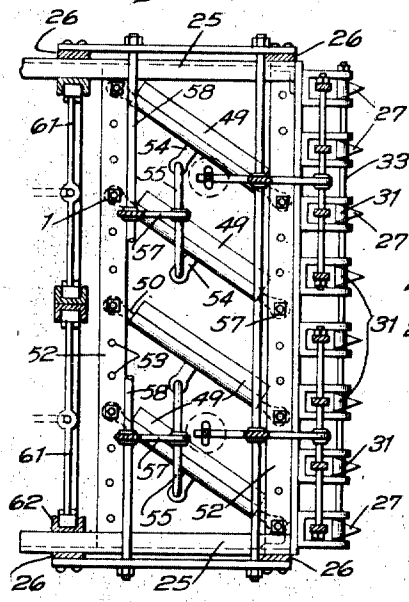


Fig. 4.

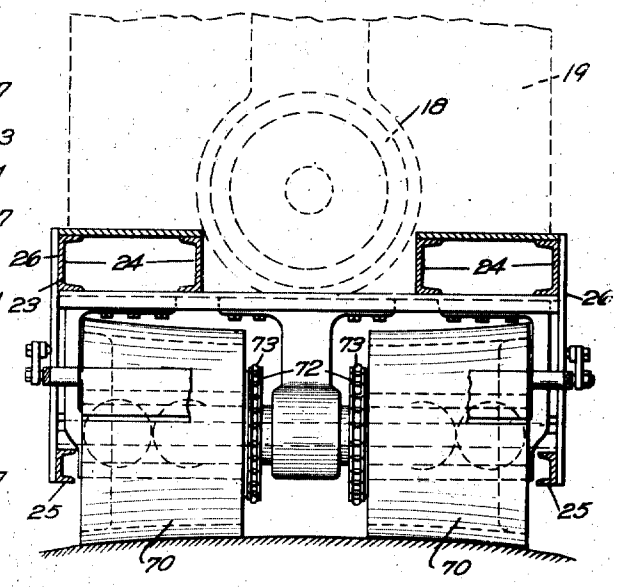


Fig. 6.

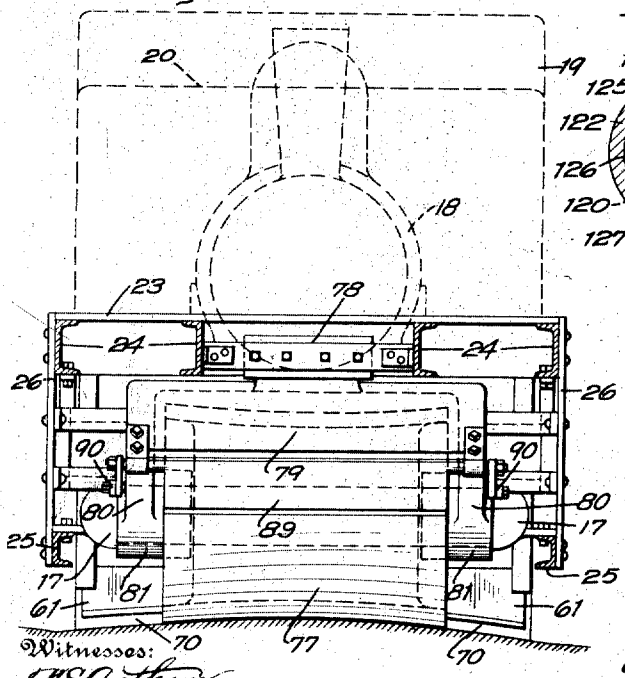


Fig. 10

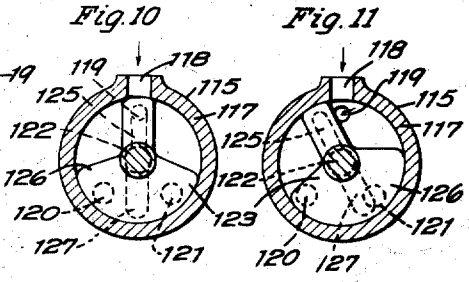
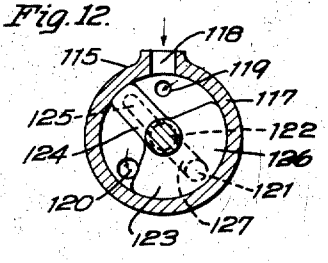


Fig. 11

Fig. 12.



Witnesses:
H. E. Arthur,
W. Thornton Rogers

Inventor:
John W. Kincaid
By Walter Murray

I. W. KINCAID.

ROAD BUILDING MACHINE.

APPLICATION FILED JUNE 26, 1916.

1,244,505

Patented Oct. 30, 1917.

4 SHEETS—SHEET 4.

Fig. 7

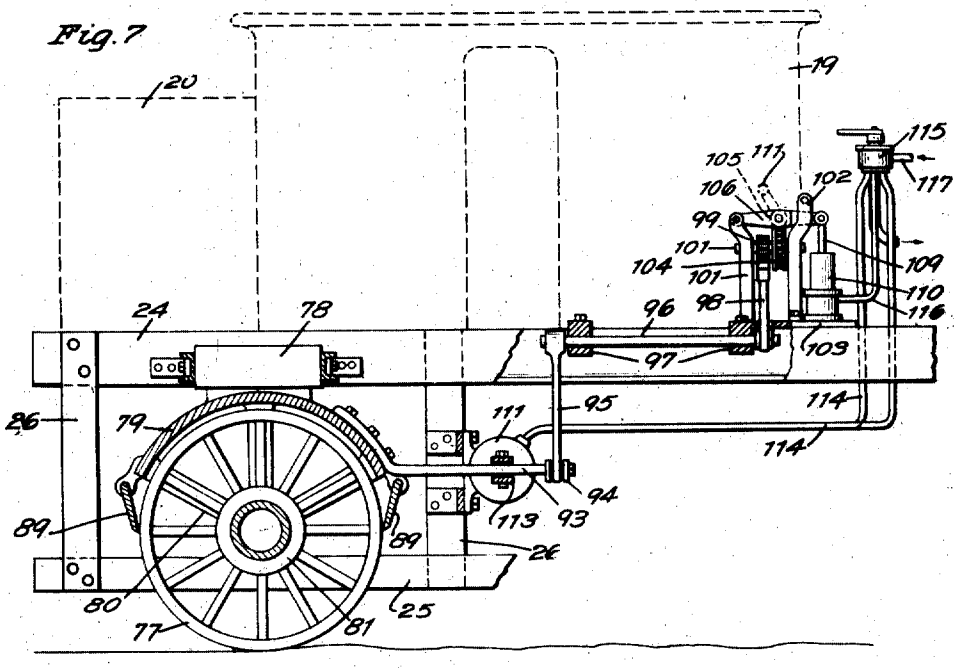
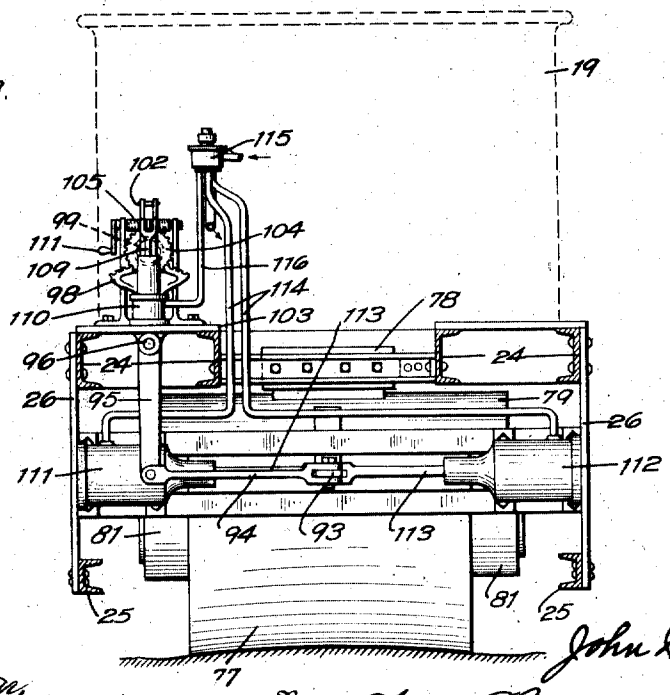


Fig. 8.



Witnesses:

H. E. Arthur,

W. Thornton Bogert

Inventor

John W. Kincaid

By Walter E. Murray

Attorney

UNITED STATES PATENT OFFICE.

JOHN W. KINCAID, OF MOUNT CARMEL, OHIO.

ROAD-BUILDING MACHINE.

1,244,505. Specification of Letters Patent. Patented Oct. 30, 1917.

Application filed June 26, 1916. Serial No. 105,815.

To all whom it may concern:

Be it known that I, JOHN W. KINCAID, citizen of the United States of America, and resident of Mount Carmel, in the county of Clermont and State of Ohio, have invented a new and useful Improvement in Road-Building Machines, of which the following is a specification.

This invention relates to a road building machine and particularly to a road building machine adapted to reconstruct old road surfaces.

An object of my invention is to produce a machine adapted to plow or rout up, redistribute, crown and relay the material of old road surfaces at one operation.

A further object is to provide a single machine adapted to rout up, spread, crown and reroll the material of old road surfaces in such a manner that the rolling mechanism is always on a newly made road surface, thereby causing the routing, spreading and crowning elements of the machine to rout, spread and crown the road material evenly for the rolling operation.

These and other objects are attained in the machine described in the following specification and illustrated in the accompanying drawings in which Figure 1 is a side elevation of the machine, certain parts being shown in dotted outlines for convenience of illustration.

Fig. 2 is a front elevation of the machine shown in Fig. 1, the parts shown in dotted outline in Fig. 1 being likewise shown in Fig. 2.

Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a fragmental transverse sectional view taken on the line 4—4 of Fig. 1.

Fig. 5 is a sectional fragmental plan view taken in the line 5—5 of Fig. 1.

Fig. 6 is a transverse sectional view taken on the line 6—6 of Fig. 1.

Fig. 7 is a fragmental sectional side elevation of the rear roller and steering mechanism therefor.

Fig. 8 is a transverse sectional view taken on the line 8—8 of Fig. 1.

Fig. 9 is a plan view of the manual steering control and steering roller locking mechanism.

Figs. 10, 11 and 12 are transverse sectional views of the steering roller control valve.

The road building machine embodying my invention consists of a surface plowing or routing mechanism 13, a material spreading or distributing mechanism 14, a crowning mechanism 15, and a rolling mechanism 16, suitable mechanism such as an engine 17 being employed for propelling the machine. In the preferred embodiment of my invention I construct a machine having a locomotive type of boiler 18 with a cab 19 and coal bunker 20 constructed therewith. Within the cab of the machine suitable mechanism for controlling the operation of the propelling engine and the mechanism 21 employed for controlling the steering roller, is located. At the front of the machine suitable mechanism 22 for controlling the operation of the routing, distributing and crowning mechanisms, is located. The mechanisms consisting of the routing, distributing, crowning and rolling mechanisms and the means for operating them, together with the boiler, the cab and the bunker are mounted upon a chassis or frame work 23 consisting of longitudinal top channel iron side members 24 and bottom longitudinal side channel iron members 25 connected at intervals between their ends by bars 26 and transversely at their ends by similar frame members.

The routing mechanism which is adapted to rout or plow the road surface consists of a series of plows or routers 27 connected with bars 28 at their upper ends and reciprocally mounted in guides 29 at their lower ends and in guides 30 at their upper ends, rollers 31 and 32 mounted on transversely extending shafts 33 and 34 passing through the projecting ends of the guides 29 and 30, being provided to permit of easy reciprocation of the routing points 27 so that they may be raised or lowered with relation to the surface to be routed. The mechanism employed for raising and lowering these routing tools consists of hand levers 35 having ratchets thereon adapted to engage racks 36, and secured to pivotally mounted shafts 37 mounted in short longitudinally extending frame members 38, the shafts 37 having forwardly extending arms 39 secured thereto and adapted to be operated by the hand levers. The forward ends of the arms 39 are slotted to permit of the passage therethrough of bars 40 passing through the bars 28 of the routers 27. It will be seen by referring to Figs. 2 and 5 that the routing tools are connected together in a series of

four each so as to produce two series of tools each series of which is controlled by a lever 35 located on each side of the boiler. By means of these hand levers the routers are located in position, forward movement of the levers lowering the routers, while backward movement raises the routers. In addition to this manual means of lowering and raising the routers I have also provided power controlled means, such as pneumatic cylinders 41, the piston rods 42 of which connect with rearwardly extending arms 43 secured to the shafts 37. These cylinders are connected by means of piping 44 with an air admission and exhaust valve 45 located adjacent to the hand levers 35, and thence by means of piping 46 to an air reservoir 47, the air supply of which is maintained by an ordinary air pump 48. One of each of the cylinders 41 and valves 45 is located on each side of the machine as disclosed in Fig. 2, in a position adjacent to the hand levers 35 so as to permit the operator stationed at these points, to control the operation of the routers either manually or by power. When the power means of control is employed, the ratchets of the hand levers are released so as to permit of operation of the routers by the pneumatic control means.

Located immediately back of the routers and following them up in operation, is located the distributing mechanism. This mechanism consists of a series of plates 49 having shovel-like formation and pivotally mounted on shafts 50 secured at their ends by means of bolts 51 to transversely extending bars 52 forming members of the chassis or frame 23 of the machine. These bars are provided at intervals with apertures 53 adapted to receive the bolts 51 of the shafts 50, so that the angular positions of the plates 49 may be adjusted. Extending rearwardly from each plate is an arm 54, the arms of the two plates on each side of the machine being connected by bars 55, the bars in turn being connected by means of links 56 with arms 57 secured to transversely extending shafts 58 rotatively mounted in the longitudinally extending frame members 38. Secured to these shafts 58 are hand levers 59 having ratchets adapted to engage racks 60 in the same manner that the levers 35 engage the racks 36, the levers 59 being in all respects similar to the levers 35. The purpose of these hand levers 59 is to control the positions of the plates 49 for greater or less shoveling effect and to bring them toward or from the road surface. Only manual means are provided for controlling these distributing plates, the plates not being of sufficient weight to warrant the application thereto of power controlling means. As in the routing mechanism, the levers 59 are so arranged that one of them is located on each side of the boiler and adjacent to lever 35 and valve 45. By means of the bolts 51 and the apertures 53 in the bars 52, the positions of the distributing plates 49 may be varied so that they are all inclined in one direction as disclosed in Fig. 5, that they may be reversed to incline in the opposite direction or they may be so adjusted as to have two on one side adapted to distribute the material toward the center while the two on the opposite side are also located to distribute the material toward the center of the machine. In addition to this the distributers may be so adjusted as to distribute the material in opposite directions, that is, from the center toward each side of the machine.

Located immediately back of the distributing mechanism and adapted to smooth and crown the material distributed by the distributing mechanism, is the crowning mechanism 15. This mechanism consists of two plates 61, see Fig. 3, each plate taking in substantially half the width of the machine, the plates being located in a straight line directly transversely of the machine so as to act as levelers, removing any unevenness of material left by the distributing plates. These crowning plates 61 have their lower edges curved as disclosed in Fig. 3, the curvature of the two plates coöperating to produce a continued curve. These plates are reciprocally mounted in channel iron frame members 62 located on each side of the machine as well as centrally thereof. The plates 61 are preferably of heavy construction so that they will not be affected by the material to be smoothed and crowned, thereby assuring of smooth spreading and crowning of the loosened material preparatory to its being rolled. I have provided means for controlling the raising and lowering operations consisting of a manually operated device similar to that employed for raising and lowering the routing tools 27 as previously described. This mechanism consists of hand levers 63 provided with ratchet mechanism adapted to engage racks 64 secured to the frame of the machine, and rotatively mounted on shafts 65 mounted in brackets 66 also secured to the frame of the machine. Extending forwardly from the levers 63 are arms 67 connected at their forward ends to links 68 which are connected at their lower ends with bars 69 extending transversely of the plates 61.

Immediately following these three mechanisms, viz., the routing, distributing and crowning mechanisms, is located the rolling mechanism. This mechanism comprises a pair of rollers 70 journaled in bearings 71 mounted on the framework of the machine and located on each side, a space being left between the rollers as shown in Figs. 3 and 4. These rollers are independent of one an-

other and have secured to their inner faces sprockets 72 over which pass chains 73 driven from a sprocket 74 mounted on a crank shaft 75 journaled in bearings 76 mounted on the lower channel iron frame members 25 of the frame 23. Each set of sprockets and chains is driven by a separate and distinct engine, the location of the engine for driving each roller being shown somewhat diagrammatically by means of dotted lines in Fig. 4, adjacent to each side of the frame. The purpose of this separate driving means for each roller is to permit of the differential action of the rollers with relation to one another when the machine is rounding curves in the road. Located at the rear of the machine and centrally thereof is the steering roller 77, see Fig. 6, this roller being of such a width as to roll the material left by the space between the rollers 70, with sufficient overlapping of the rollers to permit of smoothing the entire rolled surface and of preventing ridges being formed therein. This roller 77 is mounted upon a turn table or bolster 78 at the rear of the machine so as to permit it to rotate thereon and to steer the machine during the operation thereof. In order to mount the roller upon the bolster a substantially semi-cylindrical plate 79 is located over the roller, see Fig. 7, with arms 80 extending therefrom and located radially with reference to the axis of the roller. The bearing 81 connects these arms so that the roller is journaled at each end of the semi-circular frame thus formed. The lower member of the bolster is located on this frame and the upper member of the bolster is secured to the chassis or frame of the machine. Suitable mechanism is provided for controlling the steering positions of this roller both manually and power controlled devices being embodied therein. This steering mechanism will be hereinafter more fully described. It will be seen by reference to Figs. 2, 3, 4, 7 and 8 inclusive, that the contour of the rollers with relation to one another is such that the crown established by the crowning plates 61 is taken care of, the rollers 70 being formed to present the appearance of truncated cones with the smaller ends thereof facing one another, and the roller 77 being formed to carry out the curved formation between the rollers 70, this roller 77 being of substantially the shape of an hour glass. By this formation the coöperation between the rollers 70 and 77 is such that the rolled portion of the road will be crowned as disclosed in the end views above referred to. Located adjacent to the rollers 70, adapted to engage their surfaces, and mounted on shaft 82 mounted in bearings secured to the vertically disposed frame members 26 located at the front of the machine, are plates 83 having their edges of a shape adapted to engage the faces of the rollers. These plates are so connected by means of a link 84 that movement of the forward plates toward the roller surfaces will also bring the coöperating plates in engagement with the roller surfaces. The purpose of these plates is to provide means for removing mud and other matter clinging to the surfaces of the rollers so that the surface of the road may be rolled smooth without clods of material being removed therefrom and left clinging to the roller surfaces. In addition to this the plates may be caused to act as brakes to aid in controlling the movement of the machine in going down hill. For the purpose of moving the plates toward and from the surfaces of the rollers I have provided air cylinders 85 suitably connected by means of piping 86 to an admission and exhaust valve 87 located in the cab of the machine. This valve communicating in turn by means of a pipe 88 with the reservoir 47. The roller 77 at the rear of the machine is also provided with plates 89 which are pivoted at the transverse edges of the frame 79 and which are connected by means of a link 90 so as to bring each plate into engagement with the roller surfaces when one of them is operated. For the purpose of operating these plates I have provided the same type of mechanism above described for operating the plates 83, this mechanism consisting of an air cylinder 91 suitably connected by means of a pipe 92 with the admission and exhaust valve 87 so that operation of the valve 87 not only controls operation of the plates 83 but also simultaneously controls operation of the plates 89. In this way the surfaces of the rollers may be kept clean and the machine is provided with a series of powerful brakes. It is pointed out that the plates are so located with reference to the roller surfaces that they operate when the machine is going either forward or backward.

The steering mechanism for controlling the movement of the steering roller consists of an arm 93 secured to the frame 79 covering the roller 77 and extending forwardly, see Figs. 1, 7 and 8. At the forward end of this arm a link 94 is connected, the link extending transversely of the machine and being connected at its opposite end with a depending arm 95 secured to a shaft 96 extending longitudinally of the machine and rotatively mounted in bearings 97 attached to the framework thereof. To the forward end of the shaft 96 is attached a gear segment 98, see Figs. 8 and 9, which meshes with the teeth of a pinion 99 secured to a short shaft 100 rotatively mounted in bearings 101 and 102 extending upwardly from and secured to a bed plate 103 mounted on the frame of the machine. This shaft 100 is also provided with a worm gear 104 which meshes with a worm 105 rotatively mounted

in a yoke 106 having its forked ends pivotally mounted in uprights 107 of the bearing 101. At its forward end the yoke is provided with an extension 108 to which is connected the piston rod 109 of an operating cylinder 110, provided for pneumatic engagement and disengagement of the worm and the worm wheel. The shaft of the worm is extended at one end beyond the yoke and is provided with a crank handle 111ª for manual rotation thereof. The means for engaging and disengaging the worm and the worm wheel and the reason for such an operation will be hereinafter more fully set forth. Normally the worm is in engagement with the worm wheel so that steering movement of the roller 77 may be had by rotating the worm by means of the crank 111ª. Rotation of the crank in turn rotates the worm, the worm wheel, pinion 99, segment 98, shaft 96, arm 95, arm 93, and the roller 77. Opposite rotation of the crank 111ª moves the roller in the opposite direction. Because of the worm and worm gear connection the roller will be locked against accidental displacement from its adjusted positions. In order however, that the roller may be more quickly moved from one position to another, power driven mechanism is also employed. This power driven mechanism consists of two cylinders 111 and 112 located on opposite sides of the machine, the cylinders being connected by piston rods 113 with the arm 93 extending from the frame 79 of the roller 77. These cylinders are connected by means of piping 114 with an admission and exhaust valve 115 which not only controls the admission and exhaust of air in these cylinders, but also controls the admission and exhaust of air in the cylinder 110 connected with the yoke 106 carrying the worm, piping 116 being provided for this purpose. The admission of air to the valve 115 is had through a pipe 117 leading from the reservoir 47. Since the worm 105 normally engages the teeth of the worm wheel 104 the roller 77 will be held against movement from one position to the opposite position thereof and consequently any attempt to change its position by admitting air to one or the other of the cylinders 111 or 112, will result ineffectually to secure any movement of the roller 77. For this reason the yoke 106 which lifts the worm from engagement with the worm wheel, together with the cylinder 110 and its connection by means of piping 116 with the valve 115, is provided. The valve is so constructed that previous to the admission of air to one or the other of the cylinders 111 or 112, air is admitted to the cylinder 110 so as to cause the yoke 106 to lift the worm 104 from engagement with the worm wheel. Immediately thereafter air is admitted to the desired one of the cylinders 111 or 112, the position of the roller 77 is shifted, and the worm is again restored to its normal position in engagement with the worm wheel to lock the roller in its new position. The same thing occurs when the position of the roller 77 is reversed. The interior of this valve is shown somewhat diagrammatically in Figs. 10 to 12 inclusive. In these figures it will be seen that the valve casing 117 is formed in a cup-like shape and in its side an admission port 118 is provided. In the bottom of the casing a port 119 which communicates with the piping 116 leading to the cylinder 110 is provided and ports 120 and 121 communicating with the piping 114 leading to the cylinders 111 and 112, are provided. Formed centrally of the interior of the casing and located in the bottom thereof is the exhaust port 122 through which exhaust from the cylinders 110, 111 and 112 is passed. The opening and closing of these admission and exhaust ports is controlled by a movable valve member 123 having an extension 124 which is provided with a passage 125 on its under face, and a sector shaped portion 126 which is provided with a passage 127 communicating with the passage 125 and formed on the under face of the sector 126. The passages 125 and 127 communicate with each other and extend across the exhaust port 122, the ends of the passages extending over the admission ports 119, 120 and 121 of the cylinders 110, 111, 112. When the valve member 123 is moved to the position shown in Fig. 10 the passage 125 permits of exhaust of air from the cylinder 110 from the passage 125 and through the exhaust port 122. In this position the ports 120 and 121 are closed to admission and exhaust. In this position of the valve the worm is in the normally engaged position with the worm wheel and the roller 77 is in its locked position. As soon as the valve member 123 is moved to the position shown in Fig. 11 the port 119 is open to air pressure. This causes cylinder 110 to lift worm 105 from engagement with the worm gear 104. In addition to this it will be seen that passage 127 is uncovering the port 121 of one of the cylinders 111 or 112 while port 120 is being gradually uncovered to air pressure. Further movement of the movable member 123 causes the port 119 to be completely exposed to air pressure as is also the port 120, port 121 being in the meantime brought into full communication with the exhaust port 122. The worm 105 having thus previously been raised from engagement with the worm wheel 104 before the port 120 is opened, the admission of air to the port 120 will cause its connected cylinder to shift the position of the steering roller 77 while the air contained in its coöperating cylinder will be exhausted through the port 121, the passage 127 and the exhaust port 122. Upon return

of the valve member 123 to its normal position, the air in the cylinder communicating with port 120 will be retained, the port 119 will be opened and exhaust from cylinder 110 through the exhaust port 122 will take place. This causes the worm to engage the worm gear 104 and to lock the steering roller 77 in its adjusted position. Reverse movement of the valve 123 will cause the worm to be again lifted from engagement with the worm wheel and will permit of exhaust through the port 120 and admission through the port 121 so as to reverse the position of the steering roller. Movement of the member 123 to its normal position will again lock the roller in its newly adjusted position.

The remainder of the machine consists of the mechanisms employed for controlling operation of the engine, such as a reversing lever 128 which controls the position of the Stephenson link motion disclosed, a throttle 129 which controls the admission of steam to the engine, an injector 130 and the air pump 48, all of these mechanisms being located conveniently for operation by the engineer of the machine.

In the operation of the machine the services of from two to three men are necessary. One man is employed as the engineer and is located in the cab in a position accessible to the levers controlling the steering mechanism, the forward and reverse movements of the engine, the injector, the air pump, the brakes and other devices with which the machine may be provided for its general operation. At the front of the machine a man is preferably located on each side of the boiler in a position accessible to the hand levers 35, 59 and 63, as well as to the valves 45. Each of these men controls the positions of the routing tools, the distributing plates and the crowning plates by means of the manual and power operating mechanisms provided therefor. If the road to be refinished is of such a width that the machine can take care of one half of its surface, the machine will be driven down one side of the road with the distributing plates set as disclosed in Fig. 5 for pulling the material loosened by the routers toward the center of the road, the crowning plates 6 following the distributing plates in their act of distributing the material. These crowning plates smooth the redistributed material and the rollers having the contour of the crown desired, follow the smoothed material and roll the surface until the material is compactly pressed together. After a stretch of road has been finished on one side, the machine is turned and is brought up along the other side of the road, the routers, the distributing plates, the crowning plates and the rollers again performing their functions successfully as just described. When the machine is thus operated along one side of the road and turned around and brought back on the other side of the road, the distributing plates need not be reversed in their positions. After a stretch of road has been refinished on both sides it may be desirable to roll the center of the road without plowing up the freshly rolled material. In this case the routing tools, and the distributing and crowning plates are lifted and the machine is used as an ordinary road roller. If it is found desirable to shift the position of the material of the road surface so as to flatten the crown thereof the position of the distributing plates may be shifted to cause them to move the material away from the center toward the sides of the road. This may be desirable when the road surface is worn at the sides and when it is desired to place fresh material on the center of the road. Where the road is narrow enough to be taken care of by a single operation of the machine, that is where the machine is of substantially the same width as the road, two of the distributing plates may be adjusted to shift the loosened material from the side toward the center of the road and the other two distributing plates may also be adjusted to shift the material from the other side to the center of the road.

It will be seen that in my improved construction I not only provide for rolling the road surface to the crown desired, but I also provide a construction in which the rollers are always on the newly made surface of the road, which surface being smooth will cause the routing tools, the distributing plates and the crowning plates, to move at a uniform level and to plow up the high portions of the worn road surface and to distribute the loosened material into low or rutty portions of the road.

A particular advantage secured by my improved road building machine is that it may be employed for reconstructing worn out roads in which the material at the sides of the road is in condition to be placed in the center of the road to replace the worn out crown thereof. By such an operation the expense entailed in providing new road material is overcome, the same material as exists in the worn out road surface being utilized to reconstruct the road in order to provide a new crown and rolled surface therefor.

Although I have illustrated a steam engine and boiler for furnishing the power for my improved machine, it will be understood that any suitable source of power may be employed for operating the various mechanisms described.

Having thus described my invention, what I claim is:

1. In a road building machine, the combination of a frame, plowing and distribut-

ing mechanisms mounted upon the front of the frame, a pair of rollers, each roller thereof being of a form of a truncate of a cone, means for mounting one of each of said rollers upon opposite sides of the frame in the rear of said mechanism and with their smaller ends inward, a roller of the form of a double truncate of a cone, and means for mounting said roller centrally upon the frame in the rear of said pair of rollers.

2. In a road building machine, the combination of a frame, plowing, distributing and crowning mechanisms mounted upon the front of the frame, a pair of rollers, each roller thereof being of the form of a truncate of a cone, means for mounting one of each of said rollers upon opposite sides of the frame in the rear of said mechanism and with their smaller ends inward, a roller of the form of a double truncate of a cone, and means for mounting said roller centrally upon the frame in the rear of said pair of rollers.

3. In a road building machine, the combination of a frame, plowing, distributing and crowning mechanisms mounted upon the front of the frame, the crowning mechanism consisting of transverse plates having their lower edges inwardly arched, a pair of rollers, each roller thereof being of the form of a truncate of a cone, means for mounting one of each of said rollers upon opposite sides of the frame in the rear of said mechanism and with their smaller ends inward, a roller in the form of a double truncate of a cone, and means for mounting said roller centrally upon the frame in the rear of said pair of rollers.

4. In a road building machine, the combination of a frame, plowing and distributing mechanisms mounted upon the front of the frame, a pair of rollers, each roller thereof being of a form of a truncate of a cone, means for mounting one of each of said rollers upon opposite sides of the frame in the rear of said mechanism and with their smaller ends inward, a roller of the form of a double truncate of a cone, and means for mounting said roller centrally upon the frame in the rear of said pair of rollers and adapted to act as a steering mechanism for the machine.

In testimony whereof, I have hereunto subscribed my name this 23rd day of June, 1916.

JOHN W. KINCAID.

Witnesses:
WALTER F. MURRAY,
W. THORNTON BOGERT.