

March 26, 1940.

H. SCHWART

2,195,015

ROAD SURFACE MAKING MACHINE

Filed June 15, 1934

3 Sheets-Sheet 1

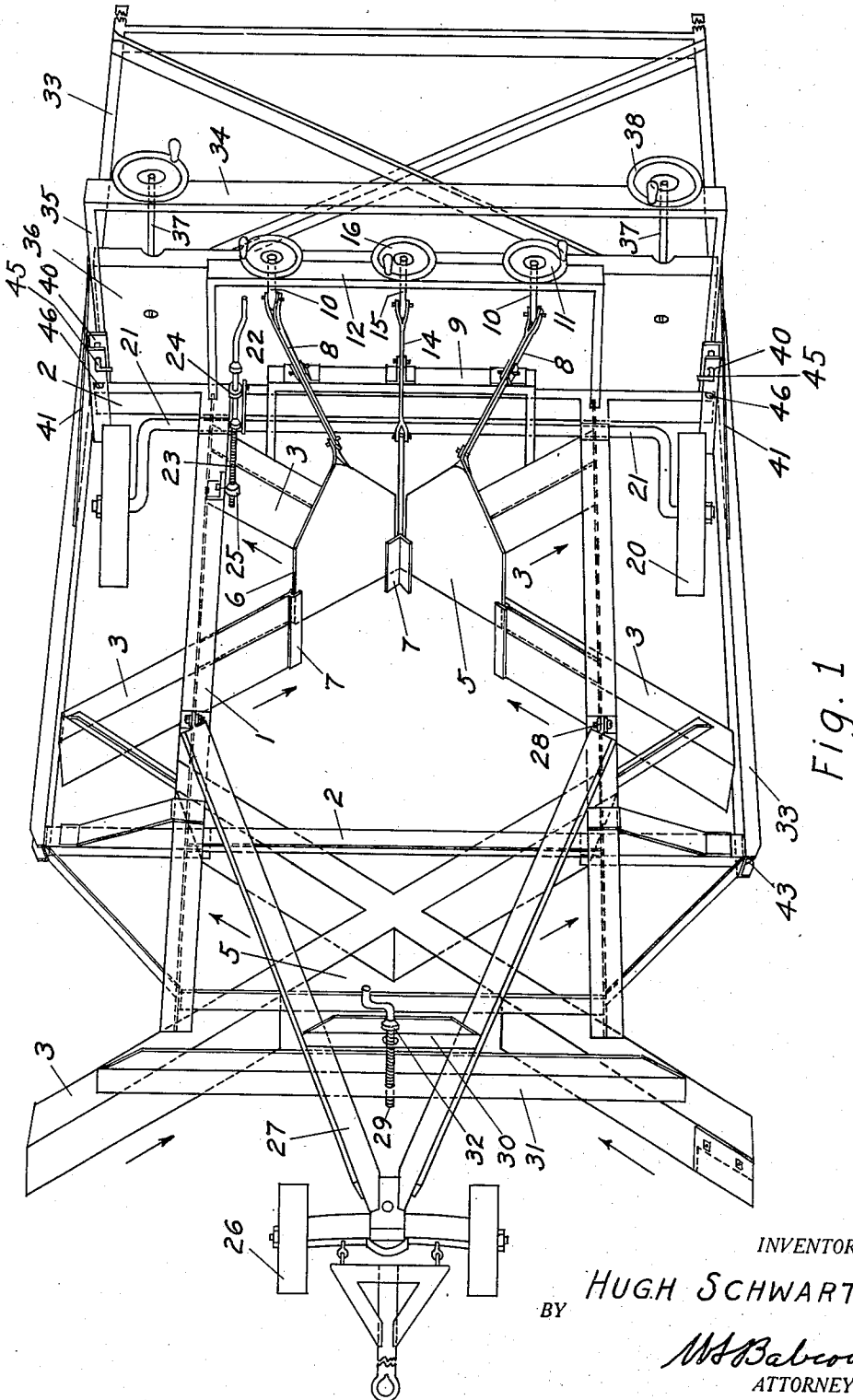


Fig. 1

INVENTOR.

HUGH SCHWART

BY

W. A. Babcock
ATTORNEY.

March 26, 1940.

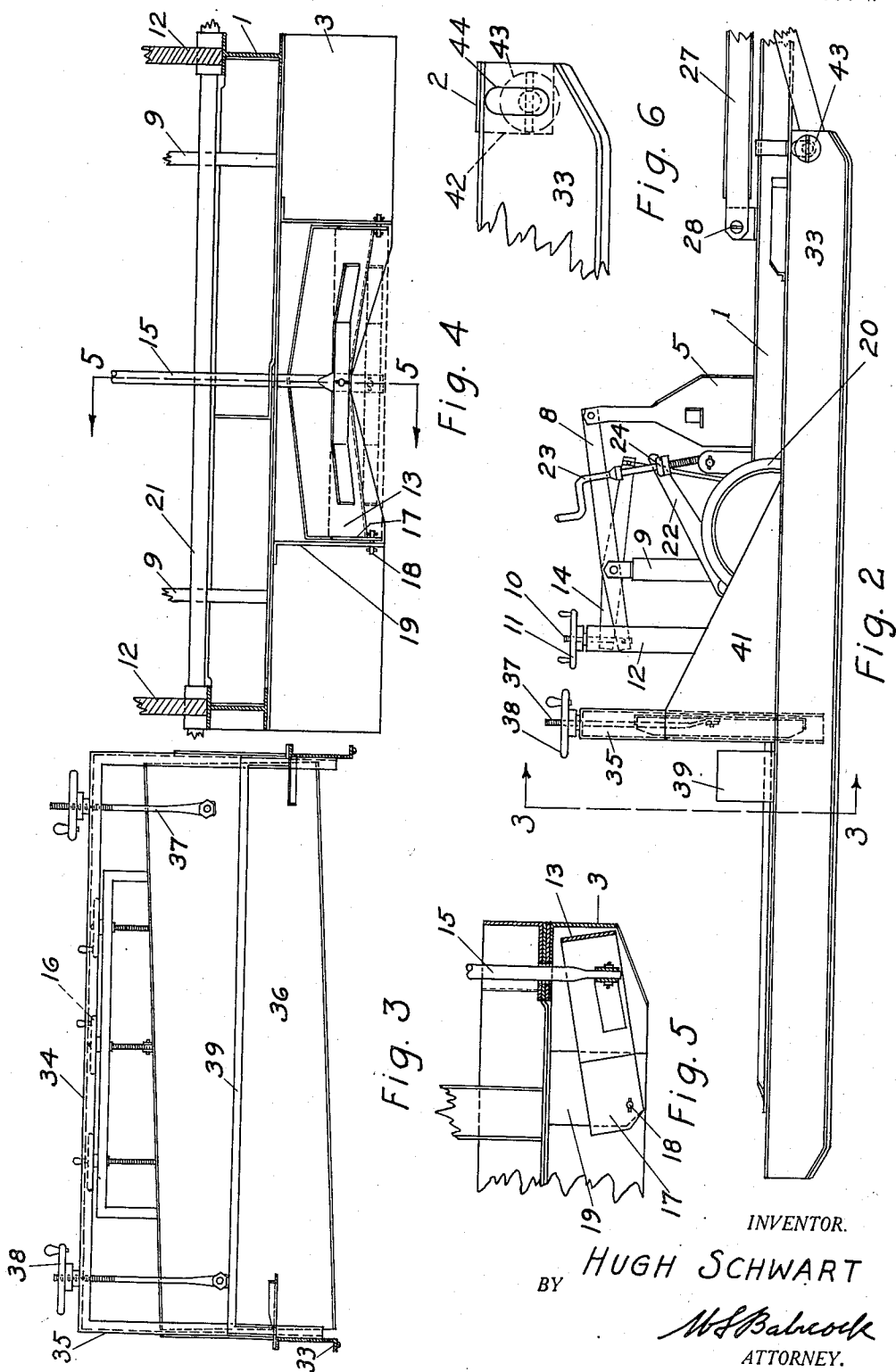
H. SCHWART

2,195,015

ROAD SURFACE MAKING MACHINE

Filed June 15, 1934

3 Sheets-Sheet 2



INVENTOR.

HUGH SCHWART

BY

W. S. Babcock
ATTORNEY.

March 26, 1940.

H. SCHWART

2,195,015

ROAD SURFACE MAKING MACHINE

Filed June 15, 1934

3 Sheets-Sheet 3

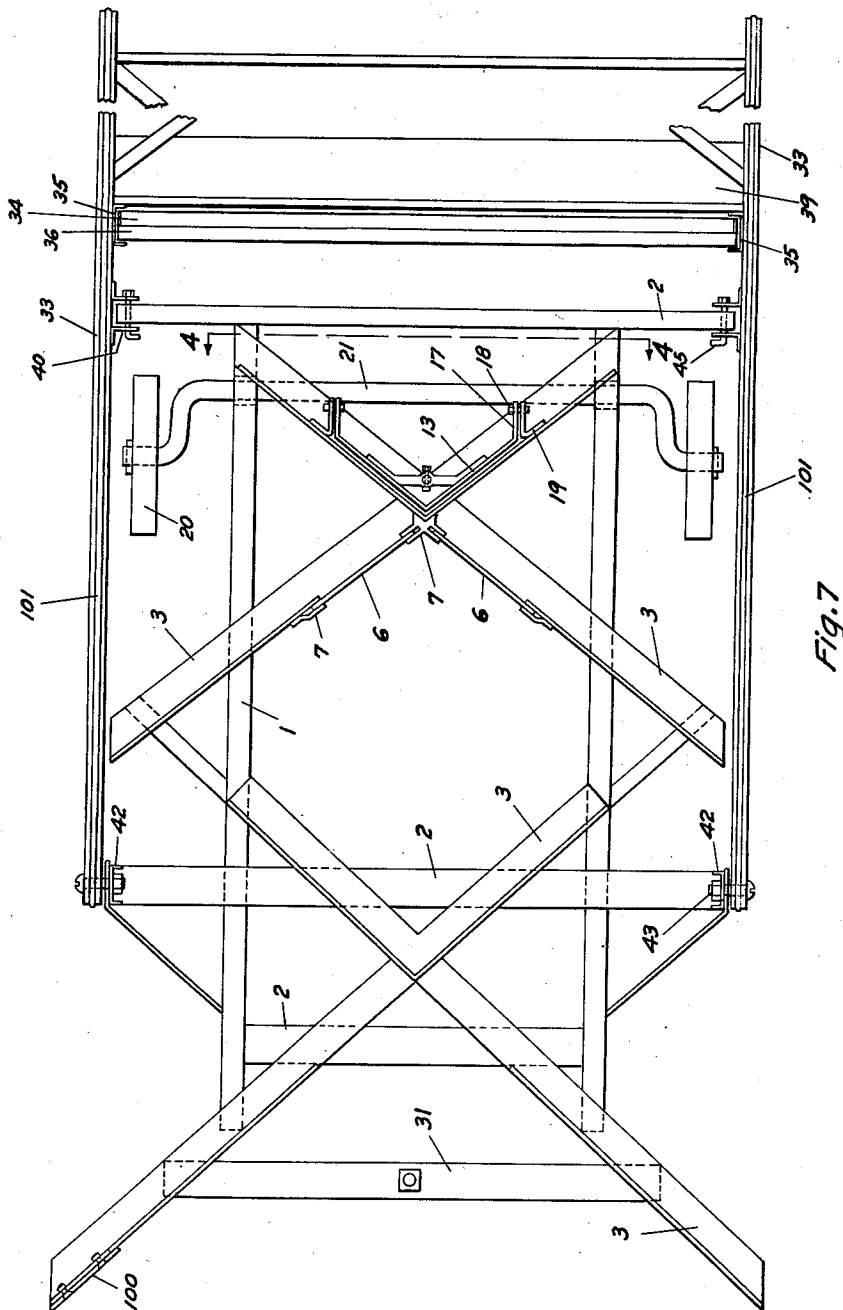


Fig. 7

INVENTOR.

Hugh Schwart

BY

W. B. Babcock

ATTORNEY.

UNITED STATES PATENT OFFICE

2,195,015

ROAD SURFACE MAKING MACHINE

Hugh Schwart, Chillicothe, Ohio

Application June 15, 1934, Serial No. 730,735

29 Claims. (Cl. 94-44)

The invention to be hereinafter described relates to road surface making equipment.

In general terms, it is a simple combination for simultaneously, continuously, mixing, spreading, distributing, forming, striking-off and finishing a road surface, by a single one-direction traverse thereover. According to best recognized present practice, a machine widely known as a multiple-blade maintainer, is first drawn (by tractor) over the surfacing materials, previously dumped at intervals, to mix them. This action, at the same time, spreads them to a considerable degree. This is a wheeled machine, the wheels of which run on and follow the irregularities of the old surface of the road, during this first operation. It carries a "strike-off" or finishing blade which, during this operation, is raised and inoperative. At the end of this spreading operation, the "strike-off" blade is lowered to its proper desired position or adjustment and the machine retraverses the same surface in the opposite direction, "finishing" the surface. This is the minimum travel—two trips over the entire surface. Frequently, as many as four trips are required, depending on the particular circumstances. The necessity of this return trip makes it impossible to use quick-setting high viscosity material. The material, therefore, must not "set-up" too quickly. It must be sufficiently slow setting to be thoroughly workable on the return or finishing trip. Otherwise the "strike-off" blade would simply tear large patches from the partially set surface and ruin even what had been done. So, in all cases in which the machine or equipment must make more than one traverse to finish the work, the degree of viscosity is limited. This lowered viscosity, in turn, requires traffic detours, because automobiles, etc., would immediately cut up the surface, "pick up" and scatter the stone, and coat themselves with the asphalt, etc.

All such wheeled machines, necessarily, rise and fall with or follow the vertical irregularities of the old and worn surface over which they travel. This, necessarily, affects the action of the surface forming elements or members. It is practically impossible for an operator, or even several, to so watch and regulate the various members as to adequately compensate or offset such irregularities. In fact, no thought is given to that. The operators watch general conditions of spread and distribution, to see that the material does not pile too thickly in one place or not thickly enough in another, as far as is practical.

In resurfacing, it is general practice, as much

as is practical, to complete one half the width of a road at a time, so that the other half may remain open to traffic. It is difficult to avoid irregularities where the edges meet along the middle. There is no means of producing, by the machines themselves, a smooth, clean cut, straight and even edge. Consequently, two uneven edges must be brought together and, as far as practical, merged and evened off. Whenever they overlap and wherever they do not fully meet, there will be unevenness. It should be mentioned, at this point, that the spreading elements of the now used machines absolutely must be spaced slightly from the surface of the road over which they travel. The result is that, with best manipulation, some surface material is continually passing outwardly under them and forming a thin ragged edge.

The main objects of the present invention are to overcome the above and other difficulties and draw-backs, and provide a simple, efficient, compact, durable and economical machine, which, in a single passage or traverse over a given road section will mix, spread, distribute, form and finish the surface, requiring only a single operator, working with much greater speed than now possible, capable of using materials of much higher viscosity, and able to produce a finished surface much sooner open to traffic—in fact, immediately open.

In order to more clearly disclose the construction, operation and use of the invention, reference should be had to the accompanying drawings forming part of the present application. Throughout the several figures of the drawings like reference characters designate the same parts.

In the drawings:

Fig. 1 is a top perspective view of the invention;

Fig. 2 is a side elevation reverse to Fig. 1, omitting the forward part of the multiple-blade maintainer;

Fig. 3 is a cross section on line 3-3 of Fig. 2, looking in the direction of the arrows;

Fig. 4 is a cross section on line 4-4 of Fig. 7, looking forward and showing the gate lifting rod 15;

Fig. 5 is a cross section on line 5-5 of Fig. 4, looking rearward;

Fig. 6 is an enlarged fragmentary detail, showing connection between runner or form end and maintainer frame, and

Figure 7 is a bottom plan view of the framework of the two units in assembled relation, omit-

ting all actuating mechanism and the forward wheels, with their crane arm.

While the parts in the different views are in the same approximate general proportions, the different views are on different scales, adapted to clearly illustrate all essential features, as will be readily understood.

In general terms, the invention is a combination of two cooperating equipment units one of which is wheeled and comprises some features already well known in this field, while the other is slidably mounted and operates as a continuously traveling form with adjustable strike-off, the two units cooperating to produce, in a single traverse, a completely finished road surface ready for rolling for immediate traffic use.

This invention, while traversing the old, worn, vertically uneven, road surface, in a single travel in one direction, accurately molds thereover and thereon, an even, uniform-finished surface ready for immediate rolling and, thereafter, immediate traffic use. The roller may follow close behind the invention and traffic immediately behind the roller, thereby doing away with all flag men, now used to keep traffic off the newly finished and unset surface.

As a matter of disclosure, it may simplify the first deal with each of the main parts or elements as a unit and then with the combination of those parts in their cooperation.

The wheeled element comprises, a modified and changed type of what is generally referred to in highway work as a multiple-blade maintainer. Such wheeled machines comprise strong metal frames carrying a plurality of diagonally disposed blades which engage, spread and mix the material. They carry at the rear a "strike-off" blade which "strikes-off" or evens off the surface laid by the machine. One important difference between the standard corresponding equipment and this part of applicant's invention is complete omission of that "strike-off" blade by applicant. Because there is no strike-off blade, the irregular vertical movements imparted by the wheels following the uneven old surface can not affect the new surface. Another is several new functions performed by the rear cross bar of the maintainer. Another difference is several new functions performed by the forward part of the maintainer frame. Other differences are several new functions performed by a new combination of gates carried by the maintainer frame. The above and other features will be brought out in detail hereinafter. The frame of the wheeled unit or element is of usual and ordinary construction, including longitudinal beams 1 and lateral beams 2. They may be H, I, T, or angle beams or any other suitable construction, suitably braced at any point desired. They are connected together in any acceptable manner. This frame carries, from its under side, a number of mixing, spreading and distributing blades 3, securely and solidly fastened in any desired manner to the underside of the frame. They extend forward to a considerable distance beyond the sides of the frame, but rearwardly, they end at the opposite outer longitudinal frame member. Preferably, each blade extends diagonally across the entire width of the frame and projects beyond the outer side members, only at its forward end. In the arrangement illustrated, there are four such blades, though there may be more. The preferred disposition is in pairs, those of each pair being spaced apart and parallel and extending diagonally rearwardly from the same side

of the frame, so that each blade of one pair intersects a blade of another pair. The point of intersection is at the approximate center, longitudinally, of the frame i. e. the longitudinal center line. The rear end of each of the blades terminates at its connection with the opposite outside frame member. The rear end of each forward blade, if projected, would intersect the forward end of a rear blade at a short distance from the forward end of the rear blade. This leaves a gap or opening rearwardly and inwardly or around the end of one blade and along the face of the other. The end wall or edge of each forward blade is cut, bevelled or inclined downwardly and inwardly, giving a wider opening at the bottom than above. At the point of intersection, each blade is cut out forwardly from the intersection to provide a considerable opening, that part of the blade rearwardly of the intersection remaining intact. As to the two forward blades, this provides a forwardly opening V of funnel having openings through its top or angle in combination with a rearwardly opening V of solid walls with its angle mid-way between the openings of the other V and presenting a spreading wedge at that point.

The rear blades are provided with openings similar and similarly disposed to those of the forward blades. Being the last set of blades, the distribution of the mixed material should be regulated at this point. For that purpose, vertically sliding control gates 6 are mounted in suitable guides 7 at the edges of the openings. The upper end of each gate is connected by loose pivot or sliding pivot, in well known manner, to a lever 8 suitably fulcrumed on a bracket or frame 9 mounted, in any usual and well known manner, on the rear blades or other stationary part. Each lever is actuated by a threaded rod 10 provided with a hand wheel or like means 11, and suitably mounted, in any well known manner, on a frame 12 carried on the rear of the frame of the wheeled unit. Thus, each gate 6 may be raised or lowered independently of the other and the material directed more or less toward one side or the other, as desired. Adjustment of those gates, assuming the rear half of each rear blade to remain its full vertical measurement, as do the rear halves of the forward blades, will produce a simple flat surface. However, it may be desired to carry an excess of material along the center of the surface being travelled so as to spread the material in a slightly convex or other cross action top surface, permitting the desired material at the center, as finally finished. To provide for that, each rear blade is cut away rearwardly and downwardly, leaving a triangular space of greater vertical measurement at the intersection of the blades and decreasing to zero toward the rear outer end of each blade. The two spaces merge or abut at the intersection so that, together, they provide a very shallow cone or conical space directly in the rear of the gates 6 and blade intersection. This conical space is controlled by a gate 13, operated in the same way as gates 6, by a lever 14, rod 15, and hand wheel 16. Gate 13, however, is shaped, designed, and mounted to control the single continuous space. A simple and practical construction is a narrow plate somewhat wider than the greatest vertical measurement of the conical space and shaped to fit into the V angle of the rear side of the intersection of the blades. Its rearward ends are offset at an angle inwardly of the V, as at 17, and pivoted, through their

lower corners as at 18, to brackets or like 18 extending at corresponding angles to the blades and in rearward directions approximately parallel with the longitudinal center of the frame.

5 The pivots are so placed, of course, that in swinging about them, the lower edge of gate 13 may come to substantial alinement with the lower edge of the rear part of each of the blades, when completely closed, but will substantially aline
10 with the edge of the cut away portion when the gate is fully open. So, when an increase is material at the center is desired, it is only necessary to raise or open the gate 13 to the desired point. Obviously, other constructions and mountings of
15 gates may be used. It will be noticed that all hand wheels are close together and readily accessible to one operator properly placed.

The rear wheels 20 of this maintainer are journaled on the usual cranked axle 21 which is
20 journaled in suitable bearings on the frame of the wheeled unit 1, at the rear. A crank arm lever 22 fixed to axle 21 is used to rock the axle. By depressing it and bringing the wheels into engagement with the road surface the axle 21
25 is raised, as will be evident; thereby raising the frame and carrying the blades to inoperative position where they will not engage the material. To operate lever 22, a threaded rod 23 with crank handle is provided. It is passed through an eye
30 or the like 24 on the free end of the arm 22 and threaded through a nut 25 carried by a suitable bracket on the frame. Suitable stop nuts may be used, if desired, to limit the operation, in well known manner. The operation is believed to be
35 obvious.

The forward wheels 26 are journaled on an axle swivelled, in well known manner, in the forward end of a crane arm or similar structure
40 27 which is pivoted at 28 to the member 1 at a considerable distance rearwardly of their front ends. This is the draft or pulling connection by which the maintainer is drawn forward. In order to raise the forward end and its blades
45 clear of the surface, a threaded rod 29 is provided. This rod is passed freely through an upper cross bar 30 carried by the crane arm 27 and threaded through a similar bar 31 below
50 30 and carried by the blades of the maintainer or the longitudinal members 1, as may be desired. Rod 29 carries a stop or shoulder 32 which engages arm 30 as rod 29 is operated by a suitable crank. Continued rotation, after such engagement, will raise or lower the forward end of the maintainer, according to the direction of
55 rotation, as will be clear. It will be noticed that the forward ends of the forward blades project appreciably beyond the forward ends of the other blades, for purposes to be later disclosed.

The machine, so far described is capable of
60 mixing, distributing and spreading road materials in usual manner. It comprises features of a multiple blade maintainer. It can not, however, "strike-off" or "finish" the surface. Nor can it give a defined or finished edge or side wall
65 lengthwise of the road.

Next, I shall take up the sliding form unit for molding the surface in one traverse. This is, actually, a slidable molding form with adjustable
70 strike-off blade. It comprises two long travelling forms arranged as runner beams, 33 having their forward ends slightly upturned in sled-runner fashion to pass clear of the surface irregularities and start the free sliding travel of the runners. They are connected in parallel spaced relation
75 by cross members of any suitable and acceptable

construction, between the rear halves of the runners. Preferably, these runners are about twenty feet long to amply bridge a number of small vertical irregularities in the road surface; spaced
5 apart about four inches greater than one-half the width of the road surface to be treated by the machine; and of a vertical height slightly greater than the greatest normal depth of any longitudinal edge to be laid by the machine. At the
10 approximate longitudinal center a vertical frame 34 extends laterally from one form 33 to the other. Its vertical members constitute channeled guides 35 in which is freely slidably mounted a strike-off blade 36, by which the mixed, distributed and spread materials may be struck-off
15 to the exact surface desired, in well known manner. This strike-off blade is vertically adjustable by rods 37 suitably connected to it in any well known manner, one near each end. These rods are extended through the top bar of the
20 frame member 34 and threaded to receive hand wheels 38 by which they may be fed up and down to raise or lower the respective end of the blade. The strike-off ends have sufficient "play" or freedom in the guides 35 to permit either end to be
25 raised the full height, at least, of the form above the opposite end, if desired. This, and the four inch extra width between forms makes it possible for the sliding unit to travel with one runner on the new laid surface and the other on the old,
30 with the strike-off set to mold the surface to an exact even joint with no overlapping or skips. To enable the free outer end of member 3 to absolutely clear the edge of the new-laid surface, when the machine is thus used, either or
35 both said members 3 may be adequately cut away. A removable plate is bolted over the end to make the member 3 continuous except at such times—see Fig. 1, showing one such plate 100.

Directly in the rear of this strike-off is mounted
40 a foot board or walk 39 for the operator in control of the strike-off adjustments.

While the total weight of the sliding unit is appreciable, the length of the member 33 so distributes it that the friction is dissipated over
45 the considerable area of each respective runner. Under the heavy side thrusts to which such equipment is continuously subjected, the plain flat surfaces of members 33 would have to depend upon simple contact friction, alone. To better
50 resist these thrusts, each member 33 is provided with a longitudinal rib 101. This rib is in the nature of a rounded rod of semi-circular cross section of small diameter. Preferably it is located about centrally relatively to the width of
55 the respective member 33. It may be of any desired construction and of any suitable material, the construction shown being simple, efficient and economical. This rib presents a line contact which sufficiently "bites" into the old road surface to act as an efficient anchor against side-
60 slipping or skidding. On the other hand, the upturned ends of members 33 provide an easy entrance for it into the road surface. It is an anchoring means counteracting lateral thrusts
65 and preventing side slipping.

The present invention comprises, especially, the cooperative combination of the two units hereinbefore described, by which combination, a simple single equipment may produce a finished
70 road surface ready for traffic in a single traverse in one direction, with the use of fewer men, in much less time, and with materials of much higher viscosity.

In combining these units there is no strike-off 75

blade carried by the wheeled unit. It no longer performs that function. The only strike-off is carried by the sliding form unit. It is at the longitudinal center of the unit. The long forms 33, bridging, as they do, a large number of small vertical irregularities, permit the strike-off to travel uniformly forward, without vertical movement such as would be imparted to it by the wheeled unit. Since the strike-off is at the center, the rise or fall of one or the other end of the form 33, as it moves forward, is so reduced as to become unnoticeable. That can not be said of any strike-off carried by any wheeled unit. In order, in the combination of this invention, that the strike-off may be in proper position to receive the spread materials from the maintainer, or wheeled unit, it is backed in between the forward halves of the forms 33 until the rear ends of its rear blades 3 and the rear cross bar 2, immediately to their rear, is very close to the adjustable strike-off. In fact, the position is such that a single operator on the walk 39 may readily reach across and operate the hand wheels 11 and 16. This makes it possible for one man to manage all adjustments of all gates and for both ends of the strike-off. This, also, brings the front cross bar 2 just within the front ends of the travelling forms 35. These cross bars 2, front and rear, are substantially equal in length to the lateral distance between forms 33, just sufficiently less to allow free vertical or non-binding play between them and the forms when the maintainer is in position between them, as above stated.

With the maintainer in the operative position as above, it is flexibly yet strongly coupled to the sliding form unit for surface treating operations in such manner that it will be positively drawn forward by and with the maintainer, will be kept in the same identical straight line of travel as that of the maintainer, and will receive and retain within its walls every bit of the material received by the maintainer. Most important, the coupling is such as to completely eliminate all transmission of all vertical movements of the wheeled maintainer, whether front or rear, right or left, or any combination of them, from the wheeled unit to the sliding or travelling form unit, and that is true equally well when the maintainer is travelling on its blades, as is often the case, in operation as a drag. The maintainer, during operation, imparts all of its horizontal movements to the sliding form unit and in substantially parallel relation, but none of its vertical movements. For this purpose, short, spaced, parallel vertical angle plates or bars or other suitable stops or abutments 40 are provided. They are, preferably, secured to retaining walls 41, hereinafter more fully described. They are spaced to just permit free vertical travel between them of the ends of the rear cross bar 2 of the maintainer. Consequently, with the bar 2 in operative position between them, forward movement of the maintainer, by engagement of the bar with the forward abutment 40, compels forward travel of the sliding unit by and with the maintainer. Obviously, however, either end or both ends of the rear bar 2 may rise or fall, between the abutments 40, according to all inequalities and vertical irregularities of the old road surface, freely and at will, with absolutely no effect on the sliding unit. It is a vertically free sliding coupling. The abutments do not need to be long, as the vertical movement of either rear wheel is never very great. So, in assembling, after the maintainer has been backed between the forms 33, its rear end is simply raised until rear

cross bar 2 clears the top of the abutment 40 and it is then moved back a little more and the bar ends dropped between the abutments. Or the front abutments 40 may be made removable in any suitable manner. In that case, they would simply be removed before backing in the maintainer and reattached after the maintainer is in place. In this position, the ends of the front cross bar 2, are just inside and very slightly spaced from the forward ends of forms 33. These ends, preferably, are provided with down-turned extensions 42. Each extension is adapted to receive a coupling bolt 43 which also passes through and has free vertical play in a vertical slot 44, its head, of course, overlapping the slot. Of course, the slot may be in the part 42, and the bolt carried by the form. Also, a short chain or other flexible means may connect the parts. The important object is to so connect the forward ends of forms 33 to the outer ends of the forward cross bar 2 that there may be the same relative freedom of vertical movement between the wheeled maintainer and the sliding unit, at that point, as there is at the rear end of the maintainer. At the same time, a very important function of this forward coupling is to insure proper alignment during operation. This class of equipment operates under heavy strains in various directions. As the equipment is drawn forward by a powerful tractor, the material directed outwardly from the first blades is engaged and held, by the forward ends of the forms 33, until the second blades engage and direct it inwardly again. If the forms had no other connections to the maintainer, forward of the rear coupling, their forward ends would be deflected from the straight course, by such engagement and they would twist about the rear coupling. The invention, in all probability, would soon be rendered inoperative and useless. In actual use, the bolt and slot have been proven very acceptable and satisfactory. It completely eliminates all possible outward deflection of the forward ends of the forms 33, and possible consequent twisting at the rear coupling. A very short chain or the like would be almost as acceptable—a second choice. It would restrict or limit the lateral twisting movement to a sufficient degree for practical operation, though the result would not be quite so good as with the bolt and slot coupling. Similarly, a strong coil spring could be used in the same place.

It will be seen that the combination of wheeled maintainer and sliding form unit cooperates as a single piece of equipment, the maintainer pulling the sliding form in a direct forward travel, preventing all excessive lateral deflection of the forms, and eliminating all transmission of vertical movements from the maintainer to the sliding form.

Because of the free vertical movement, relatively, between maintainer and sliding form unit, this combination equipment may operate with one forming member 33 riding on the top surface of the previously finished half of the road, while the other rides on the old surface. The four inches more than one-half road width, of the equipment, previously referred to, allows amply for this, as to lateral spacing of the forms. In that position, the strike-off will have the end toward the center of the road lowered of course, so as to strike-off the surface even with the edge of the previously laid section—so there will be no ridge, seam, or the like, but, instead, a continuous smooth and regular surface. Thus, the strike-off blade will assume somewhat the relative position of Fig. 3.

As this combination equipment is drawn forward, the two forward blades of the maintainer which extend laterally slightly beyond the line of the forms 33, engage the successive piles of materials and simultaneously mix it and draw it in toward the center openings 5 in well known and obvious manner, at the same time leaving an absolutely free and clear way for the molding forms 33. At the center this material meets the wedge formed by the remaining half of each of these forward diagonals. This wedge passes through the heaped, mixed wind-row of material, splits it centrally and deflects it outwardly at each side, further mixing it in doing so. This is the first outward movement of the material. The forward ends of the forming molds 33 extend amply forward to intercept and retain or confine between them any and all material as it comes from this first mixing and outward flow or deflection. In the continued forward movement, the material is engaged by the forward ends of the rear blades which extend to within a very short distance (nearly contact) of the forming molds 33, and is again directed inwardly toward the center, and further mixed, as at first, passing through the opening or space between the rear end of each forward blade and the forward end of the cooperating rear blade, as will be clear. As the equipment proceeds, the material being continually mixed in this way, reaches the gated openings 5 in the rear blades. The single operator on the walk 39 operates gates 6 to direct a greater or less quantity to one side or the other, as advisable, as will be readily understood, the rear portion of each blade engaging and deflecting its respective proportion of the material toward the nearest form 33, as previously explained relatively to the forward blades. The central gate is understood to be down or inoperative. Should increased material at the center be desired, gate 13 will be raised to the desired extent desired by the operator. Assuming no such increased material required at the center, the gate 13 is closed or inoperative, the material, as distributed by gates 6 and deflected by the rear blades will pass through the space between the rear ends of the rear blades and the forms 33 and will be engaged by the strike-off 36 which has been adjusted by the operator to the right height. Here it will accumulate more or less, as in a hopper, being rolled over and over, and more and more thoroughly mixed by the strike-off, as the equipment is drawn forward. The triangular plates 41 serve as side walls of this hopper so that the accumulated mix may not spill over the outer edges of the forms 33. As the equipment is drawn forward, the travelling forms 33 shape or mold the vertical side walls straight and even and the strike-off gives an even flat top face from edge to edge. The result is a perfectly molded half-road surface with straight, regular, even vertical side walls of full depth or thickness, and even, flat, continuous top, regardless of many vertical irregularities of the surface that it covers. From the time that the material is engaged by the two forward diagonals, until it leaves the rear of the equipment, every bit of it is kept wholly and completely between the travelling forms or molds 33 and, in a single traverse, completely and accurately molded to a finished surface with regular full depth, vertical edge walls. The equipment, actually, is a continuously operating, mixing, spreading, distributing, road surface molding apparatus, with adjustments for surface

strike-off and distribution regulation grouped for one-man operation and control.

Because a considerable mass may be accumulated in the hopper portion in front of the strike-off, the machine may stand a considerable time and yet be restarted promptly, which is not so with other machines. This is due to the fact that, though the surface of the mix may stiffen or "set" somewhat, the interior of the mass remains sufficiently viscous and plastic to permit working.

Because this equipment may complete all operations in one traverse, a high viscosity or quick setting binder may be used. In fact, a much higher viscosity may be used than is possible with any machine which makes more than one traverse. The strike-off may not be made after the material has "set" or even partially set, because the surface then tears off in patches. With the high viscosity possible with this equipment, the surface "sets" sufficiently for use by traffic within a few hundred feet behind the apparatus. Obviously, a machine making two or three or more traverses could not operate with such viscosity.

When it is desired to transport the equipment from one location to another, the slidable forms or molding unit, of course, should be raised from the surface and carried free, to eliminate the heavy friction. This is very simply done, by inserting heavy pins or bolts 45 through openings 46 through the angle bars 40 above the ends of the rear cross bar 2. With these pins in place, the lever or crank 21 is operated as previously described, to raise the rear end of the maintainer. That carries the forms or sliding unit up with it. In the same way, the forward end of the maintainer may be raised as previously stated. As the forward end approaches its upward limit, it will carry up the forward ends of the forms 33, in the same way and to about the same extent as bolts 46 raised the central part, the amount of freedom or play in the connections being properly proportioned to permit this. The entire equipment may now be transported on the wheels of the maintainer, with the forms 33 entirely clear of the surface.

It is thought that the construction, operation and use of the invention will be clear from the preceding detailed description.

Many changes may be made in the construction, arrangement and disposition of the various parts of the invention, within the scope of the appended claims, without in any degree departing from the field of the invention, and it is meant to include all such within this application wherein only a preferred form has been illustrated by way of example and with no intention to, in any degree, limit the invention thereby.

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

1. A road surface making machine comprising a frame, material distributing members carried thereby and arranged diagonally relatively to the longitudinal center line of the machine, said members being disposed at intervals longitudinally of said frame, arranged in sets, each set being inclined oppositely relatively to the others and the members of one set intersecting the members of the other set approximately at the longitudinal center line of the frame, every member being provided with an opening therethrough immediately in advance of its intersection, the two rear members having a common opening therethrough at their intersection, gates regulat-

ing the size of openings through the two rear members immediately in advance of the intersection to control the amount of material directed toward the respective side of the machine, a single centrally disposed gate regulating the opening through said two rear members at their intersection to control the amount of material passing centrally through the machine, and means for operating said gates.

2. A road surface making machine comprising a frame, material distributing members carried thereby and arranged diagonally relatively to the longitudinal center line of the machine, said members being disposed at intervals longitudinally of said frame, arranged in sets, each set being inclined oppositely relatively to the other and the members of one set intersecting the members of the other set approximately at the longitudinal center line of the frame, every member being provided with an opening therethrough immediately in advance of its intersection, the two rear members having a common opening therethrough at their intersection, gates regulating the size of openings through the two rear members immediately in advance of the intersection to control the amount of material directed toward the respective side of the machine, a single centrally disposed gate regulating the opening through said two rear members at their intersection to control the amount of material passing centrally through the machine, forming members slidably mounted at each side of said frame and confining and molding the material therebetween to produce a finished road surface, and means for operating said gates.

3. A road surface making machine comprising a frame, material distributing members carried thereby and arranged diagonally relatively to the longitudinal center line of the machine, said members being arranged at intervals longitudinally of said frame, arranged in sets, each set being inclined oppositely relatively to the other and the members of one set intersecting the members of the other set approximately at the longitudinal center line of the frame, every member being provided with an opening therethrough immediately in advance of its intersection, the two rear members having a common opening therethrough at their intersection, gates regulating the size of openings through the two rear members immediately in advance of their intersection to control the amount of material directed toward the respective side of the machine, a single centrally disposed gate regulating the opening through the two rear members at their intersection to control the amount of material passing centrally through the machine, forming members slidably mounted at each side of said frame and confining and molding the material therebetween to provide a finished road surface, a strike-off carried by said forming members in the rear of said diagonal members, and means for operating said gates.

4. A road surface making machine comprising a frame, material distributing members carried thereby and arranged diagonally relatively to the longitudinal center line of the machine, said members being disposed at intervals longitudinally of said frame, arranged in sets, each set being inclined oppositely relatively to the other and the members of one set intersecting the members of the other set approximately at the longitudinal center line of the frame, every member being provided with an opening therethrough immediately in advance of its intersection, the two rear members having a common opening therethrough at

the intersection, gates regulating the size of openings through the rear members immediately in advance of their intersections to control the amount of material directed toward the respective side of the machine, a single centrally disposed gate regulating the opening through said two rear members at their intersection, to control the amount of material passing centrally through the machine, forming members slidably mounted at each side of said frame and confining and molding the material therebetween to produce a finished road surface, a strike-off carried by said forming members in the rear of said diagonal members, means for adjusting said strike-off to accurately match adjoining road surface edges, and means for operating said gates.

5. A road surface making machine comprising a frame, material distributing members carried thereby and arranged diagonally relatively to the longitudinal center line of the machine, said members being disposed at intervals longitudinally of said frame, arranged in sets, each set being inclined oppositely relatively to the other and the members of one set intersecting the members of the other set approximately at the longitudinal center line of the machine, every member being provided with an opening therethrough immediately in advance of its intersection, the two rear members having a common opening therethrough at their intersection, gates regulating the size of the openings through the two rear members immediately in advance of their intersections to control the amount of material directed toward the respective side of the machine, a single centrally disposed gate regulating the opening through said two rear members at their intersection to control the amount of material passing centrally through the machine, forming members slidably mounted at each side of said frame and confining and molding the material therebetween to produce a finished road surface, vertically free sliding traction connections between said frame and said forming members compelling horizontal travel of said forming members with said frame, and means for operating said gates.

6. A road surface making machine comprising a frame, material distributing members carried thereby and arranged diagonally relatively to the longitudinal center line of the machine, said members being disposed at intervals longitudinally of said frame, arranged in sets, each set being inclined oppositely relatively to the other and the members of one set intersecting the members of the other set approximately at the longitudinal center line of the frame, every member being provided with an opening therethrough immediately in advance of its intersection, the two rear members having a common opening therethrough at their intersection, gates regulating the size of openings through the two rear members immediately in advance of their intersection to control the amount of material directed toward the respective side of the machine, a single centrally disposed gate regulating the opening through said two rear members at their intersection to control the amount of material passing centrally through the machine, forming members slidably mounted at each side of said frame and confining and molding the material therebetween to produce a finished road surface, connections between said frame and said forming members limiting the relative lateral movement between them, and means for operating said gates.

7. A road surface making machine comprising a frame, material distributing members carried

thereby and arranged diagonally relatively to the longitudinal center line of the machine, said members being disposed at intervals longitudinally of said frame, arranged in sets, each set being inclined oppositely relatively to the other and the members of one set intersecting the members of the other set approximately at the longitudinal center line of the frame, every member being provided with an opening immediately in advance of the intersection, the two rear members having a common opening therethrough at the intersection, gates regulating the size of opening through the two rear members immediately in advance of their intersection to control the amount of material directed toward the respective side of the machine, a single centrally disposed gate regulating the opening through said rear members at their intersection to control the amount of material passing centrally through the machine, forming members slidably mounted at each side of said frame and confining and molding the material therebetween to produce a finished road surface, vertically free sliding traction connections between said frame and said forming members compelling horizontal travel of said forming members with said frame, connections between said frame and said forming members limiting relative lateral movement between them, and means for operating said gates.

8. A road surface making machine comprising a slidable road surface molding unit having spaced parallel runners of a length sufficient to simultaneously bridge a plurality of road surface irregularities, a strike-off carried by said runners at their approximate longitudinal centers, means for adjusting said strike-off vertically, a material distributing unit disposed between said runners extending forwardly from said strike-off, extending from said strike-off forwardly and laterally beyond the forward ends of said runners to intercept and spread material in advance of said runners, one of such laterally extended parts being vertically cut away and having a removable filler plate, said distributing unit extending laterally between said runners approximately from one runner to the other and intercepting and distributing all material passing between said runners, rear and front lateral beams carried by said distributing unit and, respectively, extending laterally substantially from one runner to the other immediately in advance of the strike-off and between the forward ends of the runners and preventing lateral movement between said units, connections between the forward ends of said runners and said front beam, and vertically free-moving traction connections between said rear beam and said runners compelling forward movement of said forming unit with said distributing unit.

9. A road surface making machine comprising a slidable road surface molding unit having spaced parallel runners of a length sufficient to simultaneously bridge a plurality of road surface irregularities, a strike-off carried by said runners at their approximate longitudinal centers, means for adjusting said strike-off vertically, a material distributing unit disposed between said runners, extending forwardly from said strike-off and having two centrally disposed and oppositely laterally directed material openings and a single centrally disposed and rearwardly directed material opening, a separate regulating gate for each laterally directed opening and a single gate for said rearwardly directed opening, said distributing unit extending from said strike-

off forwardly and laterally beyond the forward ends of said runners to intercept and spread material in advance of said runners extending laterally between said runners approximately from one runner to the other and intercepting and distributing all material passing between said runners, rear and front lateral beams carried by said distributing unit and, respectively, extending laterally substantially from one runner to the other immediately in advance of the strike-off and between the forward ends of the runners and preventing relative lateral movement between said units, flexible connections between said forward lateral beam and the forward ends of said runners, and abutment plates carried by said runners immediately in advance of the aforesaid strike-off and engaged by the ends of the rear lateral beam to compel forward movement of said forming unit with the distributing unit.

10. A road surface making machine comprising a slidable road surface molding unit having spaced parallel runners of a length sufficient to simultaneously bridge a plurality of road surface irregularities, a strike-off carried by said runners at their approximate longitudinal centers, a material distributing unit disposed between said runners, extending forwardly from said strike-off beyond the ends of said runners and laterally, approximately, from runner to runner, said distributing unit comprising two rear blades disposed diagonally of the frame of the distributing unit, intersecting approximately at the longitudinal center line of the unit, extending forwardly from the intersection approximately to the aforesaid runners and terminating rearwardly at a distance from said runners to provide rearward passages for the mixed material, and two forward blades similarly disposed but extending laterally forward slightly beyond and in advance of the forward ends of the runners, and terminating rearwardly at a distance from said runners to provide rearward passages for the mixed material between their ends and said runners, all said blades having forwardly disposed openings adjoining the respective intersections, the rear blades having a single opening extending across the intersection, independently operable gates controlling the respective forward openings in the rear blades, and a single gate controlling the single and rearward opening extending across the intersection of the rear blades, and vertically free moving traction connection between said molding unit and said distributing unit compelling longitudinal movement of said molding unit by and with said distributing unit.

11. Road surfacing equipment comprising an outer unit provided with runners to confine the materials, a strike-off carried by said runners, means for adjusting one end of said strike-off independently of the other, an inner unit provided with material manipulating means, and means carried by said units compelling travel of said units together over a road surface, there being appreciable relative vertical movement between said units.

12. Road surfacing equipment comprising spaced parallel runners to confine the materials and of a length sufficient to simultaneously bridge a plurality of road surface irregularities, and a cooperating unit between said runners and provided with material manipulating means, there being appreciable relative vertical movement between said units.

13. Road surfacing equipment comprising

spaced parallel runners to confine the materials and of a length sufficient to simultaneously bridge a plurality of road surface irregularities, a strike-off carried by said runners and extending transversely from runner to runner intermediate of their ends, and a cooperating unit between said runners and provided with material manipulating means, there being appreciable relative vertical movement between said units.

14. A road surfacing machine for molding a surface layer from material without setting forms along the edge thereof comprising an outer molding unit having runners, said runners being adapted to slide along the surface to be covered and being adapted to serve as side forms to shape the edges of said surface layer, an inner unit cooperating with said outer unit and means carried by one of said units cooperating with means carried by the other of said units and compelling travel of said units laterally and longitudinally together while permitting appreciable relative vertical movement therebetween, there being appreciable relative vertical movement between said units.

15. A road surfacing machine for molding a surface layer from material without setting forms along the edge thereof comprising a molding unit having runners, said runners being adapted to slide along the surface to be covered and being adapted to serve as side forms to shape the edges of said surface layer, a material manipulating unit cooperating with said molding unit and moveably engaging said molding unit laterally and longitudinally to compel travel of said molding unit laterally and longitudinally with said manipulating unit, and means preventing lateral twisting of one of said units relatively to the other, there being appreciable relative vertical movement between said units.

16. A road surfacing machine for molding a surface layer from material without setting forms along the edge thereof comprising an outer molding unit having runners, said runners being adapted to slide along the surface to be covered and being adapted to serve as forms to shape the edges of said surface, and a material manipulating unit cooperating with said molding unit, an inner unit cooperating with said outer unit and means carried by one of said units cooperating with means carried by the other of said units and compelling travel of said units longitudinally together while permitting appreciable relative vertical movement therebetween.

17. A road surfacing machine for molding a surface layer from material without setting forms along the edge thereof comprising a molding unit having runners of a length to simultaneously bridge a plurality of surface irregularities and accordingly eliminate vertical movements of said runners relative to the surface being covered throughout the molding operation, said runners being adapted to slide along the surface being covered and to serve as side forms of a continuously travelling mold to shape the edges of said surface layer, a material manipulating unit within said molding units, and means carried by said units compelling travel of said units together over a road surface, there being appreciable relative vertical movement between said units.

18. A road surfacing machine for molding a surface layer of material without setting forms along the edge thereof comprising an outer molding unit having runners of a length to simultaneously bridge a plurality of surface irregularities and accordingly eliminate vertical move-

ments of said runners relative to the surface being covered throughout the molding operation, said runners being adapted to slide along the surface being covered and to serve as side forms of a continuously travelling mold to shape the edges of said surface layer, an inner unit cooperating with said outer unit and means carried by one of said units cooperating with means carried by the other of said units compelling travel of said units together over the road surface while permitting appreciable relative vertical movement therebetween, there being appreciable relative vertical movement between said units, and means for limiting relative vertical movement between said units.

19. A road surfacing machine for molding a surface layer of material without setting forms along the edge thereof comprising an outer molding unit having runners of a length to simultaneously bridge a plurality of surface irregularities and accordingly eliminate vertical movements of said runners relative to the surface being covered throughout the molding operation, said runners being adapted to slide along the surface being covered and to serve as side forms of a continuously traveling mold to shape the edges of said surface layer, an inner unit cooperating with said outer unit and means carried by one of said units cooperating with means carried by the other of said units compelling travel of said units together over the road surface while permitting appreciable relative vertical movement therebetween, there being appreciable relative vertical movement between said units, and means for preventing relative lateral movement between said units.

20. A road surfacing machine for molding a surface layer of material without setting forms along the edge thereof comprising an outer molding unit having runners of a length to simultaneously bridge a plurality of surface irregularities and accordingly eliminate vertical movements of said runners relative to the surface being covered throughout the molding operation, said runners being adapted to slide along the surface being covered and to serve as side forms of a continuously traveling mold to shape the edges of said surface layer, an inner unit cooperating with said outer unit and means carried by one of said units cooperating with means carried by the other of said units compelling travel of said units together over the road surface while permitting appreciable relative vertical movement therebetween, there being appreciable relative vertical movement between said units, means for limiting relative vertical movement between said units and means for preventing relative lateral movement between said units.

21. A road surfacing machine for molding a surface layer of material without setting forms along the edge thereof comprising a molding unit having runners of a length to simultaneously bridge a plurality of surface irregularities and accordingly eliminate vertical movements of said runners relative to the surface being covered throughout the molding operation, said runners being adapted to slide along the surface being covered and to serve as side forms of a continuously traveling mold to shape the edges of said surface layer, means carried by said runners and adapted to engage a road surface to prevent lateral slipping of said runners, and a strike-off carried by said runners.

22. A road surfacing machine for molding a surface layer from material without setting forms

along the edge thereof comprising an outer molding unit having runners of a length to simultaneously bridge a plurality of surface irregularities and accordingly eliminate vertical movements of said runners relative to the surface being covered throughout the molding operation, said runners being adapted to slide along the surface being covered and to serve as side forms of a continuously traveling mold to shape the edges of said surface layer, an inner unit cooperating with said outer unit and means carried by one of said units cooperating with means carried by the other of said units compelling travel of said units together over the road surface while permitting appreciable relative vertical movement therebetween, there being appreciable relative vertical movement between said units, and means for supporting said molding unit on said manipulating unit for transportation.

23. A road surfacing machine for molding a surface layer from material without setting forms along the edge thereof comprising a molding unit having runners of a length to simultaneously bridge a plurality of surface irregularities and accordingly eliminate vertical movements of said runners relative to the surface being covered throughout the molding operation, said runners being adapted to slide along the surface being covered and to serve as side forms of a continuously traveling mold to shape the edges of said surface layer, a material manipulating unit within said molding unit, means carried by said units compelling travel of said units together over a road surface, there being appreciable relative vertical movement between said units, means supporting said molding unit on said manipulating unit and in inoperative position for transportation, and means for raising said material manipulating unit with said molding unit supported thereon.

24. A road surfacing machine for molding a surface layer from material without setting forms along the edge thereof comprising an outer molding unit having runners of a length to simultaneously bridge a plurality of surface irregularities and accordingly eliminate vertical movements of said runners relative to the surface being covered throughout the molding operation, said runners being adapted to slide along the surface being covered and to serve as side forms of a continuously traveling mold to shape the edges of said surface layer, an inner unit cooperating with said outer unit and means carried by one of said units cooperating with means carried by the other of said units compelling travel of said units together over the road surface while permitting appreciable relative vertical movement between said units, there being appreciable relative vertical movement between said units, and material leveling means carried by said molding unit.

25. A road building machine for operating upon material previously applied to the surface to be treated comprising a mixing and spreading unit, a finishing and molding unit, means for connecting both of said units together in such a manner as to permit them to float relative to each other, said mixing and spreading unit including a mix-

ing compartment, means for directing the material into said mixing compartment as the machine advances, said mixing compartment being of less width than the layer of material adapted to be produced by the machine, means for spreading said material laterally as it leaves said mixing compartment, said molding and finishing unit comprising a plurality of longitudinally extending runner members of considerable length which are held in laterally spaced relation and are so disposed as to limit lateral spreading of material produced by said mixing and spreading unit, said runner members carrying a strike-off blade which operates upon material spread by said mixing and spreading unit.

26. A machine of the type described, comprising an outer unit, a screed member mounted on said outer unit, an inner spreading unit, and means for tying said inner unit to said outer unit in such a manner that it may float up and down relative thereto during movement of the machine over the surface to be covered, said means preventing substantial relative lateral movement between said units.

27. A machine of the type described comprising a runner unit embodying parallel runners extending longitudinally of the machine and being of considerable length, said runners being adapted to slide along the surface to be covered, a screed member carried by the runners, said screed member extending transversely of the runners and being disposed substantially at right angles thereto at a point intermediate the forward and rear ends of said runners, and a spreading unit tied to said runner unit in such a manner that it may float up and down relative to the runner unit during movement of the machine along the surface to be covered, and means for preventing substantial relative lateral movement between said units during the floating action.

28. A machine of the type described comprising a runner unit embodying a plurality of runners, said runners being of considerable length and being adapted to slide along the surface to be covered, a screed member carried by said runners, a spreading unit, means for tying both of said units together, said spreading unit being tied to said runner unit in such a manner that it may float up and down relative thereto during movement of the machine over the surface to be covered, said means preventing substantial relative lateral movement between said units.

29. A machine for forming a layer or slab from material without setting forms along the edge thereof comprising a runner unit embodying a plurality of runners, said runners being adapted to slide along the surface to be covered and being adapted to serve as side forms to shape the edges of the layer or slab of material produced by the machine, a screed member carried by said runners, a spreading unit, means for tying both of said units together, said spreading unit being tied to said runner unit in such a manner that it may float up and down relative thereto during movement of the machine over the surface to be covered, said means preventing substantial relative lateral movement between said units.

HUGH SCHWART.