Nov. 11, 1947. C. JACKSON 2,430,816

MACHINE FOR PLACING CONCRETE AND OTHER MATERIALS

Filed June 30, 1944 4 Sheets-Sheet 1

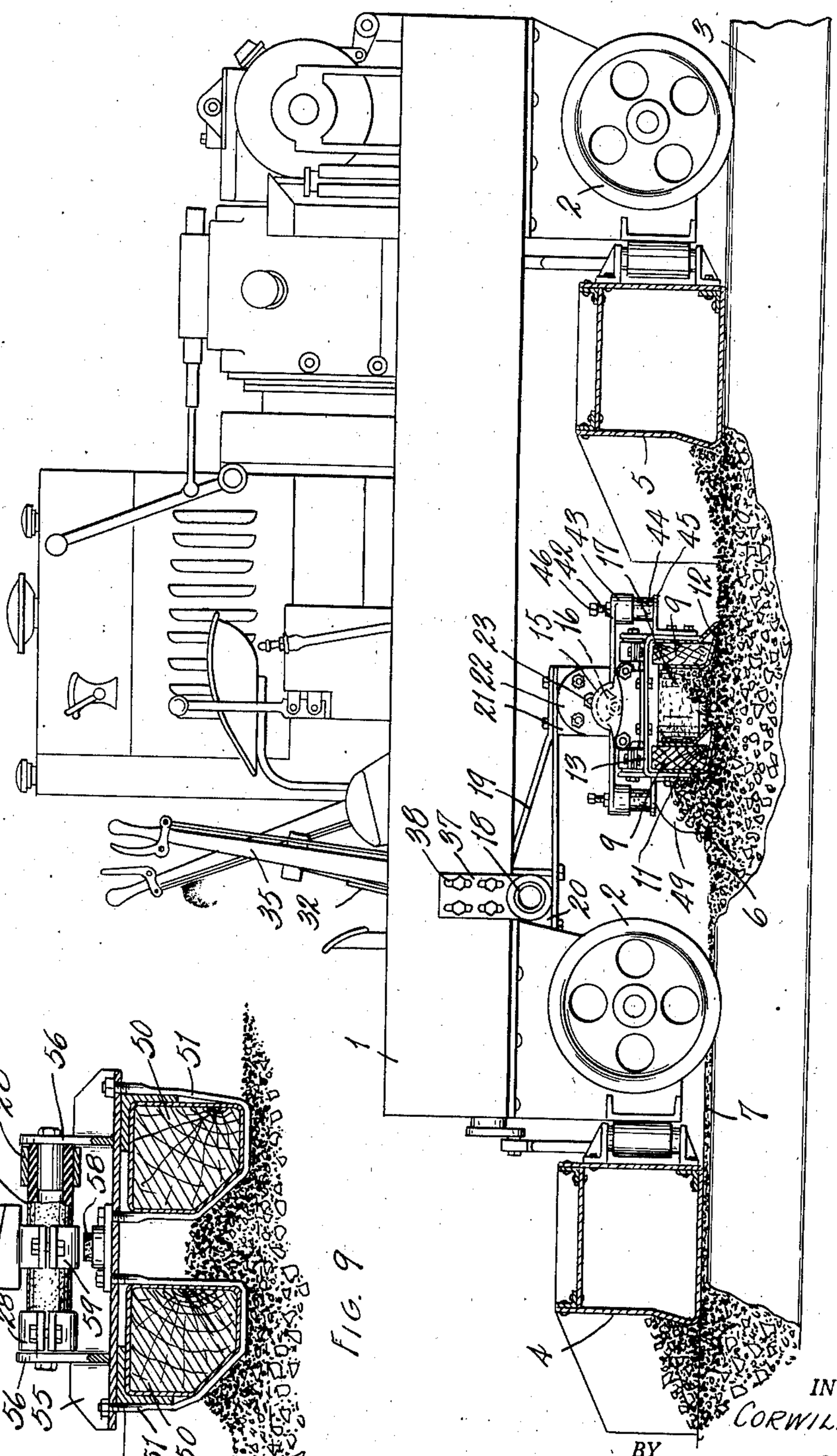


FIG. 1

FIG. 9

INVENTOR.
CORWILL JACKSON
BY
Earl B. Chappell
ATTORNEYS.

Nov. 11, 1947. C. JACKSON 2,430,816

MACHINE FOR PLACING CONCRETE AND OTHER MATERIALS

Filed June 30, 1944 4 Sheets-Sheet 2

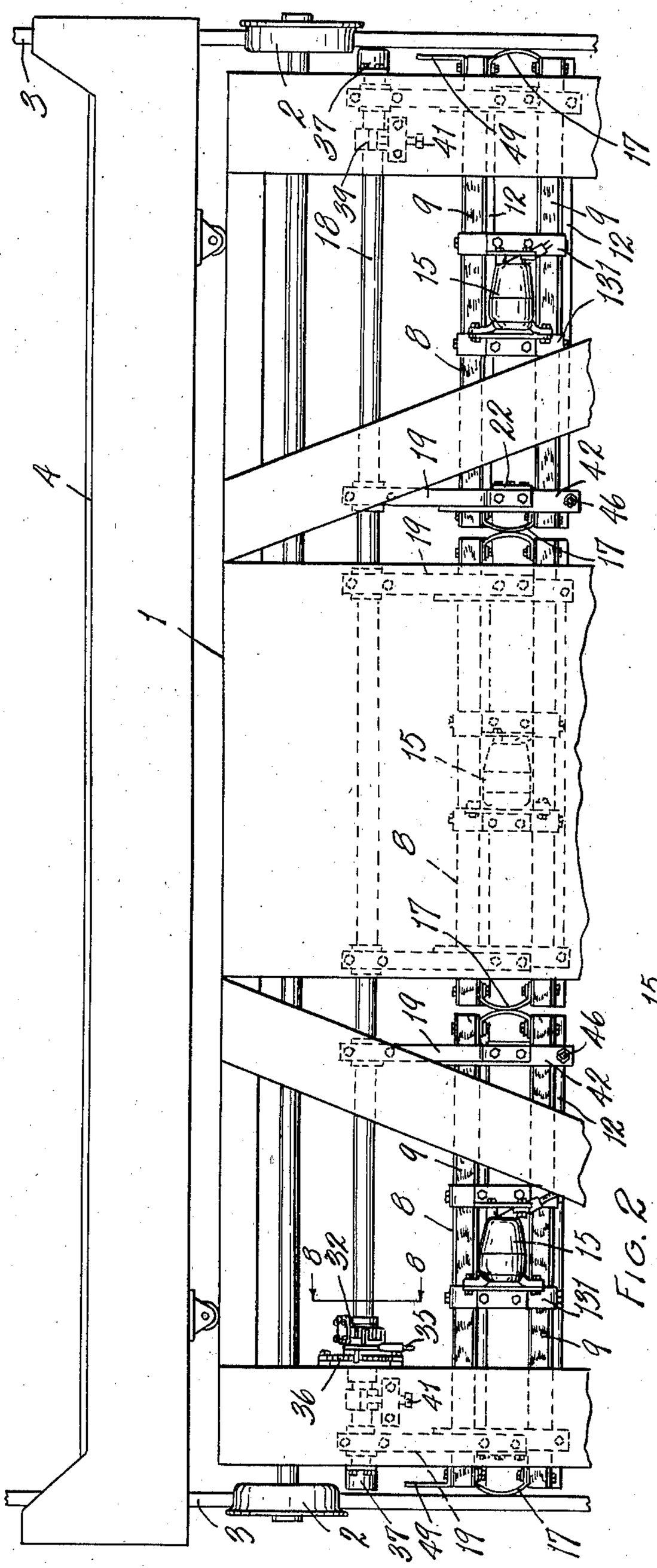


FIG. 2

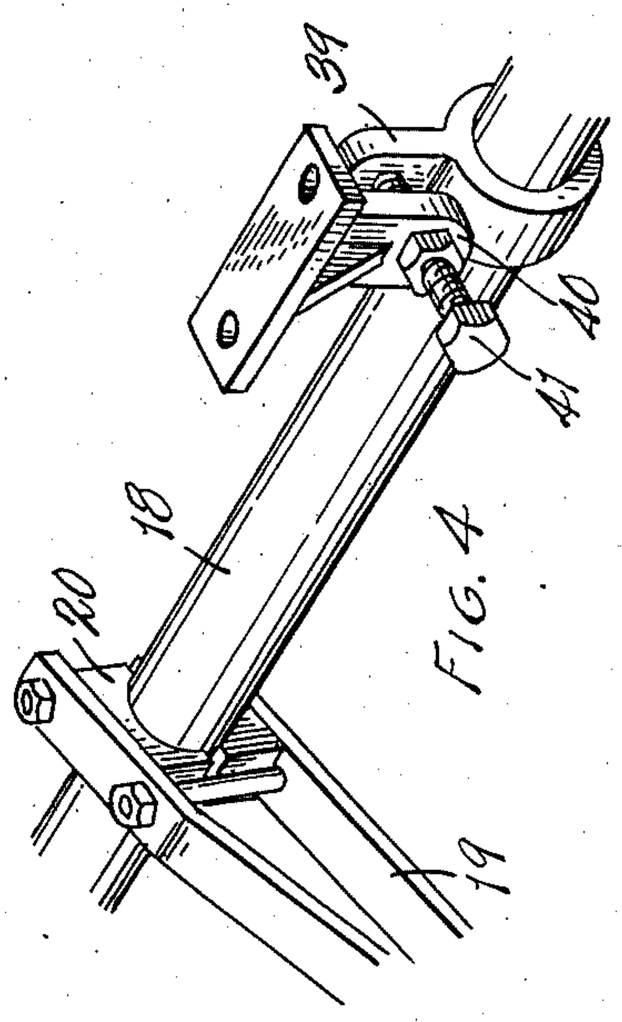


FIG. 4

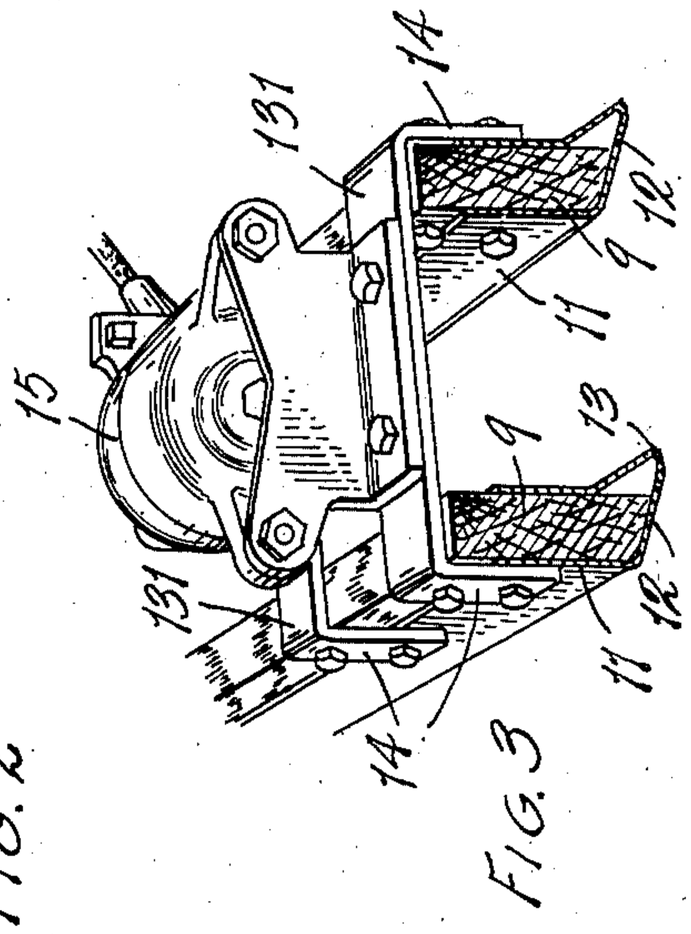


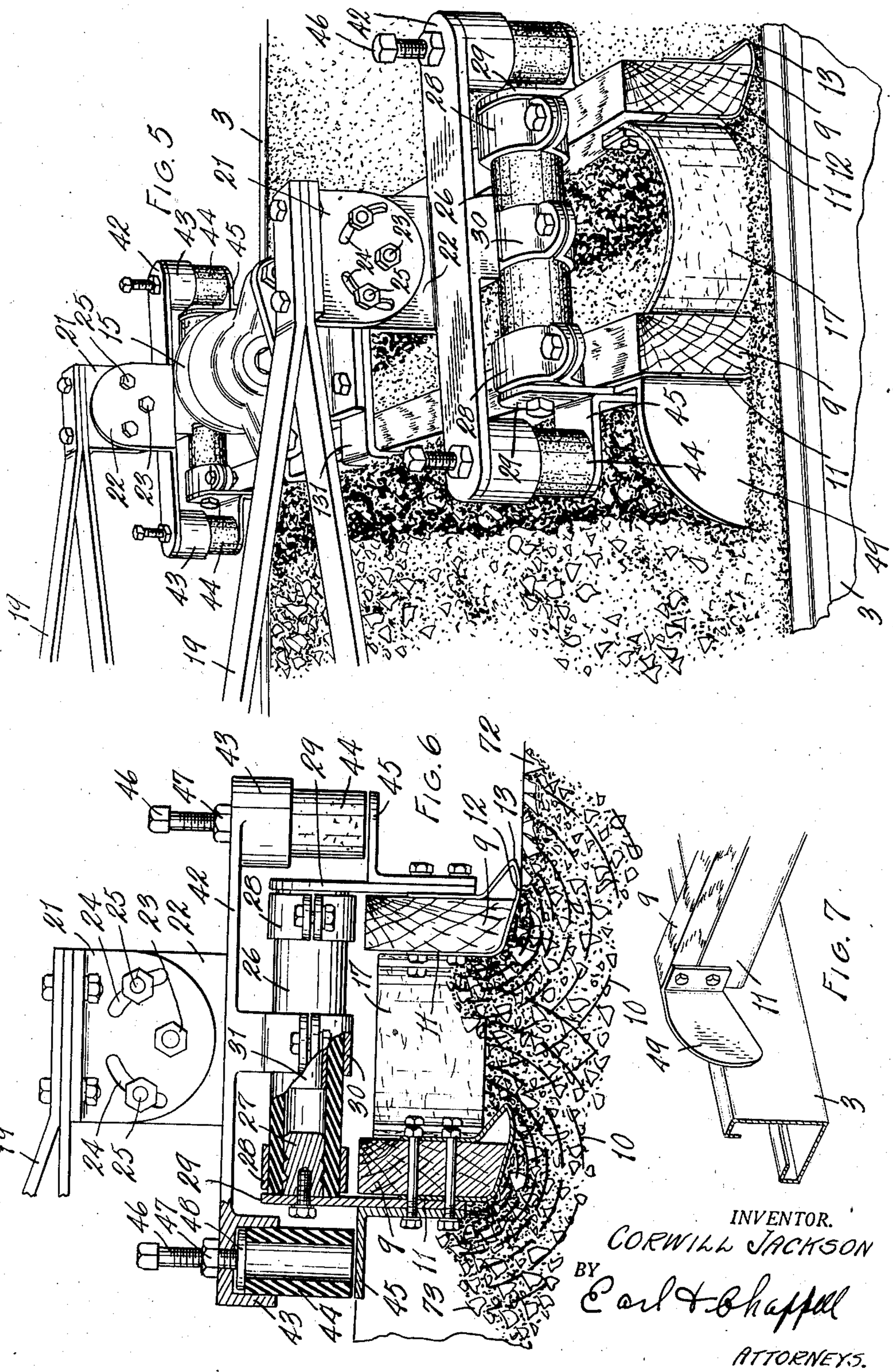
FIG. 3

INVENTOR.
CORWILL JACKSON
BY
Earl B. Chappell
ATTORNEYS.

Nov. 11, 1947. C. JACKSON 2,430,816

MACHINE FOR PLACING CONCRETE AND OTHER MATERIALS

Filed June 30, 1944 4 Sheets-Sheet 3



Nov. 11, 1947. C. JACKSON 2,430,816

MACHINE FOR PLACING CONCRETE AND OTHER MATERIALS

Filed June 30, 1944 4 Sheets-Sheet 4

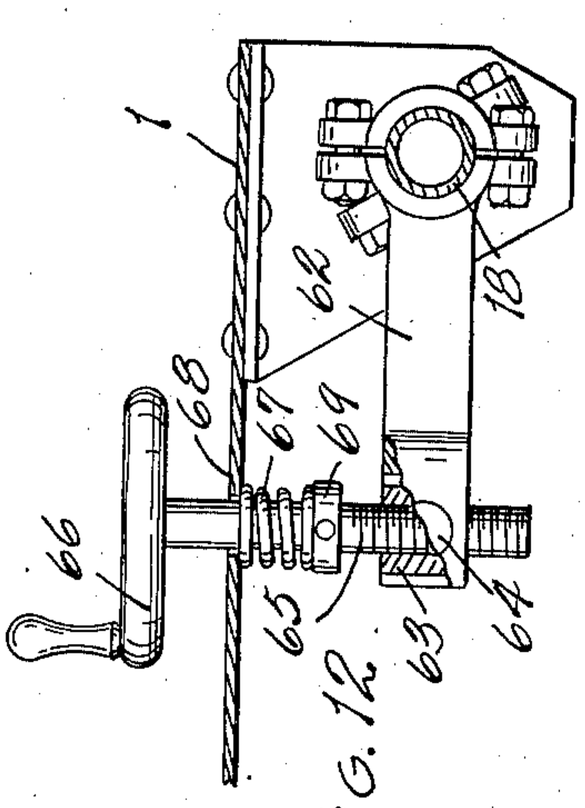


FIG. 12.

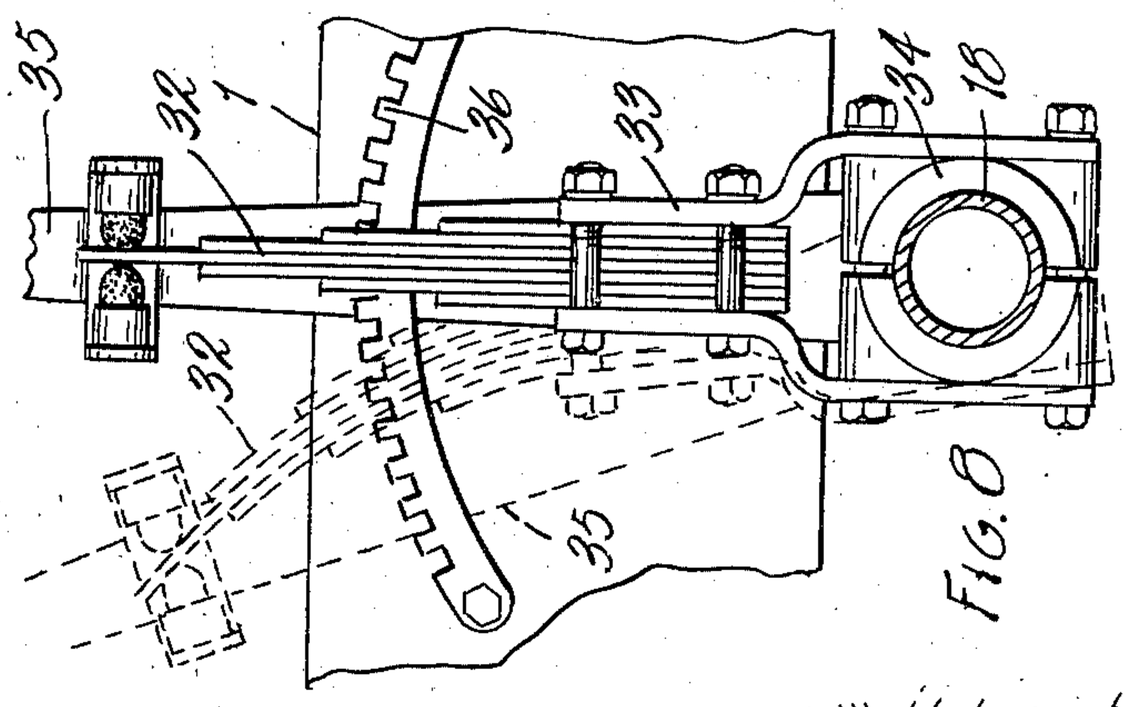


FIG. 8

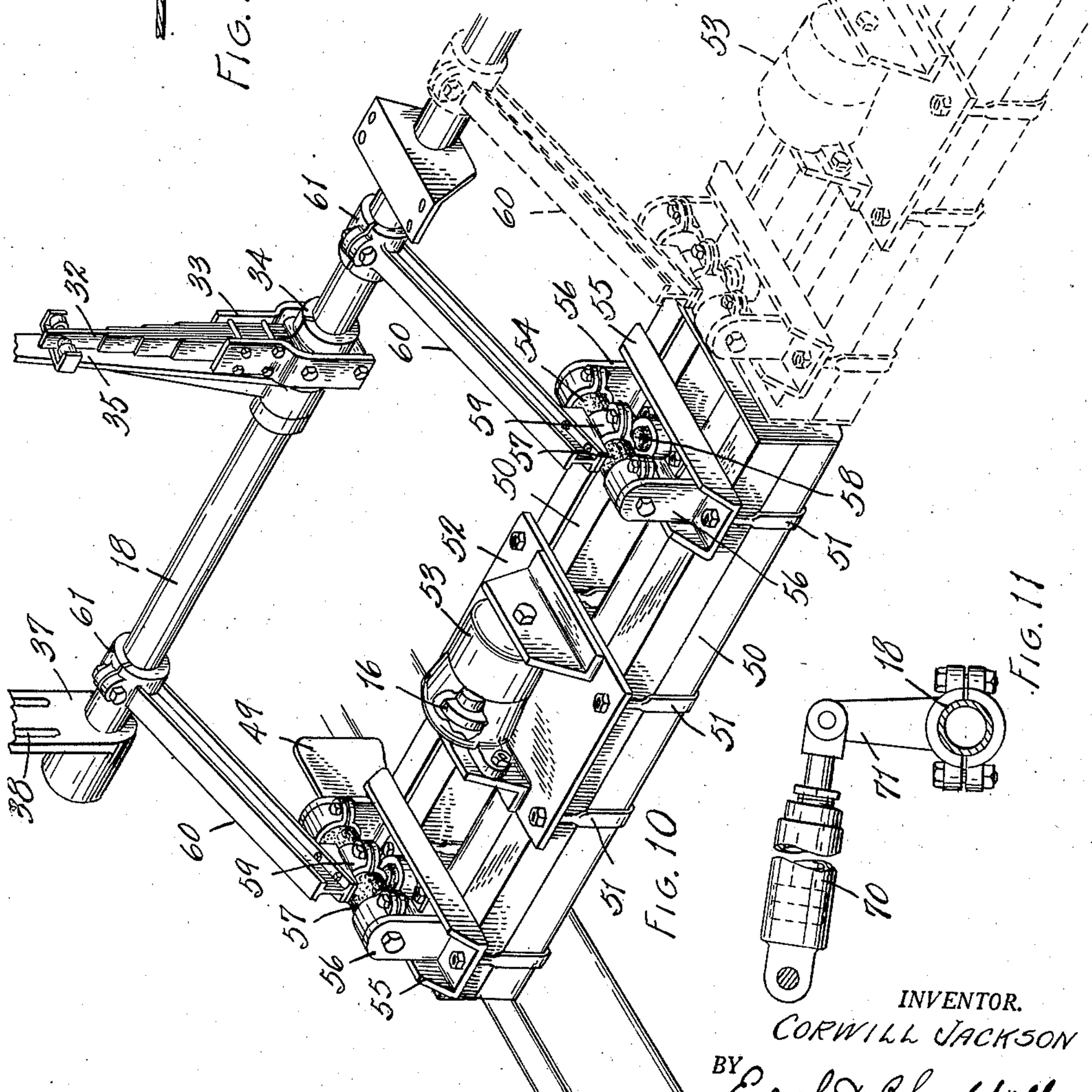


FIG. 11

INVENTOR.
CORWILL JACKSON
BY Earl F. Chappell
ATTORNEYS.

Patented Nov. 11, 1947

2,430,816

UNITED STATES PATENT OFFICE

2,430,816

MACHINE FOR PLACING CONCRETE AND OTHER MATERIALS

Corwill Jackson, Ludington, Mich.

Application June 30, 1944, Serial No. 543,016

23 Claims. (Cl. 94—48)

1

This invention relates to improvements in machine for placing concrete and other materials.

The main objects of this invention are:

First, to provide a machine or apparatus for the placement of concrete in pavements and the like by means of which relatively dry or harsh mixtures of concrete materials may be rendered fluid and workable and effectively compacted.

Second, to provide a machine of this character by means of which coarse aggregate or rock fragments may be added to the concrete mixture after it has been mixed and placed on the foundation, such added rock fragments being effectively incorporated and embedded in the surface of the cement or concrete mixture to provide a slab having a substantial amount of rock material or aggregate in the wearing surface thereof.

Third, to provide a machine or apparatus for the placement of concrete pavements and slabs which is of large capacity in that it may be rapidly advanced, at the same time leaving the work in a highly desirable condition.

Fourth, to provide a structure having these advantages which requires a relatively small amount of power to operate.

Fifth, to provide a structure which may be readily incorporated in paving machines now in use or embodied in paving machines provided with finishing screeds.

Sixth, to provide a machine equipped with vibratory elements arranged to not only effectively place or treat concrete mixtures of low water content but also to provide a surface which may be effectively troweled or finished by a finishing screed, material being reduced or brought to condition to permit effecting screeding.

Seventh, to provide a machine or apparatus of the character described having a wide range of adjustment.

Eighth, to provide a structure of the class described in which the vibratory members when assembled and adjusted as a unit are so arranged and connected as to permit vibration independently of each other, thereby permitting freedom of vibration and likewise minimizing the strains or stresses upon the connections and supports.

Ninth, to provide a structure of the character described in which the vibratory members are supported under resilient thrust in their adjusted positions and at the same time are connected to the operating parts by means which effectively absorb the shocks and vibrations.

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

2

A structure embodying the features of the invention is clearly illustrated in the accompanying drawing, in which:

Fig. 1 is a fragmentary view partially in side elevation and partially in longitudinal section of a concrete placement machine embodying my invention shown in operative relation to a side form and to the material treated.

Fig. 2 is a fragmentary plan view.

Fig. 3 is a fragmentary perspective view of one of the vibratory units of the embodiment shown in Figs. 1 and 2.

Fig. 4 is a fragmentary perspective view of the adjusting rockshaft illustrating details of the adjustable stop means provided therefor.

Fig. 5 is an enlarged fragmentary perspective view of one of the vibratory units illustrating the operative relation thereof to the concrete material being placed and showing details of the connections for the vibratory members and the mounting and supporting thereof.

Fig. 6 is a fragmentary view partially in vertical section illustrating further details of the vibratory members and the relation thereof to the material treated.

Fig. 7 is a fragmentary perspective view illustrating a plate-like vibratory member which projects forwardly from the outer end of the vibratory member adjacent the side forms functioning to vibrate the material adjacent the side forms and also to serve as retaining members for the material vibrated and supported by the vibratory member.

Fig. 8 is an enlarged fragmentary view partially in section illustrating the means for applying spring stress to the rockshaft and through the connections for the rockshaft to the vibratory members.

Fig. 9 is a fragmentary view of a modified form or embodiment of my invention.

Fig. 10 is a fragmentary perspective view of the embodiment of my invention shown in Fig. 9 illustrating further details thereof.

Fig. 11 is a fragmentary view partially in section illustrating a modified form or another means for applying yielding stress to the vibratory members.

Fig. 12 is a fragmentary view partially in section illustrating another means of applying yielding stress to the vibratory members.

In the embodiment of my invention illustrated I provide a carriage designated generally by the numeral 1 having wheels 2 adapted to travel on

the side forms 3. The structure illustrated is provided with a motor, transmission and control means therefor, but as these form no part of my present invention I have only shown them conventionally and I do not describe them herein.

The structure illustrated is provided with a strike-off screed 4 mounted at the front of the carriage and with a finishing screed 5. The strike-off screed 4 is commonly supported to strike off the material treated indicated at 6 at the desired height above the forms as indicated at 7 in Fig. 1. The finishing screed 5 is commonly mounted and supported to finish the slab flush with the top of the side forms. My present improvements relate to the vibrating and compacting of the material to be placed, preferably after it has been struck off at a predetermined height above the finished surface desired, although it should be understood that my invention is adapted for placing not only concrete slabs but other material where it is desired to compact the material.

Machines embodying my invention are particularly desirable for the placement of concrete having low water content and commonly designated as harsh, unworkable mixes; and also for incorporating crushed rock or other material in the surface of the pavement or the like so that the wear surface has a larger proportion of crushed rock or like aggregate than other portions of the concrete. As stated, it is an object to provide means by which such surfacing material may be added to the concrete at the point of placement merely by spreading on the concrete to be placed.

In the embodiment of the invention illustrated I provide three vibrating compacter units designated generally by the numeral 8 arranged in end to end relation transversely of the path of travel of the carriage and each being independently vibrated. The vibratory compacter units 8 illustrated comprise two vibratory members 9 which for convenience in manufacture are substantial duplicates. These vibratory members 9 are arranged in spaced parallel relation and each is adapted to rearwardly support a substantial mass of material treated as they are advanced against the material treated, as illustrated in the drawing. They are also preferably spaced so that the vibrations, conventionally illustrated by the dotted circles 10, merge. Three or more of the vibratory members might be used if desired, although I have found the structure illustrated to be highly satisfactory.

The vibratory members are preferably formed as pieces of wood having metal face plates 11 extended into rearwardly inclined shoes 12, the rear ends 13 of which project beyond the rear ends of the wood beams or bars; that is, the shoes are wider than the beams or bars. The vibratory members 9 are connected by cross pieces 131 preferably formed of spring steel, these cross pieces having downwardly projecting attaching portions 14 at the ends thereof bolted to the vibratory members. The use of springable material for these connecting cross members permits independent vibrations of the vibratory members, even when the vibrations are imparted from a common source as the motor 15 provided with an unbalanced rotor indicated by dotted lines at 16, Fig. 1. It is found in practice that vibrations peculiar to each vibratory member are set up therein and by thus connecting them they are permitted to vibrate each in its own cycle. This is of great advantage in full utilization of power and of material advantage in results accomplished.

The vibratory compacter units are designed to act upon the material placed substantially as a surface action and preferably after it has been struck off, although they are supported so that a roll of material is accumulated in front of both vibratory members. This is of advantage in the conversion of the harsh unworkable mixes of concrete into suitable plastic condition and also in the leveling operation and in providing desirable surfacing material. Flexible barriers 17 are provided at the ends of the vibratory members to retain the material accumulated between them for effective treatment, some of it being distributed in a ledge between the ends of the vibratory units.

The vibratory units in the embodiment illustrated are mounted for simultaneous adjustment and provided with common means for applying yielding or springable thrust thereto. This mechanism comprises a rockshaft 18 extending across the carriage and having arms 19 projecting therefrom, preferably in the rearward direction illustrated. The arms 19 are adjustably mounted on the shaft by means of clamps 20. This permits the longitudinal tilting of the vibratory units where it is desired to roughly crown the material laid. The arms 19 are provided with depending brackets 21 to which the hangers 22 are secured for tilting adjustment, the hangers being secured to the brackets by the bolts 23 which constitute pivots. The brackets are provided with arcuate slots 24 receiving bolts 25 whereby the hangers 22 may be clamped in their adjusted positions.

The hangers 22 are resiliently connected to the vibratory members, the connection illustrated consisting of tubular members 26 secured at their ends to opposed studs 27 by the encircling clamps 28. These studs are carried by uprights 29 secured to the vibratory members. The hanger is provided with a clamp 30 engaging the members 26 centrally thereof, sleeves 31 being provided to prevent collapsing of the members by the clamps. This provides a resilient shock-absorbing connection for the arms 19 to the vibratory compacter units permitting the desired freedom of vibration of the vibratory units and the independent vibration of the vibratory members without transmitting such vibrations objectionably to the other parts of the machine.

Spring or yielding thrust is imparted to the vibratory units through the rockshaft 18. In the preferred embodiment illustrated this comprises a leaf spring 32 which is secured to the rockshaft by the spring support 33 provided with shaft clamping means 34 (see Fig. 8). The free end of the spring is engaged by the adjusting lever 35 provided with a toothed segment 36 for retaining it in its adjusted positions. The rockshaft is secured to the frame of the carriage by means of the hangers 37 slotted at 38 to permit vertical adjustment (see Fig. 1). By adjusting the lever 35 the rockshaft is subjected to the desired actuating thrust of the spring 32.

To limit the actuating thrust I provide the shaft with a stop 39 which coacts with a stop 40 mounted on the carriage and provided with an adjusting screw 41. To relieve the resilient support members 26 of part of the load and to hold the vibratory members to the work, I provide the hangers 22 with cross bars 42 overhanging the vibratory members and provided with downwardly facing sockets 43 for the resilient buffer

or thrust members 44 which coact with thrust ledges 45 provided therefor on the vibratory members (see Fig. 6). The resilient thrust members 44 are provided with adjusting screws 46 threaded through the cross bar 42 and provided with lock nuts 47, a thrust disk 48 being provided for the screws.

The forward vibratory members of the end vibratory units are provided with forwardly projecting plate-like vibratory members 49 which are positioned at the inner sides of the forms 3 (see Figs. 1 and 7) and serve the double purpose of vibrating or "spading" the material at the inside of the forms and retaining the material accumulated in advance of the front vibratory member (see Fig. 5).

In the embodiment of the invention shown in Figs. 9 and 10 the vibratory members 50 are of greater cross section than those illustrated in the preceding figures, and they are rigidly secured by U-bolts 51 to the plate-like cross members 52 on which the unbalanced motor 53 is mounted. In this structure the vibratory members have no substantial independent vibration. The flexible support members 54 are carried by cross pieces 55 also clamped to the vibratory members and having upstanding arms 56 to which the resilient support members 57 corresponding to the support members 26 are secured. In this embodiment a resilient buffer or thrust member 58 is provided below each clamp 59 by means of which the arms 60 are secured to the vibratory units. These arms 60 are of I section and secured to the rockshaft by means of clamps 61.

In Fig. 12 I illustrate an alternative means for applying spring thrust to the rockshaft 18. In this embodiment the rockshaft is provided with an arm 62 having a nut 63 pivotally mounted on its outer end at 64, the nut being engaged by the screw 65 having a hand wheel 66 and a spring 67 on the screw supported at one end by the member 68 on the carriage and at the other end by the thrust collar 69.

In Fig. 11 I illustrate the hydraulic element 70 operatively associated with the arm 71 on the rockshaft 18.

By arranging the vibratory unit or units in trailing relation to the rockshaft, that is, by pulling the unit forwardly instead of pushing it, the tendency for downward tilting of the unit is largely overcome, this tendency being quite substantial when working on heavy materials such as ordinary concrete. Further, in the preferred embodiment means are provided, as described, for tilting the unit axially.

Structures embodying my invention are highly practical for the placement of concrete, even mixes having such low water content as to have substantially no slump. The bed of material is effectively vibrated and is rendered workable. The machine may be operated with satisfactory compacting placement at relatively high speed. It is sometimes desired that concrete shall have a wear surface largely of rock fragments as indicated at 72 in Fig. 6. This may be accomplished with my concrete placement apparatus by spreading the rock fragments on the surface of the regular concrete mass as I have indicated at 73 in Fig. 6. I have made no attempt here to indicate quantities.

I have not attempted to illustrate or describe other modifications and adaptations of my invention as it is believed the disclosure made will enable those skilled in the art to embody or

adapt the same as may be desired. The structures illustrated are highly efficient, both in the amount of material which can be placed by the use thereof and that the placed material is of a superior quality.

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

1. In a machine of the class described, the combination with a carriage adapted to travel on forms, of a plurality of vibratory units disposed end to end transversely of the path of travel of the carriage, each unit comprising a plurality of vibratory members disposed horizontally in spaced parallel tandem relation, each vibratory member being adapted to rearwardly support a substantial mass of material treated as they are advanced against the material treated, said vibratory members being spaced to receive material treated between them, means for imparting vibrations to said vibratory members, flexible material retaining members extending between the ends of the vibratory members, the forward vibratory members of the end units being provided with forwardly projecting vibratory plates adapted to retain material and vibrate the material treated at the inner sides of the forms as the carriage is advanced, a rockshaft disposed transversely of the carriage, arms on said rockshaft, hangers connected to said rockshaft arms for tilting adjustment and resiliently connected to said vibratory units, resilient thrust members for said vibratory members adjustably mounted on the said hangers, means operatively associated with said rockshaft for applying spring thrust to said vibratory units, and an adjustable stop means for limiting the movement of said rockshaft under the action of said spring thrust means.

2. In a machine of the class described, the combination with a carriage adapted to travel on forms, of a plurality of vibratory units disposed end to end transversely of the path of travel of the carriage, each unit comprising a plurality of vibratory members disposed horizontally in spaced parallel tandem relation, each vibratory member being adapted to rearwardly support a substantial mass of material treated as they are advanced against the material treated, said vibratory members being spaced to receive material treated between them, means for imparting vibrations to said vibratory members, flexible material retaining members extending between the ends of the vibratory members, the forward vibratory members of the end units being provided with forwardly projecting vibratory plates adapted to retain material and vibrate the material treated at the inner sides of the forms as the carriage is advanced, a rockshaft disposed transversely of the carriage, arms on said rockshaft, hangers connected to said rockshaft arms and to said vibratory units, and means operatively associated with said rockshaft for applying spring thrust to said vibratory units.

3. In a machine of the class described, the combination with a carriage, of a plurality of vibratory members disposed horizontally in spaced parallel tandem relation transversely of the path of travel of the carriage and having rearwardly inclined shoes, each vibratory member being adapted to rearwardly support a substantial mass of material treated as they are advanced against the material treated, said vibratory members being spaced to receive material treated between them and so that the vibrations set up in the

material by the vibratory members are merged, springable cross bars connecting said vibratory members and permitting independent vibratory movement thereof, unbalanced rotors mounted on said cross bars for imparting vibrations to said vibratory members, flexible material retaining members extending between the ends of the vibratory members, a rockshaft disposed transversely of the carriage, rearwardly projecting arms on said rockshaft, resilient support members connected at their ends to said vibratory members, hangers connected to said rockshaft arms for tilting adjustment, said hangers being connected to said support members intermediate their ends, said hangers being provided with cross bars overhanging said vibratory members, resilient thrust members for said vibratory members mounted for vertical adjustment on the said hanger cross bars, an adjusting lever for said rockshaft, a spring on said rockshaft operatively associated with said adjusting lever for applying spring thrust to said vibratory members, and an adjustable stop means for limiting the movement of said rockshaft under the action of said spring.

4. In a machine of the class described, the combination with a carriage, of a plurality of vibratory members disposed horizontally in spaced parallel tandem relation transversely of the path of travel of the carriage, each vibratory member being adapted to rearwardly support a substantial mass of material treated as they are advanced against the material treated, said vibratory members being spaced to receive material treated between them and so that the vibrations set up in the material by the vibratory members are merged, cross bars connecting said vibratory members, unbalanced rotors mounted on said cross bars for imparting vibrations to said vibratory members, a rockshaft disposed transversely of the carriage, rearwardly projecting arms on said rockshaft, resilient support members connected at their ends to said vibratory members, hangers connected to said rockshaft arms for tilting adjustment, said hangers being connected to said support members intermediate their ends, said hangers being provided with cross bars overhanging said vibratory members, resilient thrust members for said vibratory members mounted for vertical adjustment on the said hanger cross bars, an adjusting lever for said rockshaft, a spring on said rockshaft operatively associated with said adjusting lever for applying spring thrust to said vibratory members, and an adjustable stop means for limiting the movement of said rockshaft under the action of said spring.

5. In a machine of the class described, the combination with a carriage, of a plurrality of vibratory members disposed horizontally in spaced parallel tandem relation transversely of the path of travel of the carriage and having rearwardly inclined shoes, each vibratory member being adapted to rearwardly support a substantial mass of material treated as they are advanced against the material treated, said vibratory members being spaced to receive material treated between them and so that the vibrations set up in the material by the vibratory members are merged, springable cross bars connecting said vibratory members and permitting independent vibratory movement thereof, unbalanced rotors mounted on said cross bars for imparting vibrations to said vibratory members, flexible material retaining members extending between the ends of the vibratory members, a rockshaft disposed transversely of the carriage, rearwardly projecting arms on said

rockshaft, resilient support members connected to said vibratory members and to said rockshaft arms, resilient thrust members for said vibratory members carried by said arms, spring means operatively associated with said rockshaft for applying thrust to said rockshaft, and an adjustable stop means for limiting the movement of said rockshaft.

6. In a machine of the class described, the combination with a carriage, of a plurality of vibratory members disposed horizontally in spaced parallel tandem relation transversely of the path of travel of the carriage, each vibratory member being adapted to rearwardly support a substantial mass of material treated as they are advanced against the material treated, said vibratory members being spaced to receive material treated between them and so that the vibrations set up in the material by the vibratory members are merged, cross bars connecting said vibratory members and permitting independent vibratory movement thereof, unbalanced rotors mounted on said cross bars for imparting vibrations to said vibratory members, a rockshaft disposed transversely of the carriage, rearwardly projecting arms on said rockshaft, resilient support members connected to said vibratory members and to said rockshaft arms, resilient thrust members for said vibratory members carried by said arms, spring means operatively associated with said rockshaft for applying thrust to said rockshaft, and an adjustable stop means for limiting the movement of said rockshaft.

7. In a structure of the class described, the combination with a carriage, of a plurality of vibratory members disposed in spaced tandem relation transversely of the path of travel of the carriage, said vibratory members having rearwardly inclined shoes and each being adapted to rearwardly support a substantial mass of material treated as they are advanced, said vibratory members being spaced to receive material treated between them and in such relation that the vibrations set up in the material treated are merged, springable cross bars connecting said vibratory members and permitting an independent vibratory movement thereof, unbalanced rotors mounted on said cross members for imparting vibrations to said vibratory members, resilient support members connected to said vibratory members, hangers connected to said resilient support members intermediate the ends thereof, and means for adjustably supporting said hangers including means for supplying spring thrust thereto.

8. In a structure of the class described, the combination with a carriage, of a plurality of vibratory members disposed in spaced tandem relation transversely of the path of travel of the carriage, said vibratory members being adapted to rearwardly support a substantial mass of material treated as they are advanced, said vibratory members being spaced to receive material treated between them, cross bars connecting said vibratory members and permitting an independent vibratory movement thereof, unbalanced rotors mounted on said cross members for imparting vibrations to said vibratory members, resilient support members connected to said vibratory members, hangers connected to said resilient support members intermediate the ends thereof, and means for adjustably supporting said hangers including means for supplying spring thrust thereto.

9. In a structure of the class described, the combination with a carriage, of a plurality of vibratory members disposed in spaced tandem re-

lation transversely of the path of travel of the carriage, said vibratory members being adapted to rearwardly support a substantial mass of material treated as they are advanced, said vibratory members being spaced to receive material treated between them, cross bars connecting said vibratory members and permitting an independent vibratory movement thereof, unbalanced rotors mounted on said cross members for imparting vibrations to said vibratory members, resilient support members connected to said vibratory members, hangers connected to said resilient support members intermediate the ends thereof, means for adjustably supporting said hangers including means for supplying spring thrust thereto, and adjustable stop means for limiting the action of such spring thrust.

10. In a structure of the class described, the combination with a supporting and translating means, of a plurality of vibratory members disposed horizontally in spaced tandem relation and transversely of the path of travel of the carriage, each vibratory member being adapted to rearwardly support a substantial mass of material treated as they are advanced, said vibratory members being spaced to receive material treated between them and so that the vibrations set up in the material by the vibratory members are merged, means connecting said vibratory members for adjustment as a unit, means for vibrating said vibratory members carried thereby, a rockshaft, rearwardly projecting arms on said rockshaft, said vibratory members being connected to the rear ends of the arms of said rockshaft for tilting adjustment on an axis parallel to the vibratory members, the connections for said rockshaft to said vibratory members including resilient shock absorbing elements and vertically adjustable thrust elements, spring means acting on said rockshaft to apply spring thrust to said vibratory units, and an adjustable stop means associated with said rockshaft for limiting the movement thereof under said spring actuating means.

11. In a structure of the class described, the combination with a supporting and translating carriage, of a plurality of vibratory members disposed horizontally in spaced tandem relation and transversely of the path of travel of the carriage, each vibratory member being adapted to rearwardly support a substantial mass of material treated as they are advanced, said vibratory members being spaced to receive material treated between them and so that the vibrations set up in the material by the vibratory members are merged, means for vibrating said vibratory members carried thereby, a member extending longitudinally of and having longitudinally spaced connections to said vibratory members for adjustably supporting said vibrating members bodily as a unit, and elastically yielding means associated with said member for operating the same for applying an elastically yielding thrust to said vibratory members, bodily as a unit, downwardly towards the material being treated.

12. In a structure of the class described, the combination with a supporting and translating means of a plurality of vibratory members disposed in tandem relation horizontally and transversely of the path of travel, said vibratory members being adapted to rearwardly support a substantial mass of material treated as they are advanced and being spaced to receive material between them and so that the vibrations set up in the material by the vibratory members are merged, resilient means connecting said vibratory members permitting independent vibrations thereof, vibrating means carried by said vibratory members, resilient barriers adjacent the ends of the vibratory members coacting therewith to provide a reservoir for accumulated material between said members, means for raising and lowering the vibratory members as a unit and applying downward yielding thrust thereto, and adjustable stop means for limiting the downward movement of the vibratory members.

13. In a structure of the class described, the combination with a supporting and translating means, of a plurality of vibratory members disposed in tandem relation horizontally and transversely of the path of travel, said vibratory members being adapted to rearwardly support a substantial mass of material treated as they are advanced and being spaced to receive material between them, resilient means connecting said vibratory members permitting independent vibrations thereof, means for vibrating said vibratory members at high frequency, resilient barriers adjacent the ends of the vibratory members coacting therewith to provide a reservoir for accumulated material between said members, and means for raising and lowering the vibratory members as a unit and applying downward yielding thrust thereto.

14. In a structure of the class described, the combination with a supporting and translating means, of a plurality of vibratory members disposed horizontally and in tandem relation and transversely of the path of travel, said vibratory members being adapted to rearwardly support a substantial mass of material treated as they are advanced and being spaced to receive material between them, vibrating means for said vibratory members, a member extending longitudinally of and having longitudinally spaced connections to said vibratory members for supporting the same bodily as a unit, elastically yieldable means associated with said members for operating the same, for applying a downward elastically yielding thrust to said vibratory members, bodily as a unit, and adjustable stop means for limiting the downward movement of the vibratory members.

15. In a structure of the class described, the combination with a supporting and translating means, of a plurality of vibratory members disposed horizontally and in tandem relation and transversely of the path of travel, said vibratory members being of substantial vertical dimensions whereby the same are adapted to rearwardly support a substantial mass of material treated and whereby the vibratory members are adapted to project above the material being treated as they are advanced, said vibratory members being spaced to receive material between them, means connecting said vibratory members as a unit, vibrating means for said vibratory members, and means for raising and lowering the vibratory members as a unit, said raising and lowering means including a rock shaft operatively connected to said vibratory members for raising and lowering the same, an adjustable lever loosely mounted on said rock shaft to swing thereon and relative thereto, a spring yieldingly connecting said lever to said rock shaft to cause said vibratory members when in lowered position to yieldingly engage the material being treated, and means associated with said translating means for fixedly retaining said adjustable lever relative to said translating means and against the operative

thrust of said spring when yieldingly forcing the vibratory members into operative engagement with the material being treated.

16. In a structure of the class described, the combination with a carriage, of vibratory members disposed horizontally in spaced tandem relation transversely of the path of travel of the carriage and connected to permit independent vibratory movement, means for imparting high frequency vibrations to said vibratory members, a rockshaft provided with arms, hangers connected to said rockshaft arms for tilting adjustment and having shock absorbing connections to said vibratory members, resilient thrust members on said hangers coacting with said vibratory members, said thrust members being mounted for adjustment to and from said vibratory members, spring means operatively associated with said rockshaft for applying yielding thrust to said vibratory members, and stop means for limiting the thrust movement of said rockshaft.

17. In a structure of the class described, the combination with a carriage, of vibratory members disposed horizontally in spaced tandem relation transversely of the path of travel of the carriage and connected to permit independent vibratory movement, means for imparting high frequency vibrations to said vibratory members, a rockshaft provided with arms, hangers connected to said rockshaft arms for tilting adjustment and having shock absorbing connections to said vibratory members, spring means operatively associated with said rockshaft for applying yielding thrust to said vibratory members, and stop means for limiting the thrust movement of said rockshaft.

18. In a structure of the class described, the combination with a carriage, of vibratory members disposed horizontally in spaced tandem relation transversely of the path of travel of the carriage and connected as a unit, means for imparting high frequency vibrations to said vibratory members, a rockshaft provided with rearwardly projecting arms, hangers carried by said rockshaft arms and having shock absorbing connections to said vibratory members, resilient thrust members on said hangers coacting with said vibratory members, means operatively associated with said rockshaft for applying yielding thrust to said vibratory members, and stop means for limiting the thrust movement of said rockshaft.

19. In a structure of the class described, the combination with a carriage, of vibratory members disposed horizontally in spaced tandem relation transversely of the path of travel of the carriage and connected as a unit, means for imparting high frequency vibrations to said vibratory members, a rockshaft provided with rearwardly projecting arms, hangers carried by said rockshaft arms and having shock absorbing connections to said vibratory members, and means operatively associated with said rockshaft for applying yielding thrust to said vibratory members.

20. In a structure of the class described, the combination with a supporting means, of a plurality of vibratory members disposed horizontally in spaced tandem relation and transversely to the path of advancement thereof and having rearwardly inclined shoes, resilient means connecting said vibratory members and permitting independent vibratory movement thereof, means for vibrating each of said vibratory members, and

means for supporting said vibratory members for vertical adjustment relative to each other.

21. In a structure of the class described, the combination with a supporting carriage, of a plurality of vibratory members disposed horizontally in spaced tandem relation and transversely to the path of advancement of the carriage, resilient means connecting one of the vibratory members to another vibratory member and permitting vibratory movement of one vibratory member independently of the other vibratory member, means for vibrating each of said vibratory members, and vertically adjustable means having a pivotal connection between the same and said resilient means for supporting said vibratory members for vertical adjustment relative to each other, the axis of said pivotal connection being disposed substantially parallel to said vibratory members and being disposed in a vertical plane extending between said vibratory members, said resilient means including vertically elastically yielding members supportingly connecting said vibratory members, said vertical adjustable means including laterally spaced rock arms, said pivotal connection including a first means supportingly carried by said rock arms and a second means supportingly carrying said vertically elastically yielding members, pivotal means between said first means and second means and having a circular bearing surface to permit circular adjustment of said second means relative to said first means, and means for fixedly retaining said second means in different circularly adjusted positions relative to said first means.

22. In a structure of the class described, the combination with a supporting carriage, of a plurality of vibratory members disposed horizontally in spaced tandem relation and transversely to the path of advancement of the carriage, elastically yielding means connected to said vibratory members and permitting independent vibratory movement thereof, means for vibrating said vibratory members, and adjustable means connected to said elastically yielding means for lowering and raising said vibratory members, bodily as a unit, into operative and inoperative positions, respectively, said adjustable means having associated therewith elastically yielding means for elastically yieldingly forcing said vibratory members downwardly into engagement with material being treated when the vibratory members are lowered into operative position, said adjustable means including a rock shaft, an adjustable lever loosely mounted on said rock shaft to swing thereon and relative thereto, and means for fixedly retaining said adjustable lever in different adjusted positions relative to said carriage, said last named yielding means yieldingly connecting said lever to said rock shaft.

23. In a structure of the class described, the combination with a supporting and translating means, of a vibratory member disposed substantially horizontally and transversely of the path of travel of said translating means, a rock shaft operatively connected to said vibratory member, an adjustable lever loosely mounted on said rock shaft to swing thereon and relative thereto, elastically yielding means yieldingly connecting said adjustable lever to said rock shaft for yieldingly forcing the vibratory member into operative engagement with the material being treated, and means associated with said translating means for fixedly retaining said adjustable lever relative to said translating means and against the

thrust of said elastic yielding means when yieldingly forcing the vibratory member into operative engagement with the material being treated.

CORWILL JACKSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,782,707	Bayley	Nov. 25, 1930
2,214,093	Vanable	Sept. 10, 1940
2,163,882	Jackson	June 27, 1939
2,219,248	Jackson	Oct. 22, 1940
2,332,687	Baily	Oct. 26, 1943