May 30, 1944. F. J. FARRELL 2,349,949

APPARATUS FOR CUTTING CHANNELS IN ROAD SURFACES

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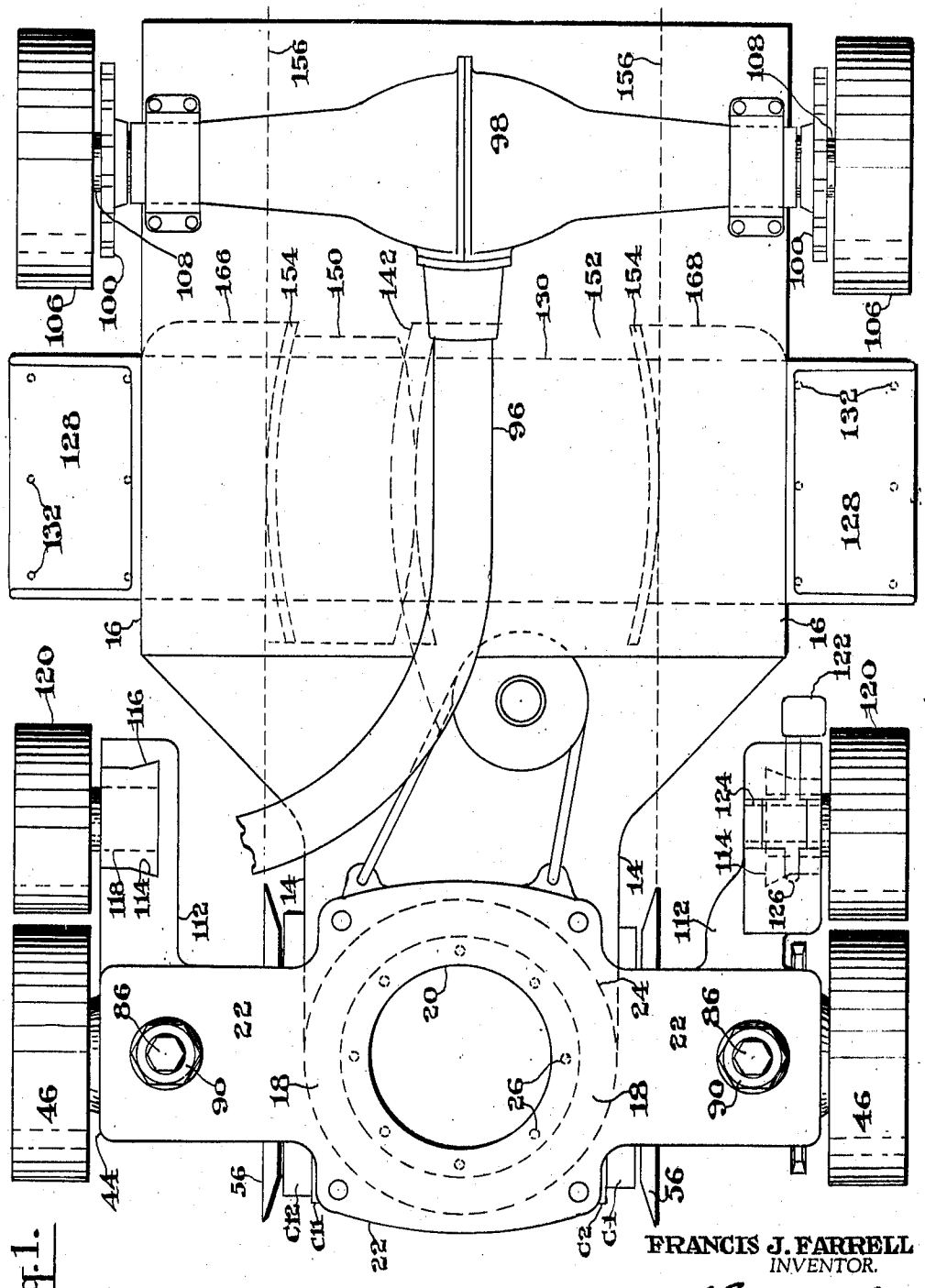


Fig. 1.

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BY Louis Necho

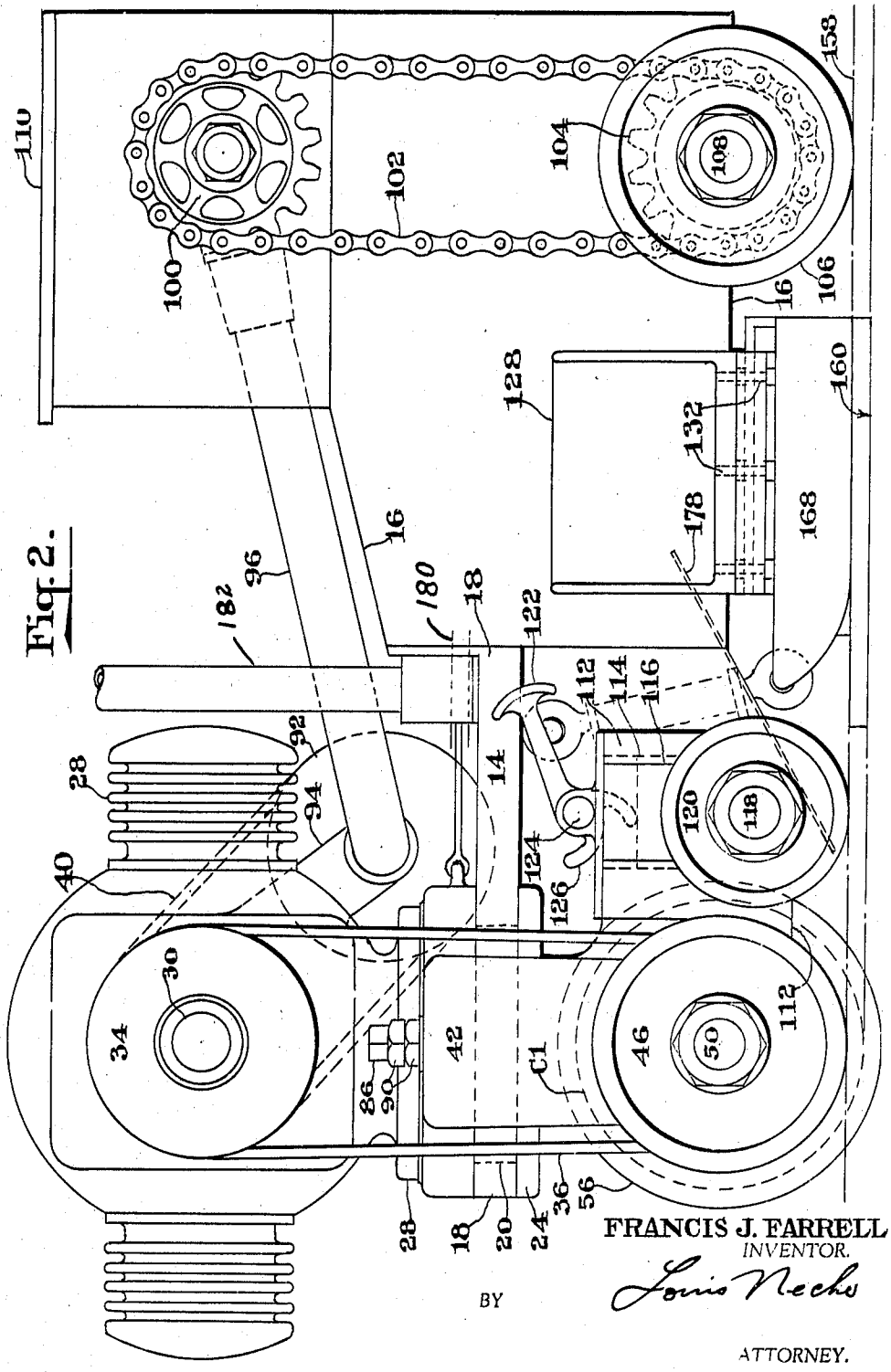
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APPARATUS FOR CUTTING CHANNELS IN ROAD SURFACES

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Fig. 2.



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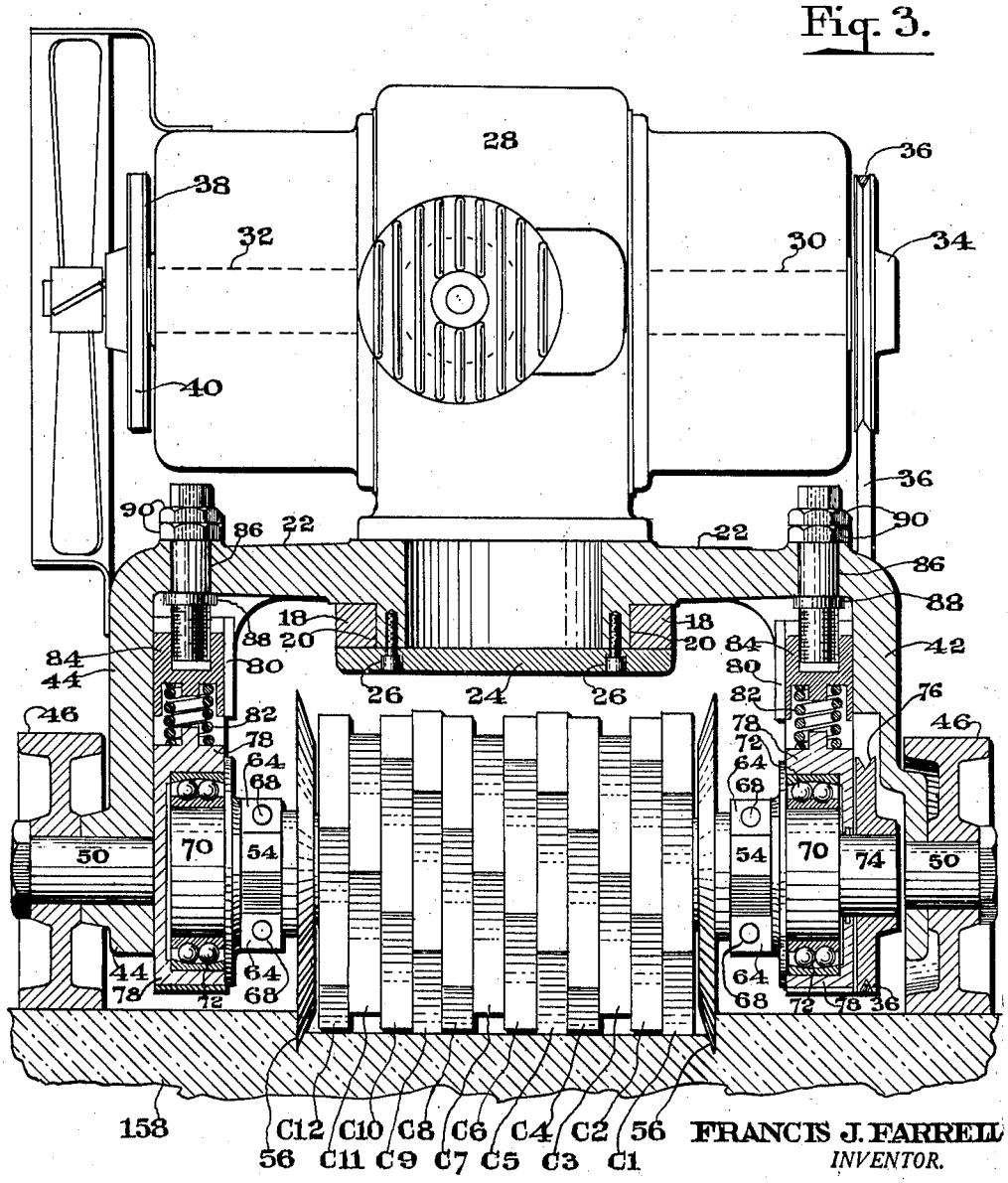
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APPARATUS FOR CUTTING CHANNELS IN ROAD SURFACES

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Fig. 3.



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APPARATUS FOR CUTTING CHANNELS IN ROAD SURFACES

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Fig. 4.

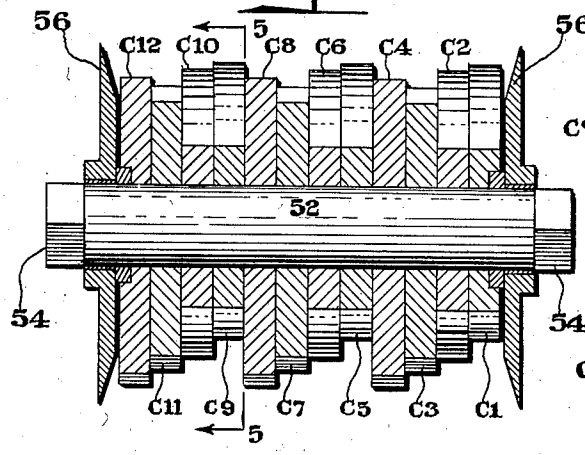


Fig. 5.

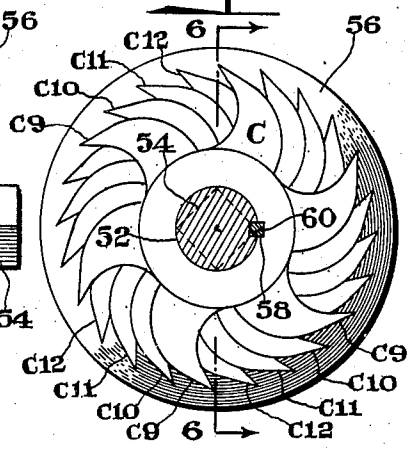


Fig. 6.

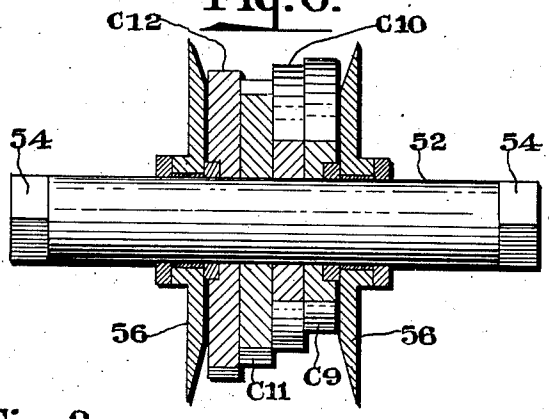


Fig. 7.

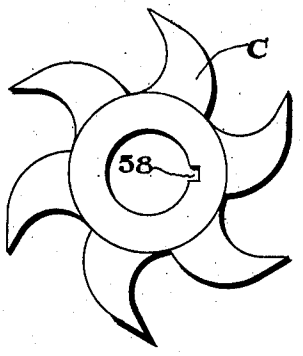


Fig. 8.

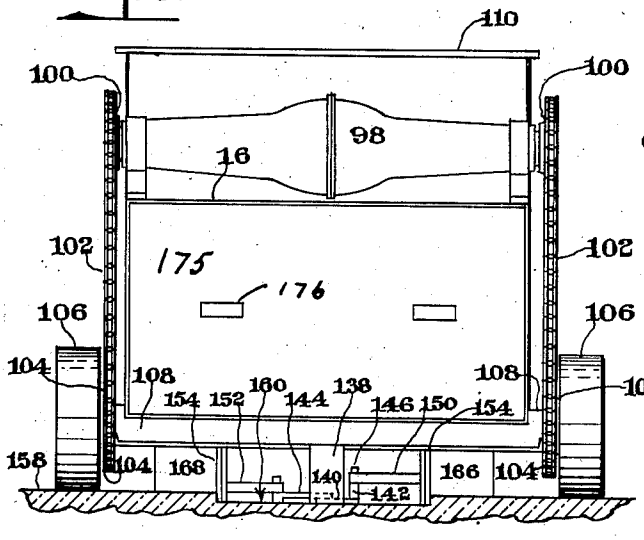
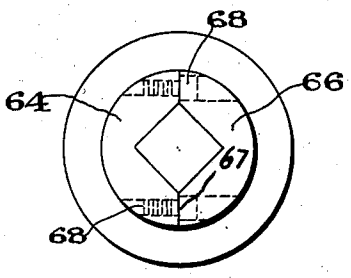


Fig. 8a.



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Fig. 9.

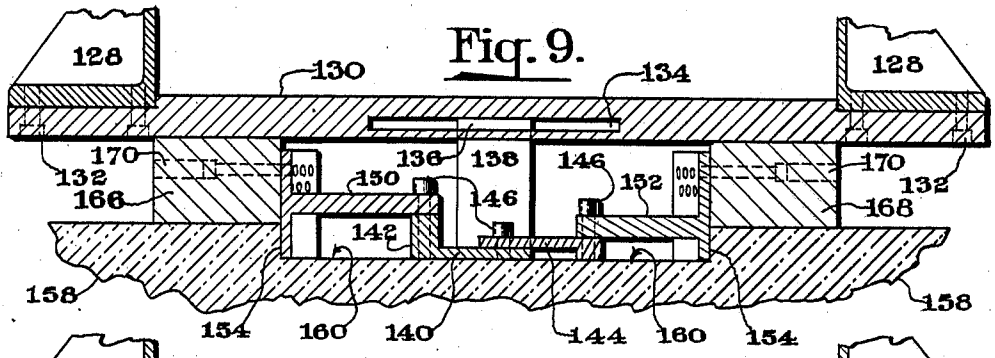


Fig. 10.

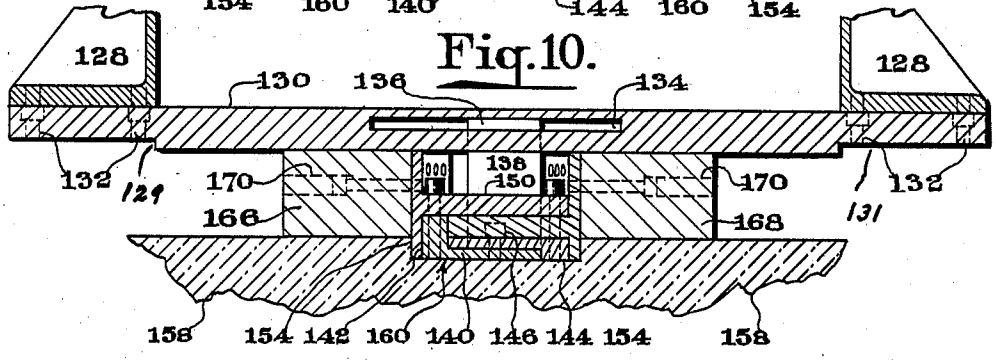


Fig. 11.

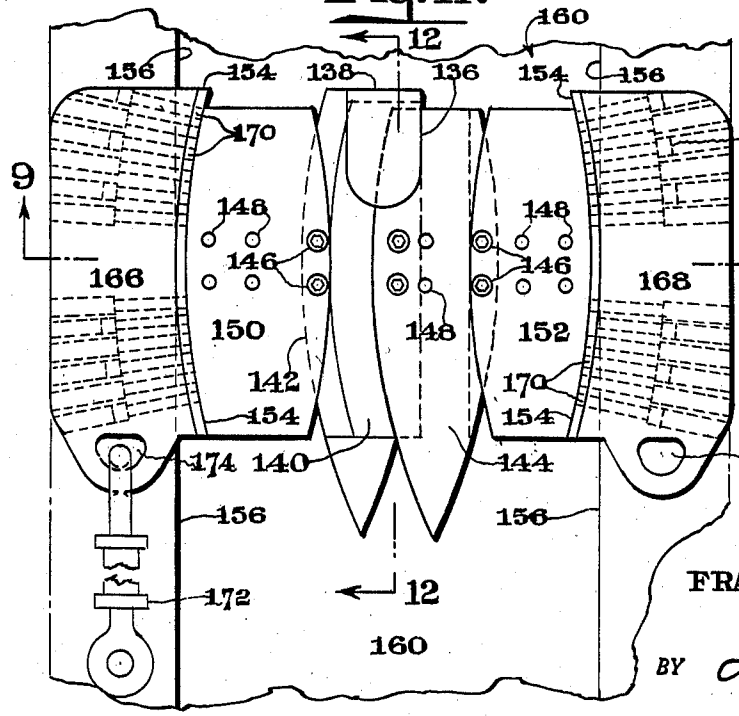
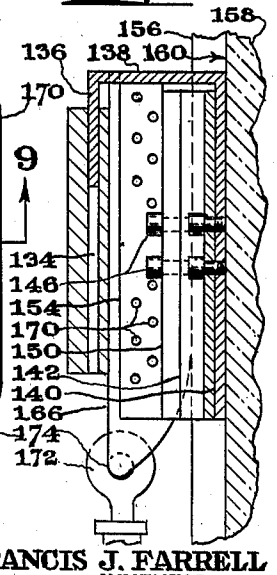


Fig. 12.



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Patented May 30, 1944

2,349,949

UNITED STATES PATENT OFFICE

2,349,949

APPARATUS FOR CUTTING CHANNELS IN ROAD SURFACES

Francis J. Farrell, Burlington, N. J., assignor to Far-Lin Inc., Burlington, N. J., a corporation of New Jersey

Application December 14, 1942, Serial No. 469,026

6 Claims. (Cl. 262—19)

My invention relates to apparatus for cutting channels of predetermined depth and width in the surface of roads for the reception of material contrasting with the road, and having a firm bond therewith, to the end that the road surface may be, relatively speaking, permanently marked in any desired design.

It is now the practice, and it has been for years, to paint lines of predetermined widths for the purpose of dividing highways off into traffic lanes, for ordering vehicles to stop at given intersections, for indicating a curve, or for indicating a speed limit, etc. Such painted markings must be renewed at relatively frequent intervals due to the fact that they wear out rapidly, and their frequent application interrupts traffic while the paint is still wet. Also, before they are renewed, such painted markings usually pass through a period of very poor visibility thus being practically worthless. To this should be added the expense of repeated application of the painted markings.

I have invented, and in a separate application I have disclosed, a novel composition which becomes plastic, when heated, but which sets rapidly and is capable of forming a firm bond with the road. This material is white so as to make a good contrast with asphalt roads and it is as durable as, or more durable than the road surface itself. Furthermore, it retains its white color permanently since the constant passage of vehicles over the markings serves to polish the surface of the marking material and thus keeps it white.

It is, therefore, an object of my invention to provide a compact, easily handled, easily constructed, durable and easily maneuverable apparatus which can be operated over the highway surface by its own motive power and with a minimum of personal attention on the part of the operator or operators.

A further object of my invention is to produce an apparatus which is equally adapted for cutting straight or rectilinear channels, as well as for cutting curvilinear channels, and whether such channels be intermittent or continuous.

A further object of my invention is to provide a self-contained unit which not only cuts a channel in the road but, which also collects the resulting debris as the work progresses, said debris to be disposed of conveniently from time to time.

My invention still further relates to apparatus of the character stated which produces a channel having neatly trimmed vertical walls, and horizontal surface edges so that when the marking composition is laid in the channel it will present a neat trim outline.

In cutting chanels in road surfaces, even if they be covered with asphalt, it is not infrequent to find small stones and other hard objects. In order not to interrupt operation or damage the cutting devices, I have provided my novel apparatus with cushioning means by means of which the cutting devices are yieldably mounted to prevent breakage or interruption.

Other novel features of construction and advantages will be more clearly understood from consideration of the specification in connection with the accompanying drawings in which:

Fig. 1 is a diagrammatical top plan view of an apparatus embodying my invention;

Fig. 2 is a diagrammatical side elevation of the apparatus shown in Fig. 1, certain parts being omitted or broken away;

Fig. 3 is a view partly in front elevation and partly in vertical section of the apparatus shown in Fig. 2;

Fig. 4 is a vertical sectional view of the cutting device forming part of my invention;

Fig. 5 is a section on line V—V of Fig. 4;

Fig. 6 is a section on line VI—VI of Fig. 5;

Fig. 7 is a side elevation of one of the cutters shown in Figs. 4, 5 and 6;

Fig. 8 is a diagrammatical rear end elevation of the apparatus;

Fig. 8a is a diagrammatical view in end elevation showing certain details of assembly;

Fig. 9 is a fragmentary vertical sectional view on line IX—IX of Fig. 11 showing details of a guiding mechanism;

Fig. 10 is a view similar to Fig. 9 showing the apparatus adjusted to cutting a channel of smaller depth than that illustrated in Fig. 9;

Fig. 11 is a fragmentary end diagrammatical top plan view of the guiding mechanism illustrated in Figs. 9 and 10; and,

Fig. 12 is a fragmentary section on line XII—XII of Fig. 11.

Referring to the drawings in which like reference characters indicate like parts, and more particularly to Figs. 1 and 2, 14 designates a frame member which, at its rear end, is connected to and supports an integral casing 16 and which, at the front end thereof, terminates in an annular member 18 which forms a guide and bearing for the hub 20 of the yoke 22, the annular member 18 being retained in position by the plate 24 bolted or otherwise secured as at 26. In order to lighten the construction, the hub 20 is made hollow as shown in Figs. 1 and 3. The yoke 22

supports, on its upper side, any desired engine or motor 28 which is provided with the two drive shafts 30 and 32. The shaft 30 drives the pulley 34 over which runs the belt 36 and the shaft 32 drives the pulley 38 over which runs the belt 40 (see Fig. 3). These pulleys and their drive belts will be further referred to. The yoke 22 is provided with the opposite arms 42 and 44 which conveniently carry axes 50 on which are mounted the front supporting wheels 46. 52 designates a shaft which is provided with the square ends 54 and which carries the outer cutting discs 56 between which is confined any desired number of toothed cutters C1, C2, C3, C4, C5, C6, C7, C8, etc. As will be later explained, the number of cutters can be varied according to the width of the channel to be cut in the road bed. The discs 56 serve as the outermost or edge cutters to define the outer edges of the channels and, as will be seen from Figs. 3 and 4, are of a larger diameter than the cutters C, C1, C2, C3, etc. The outer faces of the discs 56 are straight so as to cut a square edge and, by penetrating deeper into the road bed, the discs 56 cut a slightly deeper edge groove which receives the soft plastic in its heated state thereby forming an interlocking key for the material more firmly to bind the material and to make a watertight joint. In Figs. 4 and 6, respectively, I have shown twelve and four of the cutters C, C1, C2, C3, etc., assembled between the discs 56 in order to show their operative interrelationship, and in Fig. 7 I have shown a side elevation of one of the cutters, such as, C. It will be noted that each of the cutters is provided with a keyway 58 which is adapted to engage the key 60 but it will be understood that the keyways 58 of the respective cutters C, C1, C2, etc., are staggered with respect to one another so as to produce the equidistant disposition of the cutting edges shown in Fig. 5. The cutters in Fig. 4, in cooperation with the disc 56, are adapted to cut a channel having a width of 10 inches, which probably represents the maximum that will be needed in actual use. As shown in Fig. 6, the cutters C, C1, C2, etc., are adapted to cut a channel of 4 inches in width. It will be understood that the number of cutters can be adjusted to any desired width. In order to provide for rapid and easy change of the number of cutters, C, C1, C2, C3, etc., I have designed the demountable construction which will now be described. This demountable construction is best seen in Figs. 3 and 8*a*, from which it will be seen that I use a split socket comprising the rear portion 64 and the front removable portion 66, joined along the line 67, the two being assembled by means of the bolts 68. The rear portion 64 is provided with an extension 70 in the periphery of which is provided a ball-race supporting the ball bearings 72. The extension 70 is provided with a reduced member 74, which carries the pulley 76, over which travels the drive belt 36. The extension 70, and the ball bearings carried thereby, are contained within the housing 78 which slides vertically within the tracks 80. 82 designates a spring, the lower end of which is anchored on top of the housing 78, the upper end of which is confined in a recess in the lower end of the block 84. The block 84 is engaged at its upper end by the adjusting screw 86 which is provided with the supporting nut 88 and retained by the locking nuts 90. The spring 82 acts as a shock absorber to permit the shaft 52 and the cutters and discs carried thereby to respond to variations or obstructions which may be encountered in the road bed. As will be seen from Fig. 2, the pulley 38 drives the pulley 92 by means of the belt 40. The pulley 92 is journalled in a bracket 94 suitably secured to the frame 14 of the engine. From the pulley 92 extends the flexible shaft 96 which drives a conventional differential (such as that used in an automobile) which is housed in the axle 98. The axle 98 carries the sprockets 100 from which sprocket chains 102 extend downwardly to drive the sprockets 104 which are secured to the rear wheels 106. The rear wheels 106 rotate about the stub shafts 108. The frame 14 supports a seat 110 which is only shown diagrammatically and on which the operator of the machine sits. Referring now to Figs. 1 and 2, the yoke 22 is provided with the rear extension 112 within which is provided the dovetail groove 114 in which is disposed the slide 116. The slide 116 carries the axle 118 which in turn supports the wheel 120. 122 designates a foot pedal which is journalled on the axle 124 and which is provided with the cam 126. The cam 126 is adapted to bear upon the top of the slide 116, as shown in dotted position in Fig. 2. The purpose of this foot pedal will be later discussed. To the opposite ends of the main frame 14 are secured the brackets 128 to the lower ends of which is secured the yoke 130 by the bolts or the like 132, see Fig. 9. The yoke 130 is provided with the slot 134 in which is slidably mounted the end 136 of the bracket 138. The bracket 138 is extended downwardly to form the spacer 140, the outer edge of which is curved as at 142. 144 designates another spacer which is secured to the shoe 140 by the bolt 146. As will be seen from Fig. 11, the spacers 140 and 144 are in the nature of adjustable members since they are provided with the auxiliary holes 148 which may be engaged by the bolts 146 in a manner and for a purpose hereinafter described. To the outer edges of the spacers 140 and 144 are secured the plates 150 and 152. The plates 150 and 152 are provided with pendant shoes 154 which are adapted to contact the vertical edges of a channel 156 cut in the road bed 158. The spacers 140 and 144 move along on the bottom 160 of the channel dug in the road bed as shown in Figs. 9, 10, and 12. The plates 150 and 152 are also provided with the upper flanges 164 by means of which they are secured to the blocks 166 and 168 by means of the bolts or the like 170. The assembly of spacers 140 and 144 and the plates 150 and 152 and their adjuncts is connected to the frame 14 by means of links 172 engaging the eyes 174 and connected at their other ends to suitable points of the frame 14. Within the chamber 16 is positioned a removable container such as a drawer 175 having handles 176, said container being provided with an opening, not shown, into which leads the chute 178. A conventional steering apparatus, generally designated by the numeral 180 and having a steering column 182, is provided for directing the apparatus. The column 182 is provided with a steering wheel, not shown.

The operation is as follows: The cutting apparatus is adjusted to the desired height with reference to the surface of the road 158 so as to predetermine the depth of the channel to be cut and this can be done by the adjusting mechanism illustrated in Fig. 3. The engine 34 is then started to drive the wheels 106 as well as the cutters C, C1, C2, C3, etc., and the discs 56. The apparatus is steered by turning the steering wheel, not shown, to rotate the steering column 182 in the desired direction. It will be noted that the discs 56 cut somewhat deeper than the intervening cut-

ters so as to form a slot at the bottom of the vertical walls of the channel into which the marking material is adapted to be received thus forming an interlocking bond and a watertight joint. Referring to Fig. 9, it will be seen that the shoes **154**, adjusted to the proper width, abut against the vertical walls of the channel to smooth the latter while the blocks **166** and **168**, forming a right-angled joint with the shoes **154**, smooth the upper or horizontal surface edges of the channel. This produces a square cut and neatly trimmed channel.

It will be understood that a suitable heating apparatus precedes the channel-cutting apparatus on the surface of the highway to soften or "scorch" the asphalt to be cut, thereby greatly facilitating the task of the discs **56** and the cutters therebetween. The cutting apparatus shown in Fig. 3 is driven at a relatively high rate of speed while the apparatus itself moves along the highway at a relatively slower rate of speed, the two speeds being synchronized. This is accomplished by conventional gear reduction and differential mechanisms which need not be shown or described in detail. The small pieces of charred or scorched asphalt or other filler material cut from the surface of the road are thrown backwardly by the centrifugal action of the cutters, onto the chute **178** which guides this debris into the removable drawer or container **175** in the chamber **16**. In the event that the cutting apparatus is obstructed by a stone or other hard material, the yielding suspension (spring **82**) allows the cutters to yield, thus preventing damage to the cutters and preventing interruption of operation. Such occasional hard spots can be removed by the attendant crew. However, since this apparatus is devised for cutting a relatively shallow channel in asphalt covered surfaces, which channel is perhaps about an inch deep, such contingencies are not likely to cause much difficulty. Since it is probably desirable, in the interests of economy, to provide a road surface with intermittent marks, as distinguished from continuous markings, I have made provision for putting the cutters out of operation while the apparatus moves over the surface in which it is not desired to cut a channel. This is accomplished by applying pressure on the foot pedal **122** to depress the axle **118** and thus relatively raise the cutters out of contact with the road surface. In order to enable the apparatus to take the curves usually encountered on highways, I have provided the shoes **154** with curvilinear outer edges of a radius calculated to be sufficient to compensate for turns in the road. The spacers **140** and **144** having adjustable relationship to the shoes **154**, as clearly shown in Figs. 9 to 12, permit adjustment of the apparatus to channels of various widths and by omitting some of the cutters C, C1, C2, C3, etc., the cutting devices are also adjusted to the same width as clearly shown in Fig. 6.

I also have devised very simple means for adjusting the depth of the channel to be cut, in addition to the available adjustment illustrated in Fig. 3, and this is accomplished by merely reversing the yoke **130**. Thus, in Fig. 9, the brackets **128** are seated in recesses **131** formed in the upper surface of the yoke **130**, as shown in Fig. 9, and this results in spacing the shoes **154** vertically only the thickness of the blocks **166** and **168**. If, however, the bolts **132** are disengaged and the yoke **130** is reversed, the thickness of the shoulder **129** is added to the height of the blocks **166** and **168** thus elevating the shoes **154** and the intermediate spacers to that extent to cut a shallower channel, as shown in Fig. 10.

What I claim is:

1. In a device of the character stated, the combination with a housing, front and rear wheels for movably supporting said housing, an engine for driving said rear wheels to propel said device, and a steering mechanism operatively connected to said front wheels, of a cutter disc assembly mounted at the front end of the machine, means for operatively connecting said cutters to said engine, said cutter disc assembly comprising two end discs having uninterrupted cutting edges and a plurality of intermediate toothed cutting discs, means for driving said cutters, a receptacle removably carried by said housing for receiving the debris resulting from the action of the cutters and thrown rearwardly by centrifugal force into said receptacle.

2. In a device of the character stated, the combination with a housing, front and rear wheels for movably supporting said housing, an engine for driving said rear wheels to propel said device, and a steering mechanism operatively connected to said front wheels, of a cutter disc assembly mounted at the front end of the machine, driving means for operatively connecting said cutters to said engine, said cutter disc assembly comprising two end discs having uninterrupted cutting edges and a plurality of intermediate toothed cutting discs, means for driving said cutters, a receptacle removably carried by said housing for receiving the debris resulting from the action of the cutters and thrown rearwardly by centrifugal force into said receptacle, said end discs being of a greater effective diameter than said intermediate cutters.

3. In a device of the character stated, the combination with a housing, front and rear wheels for movably supporting said housing, an engine for driving said rear wheels to propel said device and a steering mechanism operatively connected to said front wheels, of a plurality of cutters mounted in the front end of said housing for engagement with the surface into which a channel is to be cut, means for driving said cutters, a receptacle removably carried by said housing for receiving the debris resulting from the action of the cutters and thrown rearwardly by centrifugal force into said receptacle, and means carried by said housing for smoothing the edges of the channel cut by said channel.

4. In a device of the character stated, the combination with a housing, front and rear wheels for movably supporting said housing, an engine for driving said rear wheels to propel said device, and a steering mechanism operatively connected to said front wheels, of a plurality of cutters mounted in the front end of said housing for engagement with the surface into which a channel is to be cut, driving means operatively connecting said cutters to said engine, a receptacle removably carried by said housing for receiving the debris resulting from the action of the cutters and thrown rearwardly by centrifugal force into said receptacle, and means carried by said housing and engaging the bottom of the channel, said means having arcuate outer edges for guiding said cutters in the cutting of curvilinear as distinguished from rectilinear channels.

5. In a device of the character stated, the combination with a housing, front and rear wheels for movably supporting said housing, an engine for driving said rear wheels to propel said device and a steering mechanism operatively connected

to said front wheels, of a plurality of cutters mounted in the front end of said housing for engagement with the surface into which a channel is to be cut, means for driving said cutters, a receptacle removably carried by said housing for receiving the debris resulting from the action of the cutters and thrown rearwardly by centrifugal force into said receptacle, and means carried by said housing for smoothing the vertical walls and surface edges of the channel cut by said channel.

6. In a device of the character stated, the combination with a housing, front and rear wheels for movably supporting said housing, an engine, reduction gearing positioned between said engine and said rear wheels for driving said wheels to propel said device, at a relatively slow rate of speed and a steering mechanism operatively connected to said front wheels, of a cutter disc assembly mounted at the front end of the machine, means for operatively connecting said cutters for said engine, said cutter disc assembly comprising two end discs having uninterrupted cutting edges and a plurality of intermediate toothed cutting discs, direct means for driving said cutters, at a relatively high rate of speed a receptacle removably carried by said housing for receiving the debris resulting from the action of the cutters and thrown rearwardly by centrifugal force into said receptacle.

FRANCIS J. FARRELL.