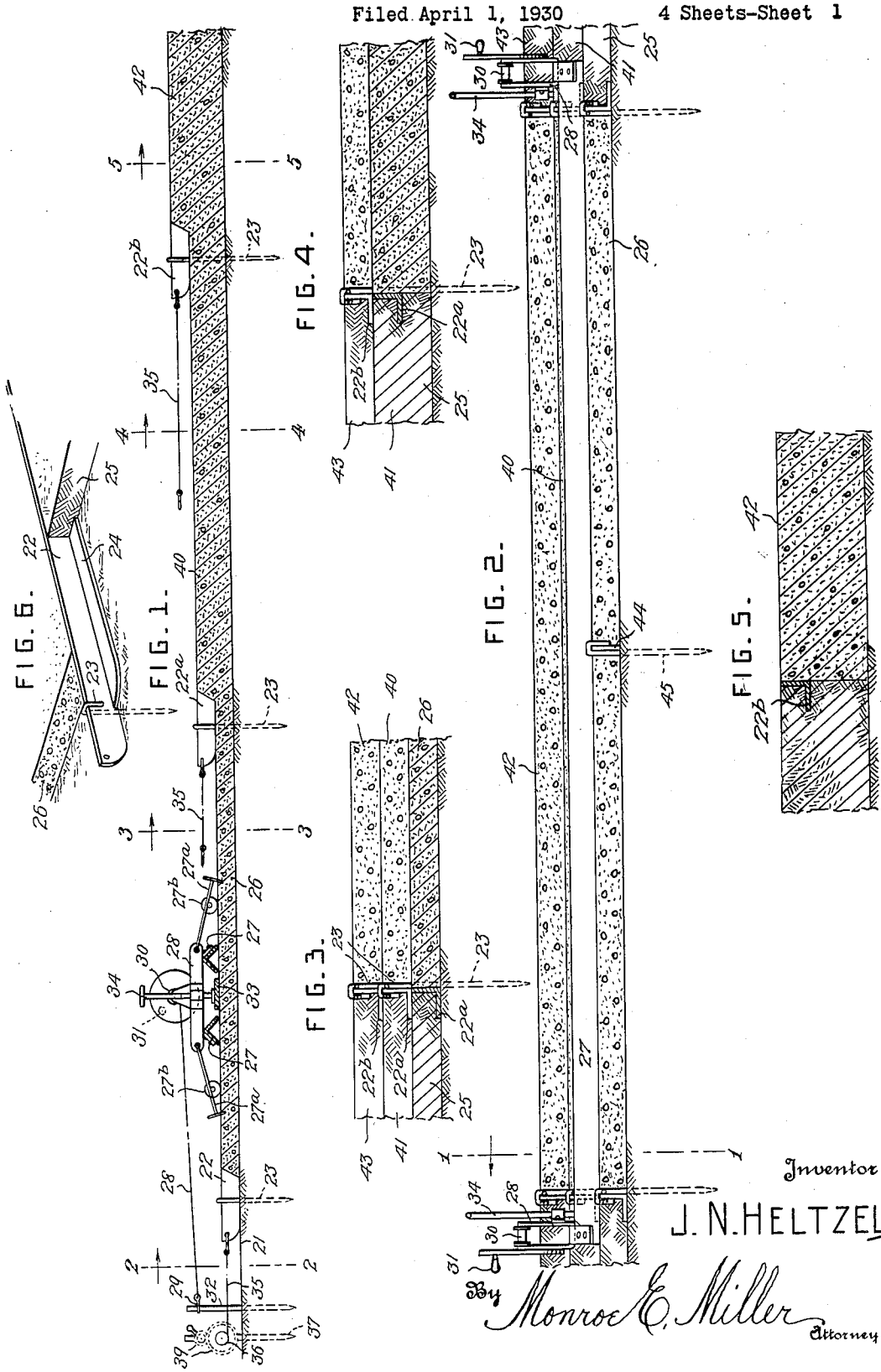
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METHOD FOR BUILDING ROADS

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FIG. 7.

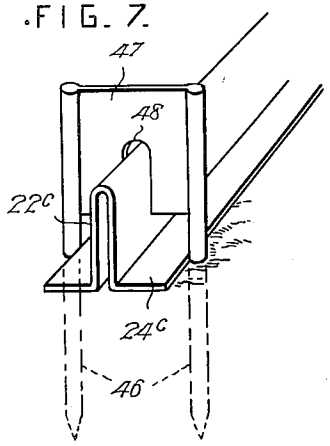


FIG. 9.

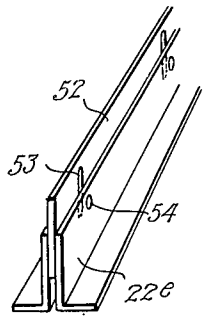


FIG. 11.

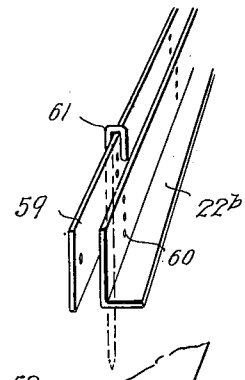


FIG. 8.

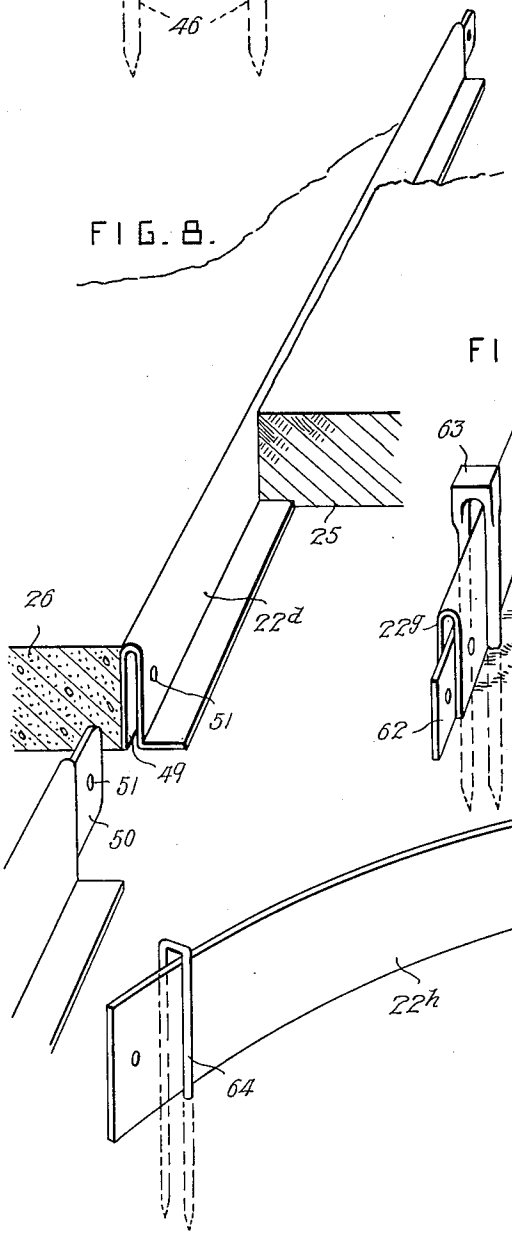


FIG. 10.

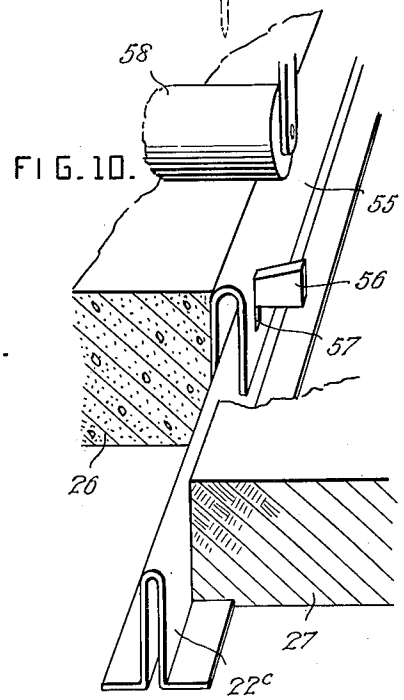
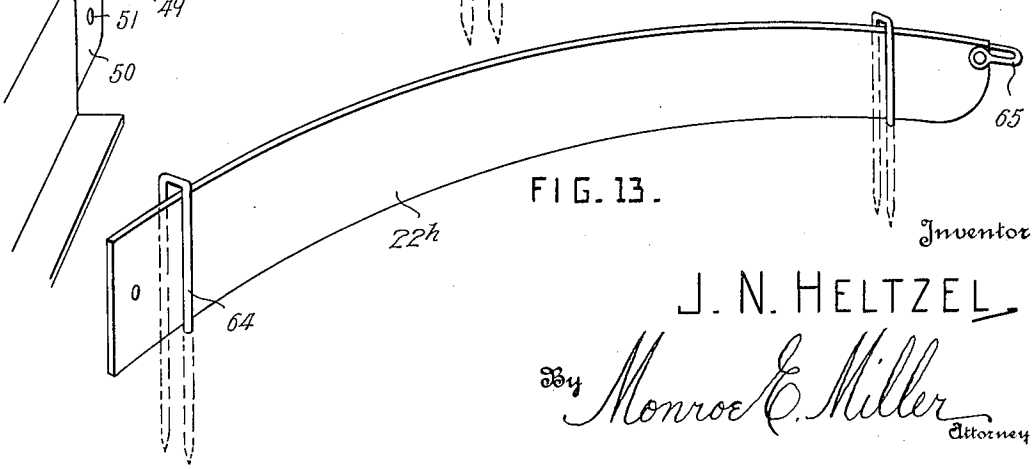


FIG. 12.

FIG. 13.



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FIG. 14.

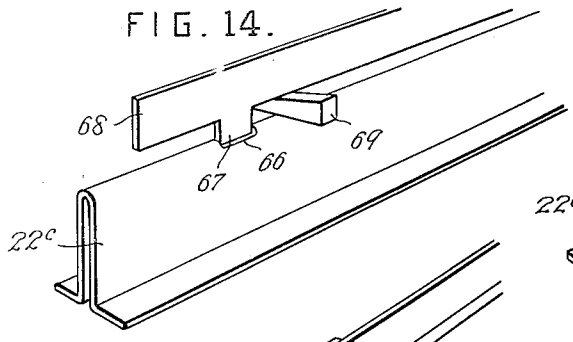


FIG. 15.

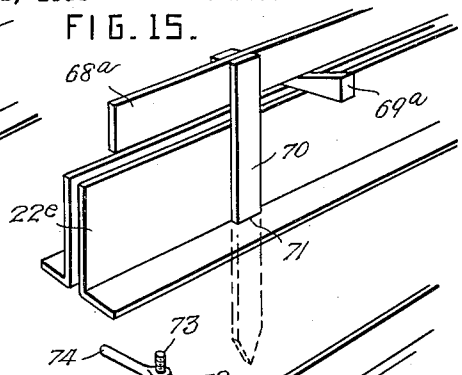


FIG. 16.

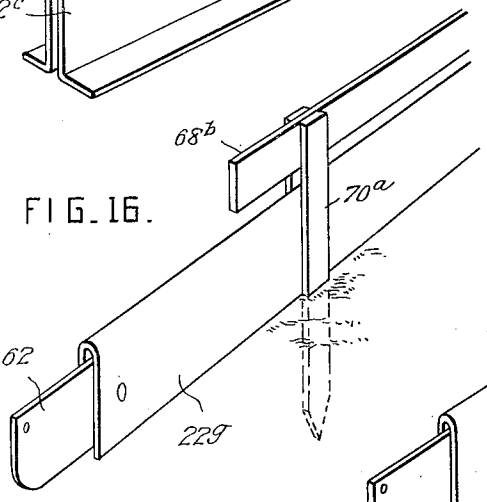


FIG. 17.

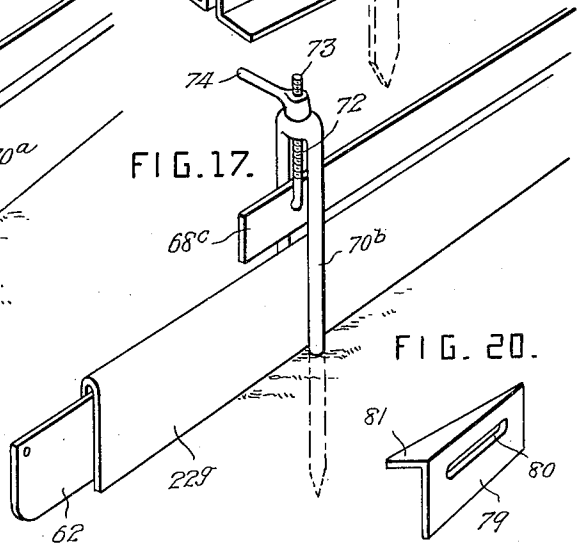


FIG. 20.

FIG. 18.

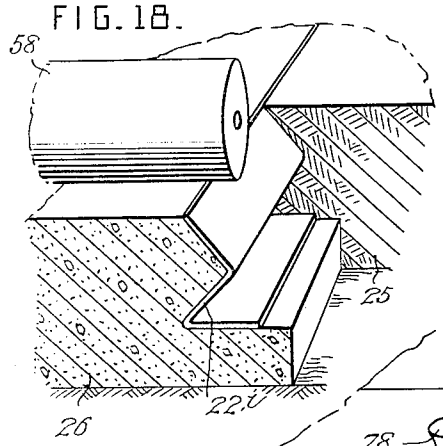
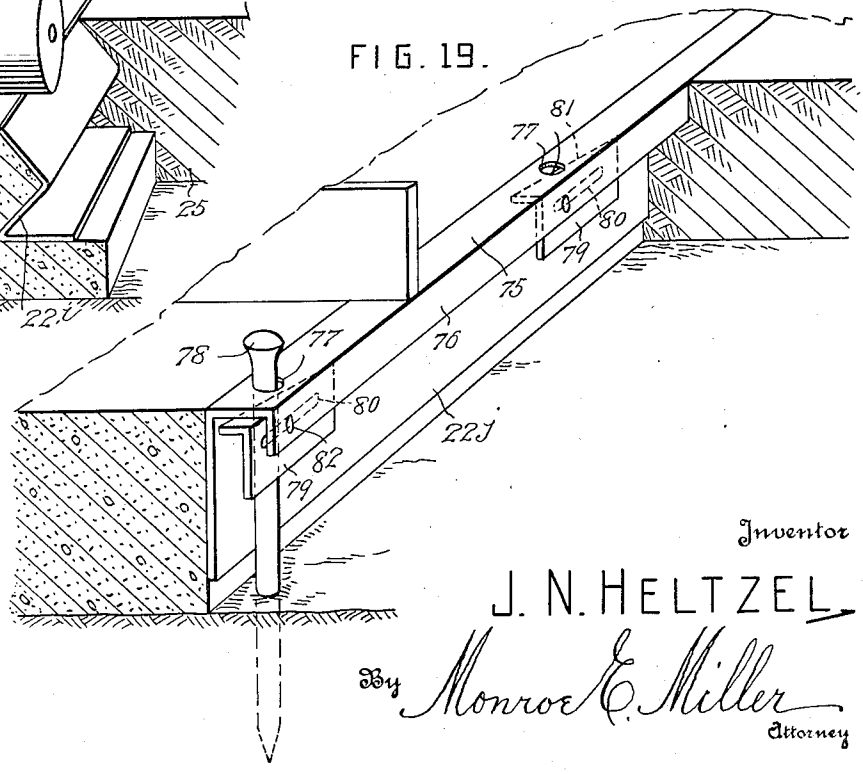


FIG. 19.



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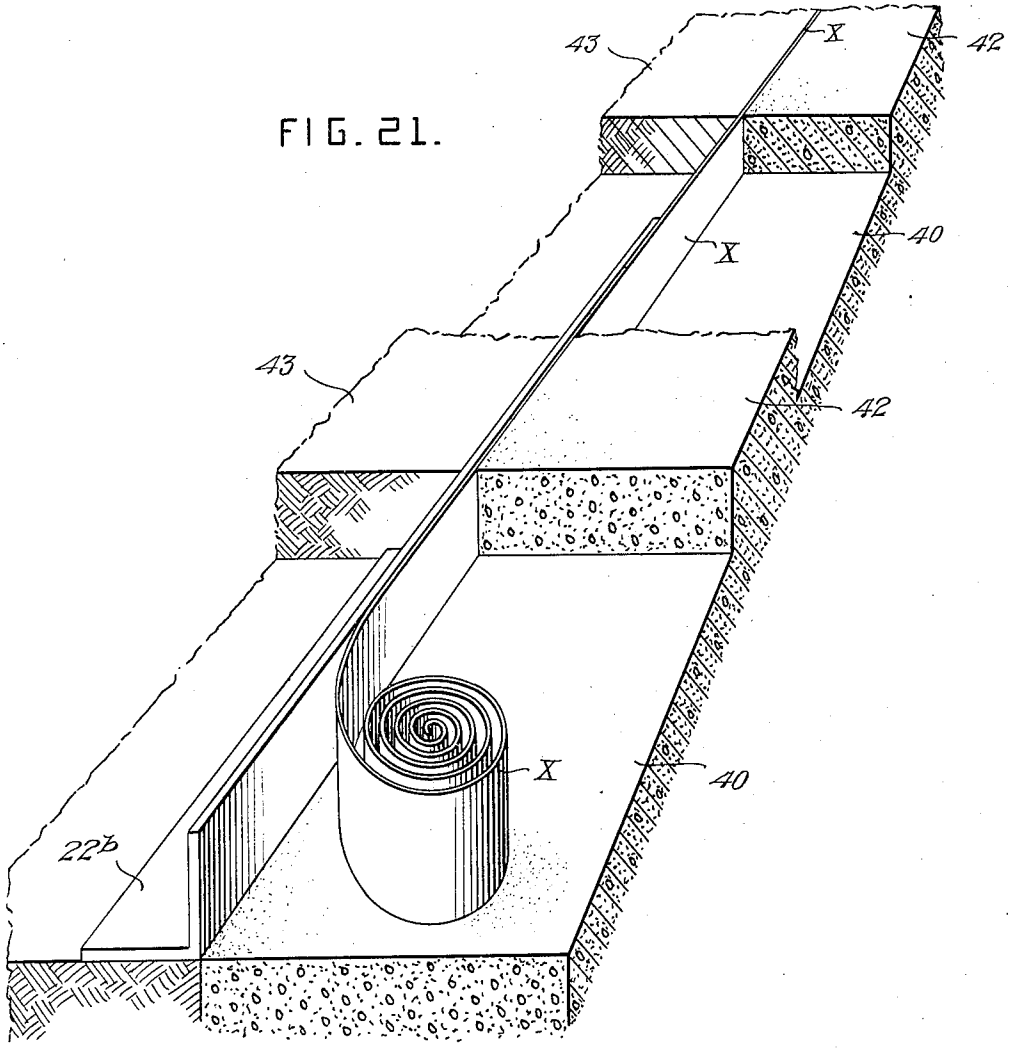
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FIG. 21.



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UNITED STATES PATENT OFFICE

1,963,088

METHOD FOR BUILDING ROADS

John N. Heltzel, Warren, Ohio

Application April 1, 1930, Serial No. 440,761

6 Claims. (Cl. 94—39)

The present invention relates to improvements in methods for building roads and has for an object to provide improved forms and methods to more adequately respond to the demand of highway departments for smoother and better roads.

A still further object of the invention is to provide an improved method for constructing roads, by the various steps and processes of which road building may be more expeditiously carried out.

With the foregoing and other objects in view, the invention will be more fully described hereinafter and more particularly pointed out in the appended claims.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views,

Figure 1 shows a longitudinal section taken through an improved roadway constructed in accordance with the present invention with the improved apparatus in place, illustrated partly in section and partly in elevation, showing the mechanical raking apparatus for leveling the various courses of materials and for mixing or agitating the bituminous materials, which may be used in the construction of macadam and similar types of roads.

Fig. 2 is a cross section taken on the line 2—2 in Fig. 1.

Fig. 3 is a similar view taken on the line 3—3, also in Fig. 1.

Fig. 4 is a transverse section taken on the line 4—4 in Fig. 1.

Fig. 5 is also a transverse section taken on the line 5—5, likewise in Fig. 1.

Fig. 6 is a fragmentary perspective view showing a portion of the roadway and earth shoulder with an improved form therebetween.

Figs. 7 to 19, inclusive, are all fragmentary perspective views showing modified forms of the invention and

Fig. 20 is a perspective view of a wedge employed in connection with Fig. 19.

Fig. 21 is a fragmentary perspective view of a road being constructed according to my invention, showing the method of installing a flexible separator strip *x*.

Referring more particularly to the drawings and for the present to Figs. 1 to 6, inclusive, 21 represents the subgrade, and 22 represents a steel or other form supported to alignment on the subgrade by the use of U-shaped or other stakes 23, which are driven into the subgrade and support the form 22 in the vertical position shown to best advantage in Fig. 6.

It will be understood that the top edge of the form 22 is raised to the proper elevation to serve as a screeding line. The form or the vertical rail 22 thereof is provided with an outwardly extending base flange 24 to give the form a suitable support on the subgrade and to tend to hold the same in correct position. The forms 22 may be of any appropriate length, and a suitable number of these forms are securely coupled together, the same constituting a line of forms 100′ to 200′ or more in length.

After the forms 22 have been set to grade and alignment, an earth shoulder 25 is banked against the outer portions of the forms, such earth shoulder resting upon the flange 24 and engaging the outer side of the vertical rail 22 whereby to act as a support for the forms, holding the same to correct position. Subsequently the crushed stone 26 is placed between the two forms at opposite sides of the roadway, and such crushed stone is levelled off by a drag or template, such as shown in Fig. 1.

The template may consist of inverted V-shaped bars or beams 27 coupled together in spaced relation by cross pieces 28. The template may be moved longitudinally of the roadway over the top of the forms 22 by cables 28 or by other suitable means; such cables being provided with couplings 29, which may be attached to a tractor, truck or other suitable vehicle; or if desired, a drum 30 may be carried by the template on which the cable 28 is wound either by hand or power.

A hand crank or wheel 31 is shown as one means whereby this result may be secured. When the drum is used, it becomes necessary to provide a stake 32 to which the free end of the cable 28 is attached. The stake 32 is driven into the subgrade. When the drum 30 is rotated to wind the cable 28 thereupon, the template will of course be drawn along toward the stake 32. The template may be provided with a pressing member 33, preferably located between the bars 27 and being so arranged that it may be reciprocated up and down by means of handles 34. If a power machine is used, this member may of course be operated by power. When the template is to be moved forward, the U-stakes 23 are withdrawn so that the tops of the forms will be free of any obstruction.

A steel rake or a plurality of rakes #27—*a* are manipulated mechanically to operate in the stone for raking the stone to the required level and carried on rollers #27—*b*. Before pulling the side forms #22, the weight of the spreading apparatus is released from the forms. It is understood that

the raking apparatus consists of a plurality of rakes and each contains a plurality of depending prongs, and when this raking apparatus is used in the spreading and leveling of the top course of material, which may consist of aggregate saturated with bituminous or asphaltic binder, the prongs on these rakes will mix or agitate these materials so as to produce a homogeneous mixer and at the same time the material is leveled off by the surfacing members. It is understood that the prongs of the rakes may be adjusted so they will penetrate the mass of material at a limited depth so the prongs will not score or route out the underlying course of material.

To the forms 22 may also be attached cables 35 or other suitable means for drawing these forms longitudinally. For instance, after the stone 26 has been levelled for a suitable distance, and after the earth shoulder 25 has been compacted against the outsides of the forms, the outer ends of the cables 35 associated with the forms may be attached to a truck, tractor or other suitable vehicle, and the forms 22 may be drawn longitudinally of the roadway and of themselves to an advanced position, which may constitute a movement of five to twenty feet at various intervals as conditions will permit.

Assuming that the form has been advanced 10' to 20', the U stakes 23 or other suitable supporting elements, are again driven into the subgrade to hold the form to proper alignment, and the operation of placing the crushed stone 26 and the banking of the earth shoulder 25 is progressively carried out.

Instead of using a truck or tractor for the movement of the forms 22, it may be desirable to use a hand-operated winding drum 36 supported on a steel or other stake 37, which may be quickly driven into the subgrade. An operator's handle 38 will facilitate the winding of the cable 35 on the drum 36, appropriate gearing 39 being preferably provided.

It will be understood that the stone and the earth shoulder have been levelled off and the form withdrawn. The next operation consists of rolling the stone 26, together with the earth shoulder 25, using a suitable roller, preferably a very heavy implement, which will insure the proper compacting of the stone 26 and the earth shoulder 25, reducing the thickness of the layer of the stone and the berm or earth shoulder 25.

The progress of the road under construction is then continued by placing similar forms 22*a* on top of the rolled base of stone 26, as shown in the intermediate part of Fig. 1. Substantially the same operation is repeated, as described in the building of the base 26 and the berm 25. This second operation however produces another stone course 40 as shown in Fig. 1 and another berm or earth shoulder course 41 as shown in Fig. 2.

The final wearing course 42 is then placed on top of the second course 40 by using forms 22*b* and filling stone between such forms 22*b* and earth shoulders 43, as shown in Fig. 2, outside such forms 22*b*. After the forms 22*b* have been withdrawn, the edges of the road will be well defined.

As shown in Fig. 2 a center form 44 may be used when constructing very wide roads, the center form being secured in place by stakes 45 driven into the subgrade or into the other subsequent courses.

Referring more particularly to Fig. 7, there is shown a double pronged yoke stake having prongs 46, which are driven into the subgrade. A web portion 47 serves to connect the prongs 46 together at their upper end portion. The web plate 47 is provided with a slot 48 straddling the upstanding portion 22*c* of a different type of form consisting of an inverted U-shaped rail having the spaced flanges 24*c* for resting upon the subgrade or one of the subsequent courses. The slot 48 in the web plate 47 will preferably be slightly wider than the form so as to permit the entire form 22*c* to be drawn longitudinally of itself through the slot 48 while the yoked stakes 46 remain in position.

Referring now more particularly to Fig. 8, another type of form is shown, involving the inverted U-shaped section 22*d*, producing two vertical side walls, having a single outside base flange 24*d*. The space 49 between the vertical walls of the form is arranged to accommodate the connecting tab 50 of an adjacent form, which tab 50 enters the space 49 so that the abutting ends of the rails or forms are coupled together by inserting a pin or other suitable fastening through the openings 51, which securely couple the rails or forms together, and at the same time permits enough flexibility in the joints to negotiate curves or dips in the roadway. Any convenient number of rails or forms may be hooked together and staked on the roadway as described in connection with Figs. 1 to 6, inclusive. After the stone 26 is placed on the insides of the forms and the earth shoulder 25 on the outsides of the forms, the forms may be trailed longitudinally of themselves as described in connection with Figs. 1 to 6, inclusive.

Coming now to Fig. 9, a further different type of form is illustrated consisting of two angle members 22*e* and a vertical web plate 52, which is positioned between the angle members 22*e*. In the web plate 22 are vertically elongated slots 53 for receiving bolts or other suitable fastenings carried by the form members 22*e*. Preferably flat-head bolts are employed. Such construction provides a form which is adjustable to various heights and is to be used in connection with the building of roads where conditions require that the stone and earth be rolled while the form remains in position and this form is used in the following manner:—

The vertical web plate 52 is adjusted to the proper height or elevation; the stone or other road material is placed on one side of the form and the earth filled on the opposite side. The top of the vertical plate 52 is used as a strike-off, and serves to screed the stone or other material to the proper thickness. The roller is then brought into play, and when the roller passes over the material and over the form, the plate 52 will be forced down into the space between the two form members 22*e* progressively as the material is compressed by the roller or finishing machine, or any other implement which may be used for that purpose. Thus, the form will not be damaged by the roller or other compacting implement which may be used.

Referring now to Fig. 10, in which a further modification is represented 22*c* represents the form rail, being similar to the rail shown in Fig. 7. This rail rests on the subgrade or other prepared base. An inverted U-shaped section 55 fits snugly over the vertical portion of the form 22*c* and is adjusted and held to the proper elevation required by a tapered wedge 56 or other suitable means, driven through slots 57 in the side walls of the section 55. The crushed stone 26 is placed on the inside of the form and the earth shoulder 27 on the outside of the form and struck off and

levelled by using the top surface of the member 55 as a guide, the wedges 56 are then removed and the roller 58 or other suitable compacting member is used for compressing the stone or other road material. The roller 58 will roll over the form member 55, which will be forced down and recede simultaneously as the materials are depressed.

It is to be understood that in lieu of the roller a tamping machine or finishing machine may be used. After the materials have been compacted, the form is removed by trailing or dragging the form longitudinally of itself from the compacted material, leaving the upper form member 55 in place. This upper member 55 may be removed later by withdrawing it vertically from its position, or if desired, the top form member 55 may be removed by withdrawing it vertically out of its position before the form 22*c* is trailed or dragged out of its position.

Referring now to Fig. 11, this figure represents a further modification of the form involving the use of a single angle member 22*f*, which is either permanently or adjustably secured to a vertical plate 59 by using bolts in connection with a series of holes 60. In this way the plate 59 may be adjusted to various heights. U-shaped stakes 61 are driven into the ground or other suitable means and engage over the top of the form member 59.

In Fig. 12 there is represented an inverted U-shaped section 22*g* without any base flanges. Such section constitutes the form and is provided with a connecting link 62 secured within the U-shaped section for the purpose of coupling a suitable number of the forms together.

There is a double pronged U-shaped stake 63, which is driven into the subgrade or other suitable base for supporting the form 22*e* in a vertical position while the stone, earth or other material is being crushed. This form may be trailed longitudinally of itself or may be withdrawn vertically out of position as may be required.

In Fig. 13 is illustrated a flexible form 22*h* comprising a flat steel or other plate supported by U-shaped stakes 64. This flexible form may be trailed longitudinally of itself by use of the coupling member 65, which may be used on all of the various types of forms.

Fig. 14 represents still another modification of form which may be used substantially in the same manner as described in Fig. 10. This form consists of a bottom member 22*c*, which may be of the section shown, or any of the other sections described. In case the hollow or tubular section is used, a number of slots 66 are provided at its upper portion to accommodate the prongs 67 which are attached to the top form 68. This top section 68 may be adjusted up or down by use of the wedges 69 or other suitable devices engaged between the two sections of the form.

However, the lower portion of the prong 67 may be driven into the subgrade or sub-base to the required distance until the proper elevation of the rail 68 is had.

Fig. 15 shows an instance where a tubular type of form, such as shown in Fig. 14 is not used. The type of form 22*e* shown in Fig. 15 corresponds to that illustrated in Fig. 9. In this case the upper rail 68*a* is provided with two prongs 70 which straddle the vertical portions of the form 22*e* and pass through the slot 71 in the base portion of the form 22*e*. The prongs 70 may enter the subgrade or base of the roadway to manipulate the top form or rail 68*a* to the proper elevation. When it is desired to remove the forms, it will be necessary to move the top form or rail 68*a* before the bottom form could be trailed out of position.

Fig. 16 shows still another modification of form which may be used in connection with this type of construction wherein 22*g* represents a lower rail, similar to that shown in Fig. 12, arranged to be trailed longitudinally of itself by the link member 62. There is a top rail 68*d* having depending prongs or stakes 70*a*, similar to Fig. 15, which are driven into the subgrade or base as shown in Fig. 16, permitting the top rail 68*d* to be adjusted to various heights to serve as a screed line for screeding off the material to the proper elevation.

When it is desired to remove this form, the bottom form 22*g* may be trailed longitudinally of itself and the top form 68*d* left in position. The roller may operate over the top of this form 68*d* if desired. The stakes 70*a* will be forced into the subgrade if the form is permitted to remain in place during the rolling or depressing operation. This would prevent damage to the form and keep the ground separated from the stone along the top edge if required.

In lieu of the double stakes 70*a*, a U-shaped double pronged stake 70*b* may be used as shown in Fig. 17 for supporting both the top form 68*c* and the bottom form 22*g* in a vertical position. A hook member 72 is engaged with the top rail 68*c* and extends through the yoke portion of the double stake 70*b*, having a threaded upper end 73 for receiving an adjustable wing nut 74. By rotating this nut 74, the hook member 72 may be raised and lowered in the yoke stakes and the top rail 68*c* thus adjusted to the proper elevation. The bottom form 22*g* may be trailed longitudinally independently of the top rail 68*c*. When it is desired to remove the top form 68*c*, the stakes or members 70*b* are withdrawn after disengaging the hooks 72.

Fig. 18 represents a modification wherein I employ a deformed side member 22*i*. This member being made of steel or some other flexible material will depress or recede when the roller 58 bears on the top edge of the form when rolling or depressing the material 26. This form may be trailed longitudinally of itself as described in connection with the other figures, or may be removed vertically out of position by removing a portion of the earth shoulder 25. While this type of form could be used for the lower course as illustrated in Fig. 1, this is recommended for the top wearing course 42 as shown and described in connection with Fig. 1.

Fig. 19 represents still another modification of form for the building of new roads or for the widening of old roads, and while this form can be trailed longitudinally of itself by connecting a plurality of rails together, this rail is recommended to be used in localities where obstructions are encountered which would not permit the trailing of the form under all conditions, and wherein it would require that the form be removed vertically out of position rather than trailing. This form may be utilized for other purposes and would be recommended where heavy subgraders or finishing machines are used, and in order to supply rigidity to the top portion of the rail to support heavy equipment and also provide for vertical up and down adjustment while material is in place, I provide a form having a vertical web 22*j* reinforced at its top portion with a transverse tread flange 75, said tread flange having at its free edge a depending flange 76. In the flange 75 are stake holes 77 for receiving stakes 78, the holes 77 being wider than the

diameters of the stakes to permit play. The stakes 78 are driven into the subgrade as illustrated. To support the form to adjusted elevation on the stakes 78, there are provided wedge shaped keys 79 having slots 80 and wedge shaped or inclined flanges 81 adapted to take against the shanks of the stakes 78. The keys 79 are permanently or otherwise secured to the insides of the depending flanges 76 by the use of rivets, bolts or other fastenings 82, which engage in the slots 80 and permit longitudinal movement of the keys 79. The wedge shaped portions 81 come in contact with the stakes 78 when the keys are driven longitudinally, as by tapping the same with a hammer or other appropriate tool. The wedge will bind against the shank of the stake 78 and hold the form to the desired elevation.

Referring to Figure 21, 42 represents the top or wearing course, 43 represents the earth shoulder, 22*b* represents the top form—all as heretofore described; X represents a flexible longitudinal strip, which may consist of any suitable composition—waterproof paper or metal, which is placed against the inside face of the form 22*b*, using substantially the same method as shown in Fig. 16 in my application Serial No. 385,800 filed Aug. 14, 1929, and when the member 22*b* is drawn longitudinally, the strip X is left in place to serve as a separator between the material 42*b* and the earth shoulder 43. This separator will prevent the earth shoulder 43 from absorbing the binder fluid contained in the body 42. After the form has been withdrawn, the strip is left in place, and both the earth shoulder 43 and the wearing course 42 are rolled. The strip X is left in place and serves as a separator and assists in solidifying the wearing surface along the strip, thus producing a denser wearing surface, and preventing the waterproofing or binder fluid from being absorbed by the earth shoulder 43, and at the same time defining a more definite line along the edge of the roadway.

Having thus described the invention, what is claimed as new is:

1. The herein described method for building roads which consists in erecting depressible forms at the sides of the roadway, filling road material between said forms, and pressing down the road material and the depressible forms at the same time.

2. The herein described method for building roads which consists in erecting depressible forms at the sides of the roadway, filling road material between such forms, subjecting the road material and the forms simultaneously to pressure for compacting the road material, and withdrawing the forms longitudinally of themselves.

3. The herein described method for building roads which consists in erecting depressible forms at the sides of the road, banking material against the outsides of the forms, filling road material between such forms, simultaneously rolling the road material and the depressible forms, and withdrawing the forms longitudinally of themselves.

4. The herein described method of constructing roads, which consists of placing a longitudinal form member to define the edge of the roadway, placing a strip longitudinally on the inside face of the form member, placing road material against the strip, and banking the forms on the outside with earth or other suitable material, levelling both materials while both named members are in position and then withdrawing the first named member longitudinally of itself and leaving the strip deposited to separate the two materials.

5. The herein described method for constructing roads which consists in erecting vertically deformed forms at the sides of the road, banking material against the outsides of the forms, and pressing down the road material and the deformed forms at the same time.

6. The herein described method for constructing roads which consists in erecting flexible vertically deformed forms at the sides of the road, banking material against the outsides of the forms, and pressing down the road material and the deformed forms at the same time whereby through said form to positively compact the sides of the road.

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