

Jan. 7, 1958

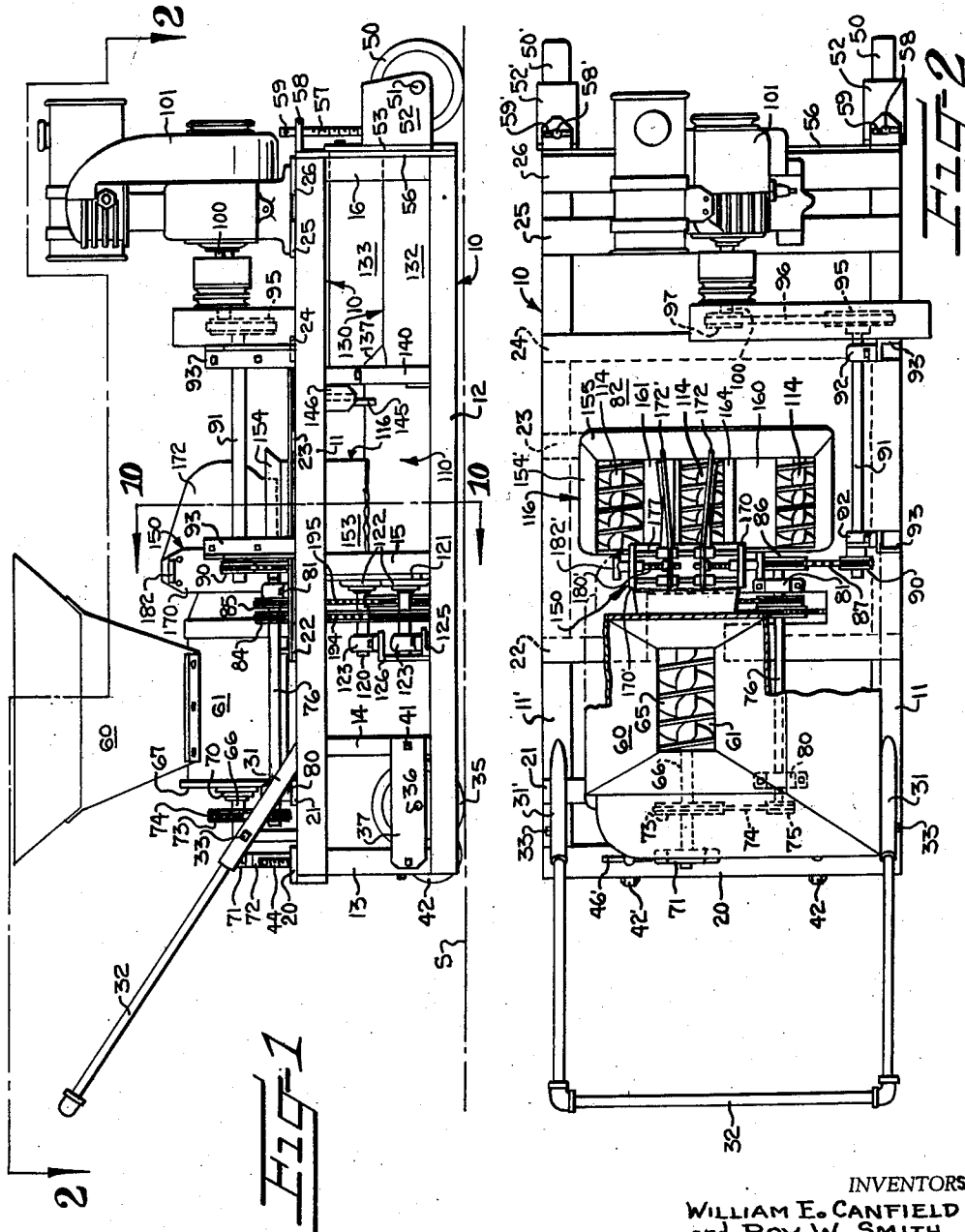
W. E. CANFIELD ET AL.

2,818,790

CURB AND GUTTER LAYING MACHINE

Filed Nov. 15, 1954

6 Sheets-Sheet 1



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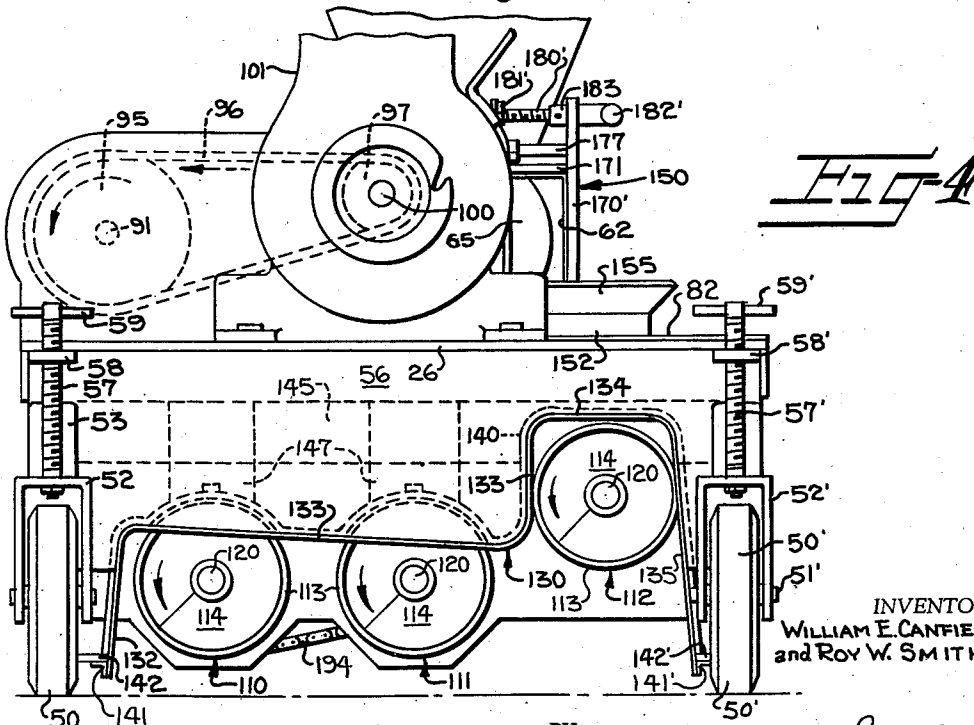
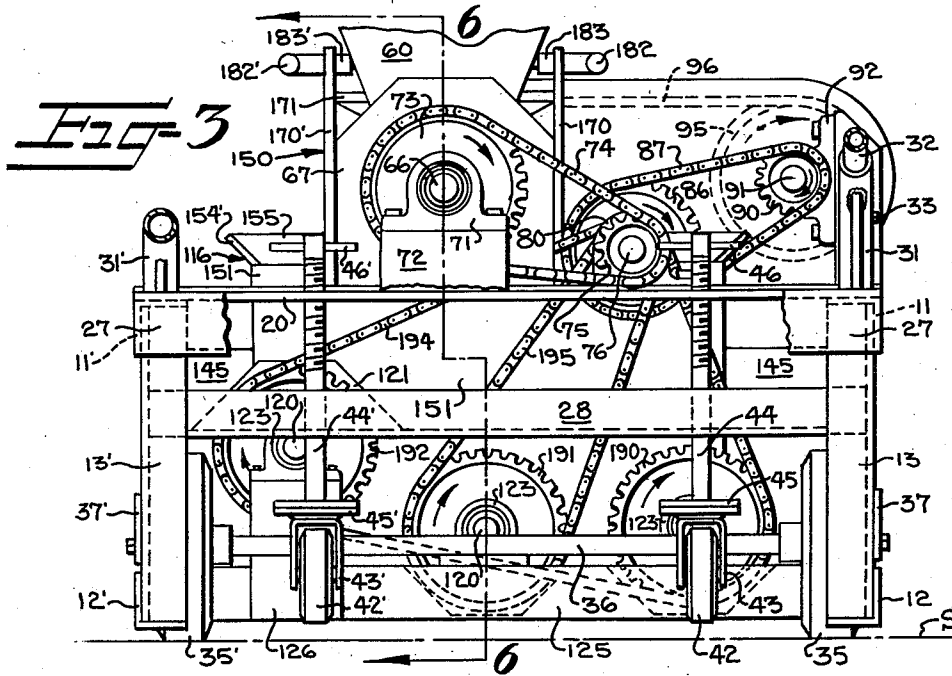
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6 Sheets-Sheet 2



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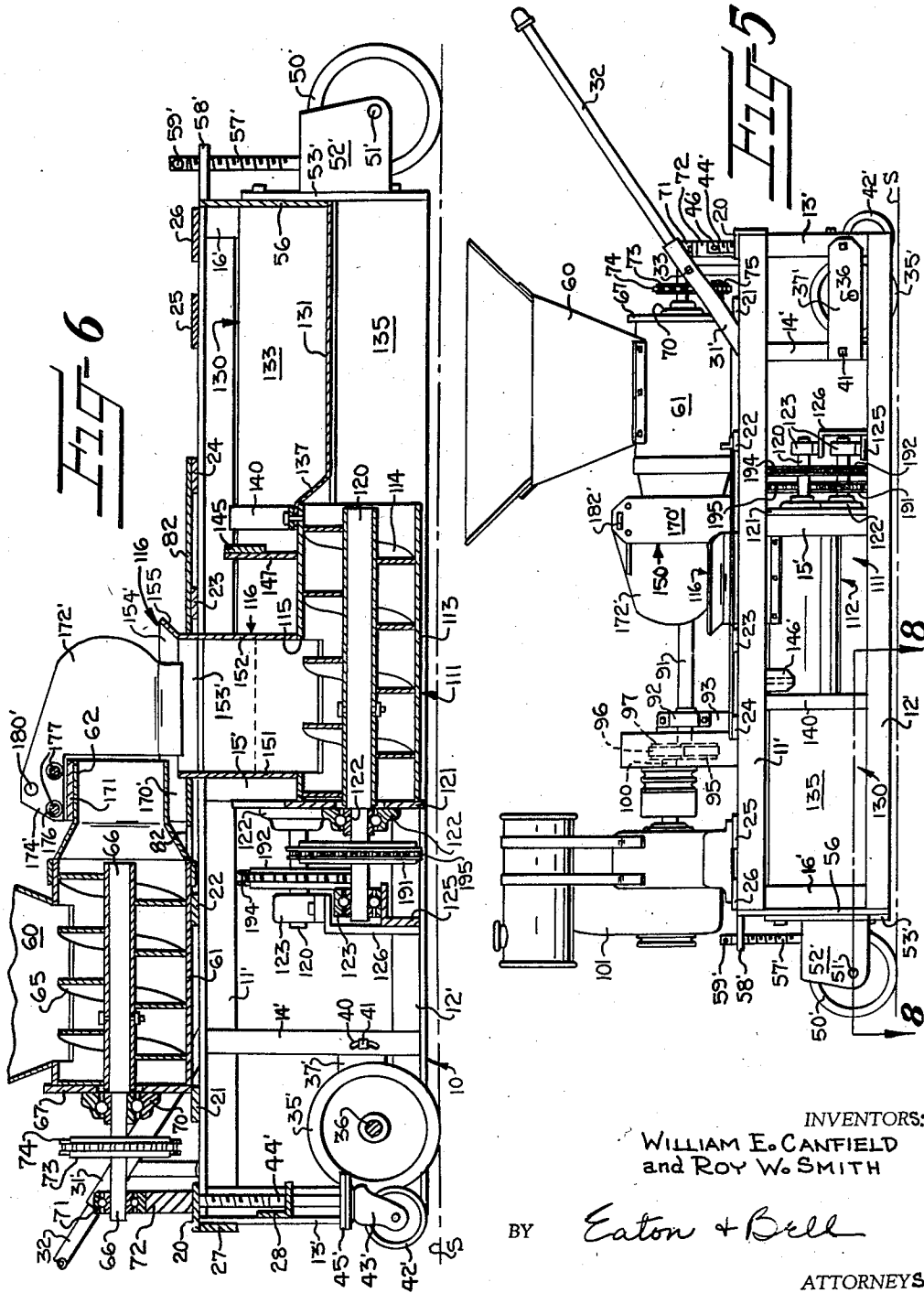
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CURB AND GUTTER LAYING MACHINE

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6 Sheets-Sheet 3



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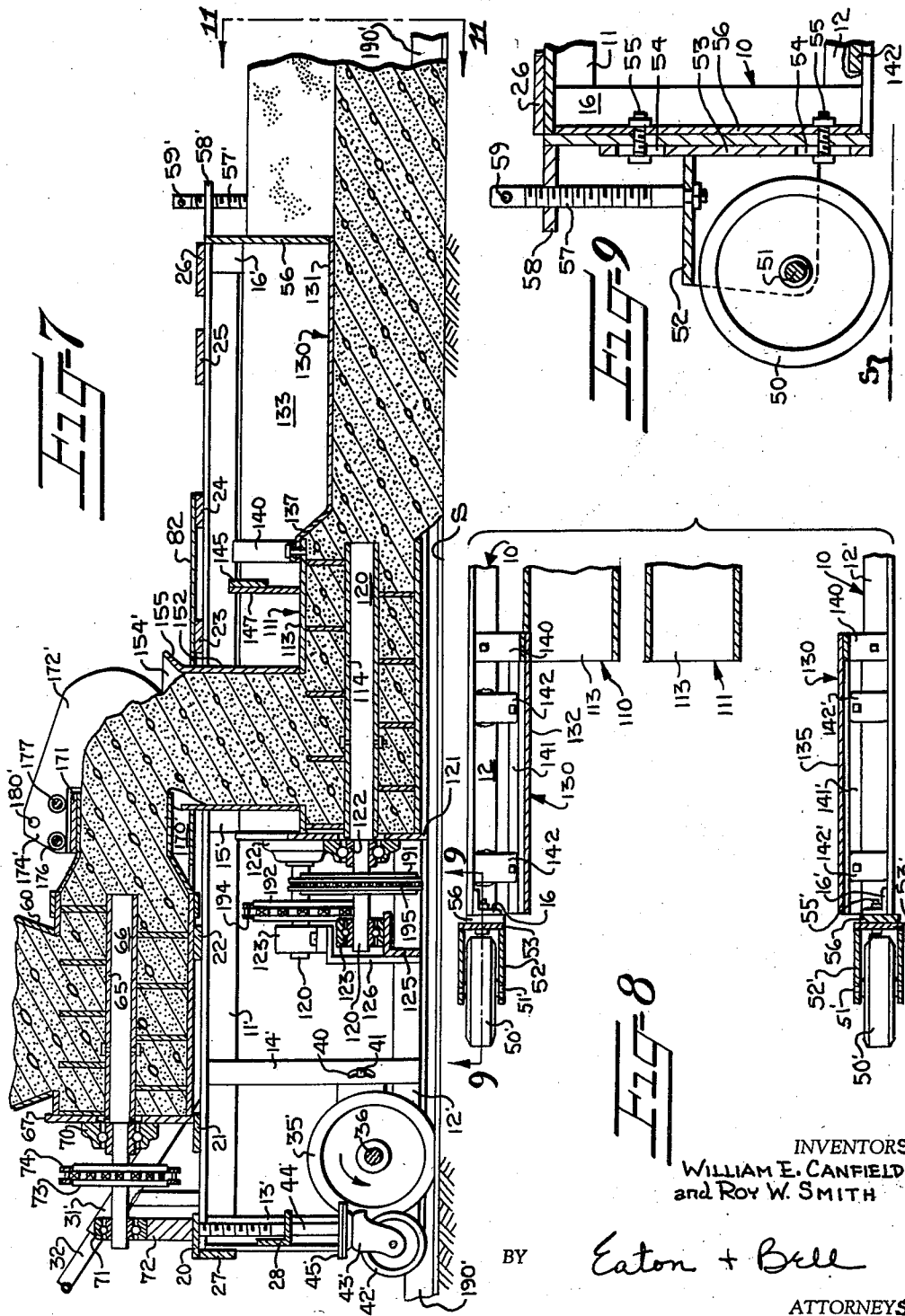
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CURB AND GUTTER LAYING MACHINE

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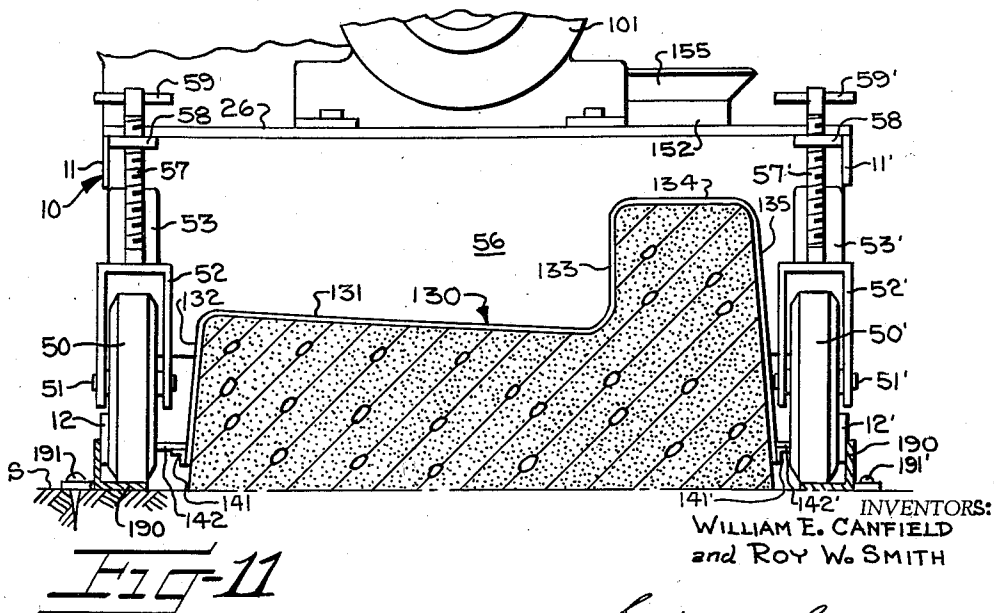
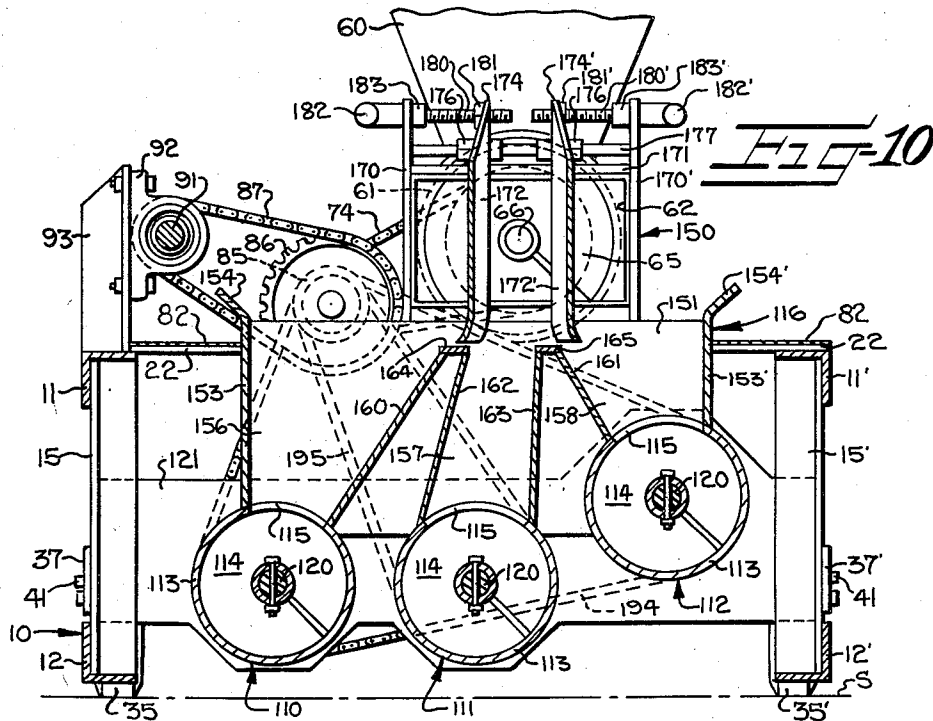
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6 Sheets-Sheet 5



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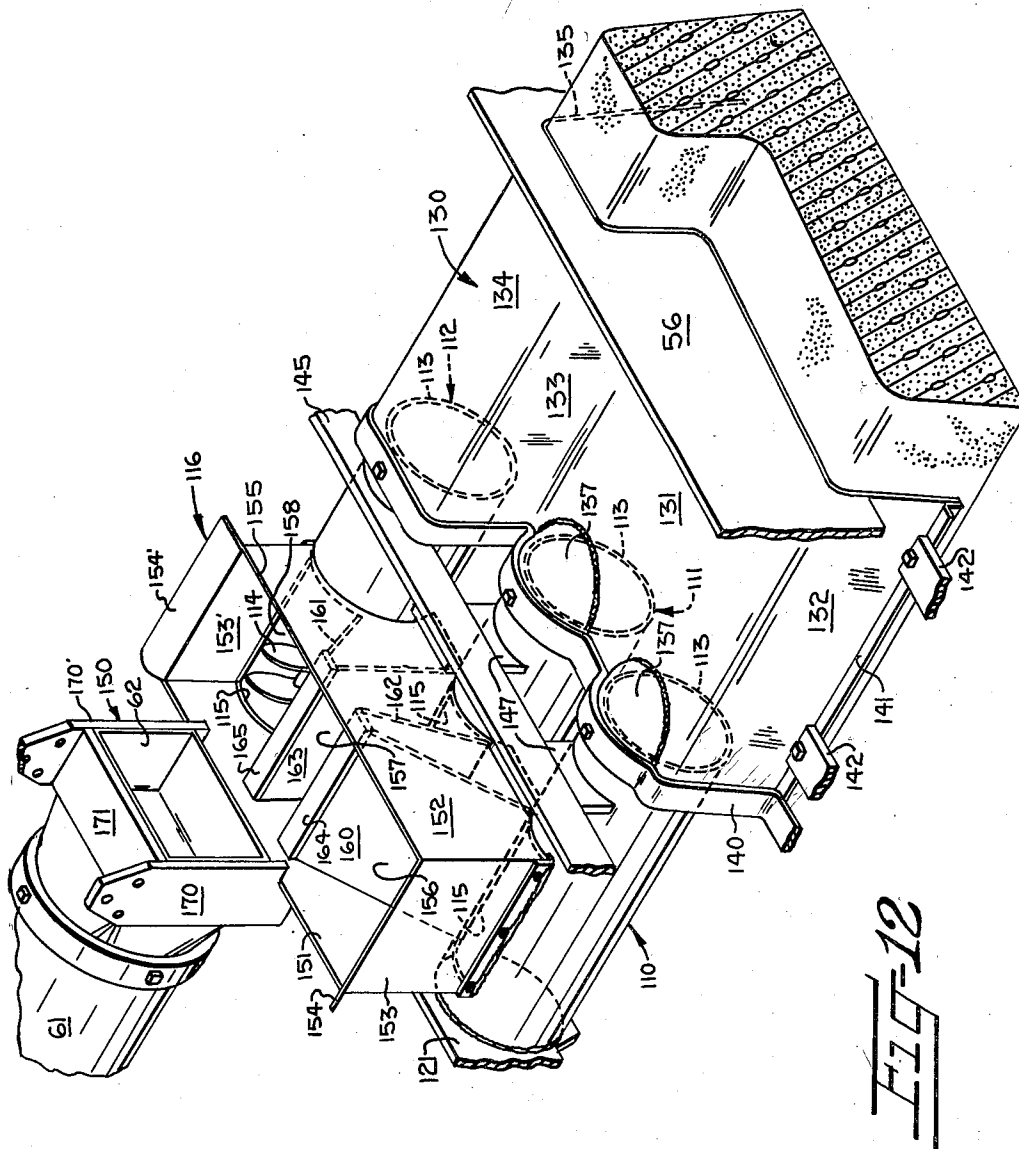
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6 Sheets-Sheet 6



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2,818,790

CURB AND GUTTER LAYING MACHINE

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Application November 15, 1954, Serial No. 468,794

8 Claims. (Cl. 94—46)

This invention relates to curb and pavement laying machines and is particularly concerned with improvements in a curb laying machine of the character disclosed in the copending application of applicant William E. Canfield; Serial No. 337,057, filed February 16, 1953, and entitled Curb Laying Machine which is now Patent No. 2,707,422.

The machine disclosed in said copending application generally comprises a horizontally disposed pipe above one end of which a hopper is disposed and within which a driven screw is disposed for propelling and compressing the paving material, directed into the pipe from the hopper, rearwardly through said pipe. The rear end of the pipe has an elongated mold connected thereto and communicating therewith, the mold having an open bottom and an open rear end whereby the paving material extruded by the screw from the pipe is formed according to the shape of the mold and molded upon the surface upon which the machine is positioned so the machine is propelled due to the thrust of the screw in compressing the paving material.

However, the mold associated with the machine disclosed in said copending application has necessarily been limited in size to correspond to the amount of paving material that could be extruded and compacted by the corresponding screw and this has necessarily limited the expanse or the width of the curb which could be laid by the machine disclosed in said copending application.

It is an object of this invention to provide an improved machine for laying combined curbs and gutters from a paving material, such as concrete or asphalt and, particularly, for laying broad expanses of paving material.

To this end, we have provided a wheeled framework having a hopper thereon into which any suitable paving material may be dumped and which hopper is disposed upon and communicates with a first pipe in which a first driven screw is provided for propelling the paving mixture rearwardly through said pipe and into a manifold which, in turn, communicates with a second plurality of pipes disposed on a lower level than the first pipe. Each of said last-named pipes also has a second driven screw therein for compacting and extruding paving material therefrom and the rear ends of these pipes communicate with a common open-bottomed mold which is open at its rear end whereby relatively wide or expansive sections of paving may be molded thereby.

It is another object of this invention to provide apparatus of the character described wherein the mold is in the shape of a combined curb and relatively broad gutter whereby a curb and a gutter may be formed simultaneously.

It is another object of this invention to provide an improved metering device at the discharge end of the first pipe for guiding predetermined proportions of said paving material from the first pipe into selected passageways or chutes in said manifold, there being one of said passageways communicating with each of the second pipes, to thereby insure that the proper proportions of paving

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material are extruded from the second pipes to all portions of the mold to prevent the occurrence of voids in the molded paving, curbs or gutters and the like.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of the improved apparatus; Figure 2 is a top plan view of the apparatus with parts broken away and parts in section;

Figure 3 is an enlarged front elevation of the apparatus with the handles and a portion of the hopper broken away;

Figure 4 is an enlarged rear elevation of the apparatus with portions of the hopper and engine broken away;

Figure 5 is a side elevation looking at the opposite side of the apparatus shown in Figure 1;

Figure 6 is a longitudinal vertical sectional view through the apparatus, on a reduced scale, taken substantially along line 6—6 in Figure 3;

Figure 7 is a view similar to Figure 6 showing how the paving material is extruded from beneath the hopper into the manifold or distributor and extruded from the lower tubes into the mold to form the combination curb and gutter;

Figure 8 is an enlarged fragmentary sectional plan view taken substantially along line 8—8 in Figure 5;

Figure 9 is an enlarged fragmentary vertical sectional view taken substantially along line 9—9 in Figure 8;

Figure 10 is an enlarged transverse vertical sectional view taken substantially along line 10—10 in Figure 1 showing the manifold for directing the paving material from the upper feeding means or upper extruder into the lower extruders or tubes;

Figure 11 is an enlarged elevation looking at the right-hand end of Figure 7 substantially along line 11—11 and showing the formed paving material in cross-section;

Figure 12 is an isometric view looking at the rear end of the apparatus, showing the formed paving material extending beyond the rear end of the mold, showing the discharge end of the paving material feeding means, the manifold and the lower extrusion pipes connected to the front end of the mold, with many of the parts being broken away and other parts being omitted for purposes of clarity.

Referring more specifically to the drawings, the apparatus comprises a frame broadly designated at 10 and including upper and lower left-hand longitudinal side frame members 11 and 12 which are secured in spaced relation to each other by means of upright frame members or bars 13, 14, 15 and 16 (Figure 1), corresponding longitudinal side frame members on the right-hand side of the apparatus being indicated at 11', 12' secured in spaced relationship by means of upright frame members 13', 14', 15' and 16' (Figure 5). The upper longitudinal frame members 11, 11' are joined together by cross bars or transverse frame members 20 to 26, inclusive, and the front upright frame members 13, 13' have opposite ends of upper and lower transverse frame members 27, 28 suitably secured thereto (Figures 3, 6 and 7).

The front portions of the upper longitudinal frame members 11, 11' have the lower ends of upwardly and forwardly inclined tubular members or pipe members 31, 31' suitably secured thereto in which the legs of a substantially U-shaped handle member 32 are adjustably secured, as by set screws 33. The front portion of the frame 10 is normally supported in closely spaced relation above the surface S over which it is moved by means of a pair of wheels 35, 35' (Figures 1, 3, 5, 6, 7 and 10) rotatably mounted on a transverse shaft or axle 36 whose opposite ends are fixed in bars 37, 37' spaced closely above the forward portions of the respective lower longitudinal

frame members 12, 12'. As is the case in said copending application, the front ends of the bars 37, 37' are pivotally connected to the respective upright frame members 13, 13' and each of the upright frame members 14, 14' has an arcuate slot 40 (Figure 6) penetrated by a bolt 41 to adjustably secure the rear ends of the bars 37, 37' to the upright frame members 14, 14' to thereby permit regulating the elevation of the wheels 35, 35' relative to the frame 10. The purpose of this arrangement is to support the frame off the surface S, if desired, or to raise the wheels 35, 35' off the surface S to allow the front ends of the frame members 12, 12' or suitable slide bars or skids thereon, not shown, to rest on the surface S to retard movement of the frame (for purposes to be later described).

In order to raise the front ends of the frame 10 independently of the wheels 35, 35', to enable adjustment of the wheels 35, 35' and to also facilitate movement of the apparatus from one place to another when a section of curbing and gutter is being formed or at other times, the front end of the frame 10 is provided with a pair of laterally spaced vertically adjustable caster wheels 42, 42' (Figures 3 and 6) which are spaced between the ground wheels 35, 35' and between the front upright frame members 13, 13'. Since the structure associated with the caster wheel 42' is identical to the structure associated with the caster wheel 42, only the structure associated with the caster wheel 42 will be described in detail and like parts associated with the caster wheel 42' will bear the same reference characters with the prime notation added.

The caster wheel 42 is suitably journaled between the legs of an inverted substantially U-shaped caster frame 43 which is supported for rotation about a vertical axis on the lower end of a vertically disposed shaft 44 by means of a suitable thrust bearing generally designated at 45. The medial portion of shaft 44 loosely penetrates and is guided in the lower front transverse frame member 28 and its upper portion threadably penetrates the cross bar 20 and has a suitable handle 46 on the upper end thereof. It is thus seen that the front end of the frame 10 may be raised and lowered simply by rotating the shafts 44, 44' in the corresponding directions and the caster frames 43, 43' may rotate freely on the lower ends of the respective shafts 44, 44'.

The rear end of the frame 10 is supported in predetermined spaced relation above the surface S by means of a pair of laterally spaced rear wheels 50, 50' and, since the structure associated with the rear wheel 50' is identical to that associated with the rear wheel 50, only the structure associated with rear wheel 50 will be described in detail and like parts associated with rear wheel 50' will bear the same reference characters with the prime notation added. This structure is best shown in Figures 4, 8, 9 and 11 wherein it will be observed that the rear wheel 50 is journaled on a relatively short shaft 51 whose opposite ends are fixed in the lower rear corners of the legs of an inverted substantially U-shaped bracket 52, the front ends of said legs being suitably secured to an upright plate 53.

Each upright plate 53, 53' is provided with a pair of vertically extending adjustment slots 54, each of which is penetrated by a bolt 55 for adjustably securing the plates 53, 53' to the rear surface of a relatively large transverse mold reinforcing plate 56. It will be observed in Figure 9 that the bolts 55 also penetrate the corresponding rear upright frame members 16, 16' to which opposite ends of the rear plate 56 are suitably secured. In order to further assist in adjusting the rear ground wheels 50, 50' the reduced lower ends of vertically disposed threaded shafts 57, 57' loosely penetrate the horizontal upper portions of the inverted U-shaped brackets 52, 52', respectively, and are suitably attached thereto.

The shafts 57, 57' threadably penetrate respective plates 58, 58'. The upper ends of the vertically disposed

threaded shafts 57, 57' have respective handles 59, 59' thereon. By this means, the brackets 52, 52' can be adjusted vertically by turning the handles 59, 59' and shafts 57, 57' in the desired direction to vary the displacement between the lower surface of the rear portion of the frame 10 and the surface S, as desired.

A suitable hopper 60 is provided for receiving the paving material and extends downwardly and is adapted to feed the paving material to a first or upper conveying or extruding means. The hopper 60 has an open bottom which communicates with a first or upper pipe or tube 61, to the upper portion of which the hopper 60 is suitably secured. The horizontally disposed first tube or pipe 61 is suitably secured to the central portions of the cross bars 21, 22 and its open rear end has a substantially rectangular tubular extension or nozzle 62 communicatively connected thereto which is also open at its rear end.

Disposed within the first or upper pipe or tube 61 is a screw conveyor 65 (Figures 6 and 7) which is fixed on a shaft 66 which loosely penetrates a front closure plate 67 closing the front end of the first pipe or tube 61. The reduced front portion of shaft 66 is journaled in a suitable bearing 70 fixed on the front surface of plate 61 and is also journaled in a suitable bearing 71 fixed on a bearing stand 72 suitably secured to the cross bar 20. The reduced front portion of shaft 66 has a sprocket wheel 73 fixed thereon which is engaged by an endless sprocket chain 74 (Figures 1, 2, 3, 6, 7 and 10) which also engages a sprocket wheel 75. The sprocket wheel 75 is fixed on the front end of a horizontally disposed jack shaft 76 journaled in bearing blocks 80, 81 suitably secured to the cross bar 21 and the front portion of a plate or platform 82, respectively.

The platform 82 is suitably secured to the upper surfaces of the cross bars 22, 23 and 24. The rear portion of shaft 76 also has sprocket wheels 84, 85 and 86 fixed thereon.

It will be observed in Figure 10 that the rearmost sprocket wheel 86 on shaft 76 is engaged by a sprocket chain 87 which also engages a sprocket wheel 90 fixed on the front end of a drive shaft 91 (Figures 1, 2, 3 and 10). The shaft 91 is journaled in a pair of spaced bearing blocks 92 each of which is suitably secured to the inner surface of a standard or post 93. The standards or posts 93 extend downwardly and are suitably secured to the upper surface of the left-hand upper longitudinal frame member 11.

The rear end of shaft 91 has a pulley 95 fixed thereon which is engaged by an endless belt 96 (Figures 3 and 4) which also engages a pulley 97 fixed on motor shaft 100 of a suitable motor 101, shown in the form of an internal combustion engine, supported by the cross bars 25, 26.

Improved extrusion means and mold

The paving material is formed into a strip having a relatively broad expanse as compared to the thickness or height thereof by means of a plurality of laterally spaced extrusion devices or conveying and packing devices, there being three such devices employed in this instance which are respectively broadly designated at 110, 111, 112. In this instance, due to the cross-sectional configuration of the mold into which the paving material is compacted or extruded, the two extrusion devices 110, 111 are disposed in substantially horizontally spaced side-by-side alignment closely adjacent the level of the bottom of the frame 10 and the extrusion device 112 is positioned on a somewhat higher level than the extrusion devices 110, 111. Since all three of the extrusion devices 110, 111, 112 are substantially identical, like parts associated with each of the extrusion devices 110, 111, 112 will bear the same reference characters.

Each of these extrusion devices 110, 111, 112 is constructed in a manner similar to the upper extrusion or

pavement material feeding device and comprises a substantially horizontally disposed pipe 113 which is open at its rear end and in which a screw conveyor 114 is positioned. The upper front portion of each of the pipes or tubes 113 has an elongated opening 115 therein through which the paving material passes into each of the pipes 113 from a manifold or distributor broadly designated at 116, to be later described in detail. Each screw conveyor is fixed on a corresponding shaft 120 which loosely penetrates a front closure plate 121 which is common to all of the pipes 113.

The reduced front portion of each shaft 120 is journaled in a suitable radial thrust bearing 122 and a bearing 123. All of the bearings 122 are suitably secured to the front surface of the closure plate 121 and the two bearings 123, in which the reduced portions of the shafts 120 of the extrusion devices 110, 111 are mounted, are suitably secured to a transverse lower frame member 125 whose opposite ends are suitably secured to the lower longitudinal frame members 12, 12' (Figures 6 and 7). The reduced front portion of the remaining shaft 120, associated with the extrusion device 112, has its bearing 123 fixed on a standard 126 shown in the form of an angle plate (Figures 3, 6 and 7) and the vertical leg of which is suitably secured to the lower transverse member 125.

The open rear ends of the pipes or tubes 113 of the extrusion devices 110, 111, 112 communicate with a mold broadly designated at 130 which is open at its rear end and whose bottom is also open and which comprises a plate portion 131 defining the top wall of a gutter-forming portion of the mold 130 and which gutter-forming plate 131 is curved slightly and then extends downwardly and outwardly at a slight angle to the vertical to form one side wall portion 132 which forms the outer edge of the gutter portion. It will be noted in Figures 4 and 12 that the top wall 131, defining the gutter portion of the mold 130, is inclined inwardly and downwardly transversely of the longitudinal axis of the frame 10 from the wall 132 whereat it curves upwardly to form an inner wall 133 of a curb portion of the mold 130.

It will be noted that the pipes 113 of the extrusion devices 110, 111 communicate with the gutter-forming portion of the mold 130 defined by the horizontal plate 131 and the side wall 132, and the rear end of the pipe 113 of the third lower extrusion device 112 communicates with the curb-forming portion of the mold 130. This curb-forming portion of the mold 130 also includes an upper or top horizontally disposed wall 134 and an outer steeply inclined wall 135 whose lower edge terminates on substantially the same level as the lower edge of the opposite side wall 132. Since the uppermost portions of the pipes 113 of the extrusion devices 110, 111 are disposed on a slightly higher level than the transversely inclined upper wall 131 of the gutter-forming portion of the mold 130, each of the latter pipes has the front end of an inclined pavement material guiding portion 137 suitably secured thereto which extend downwardly and rearwardly and are fixed to or formed integral with the corresponding rear portions of the top wall 131 of the gutter-forming portion of the mold 130.

The front end of the mold 130 is suitably secured to the rear ends of the pipes 113 of the extrusion devices 110, 111, 112 by means of a strap member 140 which is shaped to conform substantially to the cross-sectional configuration of the outer surface of the mold 130, with the exception that it is curved to conform substantially to the shape of the portions of the pipes 113 of the extrusion devices 110, 111 which project above the mean horizontal plane of the gutter-forming top wall 131 of the mold 130.

Opposite ends of the strap member 140, adjacent the lower edges of the respective walls 132, 135 of the mold

130, project outwardly and are suitably secured to the corresponding lower longitudinal frame members 12, 12'. The lower edges of the side walls 132, 135 of the mold 130 are reinforced by suitable longitudinally extending bars 141, 141' (Figures 4, 8 and 12) which have the inner ends of respective pairs of braces 142, 142' suitably secured thereto and extending outwardly therefrom whose outer ends are suitably secured to the respective lower longitudinally extending frame members 12, 12'.

The closure plate 121 at the front ends of the pipes 113 also serves as a support for the front ends of the pipes 113, since opposite ends of the closure plate 121 are fixed to the upright frame members 15, 15' (Figures 1, 5 and 10). The rear portions of the pipes 113 are supported by a transverse bar or frame member 145 (Figures 1, 4, 5, 6, 7 and 12) whose opposite ends are suitably secured to brackets 146, 146' (Figures 1 and 2) depending from the upper longitudinal frame members 11, 11' of the frame 10. As best shown in Figures 4 and 12, it will be observed that the pipe 113 of the extrusion device 112 is suitably secured to the bar 145 and each of the pipes 113 of the extrusion devices 110, 111 has the lower end of a plate 147 suitably secured thereto whose upper end is suitably secured to the transverse bar 145.

It will also be observed in Figures 11 and 12 that the rear end of the mold 130 is supported by means of the reinforcing plate 56 whose lower edge conforms to the configuration of the rear portion of the mold 130, whose upper edge is suitably secured to the cross bar 26 heretofore described, and whose opposite ends are suitably secured to the upright frame members 16, 16'.

Manifold and metering device

In order to direct the paving material through the openings 115 in the tubes or pipes 113 of the extrusion devices 110, 111, 112 and to proportionately control the amount of paving material directed through each of the openings 115, the improved manifold 116 and a metering device broadly designated at 150 are provided, the detailed structure of the manifold 116 being best illustrated in Figures 1, 2, 5, 6, 10 and 12 and the metering device 150 being best illustrated in Figures 1, 2, 5, 6 and 10. The manifold 116 is in the form of a substantially rectangular housing including front and rear walls 151, 152 and spaced side walls 153, 153'. The upper ends of the side walls 153, 153' have respective upwardly and outwardly inclined deflector plates or guide plates 154, 154' thereon and the upper edge of the rear wall 152 also has an upwardly and rearwardly inclined deflector plate or guide plate 155 thereon.

It will be observed in Figures 6 and 7 that the upper edge of the front wall 151 terminates in spaced relation below the front portion of the extension or nozzle 62 so the paving material is extruded through the nozzle and falls into the housing of the manifold 116. The manifold is provided with a plurality of passageways, chutes or channels, there being one of these passageways for each of the lower tubes 113 of the extrusion devices 110, 111, 112 and which are indicated at 156, 157, 158, respectively.

The side walls 153, 153' of the manifold 116 form the outer walls of the respective chutes 156, 158 and the inner walls of the chutes or passageways 156, 158 are defined by downwardly diverging plates or wall members 160, 161. Opposite sides of the chute or passageway 157 are defined by spaced downwardly diverging plates or wall members 162, 163. It will be observed in Figures 10 and 12 that the lower edges of the outer side walls 153, 153' terminate flush with opposite side walls of the corresponding openings 115 in the tubes 113 of the respective extrusion devices 110, 112, and the lower edges of the plates 160, 161 terminate substantially flush with the inner walls of the latter openings.

The lower edges of the plates 162, 163 terminate flush with opposite side walls of the opening 115 in the tube 113 of the center extrusion device 111. The upper edges

of the plates 160, 162, 163, 161 terminate in spaced relation to each other and in spaced relationship below the upper edge of the front wall 151 and the space between the upper edges of plates 160, 162 is closed by a forwardly and rearwardly extending bar 164 while the space between the upper ends of the plates 161, 163 is closed by a forwardly and rearwardly extending bar 165.

The opposite ends of the bars 164, 165 are suitably secured to the front and rear walls 151, 152 and it will be noted that the lower edges of the front and rear walls are disposed on substantially the same horizontal plane as the lower edges of the plates 160, 162, 163 and conform substantially to the corresponding curved portions of the tubes 113 of the extrusion devices 110, 111, 112.

It will be observed in Figures 10 and 12 that the rear end of the extension or nozzle 62 of the first extrusion tube 61 is substantially rectangular and is supported between a pair of vertically disposed frame members 170, 170' which are also parts of the improved metering or paving material control device 150 and whose upper medial portions are connected to opposite ends of a transverse plate or frame member 171 to which the upper wall of the rear rectangular portion of the nozzle 62 is suitably secured. The lower ends of the vertically disposed frame members 170, 170' are suitably secured to the upper surface of the plate or platform 82 heretofore described.

Mounted for lateral relative adjustment at the mouth or rear end of the nozzle 62 is a deflecting means shown in the form of a pair of vertically disposed metering plates 172, 172' whose lower ends terminate in slightly spaced relationship above the bars 164, 165 where they preferably flare outwardly as best shown in Figure 10. It will be observed in Figure 2 that these metering plates 172, 172' also extend rearwardly in diverging relationship from adjacent the mouth or discharge end of the nozzle 62. The metering plates 172, 172' are each supported for lateral adjustment by means of forwardly projecting portions 174, 174' on the upper ends thereof which portions 174, 174' overlie the transverse frame member 171 and the portions 174, 174' of the respective metering plates 172, 172' each has a pair of spaced tubes 176 (Figure 10) fixed therein and these tubes 176 are mounted for sliding movement on guide rods 177, there being two of the guide rods 177 whose opposite ends are suitably secured in the upper portions of the upright frame members 170, 170'.

It will be observed in Figure 10 that the forwardly projecting portions 174, 174' on the respective metering plates 172, 172' are threadably penetrated by respective threaded shafts or adjustment screws 180, 180', which shafts also threadably penetrate nuts 181, 181' suitably secured to the distal surfaces of the portions 174, 174' of the metering plates 172, 172'. The shafts 180, 180' extend outwardly, are journaled in the upper portions of the respective upright frame members 170, 170' and have respective handles 182, 182' fixed thereon, the thickened central portions of which engage the distal surfaces of the upright frame members 170, 170' to prevent inward movement of the screws 180, 180'. Outward movement of the screws 180, 180' is prevented by means of respective collars 183, 183' which slidably and rotatably engage the proximal surfaces of the upright frame members 170, 170'.

The screws 114 are driven by means of sprocket wheels 190, 191, 192 (Figure 3) mounted on the reduced portions of the shafts 120 of the respective extrusion devices 110, 111, 112. It will be observed in Figures 1, 3, 5, 6 and 7 that the sprocket wheels 84, 190 and 192 are engaged by a common endless sprocket chain 194 and the sprocket wheels 85, 191 are engaged by an endless sprocket chain 195. It is thus seen that the motor 101 simultaneously imparts rotation to the four screws 65 and 114.

It is thus seen that, in operation, paving material, such as concrete or asphaltic material of the proper consistency, is dumped into the hopper 60 and, assuming the motor 101 is running, the conveyor screw 65 then feeds the paving material through the extension or nozzle 62. As it

passes out of the open rear end of the nozzle 62, the paving material is directed into the three chutes or passageways 156, 157, 158 of the manifold 116 by the metering plates 172, 172', the position of these plates being adjusted by the screws 180, 180' to insure that the proper amounts of paving material are directed into the chutes or passageways 156, 157, 158 of the manifold 116 to correspond to the cross-sectional area of the interior of the mold 130 which must be supplied by the tubes 113 of the corresponding extrusion devices 110, 111, 112.

In other words, if the amount of material directed into any one of the passageways 156, 157, 158 is insufficient to prevent the occurrence of voids in the paving, the metering plates 172, 172' may be correspondingly adjusted relative to each other and relative to the manifold 116 to thereby increase the amount of paving material directed into the corresponding chute or passageway. For example, if there is an insufficient amount of paving material being directed into the tube 113 of the first lower extrusion device 110, while the amounts being directed into the other two tubes 113 are proportionately correct, the two metering plates 172, 172' are then adjusted from left to right in Figure 10 or away from the chute or passageway 156 and the space between the plates 172, 172' is also reduced proportionately to thereby permit a proportionately greater amount of paving material to pass into passageway 156 while slightly lesser amounts of the paving material are directed into the chutes or passageways 157, 158. On the other hand, if the amount of paving material being fed into the two passageways or chutes 156, 157 is insufficient to prevent the occurrence of voids in the paving, both of the metering plates 172, 172' may be adjusted from left to right in Figure 10 to proportionately increase the amount of material fed into the passageways 156, 157 while proportionately decreasing the amount of material fed into the passageway 158. If the amount of material fed into the passageways 156, 158 is insufficient to prevent the occurrence of voids in the paving, the metering plates 172, 172' may then be adjusted inwardly toward each other to again proportionately decrease the amount of material fed into the centermost passageway 157 while proportionately increasing the amount of material fed into the passageways 156, 158.

It is thus seen that accurately predetermined amounts of paving material are metered into the tubes 113 of the lower extrusion devices 110, 111, 112 and the screws 114 then extrude and pack the paving material in the mold 130 and upon the surface S and, due to the pressure exerted on the paving material by the screw conveyors 114 of the extrusion devices 110, 111, 112, the entire apparatus is moved forwardly at a rate of travel directly proportional to the amount of paving material forced into the mold 130. Also, since the paving material is metered to each of the extrusion devices 110, 111, 112 it is apparent that various irregular shapes of molds may be provided, since proportionately greater amounts of paving material may be directed to those portions of the mold having greater cross-sectional areas therein than is directed to the extrusion devices associated with portions of the mold having relatively lesser cross-sectional areas.

If so desired, a mold of proportionately lesser width than the mold 130 may be used. That is, the gutter-portion-top wall 131 may be of lesser width than that shown in Figures 11 and 12 so the side wall 132 would then extend downwardly therefrom at a point between the two extrusion devices 110, 111. In this instance, a suitable plate may be used for closing the upper end of the passageway 156 and the metering plate 172 adjusted to where its inner surface is substantially flush with inner surface of the left-hand wall (Figure 10) of the rectangular tubular extension or nozzle 62 of the upper extrusion device, whereupon the paving material will then be directed into the passageways 157, 158 and the pipes 113 of the two lower extrusion devices 111, 112 only.

It often happens that the present apparatus is used to form combined curbs and gutters on an unpaved surface or, in other words, directly on the ground. In this instance, suitable tracks such as are indicated at 190, 190' in Figure 11 and which are preferably in the form of angle bars, may be suitably secured to the ground, such as by pins 191, 191', in straight parallel spaced relationship so the uprising portions thereof may engage the outer surfaces of the lower longitudinal frame member 12, 12' to guide the apparatus as it is propelled over the surface S by the means heretofore described. The rear wheels 50, 50' could then ride upon the horizontal portions of the angle bars 190, 190'. Also, the front wheels 35, 35' could be raised from the ground so the caster wheels 42, 42' would then support the weight of the front end of the apparatus to facilitate turning the apparatus slightly, if necessary, and wherein the handle 32 could also be used for this purpose.

It is thus seen that we have provided an improved paving machine or apparatus having first means for feeding paving material past an improved metering device which metering device may be adjusted to accurately determine the amount of paving material directed from the common source into a plurality of lower extrusion devices whose rear ends are connected to a common open bottomed mold having an open rear end to thereby insure that proper amounts of paving material are directed to all portions of the mold to prevent the occurrence of voids in the strip of paving or combination gutter and curbing thus formed and wherein the entire apparatus is advanced at a rate of travel directly proportional to the amount of paving material forced into the mold due to the pressure exerted on the paving material by the extrusion devices.

In the drawings and specification there has been set forth a preferred embodiment of the invention and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

We claim:

1. In an apparatus for forming relatively broad strips from paving material, such as concrete, asphaltic material and the like, on a surface, said apparatus having a frame movable longitudinally upon said surface, a longitudinally extending mold carried by said frame and being open at its rear end and having side walls extending downwardly into close proximity to said surface, said apparatus also having means for feeding paving material to a point adjacent and above the level of the front end of said mold; the combination of a plurality of extrusion devices spaced below said point and having their rear ends communicating with the front end of said mold, said extrusion devices being arranged in substantially side-by-side relationship, communicative means between the discharge end of the feeding means and each of said extrusion devices, and laterally adjustable deflecting means adjacent the discharge end of the feeding means for directing predetermined amounts of the paving material fed therethrough into each of the extrusion devices simultaneously.

2. A structure according to claim 1 wherein said communicative means includes an open topped housing provided with a row of vertically extending passageways therein whose lower ends communicate one with each extrusion device, said laterally adjustable deflecting means comprising at least two spaced substantially vertically disposed plates having their lower ends disposed closely adjacent the open upper ends of said passageways.

3. A structure according to claim 2 wherein said plates are adjustable relative to the row of passageways and relative to each other.

4. In an apparatus for forming relatively broad strips of paving material, such as curbs and gutters and the like, on a surface, said apparatus having a frame provided with a hopper thereon into which paving material is adapted to

be placed, a substantially horizontally disposed pipe disposed below said hopper and being closed at one end thereof and open at its other end, said pipe communicating intermediate its ends with the lower end of said hopper, means for extruding the paving material from the open discharge end of said pipe, a mold open at both ends and spaced substantially below the level of said pipe and having side walls extending downwardly into close proximity to said surface, said mold being carried by and extending longitudinally of said frame; the combination of a plurality of laterally spaced tubular extrusion devices carried by said frame and having open rear ends communicating with the open front end of said mold, a housing disposed above the extrusion devices and having its upper end terminating substantially on the same level as the lower portion of said pipe and also having its upper end disposed adjacent the open discharge end of said pipe, said housing having a plurality of vertically extending open-topped passageways therein, there being one of said passageways communicating with each of said tubular extrusion devices, and laterally adjustable deflecting means disposed adjacent the discharge end of said pipe and above the upper ends of said passageways in said housing for proportionately metering predetermined amounts of paving material discharged from the pipe into each of said passageways simultaneously.

5. Apparatus for forming relatively broad strips of paving material, such as curbs and gutters and the like, on a surface, comprising a frame having a hopper thereon into which paving material is adapted to be placed, a horizontally disposed pipe disposed below the hopper and communicating intermediate its ends with the lower end of said hopper, one end of said pipe being closed and the other end being open, a plurality of laterally spaced horizontally disposed second pipes spaced substantially below the first pipe and extending rearwardly from the open end of the first pipe, said second pipes being closed at their front ends and open at their rear ends, an elongated mold secured to and extending longitudinally of said frame and being open at both ends and having side walls extending downwardly into close proximity to the surface which supports the frame and having its front end connected to the open rear ends of said second pipes, a first screw conveyor in the first pipe to force paving material from the hopper out of the rear end of the first pipe, a second screw conveyor in each of said second pipes, means for driving the second screw conveyors to force paving material from the second pipes into the mold and, due to the pressure exerted on the paving material by the second screw conveyors, to move the apparatus forwardly at a rate of travel directly proportional to the amount of paving material forced into the mold, a manifold positioned between the first pipe and the second pipes and having a plurality of vertically extending passageways therein whose lower ends communicate with intermediate portions of the respective second pipes and whose upper ends are open, a metering device communicating with the rear open end of said first pipe and comprising a plurality of substantially vertically disposed relatively adjustable metering plates whose lower ends terminate immediately above the passageways in said manifold whereby the amount of paving material directed from the first pipe into the second pipes may accurately be determined by relative adjustment of said metering plates for directing the paving material into said passageways proportionately.

6. In an apparatus for forming relatively broad strips of paving material, such as curbs and gutters and the like, on a surface, said apparatus having a frame provided with a hopper thereon into which paving material is adapted to be placed, a substantially horizontally disposed pipe disposed below said hopper and being closed at one end thereof and open at its other end, said pipe communicating intermediate its ends with the lower end of said hopper, means for extruding the paving material from the open

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discharge end of said pipe, a mold open at both ends and spaced substantially below the level of said pipe and having side walls extending downwardly into close proximity to said surface, said mold being carried by said frame and extending longitudinally of said frame; the combination of a plurality of laterally spaced tubular extrusion devices carried by said frame and having open rear ends communicating with the open front end of said mold, a housing disposed above the extrusion devices and having its upper end terminating substantially on the same level as the lower portion of said pipe and also having its upper end disposed adjacent the open discharge end of said pipe, said housing having a row of vertically extending passageways therein whose walls are substantially rectangular in plan, there being one of said passageways communicating with each of said tubular extrusion devices, a metering device disposed adjacent the discharge end of said pipe and above the upper ends of the walls of said passageways for proportionately metering predetermined amounts of paving material discharged from the pipe into each of said passageways simultaneously, said metering device comprising at least two spaced substantially parallel upright plates having corresponding end edges movable in close proximity to said pipe, and means for relatively adjusting said plates above and longitudinally of said row of passageways.

7. In a paving apparatus for forming strips of paving material, such as curbs and the like, on a surface, said apparatus having a frame provided with a hopper thereon for receiving paving material, means for feeding said paving material from the hopper to a position adjacent one side of said hopper, a mold spaced from the vertical plane of the discharge end of said feeding means and being secured to and extending longitudinally of said frame and being open at its front and rear ends and having side walls extending downwardly into close proximity to the surface which supports said frame, and said mold being disposed on a substantially lower level than the level of the discharge end of said feeding means; improved means for uniformly feeding paving material under pressure into the front end of said mold comprising a plurality of laterally spaced substantially horizontally disposed extrusion devices, each of said extrusion devices comprising a tube having a screw conveyor therein and being supported by said frame, a manifold disposed above said tubes and having a plurality of passageways therein open at their upper ends and communicating at their lower ends with the interior of the medial portions of the tubes, there being one of said passageways for each tube, said feeding means hav-

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ing a tubular discharge nozzle of substantially rectangular cross-sectional configuration thereon terminating closely adjacent and above the level of the corresponding side of said manifold, a metering device comprising a plurality of laterally adjustable substantially vertically disposed metering plates disposed closely adjacent the discharge end of said rectangular tube and having their lower ends terminating closely adjacent and above the upper limits of the passageways in said manifold whereby, as the feeding means feeds the paving material through the rectangular tubular member, the metering plates direct predetermined proportional amounts of paving material into each of said passageways and into each of the corresponding tubes of the extrusion devices therebeneath, and means for driving the screw conveyors of the extrusion devices to force paving material therefrom into the mold under pressure to pack the paving material into the mold and, due to the pressure exerted on the paving material by the screw conveyors, to move the apparatus forwardly at a rate of travel directly proportional to the amount of paving material forced into the mold.

8. In an apparatus for forming relatively broad strips from paving material, such as concrete, asphaltic material and the like, on a surface, said apparatus having a frame movable longitudinally upon said surface, a longitudinally extending mold carried by said frame and being open at its rear end and having side walls extending downwardly into close proximity to said surface, said apparatus also having means for feeding paving material to a point adjacent and above the level of the front end of said mold; the combination of a plurality of extrusion devices spaced below said point and having their rear ends communicating with the front end of said mold, said extrusion devices being arranged in substantially side-by-side relationship, and laterally adjustable deflecting means adjacent the discharge end of the feeding means comprising at least two spaced substantially vertically disposed plates adjustable relative to each other and laterally adjustable relative to the discharge end of the feeding means for directing predetermined amounts of the paving material fed there-through into each of the extrusion devices simultaneously.

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