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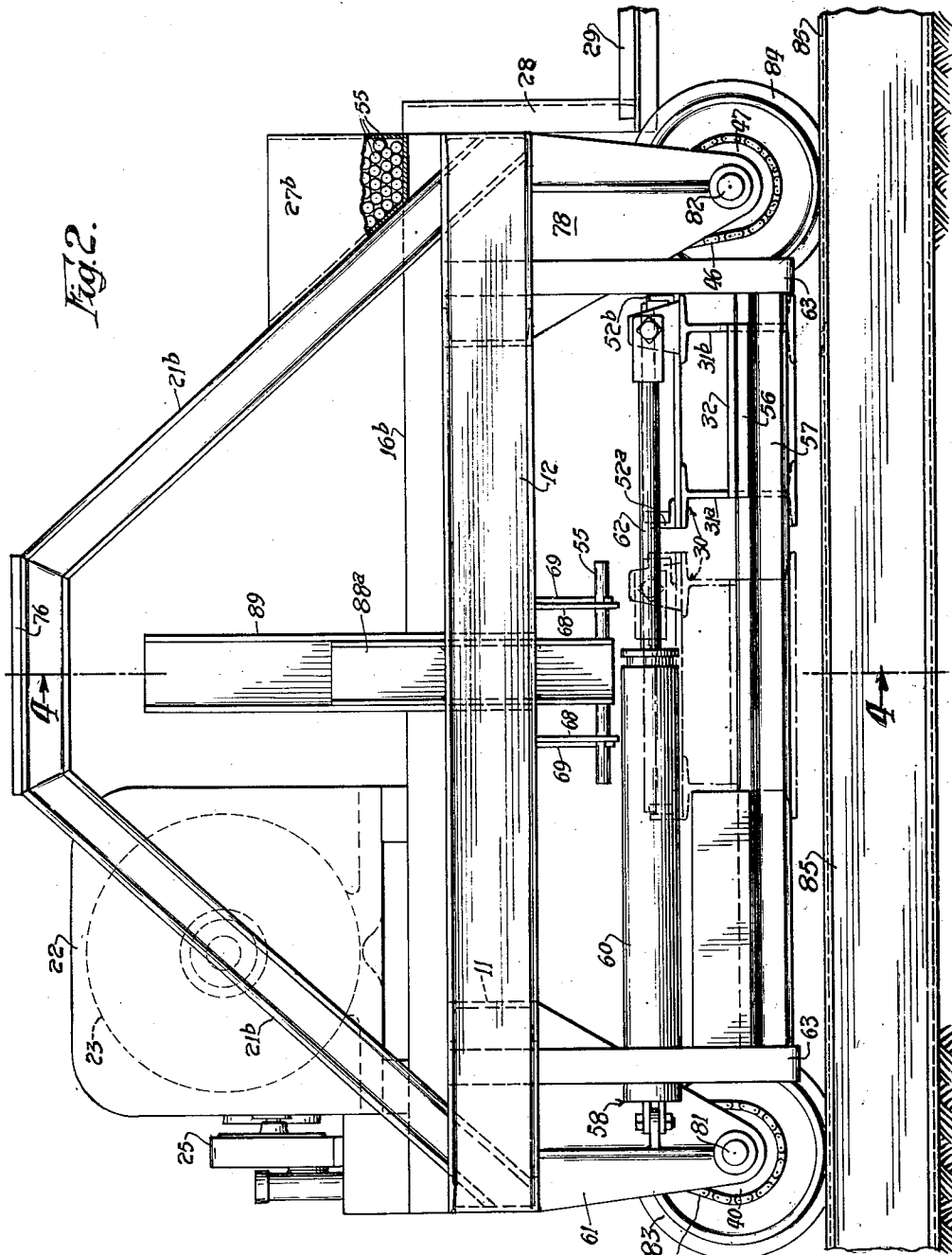
J. A. GOLDEN

2,389,773

DOWEL SETTING MACHINE

Filed Jan. 26, 1944

7 Sheets-Sheet 2



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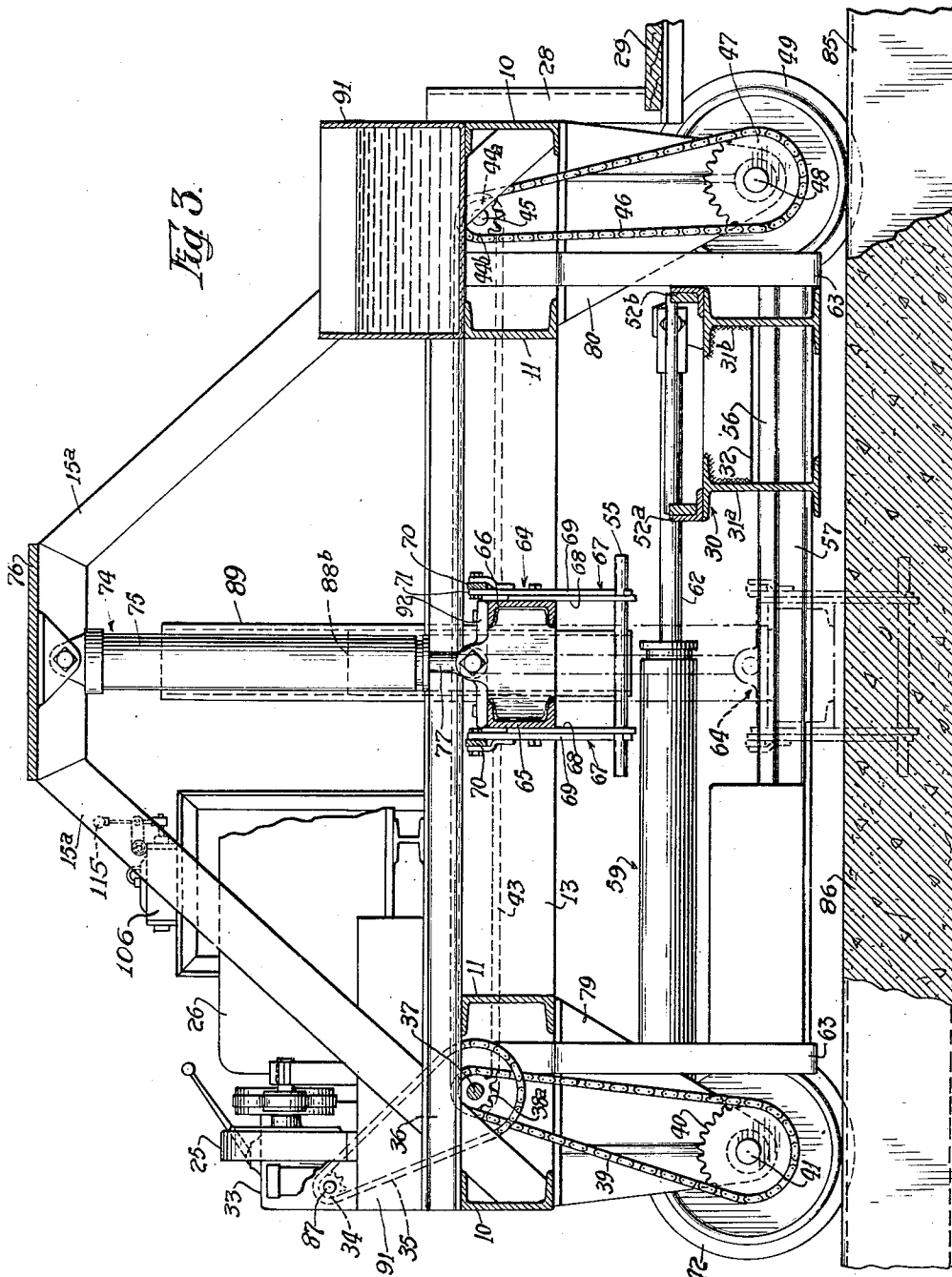
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DOWEL SETTING MACHINE

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7 Sheets-Sheet 3



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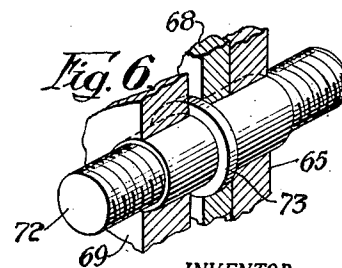
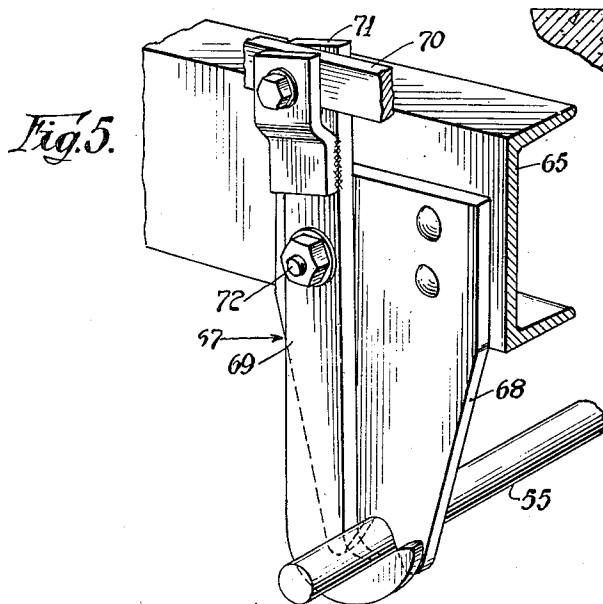
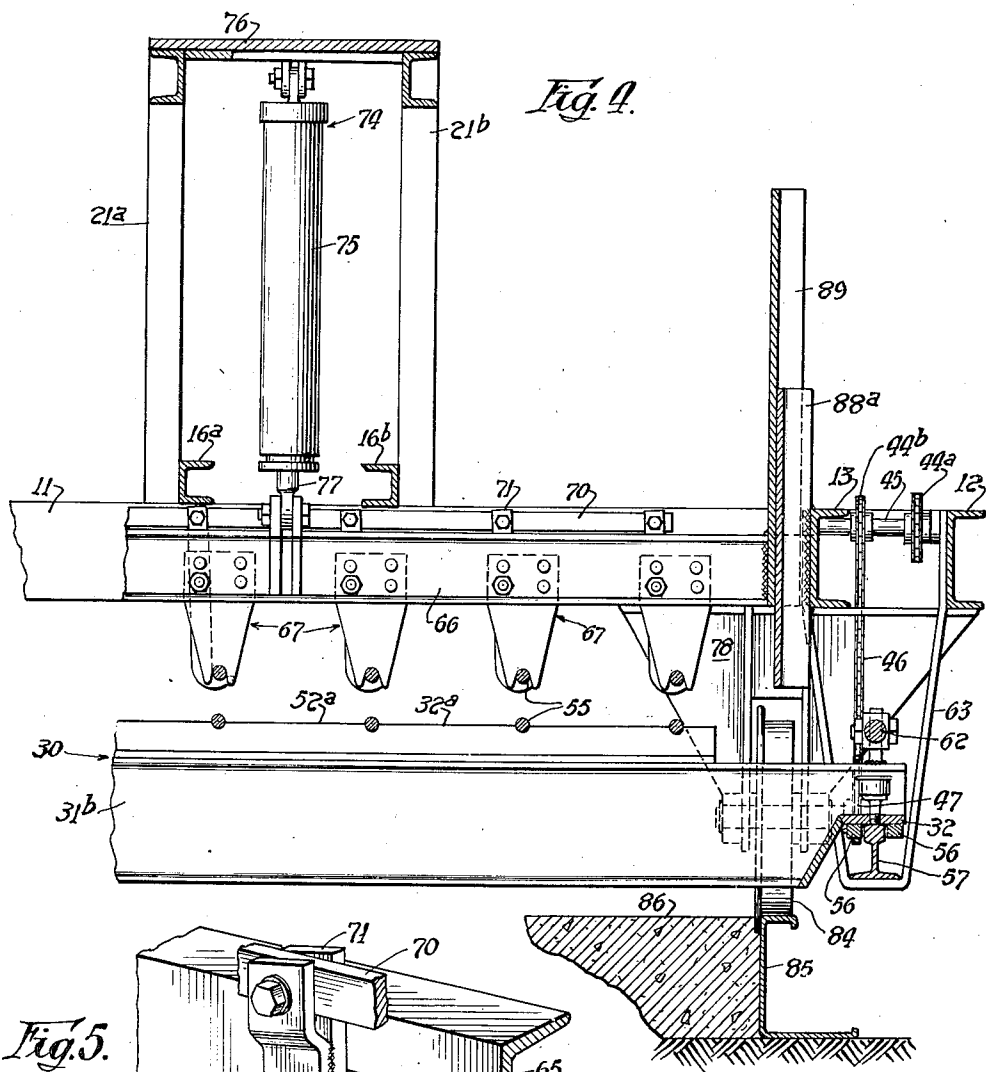
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7 Sheets-Sheet 4



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DOWEL SETTING MACHINE

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7 Sheets-Sheet 5

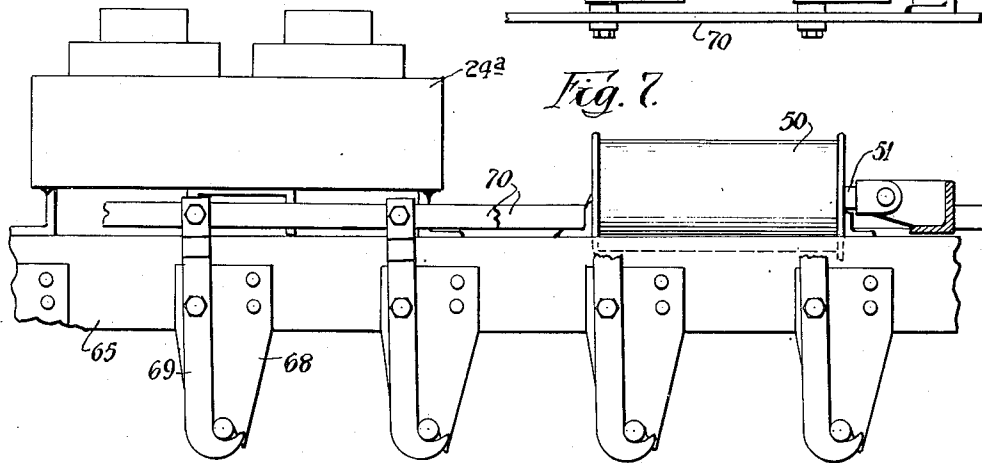
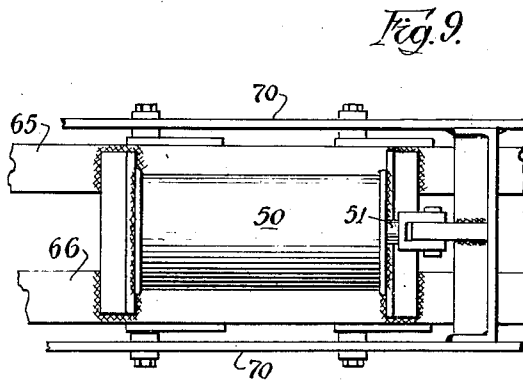
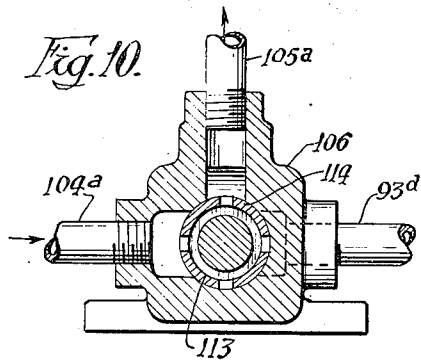
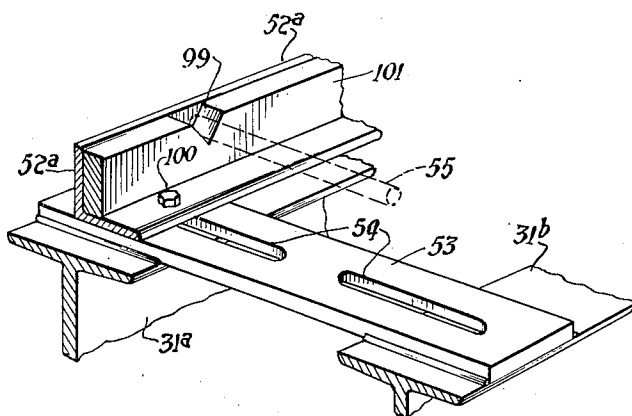


Fig. 8.



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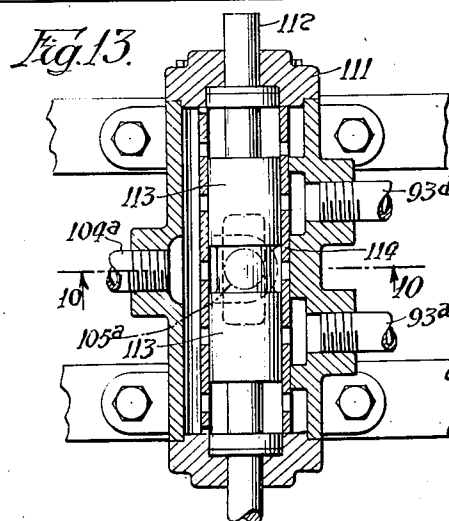
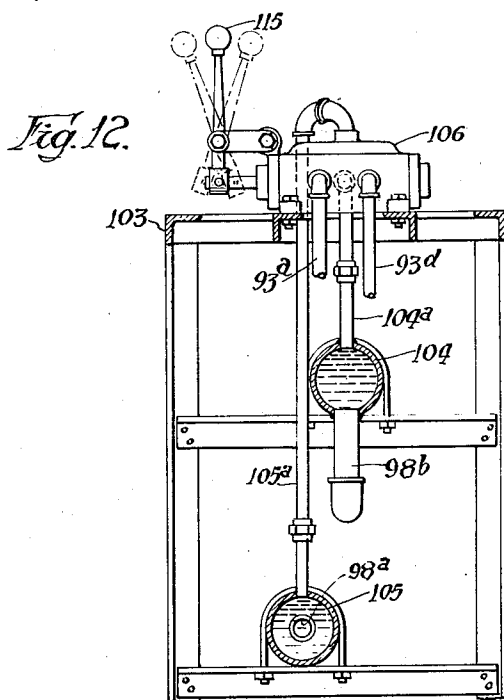
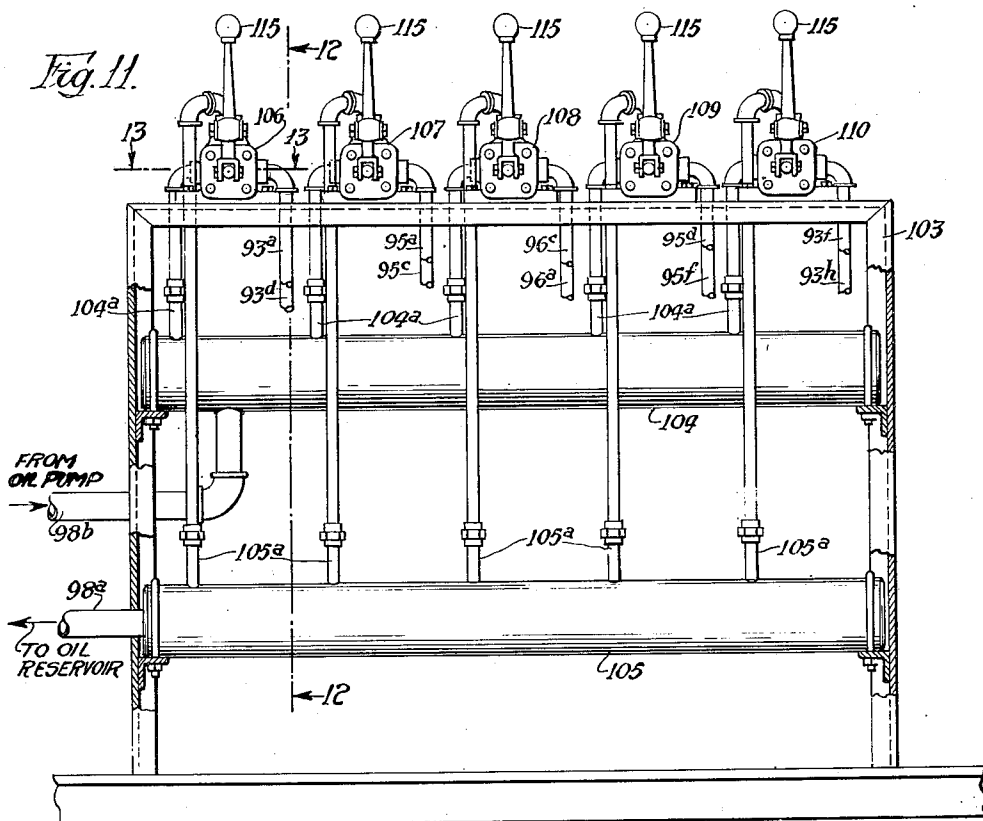
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DOWEL SETTING MACHINE

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7 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,389,773

DOWEL SETTING MACHINE

John A. Golden, San Diego, Calif.

Application January 26, 1944, Serial No. 519,737

9 Claims. (Cl. 94—39)

My invention relates to dowel setting machines, and its objects are to provide movable mechanical means for embedding dowels at regular recurrent intervals in wet concrete of roadways after such concrete has been poured and before it has become set; to arrange dowels in parallel spaced relation to form a rank extending substantially across the roadway and to transport the same in such relation to the desired position for installation; to permit the dowels, by mechanical means, while in such parallel spaced relation, to be forced downwardly and to become embedded in the wet concrete all at the same time and at the same depth; to dispense with the metallic chairs commonly employed to effect placement of dowels in the position required; and to bring about such embedment of dowels in wet concrete speedily, and with greater efficiency and economy than has been heretofore accomplished. Other objects will appear from the drawings and as hereinafter set forth and described.

At the present time, so far as I am aware, the only practicable method used for embedding dowels in wet concrete in roadway construction is that of arranging and supporting dowels upon metal chairs and of positioning said chairs upon the road bed in advance of pouring the concrete, and thereupon flowing the said concrete thereover. While, however, it has been the endeavor of the workman through the use of such chairs to position the dowels side by side at intervals in parallel relation extending across the road bed, this practice has been found to be unsatisfactory because when the wet concrete is discharged from the paver down upon said chairs, they are likely to be forced out of alignment, the dowels to become displaced, and the required arrangement disturbed. Another objection to this practice is the loss of valuable metallic material, for once these chairs are embedded in the concrete and the same becomes set, it is impossible to remove them; the chairs as well as the dowels becoming an integral part of the roadway, and as incorporated therein lasting as long as the roadway lasts.

With my improved machine, however, I dispense entirely with the metal chairs heretofore found necessary or desirable in the setting of dowels, and in place thereof have provided mechanical means for first arranging the dowels in the desired parallel relation, and then while carefully preserving such relation have furnished mechanism for carrying and for plunging said dowels downwardly at uniform depth into the wet concrete. Primarily my invention consists of

a motor vehicle constructed with a heavy metallic rectangular frame having wheels arranged to make contact with and to run upon the header boards of a pavement strip as a track; the said frame having movably mounted thereon a shuttle jig formed to carry thereon a rank of dowels arranged in parallel spaced relation, and having mechanism operated by hydraulic rams and arranged to pick up said dowels, and without disturbing their relative positions, to plunge said dowels down into the wet concrete, all at the same depth, and thereupon to release the same in the concrete while still in their same relative positions. My invention further consists in the other improvements and novel arrangement of parts hereinafter described and claimed.

Attention is hereby directed to the drawings illustrating a preferred form of my invention, in which similar numerals of designation refer to similar parts throughout the several views, and in which—

Figure 1 is a plan view of my improved dowel setting machine showing the same located in operative position over a pavement strip with the wheels of its carriage in contact with the header boards at the sides thereof;

Fig. 2 is an end elevation of the machine illustrated in Fig. 1, some of the parts being removed and some being shown in section for the purpose of clearer illustration;

Fig. 3 is a section on 3—3 of Fig. 1, looking in the direction of the arrows;

Fig. 4 is a section on line 4—4 of Fig. 2, looking in the direction of the arrows;

Fig. 5 is an enlarged view in perspective of one of the dowel clamps and adjacent parts;

Fig. 6 is a view in perspective of the pin or bolt serving as a pivot for one of the jaws of such dowel clamp;

Fig. 7 is an enlarged side elevation of a conventional form of vibrators preferably employed in setting the dowels, the ram for actuating draw bar mechanism, and adjacent parts;

Fig. 8 is an enlarged view in perspective of certain of the parts of the dowel shuttle jig, showing the construction of the support for one of the dowels and means for adjusting the same,

Fig. 9 is an enlarged plan view of the ram shown in Fig. 7, and adjacent parts;

Fig. 10 is an enlarged sectional view of the conventional 4-way valve used in my machine on line 10—10 of Fig. 13;

Fig. 11 is a view of the conventional hydraulic oil apparatus and connections employed by me for operating the rams of my machine;

Fig. 12 is a sectional view on line 12—12 of Fig. 11, looking in the direction of the arrows, and

Fig. 13 is an enlarged sectional view of one of the lever operated four-way valves on line 13—13 of Fig. 11, looking in the direction of the arrows and showing the oil inlets and outlets, and port connections with the rams.

Fig. 14 is a diagrammatic view of the hydraulic ram assembly, showing the connections of the rams, valves and pump system employed in the operation of my machine.

Referring to the drawings, the main frame 9 of the carriage there shown is preferably constructed of a number of eight-inch channel irons, two of which located on each side of said frame form the side strips 10 and 11, and two of which located at each end of said frame form the end strips 12 and 13. Welded to said side strips and extending laterally across said frame are the pairs of deck members 14a and 14b, 15a and 15b, 16a and 16b, 17a and 17b, and 18a and 18b. Also welded to said side strips are the pairs of A members 19a and 19b, 20a and 20b, and 21a and 21b, extending above and across said frame for the purpose hereinafter set forth. Located at opposite ends of said frame 9 and welded to and downwardly depending from the same are the clevis brackets 61, 78, 79 and 80, and journalled within bearings formed in the lower clevis ends of said brackets are the respective axles 81, 82, 41 and 48, upon which axles are mounted respectively the carriage wheels 83, 84, 42 and 49 within the clevis of said brackets. As shown in the drawings, these carriage wheels are positioned so as to make contact with the track formed by the tops of the header boards 85 located on each side of the pavement strip 86, and to run upon the same; my said carriage, incorporating said frame and mechanism supported thereon, being thus made longitudinally movable over said strip to any desired position thereover.

Upon the pair of deck members 18a and 18b is mounted a conventional gasoline motor 22 connected in any manner well known in the art to operate a conventional generator 23 secured to a platform upon the main frame 9, said generator being for the purpose of actuating conventional electric vibrators 24a and 24b secured to channel irons 65 and 66 hereinafter referred to and having conventional connections for vibrating the dowel injectors 64 hereinafter more specifically described. Also mounted upon members 17a and 17b of the main frame is a conventional gasoline motor 26, and secured to a platform adjacent thereto on said frame is the oil pressure pump 25; the said motor serving not only to drive said pressure pump but also to propel my said carriage in the manner hereinafter set forth. Also mounted upon said main frame 9, in any convenient location, are the dowel supply racks 27a and 27b, from which the workman from time to time may remove dowels as required; and secured to one side of said frame throughout its length are iron angle brackets 28, four in number, serving to support the cat walk 29 constructed for the convenience of the workman in loading dowels upon the movable shuttle jig 39, upon which the dowels are to be conveyed to the emplacement mechanism. Also for the purpose of supplying each dowel with a coating of oil, I preferably install between the racks 27a and 27b the oil tank 91, in which said workman may dip the dowels as he loads them upon shuttle jig.

Mounted upon the main frame and conven-

tionally connected to the motor 26 is a conventional transmission gear case 33, having the usual shaft 87, upon which is mounted the sprocket wheel 34 connected by the chain 35 to the sprocket wheel 36 mounted upon the elongated shaft 37, which is located at one side of my machine and extends nearly the entire length thereof and which is journalled in suitable bearings upon the main frame 9. Secured to one end of the shaft 37 are the sprocket wheels 38a and 38b, the wheel 38a being connected by the chain 39 to the sprocket wheel 40, mounted upon the axle 41 of the carriage wheel 42, and serving to operate the same; and the wheel 38b being connected by the chain 43 to the sprocket wheel 44a mounted upon jack shaft 45 journalled in suitable bearings upon the main frame 9, the said shaft 45 also having mounted thereon the sprocket wheel 44b, connected by the chain 46 to the sprocket wheel 47 upon axle 48 of carriage wheel 49, and serving to operate the same. This arrangement of gear train and connections from the shaft 37 to the axles of the carriage wheels, is duplicated at the other end of machine to operate axles 81 and 82, and the respective carriage wheels 83 and 84 mounted thereon, and therefore need not further be set forth and described. If desired, as is obvious, the shaft 37 could be made in two independent parts; one part being employed for operating the carriage wheels at one end of my machine, and the other part being used for independently operating the carriage wheels at the other end of such machine; such construction being of particular utility in negotiating curves in the track where such independence of operation would be found to be advantageous and effective.

Preferably, I construct the frame of my shuttle jig 30 of two ten-inch I beams, 31a and 31b, extending nearly the entire length of my machine and being connected by plates 32 welded to the ends thereof (see Figs. 3 and 4). Mounted upon the beams 31a and 31b and coextensive therewith are the respective angle irons 52a and 52b (see particularly Figs. 2, 3 and 8); plates 53 being interposed at intervals between the tops of said beams and the bottoms of said angle irons, and having therein elongated slots 54 through which extend the shanks of cap screws 100 serving detachably to secure said angle irons to said beams through threaded engagement with openings therein. Spot welded to each of said angle irons 52a and 52b is an iron dowel spacer 101, having V shaped notches 99 therein for the reception of the ends of the dowels 55. By loosening the cap screw 100 the adjacent portion of the angle iron may be moved toward or from the opposite angle iron; the slots 54 permitting the shank of said screw to be moved therein accordingly and the desired adjustment to be made for the reception of the dowel whereupon the said screw may again be tightened and the parts made ready for use. As will be observed from the drawings, provision is made for loading the jig 30 for a sufficient number of dowels in the required spaced parallel arrangement to occupy the entire width of the roadway, and when such jig is located in the loading position shown in Figs. 1 and 3, at the side of the machine, the workman operating from the cat walk can speedily load said jig with dowels procured from the racks 27a and 27b, which as above stated are conveniently located for such purpose.

For the purpose of effecting lateral movement of the shuttle jig 30 from its loading position at the side of the frame 9 to its discharging posi-

tion in the central portion thereof, I suspend from the strips 12 and 13 at each end of the frame 9, the U shaped brackets 63, which serve to support the two rails 57, one at each end of the machine; and to the under faces of the plates 32, shown as coming in contact with said rails, I secure the guides 56 spaced to form channels making sliding contact with the tread of said rails. Through this construction, using said rails as a track, the shuttle jig 30 may as a whole, carrying the loaded rank of dowels arranged as aforesaid, be readily moved transversely to and from the central position in the machine from which the dowels are to be transferred to the injector 64. To effect such transverse movement, I employ two hydraulic rams 58, 59, each located at opposite ends of the shuttle jig; the head cylinder 60 of each ram being pivotally connected with one of the downwardly depending brackets 61 or 79, serving as mountings for wheels 83 and 42, and the piston shaft 62 of each cylinder being pivotally connected with the top of I beam 31b forming part of the supporting structure of said jig 30. Such rams are of conventional construction and may be operated and controlled in the manner well understood in the art.

For the purpose of embedding the said rank of dowels in the wet concrete of the roadway, I employ the injector 64, consisting of a substantial back support or frame formed by a pair of channel irons 65 and 66, which are connected in parallel spaced relation by bars 92 bolted thereto, and extend nearly the entire length of my machine, and to which are secured at regularly spaced intervals pairs of jaws 67, each jaw having a stationary member 68 firmly affixed to one of said channel irons, and having a movable member 69 pivotally connected to said iron. Each of these jaws 67, as will be observed, has its members so disposed so that upon closing the movable member 69, the dowels may be firmly grasped and held rigidly in position, and upon opening said movable member the said dowels can readily be released. As shown in Figs. 2 and 4, the arrangement of injector jaws and dowels is such that when the jig shuttle carrying the dowels is moved to its central position for transfer and discharge of such dowels, each of the jaws 67 is located exactly above one of the dowels 55 and in a position upon being sufficiently depressed for grasping the same through proper movement of its member 69.

To effect grasping or release of the entire rank of dowels by said injector jaws at one and the same time, I preferably employ draw bars 70, of which there are two in number, and each of which is pivotally connected with the upper ends 71 of each of the movable members 69 forming one of the pairs of said jaws; each draw bar upon longitudinal movement thereof serving to open or close the set of jaws with which it is connected and being controlled by a conventional hydraulic ram 50 mounted upon the frame of the injector; the piston rod 51 of which ram is connected to the said draw bars and serves to accomplish said movement. As shown in Fig. 6, the pivotal connection of the movable member 69 of each of the jaws 67 is preferably brought about by the pin 72, having integral therewith the shoulder or annular enlargement 73, which serves as a septum to separate and to keep from frictional contact the adjacent parts of the members 68 and 69; thereby greatly aiding in the free operation of such parts and diminishing wear or

need for necessary replacement of the same. For effecting the up and down movement of my injector I employ the upright iron guides 88a and 88b which are welded to side strips 11 at the ends of the frame of my machine (see Figs. 1 and 4), and which are in sliding contact with respectively the vertically disposed channel strips 89 and 90 welded to the ends of channel irons 65 and 66 forming the frame of said injector; and I also employ the hydraulic rams 74, three in number (the general construction of each of which is best shown in Figs. 3 and 4); the head of the cylinder 75 of each ram being pivotally connected with one of the plates 76 welded to the top of each A member (see 21a and 21b for example, as shown in Fig. 4), and the piston shaft 77 of each cylinder being connected with one of the bars 92 on the upper part of the frame of said injector, and acting to raise or depress the same.

In Figs. 11, 12, 13, and 14, I have illustrated a conventional form of hydraulic apparatus for the operation of the pressure pumps and rams hereinbefore referred to. Such form or means equivalent thereto are well known in the art, although novel as adapted for use in setting dowels in wet concrete and as forming part of the combinations of elements set forth in the claims. Preferably as shown in the drawings, this apparatus incorporates the well known hydraulic pump system of the Racine Tool and Machine Co. of Racine, Wisconsin, in which an important feature is their lever operated four-way valve controlling the ingress and egress of oil to and from the reservoir, and the supplying and discharge of such oil to and out of the cylinders of the rams. This apparatus may be mounted upon the main frame of my machine, or operated apart therefrom through suitable connections. Accordingly, to the supporting structure 103 are secured the headers 104 and 105; the header 104 being connected with the oil pump by the inlet pipe 93b, and the header 105 being connected with the oil reservoir by the outlet pipe 93a, and both of these headers being in the form of elongated cylindrical chambers or cisterns. Also secured to said supporting structure and at the top thereof are the lever operated four-way valves 106, 107, 108, 109 and 110, each of which is of identical construction with the others and independently operated; pipes 104a serving to connect the header 104 with the pressure inlets of said valves, and pipes 105a serving to connect the header 105 with the return outlets of said valves.

For the operation of two of the three upright hydraulic rams 74, I employ solely the valve 106, one port thereof being connected by the pipe 93a to the lower part of the cylinder 75 of each of said rams, and the remaining port of said valve being connected by the pipe 93d to the upper part of each of said cylinders. For the operation of the other of said three upright rams 74, I employ independently the valve 110, one port thereof being connected by the pipe 93f to the lower part of the cylinder 75 of said ram 74, and the remaining port of said valve being connected by the pipe 93h to the upper part of said cylinder. For the operating of the ram 59, I employ only the valve 107, one port thereof being connected by the pipe 95a to the lower part of the cylinder of said ram, and the remaining port of said valve being connected by the pipe 95c to the upper part of said cylinder. For the operating of the ram 58, I employ solely the valve 108, one port there-

of being connected by the pipe 95c to the lower part of the cylinder of said ram, and the remaining port of said valve being connected by the pipe 95a to the upper part of said cylinder. For the operating of the ram 58, I employ independently the valve 109, one port thereof being connected by the pipe 95d with the lower part of the cylinder of said ram and the remaining port of said ram being connected by the pipe 95f with the upper part of said cylinder.

In Fig. 13, I have shown the specific construction of the interior mechanism of the valve 106, which is identical with the other four-way valves, and which is the common form of valve supplied to the trade by the aforesaid Racine Tool and Machine Co. This valve comprises the casing 111, inlet and outlet 104a and 105a, and ports connecting with pipes 93a and 93d leading to the cylinders of two of the rams 74, the cylindrical sleeve 114 with openings therethrough, the rod 112 provided with enlargements 113 slidably engaging with the bore of said sleeve and registrable with said openings, and the adjusting handle 115 connected with said rod 112. By moving the handle 115 in the manner well known in the art and making the necessary adjustments of the rod 112, the pressure or suction exerted by the oil pressure pump may be held in neutral or directed to the lower or upper parts of the cylinders of the said two rams 74, so as to cause their pistons to extend or retract for the purposes hereinbefore set forth. The other four-way valves 107, 108, 109 and 110 are similarly operated.

To operate my machine—the carriage wheels thereof being in contact with the track formed by the tops of the header boards 85, and while the concrete after being poured is still soft—the gasoline motor 26 is started, and through its gear train connections with said wheels, the carriage of my machine is moved and stopped in operative position above the place in the pavement strip 86 where the dowels are to be installed. These dowels are made of steel or other suitable material, and are ordinarily each about two feet in length and about three-fourths of an inch in diameter. These dimensions, however, depending upon the character of the work and climatic conditions, may be varied to suit the requirements of the situation. Thus for example, in heavy duty runways such as are used for airplanes, the dowels might be seven-eighths of an inch in diameter or even larger and might be of greater length than two feet. The usual spacing apart of dowels in rank formation is from twelve to eighteen inches, and the ranks are usually separated by a space of twenty feet, but this spacing may be varied as occasion requires. The ordinary emplacement of a rank of dowels in wet concrete as employed by me is illustrated at the right of Fig. 1, where such arrangement is set forth by the dowels indicated in dotted lines, the formation of the desired crack being shown by the straight furrow extending completely across the pavement strip 86.

Upon my machine being placed in operative position as aforesaid, and the shuttle jig 30 being in its normal location at the side of the machine as shown in Fig. 2, the workman proceeds to load the said jig with dowels taken from the supply racks 27a and 27b and dipped in oil tank 91 in the manner hereinbefore set forth; but if desired such loading may of course precede the moving of my machine to operative position. As will be observed, the arrangement and spacing

of the rank of dowels upon said jig is the same as that indicated of their desired emplacement in the concrete as shown in Fig. 1. After this loading of dowels has been accomplished, the shuttle jig 30, through the aid of hydraulic rams 58 and 59 and connections, operated as aforesaid, is slid from its said normal location near the edge of my machine to the central part thereof directly beneath the injector and there caused to stop as shown in dotted lines in Fig. 2. Whereupon, through the activation and co-ordinate action of the three hydraulic rams 74 and the hydraulic ram 50, and their connections operated as aforesaid, the injector 64 is depressed and the jaws 67 each caused to seize one of the dowels 55, resting as aforesaid upon the jig 30; and, upon such seizure being accomplished, the injector is again raised carrying with it in undisturbed arrangement the complete rank of said dowels. Then, upon further activation of rams 58 and 59, the unloaded jig 30 is moved back to normal position at the side of the machine; and the way being now cleared below said injector, it is again thrust downwardly by action of its rams and connections so as to embed the said dowels in the wet concrete of the pavement strip beneath (all at the same depth and preserving the said arrangement) and thereafter through activation of said rams and connections to release without disturbance the rank of said dowels so emplaced, and to return to its normal position shown in full lines in the drawings (see Figs. 2 and 3). To facilitate such emplacement, I preferably employ the electric vibrators 24a and 24b which acting upon the said injector serve more readily to force the dowels down into the wet concrete. For further installations of dowels, the carriage of my machine is moved on its wheels further down the pavement strip to the required position, and this operation repeated.

My invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment, as above set forth, is therefore to be considered in all respects as illustrative and not restrictive, the scope of my invention being indicated by the appended claims rather than by the foregoing description, and all changes which may come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What I claim and desire to secure by Letters Patent is:

1. In a dowel setting machine, the combination of a frame, plunger mechanism mounted thereon for embedding dowels in wet concrete, a dowel rack movably secured to said frame, and means for removing dowels from said rack to said plunger mechanism.

2. In a dowel setting machine, the combination of a frame, means mounted thereon for setting dowels in wet concrete, a dowel rack mounted to move upon said frame to and from said setting means, and means for removing dowels from said rack to said setting means upon its approach thereto.

3. In a dowel setting machine, the combination of a frame, hydraulic ram means mounted thereon for setting dowels in wet concrete, a dowel rack mounted to move upon said frame to and from said setting means, hydraulic ram mechanism connected with said frame to accomplish said movement of said rack, and means for removing dowels from said rack to said setting means upon its approach thereto.

4. In a dowel setting machine, the combination of a frame, a dowel setting injector means mounted upon said frame and vertically slidable thereon, plunger mechanism mounted upon said frame and connected to move up or down said injector means, a dowel rack secured to said frame and means for removing dowels from said rack to said injector means.

5. In a dowel setting machine, the combination of a frame, dowel setting injector means mounted upon said frame and vertically slidable thereon, plunger mechanism mounted upon said frame and connected to move up or down said injector means, a dowel rack mounted to move upon said frame to and from said injector means, mechanism connected with said frame to accomplish said movement of said rack, and means for removing dowels from said rack upon its approach to said injector means.

6. In a dowel setting machine, the combination of a frame, an injector for setting dowels in wet concrete mounted upon said frame and vertically slidable thereon, hydraulic ram mechanism mounted upon said frame and connected to move said injector up or down, a dowel rack mounted to move upon said frame to and from said injector, and means connected with said injector for removing said dowels from said rack to said injector upon its approach to said injector.

7. In a dowel setting apparatus, the combination of a carriage, a dowel setting injector mounted upon said carriage and vertically slidable thereon, hydraulic ram mechanism secured to said carriage and operating to move said injector to and from the road bed below, a dowel shuttle rack mounted to move on said carriage to and from said injector, hydraulic ram means mounted upon said carriage and operating to ac-

complish the movement of said rack and hydraulic ram means connected with said injector for removing dowels from said rack to said injector upon the approach thereto of said rack.

8. In a dowel setting apparatus, the combination of a carriage, a carrier mounted upon said carriage and vertically slidable thereon, a plurality of dowel seizure jaws depending downwardly from said carrier, hydraulic rams secured to said carriage and operating to plunge said jaws downwardly to the road bed below, a dowel shuttle rack mounted to move on said carriage to and from said dowel seizure jaws, hydraulic rams mounted upon said carriage for accomplishing the movement of said rack, and hydraulic ram means connected with said injector for causing the seizure of dowels carried by said rack by the jaws carried by said carrier upon the approach thereto of said rack.

9. In a dowel setting apparatus, the combination of a carriage, a carrier mounted upon said carriage and vertically slidable thereon from the top thereof to the road bed below, a plurality of dowel seizure jaws downwardly depending from said carrier, plunger mechanism connected with said carriage and operating to depress or raise said carrier and to move said jaws to and from the road bed below, a dowel rack mounted to move on said frame to and from a position below said jaws upon said carrier being slid upwardly to the top of the machine, means associated with said plunger mechanism for causing said jaws to seize dowels carried by said rack while in said position below said jaws, and thereafter upon said rack being removed back therefrom, to permit said mechanism to plunge said dowels downwardly to said road bed and to release the same therein.

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