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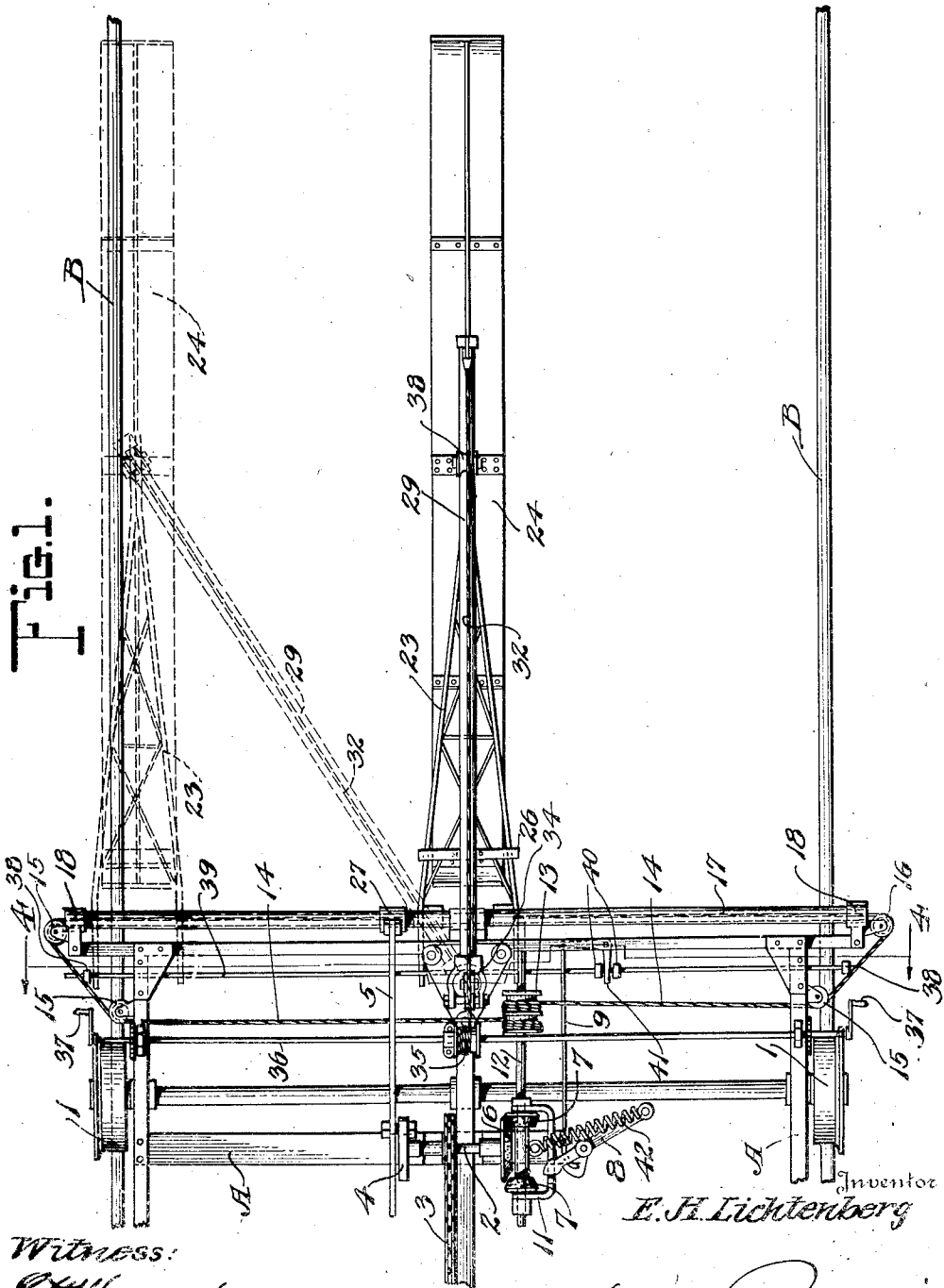
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E. H. LICHTENBERG

ROAD FINISHING MACHINE

Filed May 20, 1922

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Dec. 15, 1925.

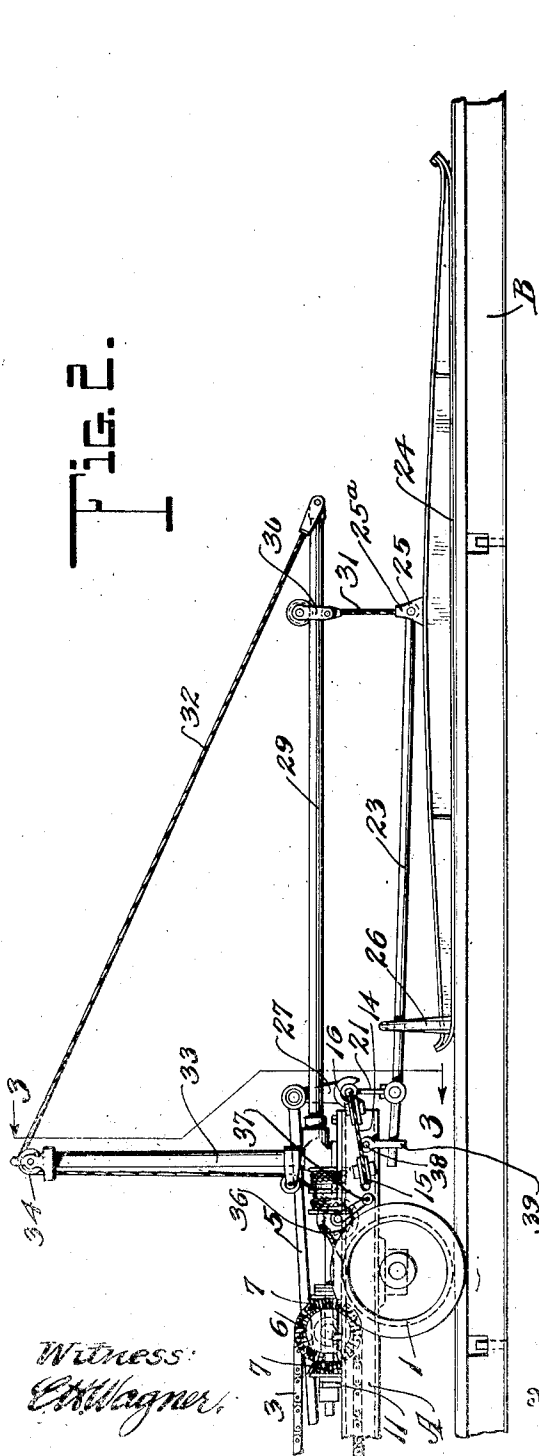
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5 Sheets-Sheet 2



Witness:
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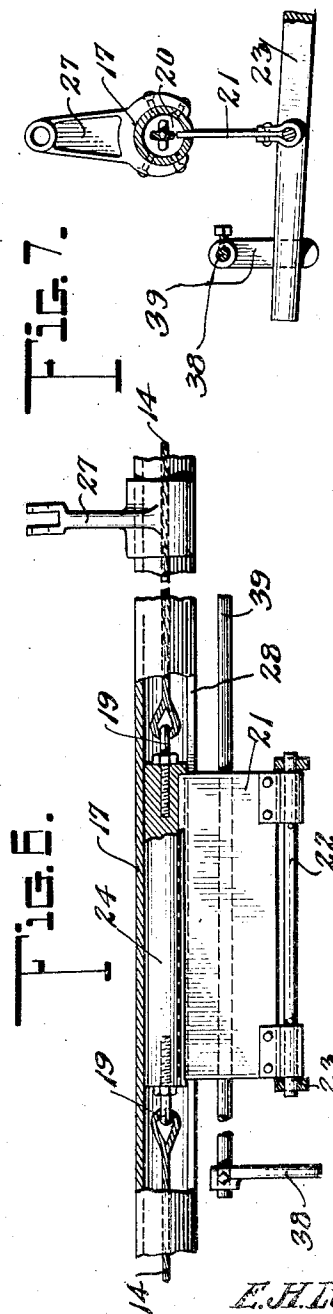
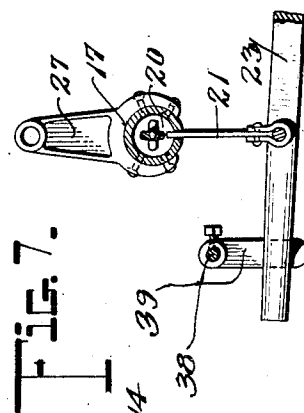


Fig. 7.



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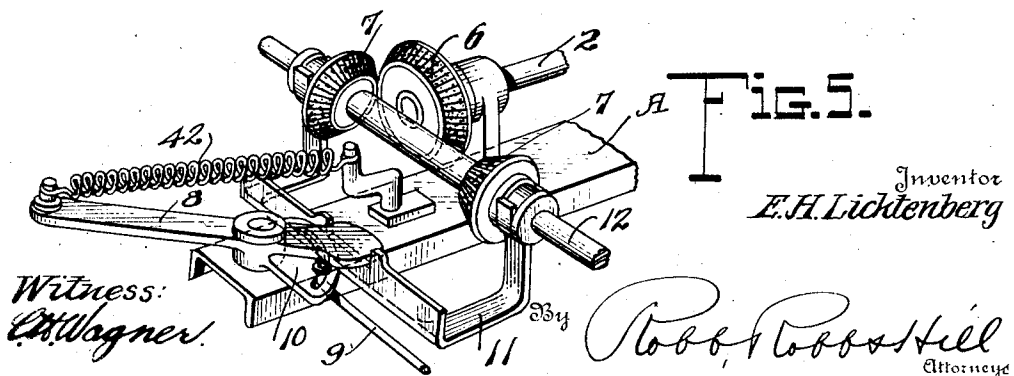
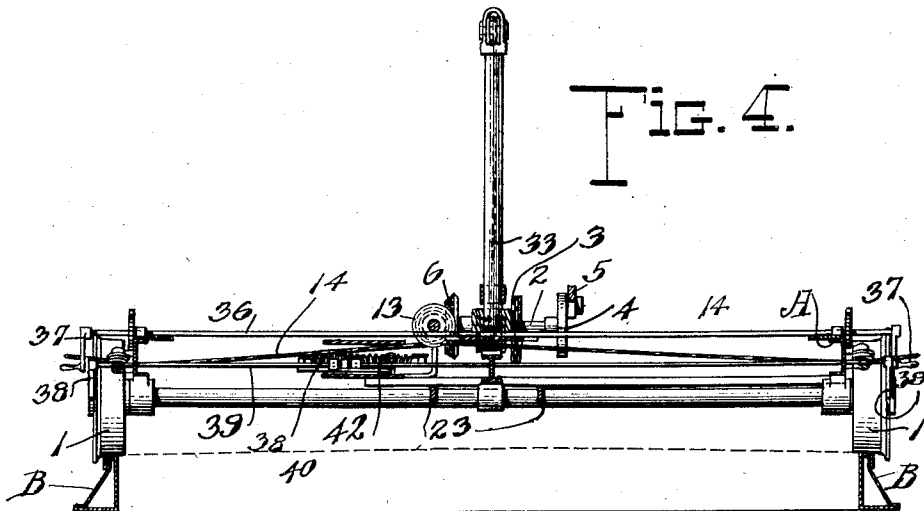
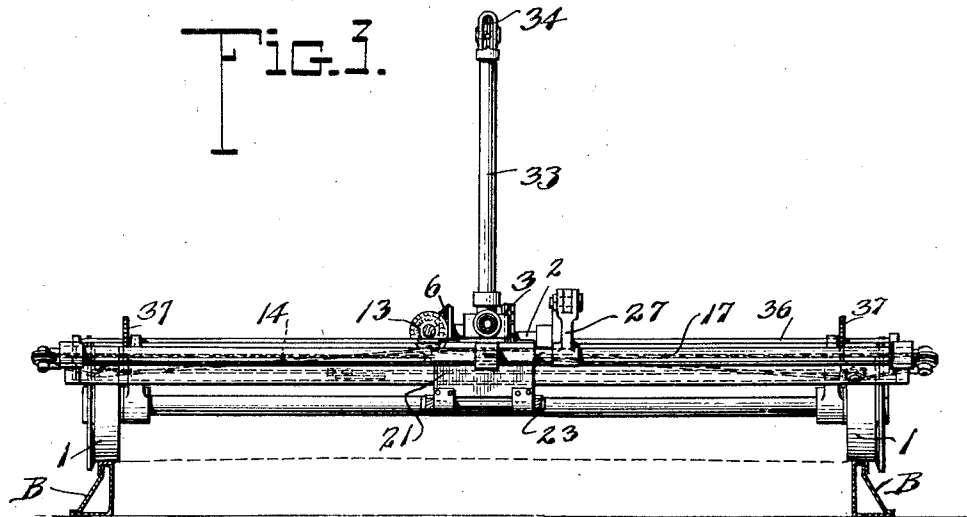
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FIG. 8.

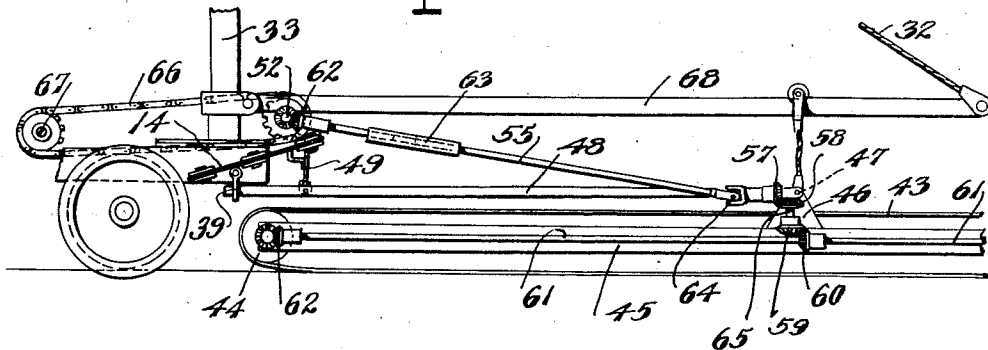
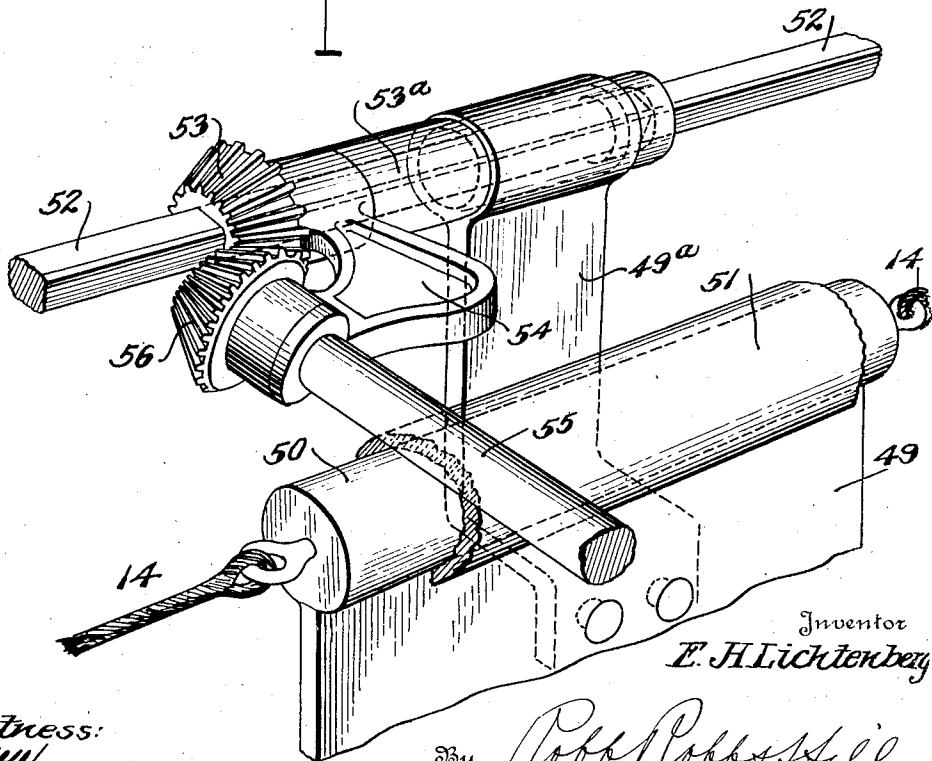


FIG. 10.



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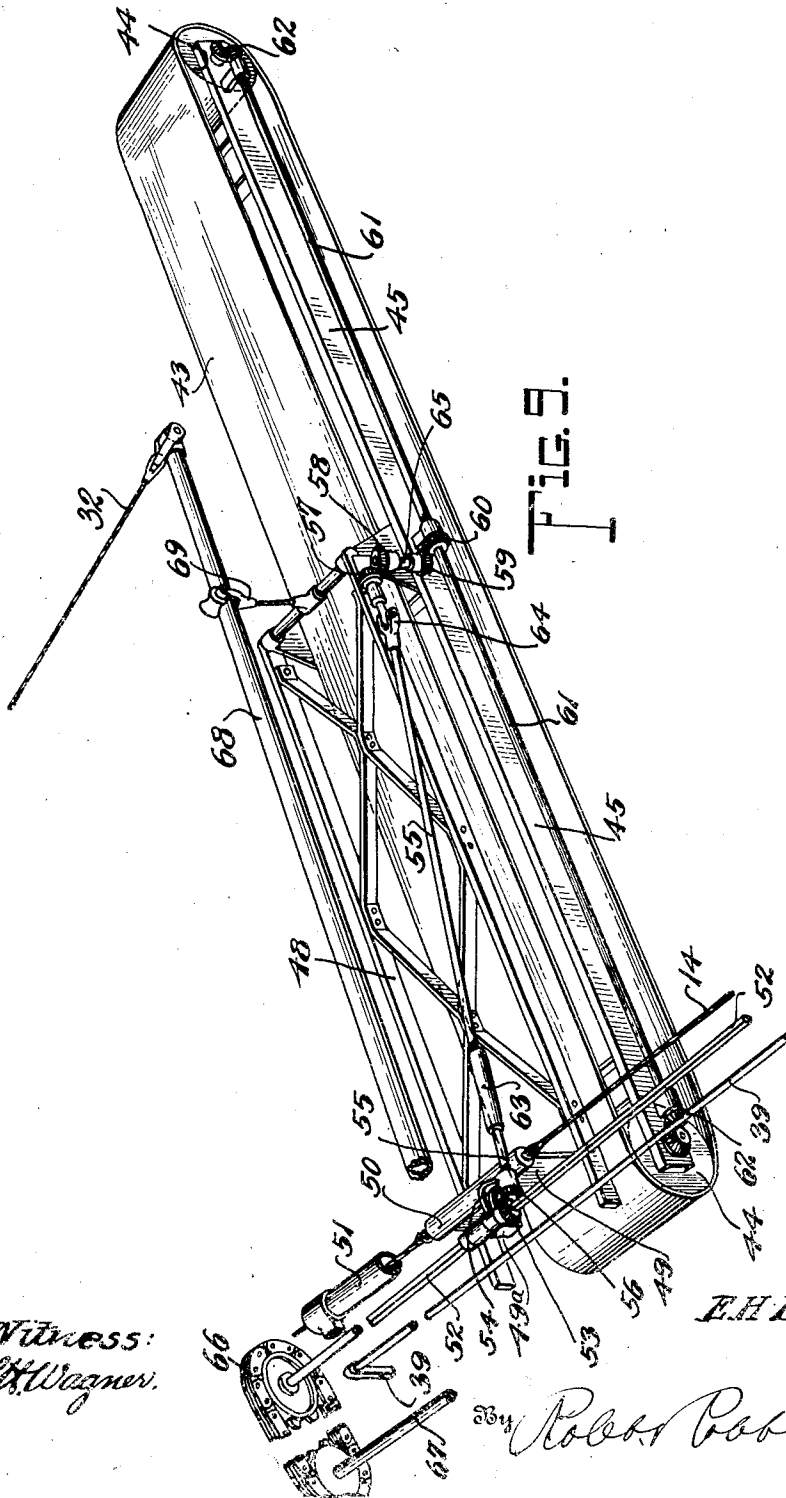


Fig. 9.

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UNITED STATES PATENT OFFICE.

ERICH H. LICHTENBERG, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO KOEHRING COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION.

ROAD-FINISHING MACHINE.

Application filed May 20, 1922. Serial No. 562,480.

To all whom it may concern:

Be it known that I, ERICH H. LICHTENBERG, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Road-Finishing Machines, of which the following is a specification.

In concrete pavement or road construction today, the concrete is being finished in a large proportion of the work by what are known as finishing machines. In general these machines embody a carrier or wheeled support adapted to travel on the road forms at opposite sides of the pavement being constructed, upon which carrier is mounted a vibrating tamping instrumentality, or instrumentalities, adapted to act upon the surface of the concrete aggregates in a well known manner to accomplish the finishing operation.

Engineers, and those skilled in concrete highway and pavement construction generally, have found the operation of the general type of finishing machines, to which I have referred above, to be objectionable, because the finishing or tamping element or elements are mounted transversely of the direction of movement of the machine, and transversely of the road-bed. Therefore, if any slight obstructions lodge upon the road forms on which the carrier travels, or if these forms are not alined truly horizontally, a constant level for the finishing machine, so to speak, is not provided. The slightest upward or downward movement of the carrier correspondingly acts upon the transverse tamper or finishing member which is operated or vibrated according to the machine's design, so that the latter is prevented from properly leveling the concrete surface. Indeed under practical conditions, owing to the fixed limits of movement of the vibrating tampers or finishing members referred to, slight transverse humps or ripples will be caused in the road surface formation. This rippling of the road surface transversely thereof gives rise to a road with an uneven surface, obviously, promoting impact pressures on the part of heavy vehicles traveling thereover, to increase the unevenness of the surface and causing undue wear on the road. Additionally such a road surface causes a tremendous vibration of the parts of vehicles passing there-

over and defeats one object of the construction which is to obtain an "easy riding" road or pavement.

With a view to avoiding the foregoing defective action of ordinary concrete finishing machines, I have invented the new machine hereinafter set forth in detail, so that it embodies the primary important feature of a longitudinal finishing member, by which I mean a finishing member which operates longitudinally of the road and shifting transversely across the same so as to be brought into action upon the full surface of the road. Obviously, slight longitudinal ripples in a road surface in no way interfere with its easy riding qualities and would have little or no effect by way of creating disadvantageous unevennesses such as the transverse ripples to which I have referred above.

My invention involves broadly the idea of a finishing machine embodying a finishing member operating longitudinally of the road and shiftable to act upon the entire road surface aggregates as the machine is progressively moved in a road or pavement finishing operation.

The particular embodiment of my invention, as I have illustrated in connection with this specification, is not essential, but forms one particular type of an efficient machine suitable for the purposes of the invention.

In the accompanying drawings;

Figure 1 is a plan view of a machine embodying the invention, dotted lines showing the finishing member as when moved to its extreme of action toward one side of the machine.

Figure 2 is a side elevation of the same.

Figure 3 is a sectional view about on the line 3—3 of Fig. 2.

Figure 4 is a sectional view about on the line 4—4 of Fig. 1.

Figure 5 is a detail perspective view of the reversible drive gearing and automatic trip means therefor.

Figure 6 is a fragmentary sectional view showing more clearly the supporting and actuating means for the shifting frame of the finishing member.

Figure 7 is a sectional view taken centrally through the parts illustrated in Fig. 6.

Figure 8 is a side view somewhat like Fig. 2, of a modified form of the invention.

Figure 9 is a perspective view of the sup-

porting frame and endless finishing member of my modified type.

Figure 10 is a detail perspective view of certain gearing and the supporting hanger or bracket of the shifting frame of my modified construction.

Finishing machines are so well known to those versed in the art, that I may simply indicate that in the drawings A designates a conventional type of carrier adapted to move along suitable road rails or forms B, the wheels 1 of the carrier traveling on said rails in a well known manner. The carrier may have a motor mounted thereon as usual, a driving mechanism leads from said motor to a drive shaft 2 and includes a drive chain 3. The shaft 2 has a pitman wheel 4 at one end for operating the pitman 5 connected thereto, and a bevel gear 6 at its other end for alternate co-operation with bevel gears 7 at opposite sides thereof. A trip lever 8, seen best in Fig. 5, is adapted to be shifted by a reach rod 9 connected with a slotted arm 10 of said lever, to thereby throw a shifting yoke 11 in either of two directions to engage one of the gears 7 with the gear 6. The gears 7 are mounted on a driven shaft 12 carrying the drum 13, and this drum has cables 14 wound thereabout in opposite directions, the cables 14 lead from the drum 13 over guide rollers 15 and 16 to a supporting and guide member 17 consisting of a hollow shaft, the ends of which are mounted in journals 18 at opposite sides of the carrier A. The cables 14 extend into the hollow shaft 17, as seen in Fig. 6, and connect with eye bolts 19 or any suitable fastening, attaching them to a shifting bar 20 inside of said shaft 17. The shaft bar 20 is adapted to slide from end to end of the shaft 17, back and forth, its movement being properly reversed by reversing the operation of the drum 13, as and for a purpose to be later described.

The shifting bar 20 has secured thereto a depending plate or hanger 21 to which is journaled by a pintle 22 a shifting frame 23, seen best in Figs. 1 and 2. The frame 23 has a longitudinally disposed finishing member 24 mounted thereon by being pivotally connected intermediate its ends at 25 with the outer end of the frame 23. The finishing member 24 is provided with a guide loop 26 at the inner end of the finishing member, said loop cooperating with a guide rod or part on the shifting frame 23, to hold the finishing member in a position longitudinally in respect to the road or pavement being operated upon.

It is my purpose to vibrate or reciprocate the member 24 slightly and longitudinally in the operation of the machine, and at the same time to shift it bodily transversely back and forth across the road between the road forms B, in order that it

may be brought into action upon the surface of the whole road being constructed.

For accomplishing the longitudinal movement of the member 24, the pitman 5 is connected with an arm 27 fixed to the shaft 17, as seen in Fig. 7, and this arm is oscillated of course in the driving of the pitman 5. The hanger 21 while sliding freely longitudinally of the shaft 17, with the bar 20, passes through a slot 28 at the bottom of the shaft 17 and is thus interlocked with the shaft to turn with the same as it is oscillated with and by the arm 27. In this manner, since the shifting frame 23 is connected with the hanger 21, a longitudinal reciprocation of the finishing member 24 is effected readily. At the same time owing to the provision of the driving cables 14, the shifting bar 20 moves back and forth inside the shaft 17 and carries the finishing member 24 across the road, the surface of which is being operated upon by said member.

To support the finishing member 24 during its longitudinal and its lateral movements, I employ a boom 29 having a single wheel trolley device 30 adapted to travel longitudinally thereon and connected by a pendant cable 31 to the bracket 25^a in which the pivot 25 previously mentioned is mounted. The boom 29 is braced and supported by a cable 32 leading from its outer free end to the top of a mast 33, and passing over a roller 34 at said top, this leading downward to a winding drum 35 mounted on a shaft 36 extending transversely across the carrier A and mounted in suitable bearings thereon. Handles 37 at opposite ends of the shaft 36, and at opposite sides of the machine, enable an operator to turn the shaft 36 to raise and lower the boom 29 and finishing member 24 at will for the purpose of adjusting it in relation to the surface of the road being finished, or to entirely disengage it from said road as when being put out of operation entirely, etc. The boom 29 is carried at its inner end by the mast 33 which is pivoted to rotate in suitable bearings on the carrier A, and as the finishing member 24 is positively moved transversely of the road surface, the boom 29 angles toward either side of the road, as shown in dotted lines in Fig. 1. In this operation the trolley 30 supporting the member 24 is adapted to travel longitudinally in and out relatively to the boom 29.

As the shifting frame 23 which supports the boom approaches one extreme of its travel transversely of the road, as seen in Fig. 1, the supported end of said frame engages a trip arm 38, on the adjacent end of a trip rod 39 supported on the carrier for transverse shifting or sliding movement. The trip rod 39 has spaced lugs 40 at opposite sides of an arm of a bell crank 41, which is connected to the reach rod 9 that cooperates

with the trip lever 8 previously described. The movement of the frame 23 as it engages the said stop or arm 38, shifts the trip rod 39 slightly and rocks the lever 41 to pull upon the reach rod 9 and throw lever 8 over to shift the previously inactive bevel gear 7 into engagement with the gear 6, whereby to reverse the drive acting on the shifting bar 20, whereupon the finishing member 24 begins to travel back toward the side of the road opposite that in which it is shown in dotted lines in Fig. 1. When it reaches its opposite extreme of movement it cooperates with another stop or arm 38 on the trip rod 39, to shift the lever 8 and carry out substantially the operation above set forth. A spring 42 is preferably used by me to coast with the trip lever 8, see Figs. 1 and 5, to assist in shifting and holding the yoke 11 when operated by the lever 8, after the lever has passed beyond what may be called its dead center position.

It will be apparent from the foregoing, that with my longitudinally arranged finishing member susceptible of the transverse movement across the road surface, the objectionable ripples that are created in the use of ordinary finishing machines of the transverse type, are avoided. Likewise, I use the movement of the finishing member longitudinally, or in an equivalent manner, to facilitate a greater perfection in the finished surface, and the movement of said member across said surface.

I have illustrated in Figs. 8 to 11, another type of finishing member that moves longitudinally of the road, as well as an arrangement lengthwise of said road, and while the principle of the invention is similar to that previously described, I will very briefly describe the construction.

In Fig. 8 the finishing member 43 comprises an endless belt passing around rollers 44 at opposite ends of a frame 45 which is suspended by brackets 46 centrally of its ends from a pivot rod 47 on a shifting frame 48 that corresponds somewhat to the shifting frame 23 before described.

The shifting frame 48 is also mounted on a hanger 49, the latter being carried by a shifting bar 50 mounted in the hollow shaft 51, which shaft in the present instance is not rocked as is the shaft 17 in my other construction. The hanger 49 in the present case has a vertically extending arm 49^a carried by and movable longitudinally of a square shaft 52. The square shaft 52 is mounted in bearings at the opposite sides of the carrier, and on the shaft 52 is a bevel gear 53 having a sleeve formed with a square opening therethru to fit the shaft 52. The arm 49^a is directly carried by said sleeve as is also a bracket 54 which supports the inner end of a drive shaft 55 carrying the bevel gear 56 engaging the gear 53. As the

shaft 52 turns the sleeve 53^a of the gear 53 rotates in the receiving portions of the parts 49^a and 54. The shaft 55, see Fig. 9, is merely a drive shaft to transmit motion from the shaft 52 through the gears 57, 58, 59 and 60, to a driven shaft 61 on the frame 45 supporting the finishing member 43. The shaft 61 carries bevel gears 62 at its opposite ends engaging corresponding gears on the ends of the rollers 44 on which the finishing belt or member 43 operates. Preferably the shaft 55 may embody the slip joint 63 and the universal joint 64, and the shaft 65 supporting the gears 58 and 59 will have a universal joint thereon to accommodate for slight shifting positions of the finishing member 43 in relation to the drive shaft 55 on the shifting frame 48.

The shaft 52 from which motion is taken to drive the belt of the finishing member 43, is preferably constantly driven when the machine is in action, by suitable chain 66 connecting a sprocket on one end of said shaft, with a main drive shaft 67 operated from a motor on the carrier A. The means for shifting the bar 50 back and forth are practically the same in the present construction as in that previously described, and will therefore not be redescribed, as any suitable mechanism may be employed for the purpose. Likewise, it is notable that the belt type finishing member 43 is supported by the boom 68 and trolley device 69, as seen best in Fig. 9, all in a manner like that previously set forth. The finishing member 43 therefore is not only driven positively in a direction lengthwise of the road being surfaced, but it is shifted transversely of the road so as to cover the whole surface area in its finishing operation.

As the operation of my modified form of finishing machine will be self evident from the foregoing specific description, and the description of my preferred construction first set forth, a repetition of the outline of such operation will not be made.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A machine for finishing concrete roads comprising a support adapted to travel over the subgrade on which the concrete aggregates are to be laid, a finishing member disposed longitudinally of the road and movable longitudinally upon said support for performing its finishing work, while in engagement with aggregates laid upon the road subgrade, means to effect such movement of the finishing member longitudinally of the road and means to gradually vary the point of application of the finishing member to the plastic aggregates in a direction transversely of the road and during said longitudinal finishing movement of the longitudinal finishing member.

2. In a finishing machine, in combination, a portable support, a boom mounted on said support, means enabling said boom to swing back and forth transversely to a road along which the support travels, a finishing member supported on the said boom, and means to maintain said finishing member in a position longitudinal of the road, as said member is carried back and forth across the road by swinging of the boom, together with means for causing said back and forth movements of the boom and finishing member.

3. In a finishing machine, in combination, a portable support adapted to travel along a road sub-grade above the same, a swinging boom mounted on said support, a finishing member longitudinal of the support and the road sub-grade over which it travels, having a movable connection with the boom, and means to move said finishing member transversely of the sub-grade over which it is suspended from the boom, for maintaining the said finishing member parallel with the sub-grade and longitudinal in respect thereto during said movement, and for reciprocating said finishing member longitudinally in said movement.

4. In a machine for finishing concrete roads, a support, a finishing member mounted upon said support and having a finishing portion arranged longitudinally of the road, and means for effecting longitudinal movement of said finishing member in its finishing operation.

5. In a machine for finishing concrete roads, a support, a finishing member mounted upon said support and provided with a long finishing element arranged longitudinally of the road, and means for moving the longitudinal finishing member transversely of the road to vary the point of application of its finishing effect upon the road when in action and simultaneously reciprocating said finishing member longitudinally.

6. In a machine for finishing concrete roads, a support, a finishing member mounted upon said support and having a finishing portion arranged longitudinally of the road, means for effecting longitudinal movement of said finishing member in its finishing operation, and means for shifting the finishing member transversely relatively to the road as it is moved longitudinally in its finishing action, so that its effective operation will take place over the entire surface of the road.

7. In a concrete finishing machine, the combination of a carrier to travel along a road, a boom swinging pivotally on said carrier and movable horizontally over the road, and a longitudinal movable finishing member suspended from said boom, with means to maintain said finishing member longitudinal in respect to the road it oper-

ates upon, as the boom swings to carry said finishing member back and forth across the road.

8. In a concrete finishing machine, the combination of a carrier adapted to travel along a road, a boom on said carrier movable horizontally over the road, a finishing member supported by said boom, means to maintain the finishing member longitudinal in relation to the road, and means for imparting to the finishing member a finishing movement other than its movement with the boom whilst it is carried over the road-bed by the boom.

9. In a concrete road finishing machine, the combination of a carrier adapted to travel along the road, a horizontally swinging boom mounted on said carrier, a finishing member mounted on the boom and disposed longitudinally of the road, means to maintain the finishing member longitudinal in relation to the road, and means for operating the boom and said finishing member to shift the boom and impart to the finishing member a reciprocatory movement relatively to the boom.

10. In a concrete road finishing machine, the combination of a carrier adapted to travel along the road, a horizontally swinging boom mounted on said carrier, a finishing member mounted on the boom and disposed longitudinally of the road, means for raising and lowering the boom and thereby correspondingly operating the finishing member, and means for imparting finishing movement to the finishing member independently of its movement with the boom.

11. In a concrete finishing machine, the combination of a support adapted to move along a road-bed, a finishing member disposed longitudinally of the road-bed, instrumentalities for holding the finishing member in a position substantially longitudinal in respect to the road aggregates upon which it operates, and means on the carrier for moving said finishing member transversely to the road-bed without changing the longitudinal disposition of the finishing member.

12. In a concrete finishing machine, the combination of a support adapted to move along a road-bed, a finishing member disposed longitudinally of the road-bed, instrumentalities for holding the finishing member in a position substantially longitudinal in respect to the road aggregates upon which it operates, means on the carrier for moving said finishing member transversely to the road-bed, and means for automatically reversing the movement of the finishing member.

13. In a concrete finishing machine, the combination of a support adapted to move along a road-bed, a finishing member disposed longitudinally of the road-bed, means

to normally keep the finishing member substantially parallel with the road bed over which it operates, means on the carrier for moving said finishing member transversely to the road-bed, and means to impart to the finishing member movement longitudinally of the road-bed as it is shifted transversely across said bed.

14. In a finishing machine, the combination of a carrier adapted to travel along a road-bed, a finishing member supported on the carrier, means to hold the finishing member in parallelism with the road-bed and to engage it with the plastic road surfaces to be operated upon, means for imparting movement to said finishing member to cause it to operate upon the road surface over the entire transverse area of the same, and means for imparting to the finishing member a special finishing movement relatively to the boom as it is shifted over the road surface.

15. Means substantially as set forth in claim 14, wherein the finishing member has means to reverse the direction of the movement over the road-bed.

16. In a concrete road finishing machine, the combination of a wheeled carrier to travel over a road-bed, a boom mounted to swing horizontally of the carrier, a shifting frame mounted on the carrier for transverse sliding movement relatively thereto, operating mechanism for effecting said sliding movement of the shifting frame, a finishing member mounted on said shift-

ing frame and movable independently of its movement therewith, means for transmitting said independent movement to the finishing member, and supporting means between the boom and the finishing member.

17. Means substantially as claimed in claim 16, wherein the independent movement of the finishing member is longitudinally of the road-bed, and said finishing member is bodily disposed in a direction lengthwise of the road-bed.

18. In a machine of the class described, in combination, a carrier adapted to travel over a road subgrade lengthwise of the same, a finishing member disposed on said carrier in a direction lengthwise of the road subgrade, and means to impart transverse and longitudinal movements to said finishing member independent of its movement with the carrier.

19. In a machine of the class described, in combination, a carrier adapted to move longitudinally over a road subgrade, a finishing member disposed longitudinally of the subgrade and movably supported by said carrier so as to impart finishing effect to concrete aggregates on the subgrade, and means for reciprocating said finishing member and at the same time shifting it laterally or cross-wise of the road-bed substantially as described.

In testimony whereof I affix my signature.

ERICH H. LICHTENBERG.