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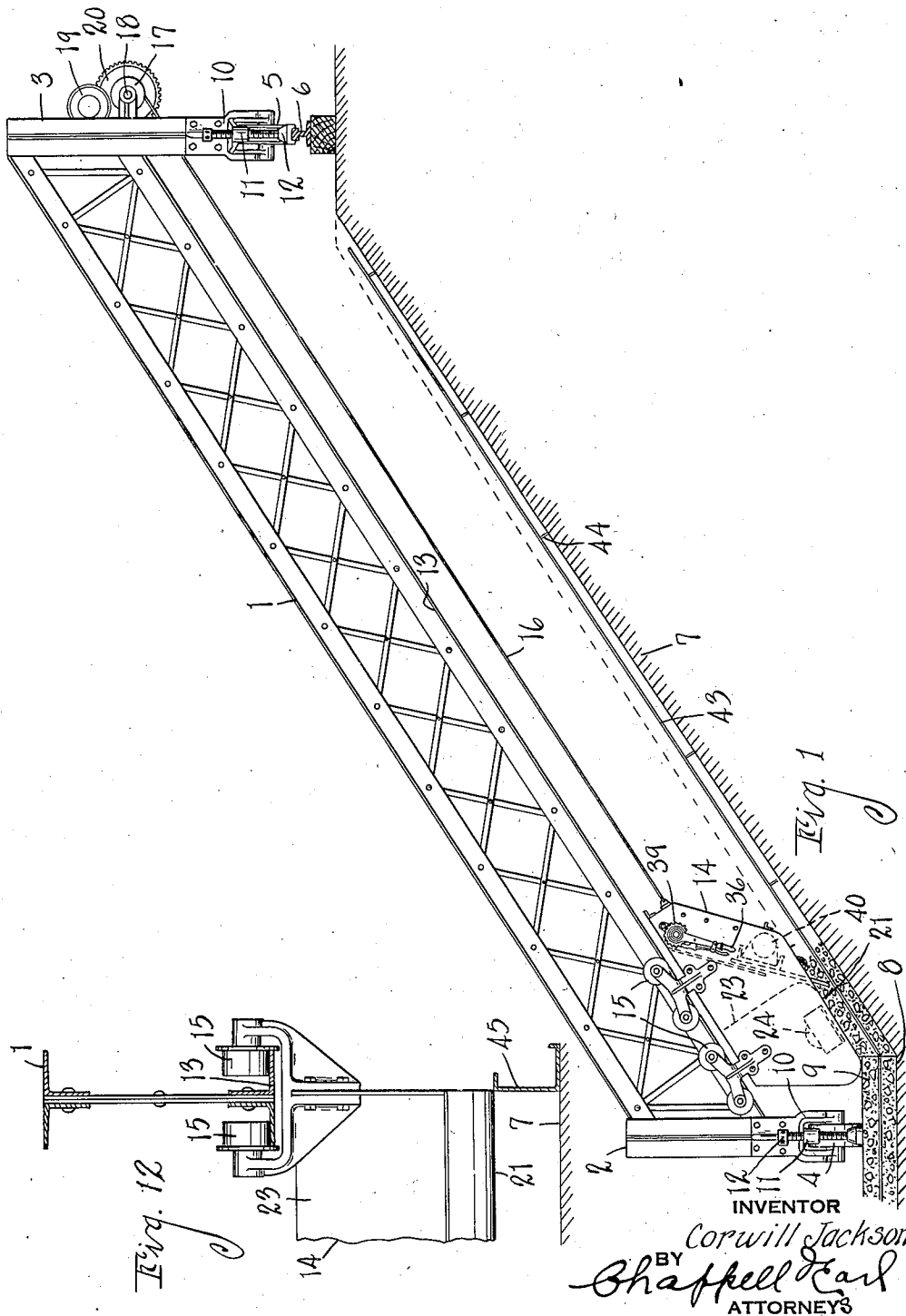
C. JACKSON

2,090,959

PAVING AND CANAL LINING MACHINE AND METHOD

Filed Aug. 2 1933

4 Sheets-Sheet 1



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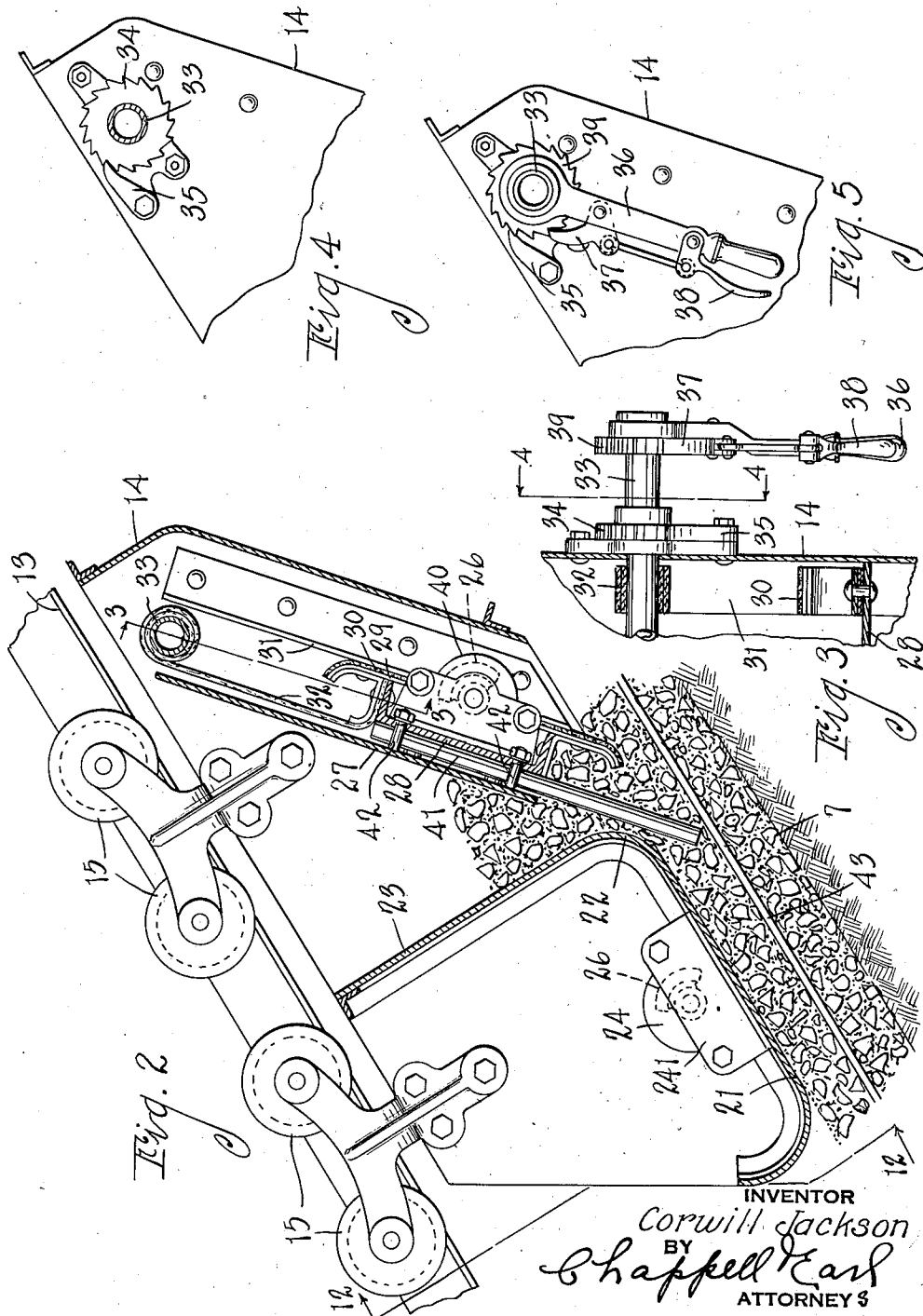
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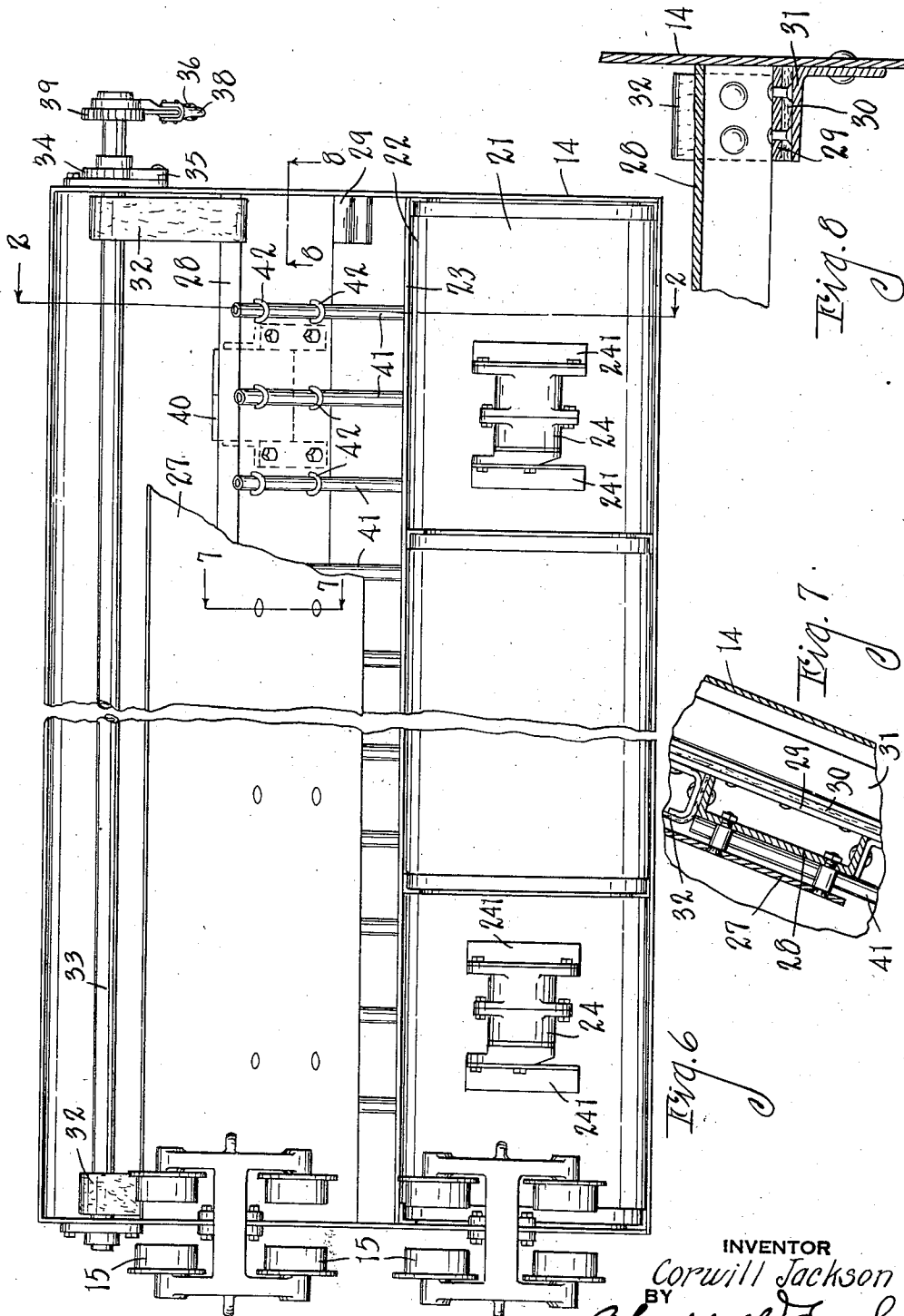
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4 Sheets-Sheet 3



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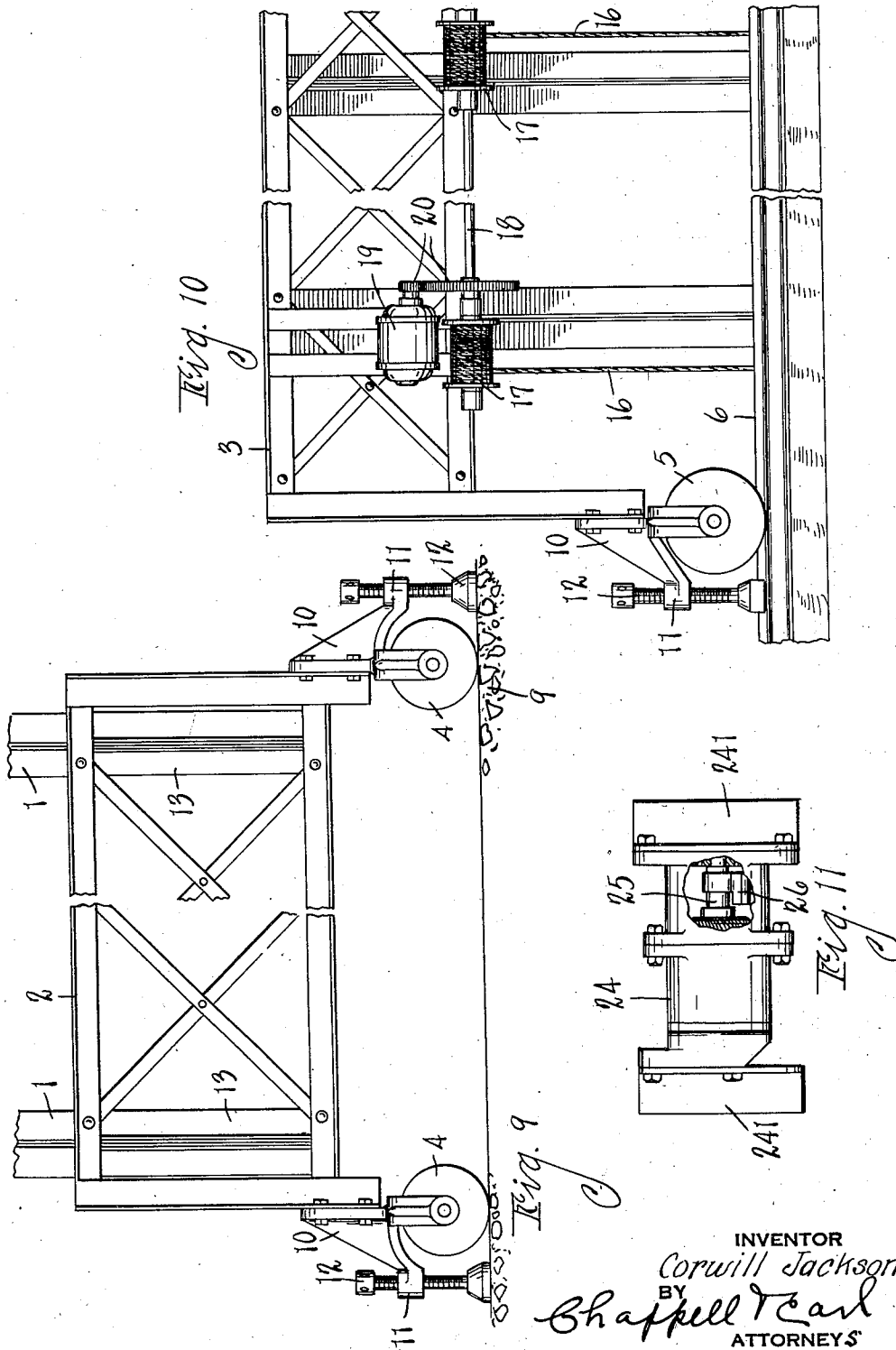
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PAVING AND CANAL LINING MACHINE AND METHOD

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,090,959

PAVING AND CANAL LINING MACHINE AND METHOD

Corwill Jackson, Ludington, Mich.

Application August 2, 1933, Serial No. 683,243

31 Claims. (Cl. 61—63)

The main objects of this invention are:

First, to provide a machine which is highly efficient for the placing of concrete linings or surfacing in canals and the like.

5 Second, to provide a machine for placing concrete slabs or facings such as in paving or canals and the like in which the concrete mass is placed and properly positioned with a minimum of labor.

10 Third, to provide a machine having these advantages the use of which results in a very superior product.

Fourth, to provide a machine of the class described which is of large capacity.

15 Fifth, to provide an improved method of placing concrete.

Objects pertaining to details and economies of my invention will definitely appear from the description to follow. The invention is defined in the claims.

20 A structure embodying the features of my invention is clearly illustrated in the accompanying drawings, in which:

Fig. 1 is a side elevation of my concrete placing machine as embodied for the laying of side wall linings or facings of canals, the machine being conventionally illustrated in operating relation to a canal.

Fig. 2 is an enlarged fragmentary view mainly in section on line 2—2 of Fig. 6 showing the machine in operative relation to the concrete being placed.

Fig. 3 is a fragmentary view partially in section on line 3—3 of Fig. 2 illustrating details of the vibrating mechanism.

35 Fig. 4 is a detail section on line 4—4 of Fig. 3.

Fig. 5 is a fragmentary end elevation from the right of Figs. 3 and 6.

Fig. 6 is a fragmentary plan view of the carriage and parts carried thereby.

40 Fig. 7 is an enlarged detail section on line 7—7 of Fig. 6.

Fig. 8 is an enlarged detail section on line 8—8 of Fig. 6.

45 Fig. 9 is a fragmentary, end elevation from the left of Fig. 1.

Fig. 10 is a fragmentary end elevation from the right of Fig. 1.

Fig. 11 is a plan view of one of the vibrating units with the housing partially broken away.

50 Fig. 12 is a detail vertical section through the supporting frame on line 12—12 of Fig. 2 illustrating the relation of the carriage thereto, a movable slab-end form element being shown in operative relation to the screed.

The structure illustrated in the accompanying drawings is well adapted for the placing of concrete in accordance with the method of my Patent No. 1,787,449, issued January 6, 1931, and the method of this application is an adaptation 5 of and for some practices an improvement upon the method of that patent.

The machine illustrated is especially designed for lining the inclined walls of canals or other inclined surfaces although it is only necessary to 10 modify the frame to adapt the same mechanism to the laying of pavements or other concrete slabs on horizontal surfaces. I have not illustrated such an adaptation as it will be appreciated that the only modification required would be to ar- 15 range the carriage supporting rails in a horizontal position instead of an inclined position as shown in Fig. 1.

The structure illustrated comprises a pair of fabricated side members designated generally by the numerals 1, 1 and end members designated 20 generally by the numerals 2 and 3. The frame is preferably open between these side and end members for purposes which will be pointed out as the description proceeds.

The end members are provided with carrying wheels 4 and 5, and the wheels 5 are adapted to travel on rails 6 arranged parallel to the canal or other inclined surface. An inclined canal wall is indicated at 7 and the bottom at 8. The 30 wheels 4 are designed to travel on the previously laid bottom slab or lining 9 for the bottom 8.

The wheels are mounted on brackets 10 on the frame which have arms 11 receiving the screws or threaded jacks 12 provided for properly 35 positioning the frame to secure the desired grade or thickness of slab. These adjusting screws also provide supporting feet sustaining the load so that while the machine is operating in laying the slab the wheels do not need to be blocked 40 or otherwise locked.

The side members of the frame are provided with rails 13 also serving in the embodiment illustrated as the bottom longitudinal rails or sills for the side members.

45 The carriage, designated by the numeral 14, is provided with carrying wheels 15 from which the carriage is suspended from the rails so that the carriage may be moved longitudinally below the side members of the frame and above the wall 50 or bed to be surfaced. In the embodiment illustrated the carriage is provided with propelling cables 16 and winding drums 17 are provided at the upper end of the frame. These winding drums are mounted on the shaft 18 driven from 55

the motor 19 and connected to the shaft through the speed reducing gear train 20, the purpose being to propel the carriage quite slowly but at uniform speed.

5 Mounted on the carriage is a screed 21 having a rounded nose 22 merging into the rear hopper wall 23, see Fig. 2. This screed is provided with means for vibrating at high frequency, a pair of vibrating units 24 being provided in the structure illustrated.

10 These vibrating units illustrated comprise motors shown conventionally in Fig. 11, the rotors of which have shafts 25 provided with unbalancing weights 26. The housing has feet or supporting brackets 241 at each end secured to the shoe of the screed so that the screed is vibrated at high frequency when the vibrating units are running.

20 The front wall 27 of the hopper, which is disposed in a forwardly inclined relation, is mounted upon the vibrating support 28 having shoes 29 at its ends. These shoes are preferably provided with a non-metallic facing 30 such as a brake lining. The shoes slidably support the member 28 on the inclined slideways 31 on the carriage. The member 28 is supported and adjusted by means of heavy straps 32 secured at their upper ends to the winding shaft 33. This winding shaft is provided with a ratchet wheel 34 coacting with a pawl or detent 35 for holding the shaft in its adjusted position.

35 The shaft is rotated from a lever 36 pivoted on the outer end of the shaft and provided with a pawl 37 controlled from the handpiece 38, the pawl coacting with a driving ratchet wheel 39 on the shaft. This provides suitable leverage for turning the shaft. It will be understood that there is considerable load on the hanger straps 32.

40 The member 28 is provided with a vibrating means, preferably a pair of vibrating units 40 similar to the vibrating units 24 on the screed.

45 On the member 28 below the hopper wall or plate 27 I mount a plurality of rods or fingers 41 clamped to the support member 28 by means of U bolts 42 so that the rods or fingers are vibrated with the vibrating support 28. These fingers or vibrating rods project in a downwardly and rearwardly inclined relation below the front end of the screed and thoroughly vibrate the concrete mixture at this point. However, they are so adjusted as not to interfere with the reinforcing elements indicated at 43, the reinforcing material being supported on suitable chairs 55 conventionally illustrated at 44.

60 The lower edge of the hopper wall 27 is suitably spaced relative to the hopper wall 23 so that the desired amount of concrete is discharged, that is, the discharge of the concrete is regulated according to the travel of the carriage. In practice the concrete mixture may discharge directly into the hopper and if necessary workmen may be provided for properly distributing the material in the hopper. It is entirely practical to employ hoppers fifteen feet long and thus lay a strip of that width.

70 It will be observed that in placing a slab on the incline as illustrated the slab may be thicker at the bottom than at the top. The vibration of the walls of the hopper not only serves to feed the concrete mixture but the machine is very effective in practicing the method of my above mentioned patent in which the water ratio is so low that concrete cannot be placed by the usual 75 methods. As pointed out in the patent, the

condition of the non-workable mixture is changed by the high frequency vibrations so that such a mixture can be effectively placed, and this is highly desirable on inclines not only on account of the superior concrete resulting but because it enables the placing of concrete without forms. The movable side wall form 45 is provided for the purpose of providing a straight edge for a succeeding slab. The previously placed slab serves as a form at one edge.

10 The rods or fingers 41 agitate and vibrate the mass below the front end of the screed so that not only are all voids effectively eliminated but these members add to the vibrating walls of the hopper and the vibration of the screed in setting up vibrations within the mass to render an otherwise non-workable mixture placeable in accordance with my said method.

15 The cooperating relation of the vibrating fingers with the screed is such that the material discharged from the hopper is effectively worked under the screed so that the finished product is of substantially uniform density, that is, there are no voids in the mass or pockets in the surface which might result particularly were it not for the action of these fingers, especially where relatively coarse aggregate is employed that might become lodged or wedged together, preventing the flowing and positioning of the concrete as discharged from the hopper.

20 It has been found that it is not essential to continuously vibrate the screed throughout the movement of the carriage, but it is quite desirable to vibrate it in initial position as shown in Fig. 1 in order that the concrete may be effectively worked into position. With certain materials and grades it is found not to be necessary to continue this vibration throughout the travel of the carriage as the vibrating plate or wall 25 and the vibrating fingers are found to be sufficient so that the screed may be used merely as a screed.

25 The method of placing concrete of non-workable water content by vibrating in the hopper and as discharged to and below the front portion of the screed is highly desirable in the placing of pavements and facings or linings for canals and the like. I have not attempted to illustrate various embodiments or adaptations of my invention such as might be desirable for particular purposes as it is believed this disclosure will enable those skilled in the art to embody or adapt my improvements as may be desired.

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

35 1. In a machine of the class described, the combination with a frame provided with spaced inclined rails, of carrying wheels arranged at the ends of the frame for travel in a direction transverse to the rails, screws at the corners of the frame for vertically adjusting and supporting the frame independently of the carrying wheels, a carriage suspended below the rails, said carriage being provided with propelling cables, a drum shaft mounted at the upper ends of the rails and provided with winding drums for said cables, a screed mounted on said carriage, there being a hopper wall extending upwardly from the front edge of said screed, a motor mounted on said screed and provided with a rotor having an unbalancing weight, forwardly inclined ways on said carriage at the front of said screed, a vibrating support member provided with slides on said ways, adjusting and supporting straps for

said support, a winding shaft for said straps disposed at the upper ends of said ways, a motor mounted on said support and provided with a rotor having an unbalancing weight, and a hopper wall mounted on said support in opposed coacting relation to said hopper wall on said screed, the lower edge of said hopper wall being spaced from the hopper wall on said screed to provide a hopper discharge opening.

2. In a machine of the class described, the combination with a frame provided with spaced inclined rails, of a carriage suspended below the rails, said carriage being provided with propelling cables, a drum shaft mounted at the upper ends of the rails and provided with winding drums for said cables, a screed mounted on said carriage, there being a hopper wall extending upwardly from the front edge of said screed, a motor mounted on said screed and provided with a rotor having an unbalancing weight, forwardly inclined ways on said carriage at the front of said screed, a vibrating support member provided with slides on said ways, adjusting and supporting straps for said support, a winding shaft for said straps disposed at the upper ends of said ways, a motor mounted on said vibrating support and provided with a rotor having an unbalancing weight, and a hopper wall mounted on said support in opposed coacting relation to said hopper wall on said screed, the lower edge of said hopper wall being spaced from the hopper wall on said screed to provide a hopper discharge opening.

3. In a machine of the class described, the combination with a frame provided with spaced inclined rails, of carrying wheels arranged at the ends of the frame for travel in a direction transverse to the rails, screws at the corners of the frame for vertically adjusting and supporting the frame independently of the carrying wheels, a carriage suspended below the rails, a screed mounted on said carriage, there being a hopper wall extending upwardly from the front edge of said screed, a motor mounted on said screed and provided with a rotor having an unbalancing weight, forwardly inclined ways on said carriage at the front of said screed, a vibrating support member provided with slides on said ways, a motor mounted on said vibrating support and provided with a rotor having an unbalancing weight, and a hopper wall mounted on said support in opposed coacting relation to said hopper wall on said screed, the lower edge of said hopper wall being spaced from the hopper wall on said screed to provide a hopper discharge opening.

4. In a machine of the class described, the combination with a frame provided with spaced inclined rails, of a carriage suspended below the rails, a screed mounted on said carriage, there being a hopper wall extending upwardly from the front edge of said screed, a motor mounted on said screed and provided with a rotor having an unbalancing weight, forwardly inclined ways on said carriage at the front of said screed, a vibrating support member provided with slides on said ways, a motor mounted on said vibrating support and provided with a rotor having an unbalancing weight, and a hopper wall mounted on said support in opposed coacting relation to said hopper wall on said screed, the lower edge of said hopper wall being spaced from the hopper wall on said screed to provide a hopper discharge opening.

5. In a machine of the class described, the combination with a frame provided with spaced inclined rails, of a carriage suspended below the

rails, a screed mounted on said carriage, there being a hopper wall extending upwardly from the front edge of said screed, a motor mounted on said screed and provided with a rotor having an unbalancing weight, forwardly inclined ways on said carriage at the front of said screed, a vibrating support member provided with slides on said ways, a motor mounted on said vibrating support and provided with a rotor having an unbalancing weight, a hopper wall mounted on said support in opposed coacting relation to said hopper wall on said screed, the lower edge of said hopper wall being spaced from the hopper wall on said screed to provide a hopper discharge opening, and spaced rods mounted on said support below said hopper wall thereon and projecting downwardly and rearwardly below the front edge of the screed.

6. In a machine of the class described, the combination with a frame provided with inclined rails, of carrying wheels arranged at the ends of the frame for travel in a direction transverse to the rails, means at the corners of the frame for vertically adjusting and supporting the frame, a carriage suspended below the rails, said carriage being provided with propelling cables, a drum shaft mounted at the upper ends of the rails and provided with winding drums for said cables, a screed mounted on said carriage, there being a hopper wall extending upwardly from the front edge of said screed, a vibrating support member provided with slides on said ways, adjusting and supporting straps for said support, a winding shaft for said straps disposed at the upper ends of said ways, a vibrating unit on said vibrating support, and a hopper wall mounted on said support in opposed coacting relation to said hopper wall on said screed, said walls being arranged to provide a hopper discharge opening at the bottom of the hopper.

7. In a machine of the class described, the combination with a frame provided with inclined rails, of a carriage suspended below the rails, said carriage being provided with propelling cables, a drum shaft mounted at the upper ends of the rails and provided with winding drums for said cables, a screed mounted on said carriage, there being a hopper wall extending upwardly from the front edge of said screed, a vibrating unit on said screed, forwardly inclined ways on said carriage at the front of said screed, a vibrating support member provided with slides on said ways, adjusting and supporting straps for said support, a winding shaft for said straps disposed at the upper ends of said ways, a vibrating unit on said vibrating support, and a hopper wall mounted on said support in opposed coacting relation to said hopper wall on said screed, said walls being arranged to provide a hopper discharge opening at the bottom of the hopper.

8. In a machine of the class described, the combination with a frame provided with inclined rails, of carrying wheels arranged at the ends of the frame for travel in a direction transverse to the rails, means at the corners of the frame for vertically adjusting and supporting the frame, a carriage suspended below the rails, a screed mounted on said carriage, there being a hopper wall extending upwardly from the front edge of said screed, a vibrating unit on said screed, forwardly inclined ways on said carriage at the front of said screed, a vibrating support member provided with slides on said ways, a vibrating unit on said vibrating support, and a hopper wall mounted on said support in opposed coacting relation to

said hopper wall on said screed, said walls being arranged to provide a hopper discharge opening at the bottom of the hopper.

9. In a machine of the class described, the combination with a frame provided with inclined rails, of a carriage suspended below the rails, a screed mounted on said carriage, there being a hopper wall extending upwardly from the front edge of said screed, a vibrating unit on said screed, forwardly inclined ways on said carriage at the front of said screed, a vibrating support member provided with slides on said ways, a vibrating unit on said vibrating support, and a hopper wall mounted on said support in opposed coacting relation to said hopper wall on said screed, said walls being arranged to provide a hopper discharge opening at the bottom of the hopper.

10. In a machine of the class described, the combination with a frame provided with inclined rails, of a carriage suspended below the rails, a screed mounted on said carriage, there being a hopper wall extending upwardly from the front edge of said screed, a vibrating unit on said screed, forwardly inclined ways on said carriage at the front of said screed, a vibrating support member provided with slides on said ways, a vibrating unit on said vibrating support, a hopper wall mounted on said support in opposed coacting relation to said hopper wall on said screed, said walls being arranged to provide a hopper discharge opening at the bottom of the hopper, and spaced rods on said support projecting downwardly and rearwardly below the front of the screed.

11. In a machine of the class described, the combination of a frame provided with spaced inclined rails, carrying wheels arranged at the ends of the frame for travel in a direction transverse to the rails, means at the corners of the frame for vertically adjusting and supporting the frame, a carriage suspended below the rails, said carriage being provided with propelling cables, a drum shaft mounted at the upper ends of the rails and provided with winding drums for said cables, a screed mounted on said carriage, a hopper discharging at the front of said screed, and spaced series of vibrating fingers carried by said carriage and projecting downwardly and rearwardly below the front of the screed.

12. In a machine of the class described, the combination of a frame provided with spaced inclined rails, carrying wheels arranged at the ends of the frame for travel in a direction transverse to the rails, means at the corners of the frame for vertically adjusting and supporting the frame, a carriage suspended below the rails, said carriage being provided with propelling cables, a drum shaft mounted at the upper ends of the rails and provided with winding drums for said cable, a screed mounted on said carriage, and a hopper discharging at the front of said screed.

13. In a machine of the class described, the combination of a carriage, a screed on said carriage, ways on said carriage at the front of said screed, a vibrating support member provided with slides on said ways, adjusting and supporting straps for said support, a vibrating unit on said vibrating support a hopper including a rearwardly inclined wall mounted on said support, and spaced fingers on said support projecting downwardly and rearwardly below the plane of the screed.

14. In a machine of the class described, the combination with a frame provided with spaced inclined rails, of carrying wheels arranged at the ends of the frame for travel in a direction transverse to the rails, means at the corners of the

frame for vertically adjusting and supporting the frame, a carriage suspended below the rails, a screed mounted on said carriage, a hopper discharging at the front of said screed, and spaced series of vibrating fingers carried by said carriage and projecting downwardly and rearwardly below the front of the screed.

15. In a machine of the class described, the combination with a frame provided with spaced inclined rails, of carrying wheels arranged at the ends of the frame for travel in a direction transverse to the rails, means at the corners of the frame for vertically adjusting and supporting the frame, a carriage suspended below the rails, a screed mounted on said carriage, and a hopper discharging at the front of said screed.

16. In a machine of the class described, the combination with a supporting frame, of a carriage on said frame, a screed on said carriage, ways on said carriage at the front of said screed, a vibrating support member adjustable on said ways, a motor mounted on said vibrating support and provided with a rotor having an unbalancing weight, a hopper including a rearwardly inclined wall mounted on said support, and spaced fingers on said support projecting downwardly and rearwardly below the plane of the screed.

17. In a machine of the class described, the combination with a supporting frame, of a carriage on said frame, a screed on said carriage, ways on said carriage at the front of said screed, a vibrating support member adjustable on said ways, a motor mounted on said vibrating support and provided with a rotor having an unbalancing weight, and a hopper including a rearwardly inclined wall mounted on said support.

18. In a machine of the class described, the combination of a carriage, a screed on said carriage, vibrating means for said screed, a vibrating support adjustable on said carriage relative to said screed, means for vibrating said support, a hopper including a wall carried by said support, and spaced fingers on said support projecting downwardly into the material discharged from the hopper.

19. In a machine of the class described, the combination of a carriage, a screed on said carriage, a vibrating support adjustable on said carriage relative to said screed, means for vibrating said support, a hopper including a wall carried by said support, and spaced fingers on said support projecting downwardly into the material discharged from the hopper.

20. In a machine of the class described, the combination of a carriage, a screed on said carriage, vibrating means for said screed, a vibrating support adjustable on said carriage relative to said screed, means for vibrating said support, and a hopper including a wall carried by said support.

21. In a machine of the class described, the combination with a supporting frame, of a carriage, a screed on said carriage, vibrating means for said screed, a vibrating support on said carriage, vibrating means for said support, a hopper discharging in front of said screed support, and fingers on said support projecting into the material discharged from the hopper.

22. In a machine of the class described, the combination with a supporting frame, of a carriage, a screed on said carriage, a vibrating support on said carriage, vibrating means for said support, a hopper discharging in front of said screed support, and fingers on said support projecting into the material discharged from the hopper.

23. In a machine of the class described, the combination of a carriage, a screed on said carriage, a vibrating means for said screed, a hopper discharging in front of said screed, and vibrating
5 fingers projecting into the material discharged from the hopper.

24. A structure of the class described comprising a vibrating screed, a hopper having vibrating walls discharging in front of the screed, and
10 means in addition to the vibrating screed for internally vibrating the concrete within the slab under the forward portion of the screed.

25. A structure of the class described comprising a vibrating screed, a hopper having vibrating walls discharging in front of the screed, and
15 means for internally vibrating the concrete within the slab under the forward portion of the screed.

26. The method of forming concrete slabs consisting of discharging the concrete mixture at the front of a traveling screed, vibrating at high frequency, and simultaneously vibrating the concrete mixture by means independent of the screed
20 substantially below the face of the screed.

27. The method of forming concrete slabs consisting of discharging the concrete mixture from a hopper vibrated at high frequency under a traveling screed also vibrated at high frequency.

28. The method of forming concrete slabs consisting of discharging the concrete mixture from a vibrating hopper in advance of a screed, and internally vibrating the concrete as discharged from the hopper under the forward portion of
5 the screed.

29. The method of forming concrete slabs consisting of discharging the concrete mixture at the front of a traveling screed, and simultaneously internally vibrating the concrete mixture
10 substantially below the face of the screed.

30. Apparatus for handling concrete and like material including, a hopper adapted to be operated along a form to pass material into the form, an element extending through the lower portion
15 of the hopper and supported for free vibration relative thereto, and means for continuously vibrating the element.

31. Material handling apparatus including, a hopper adapted to be operated along a form to
20 pass material into the form, an element for passing into the materials at the lower end of the hopper, means supporting the element for movement with the hopper and free vibration relative thereto, and means for vibrating the element.
25

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