S. F. AUSTIN.

ROAD BUILDING MACHINE.

APPLICATION FILED OCT. 1, 1920.

1,399,681.

Patented Dec. 6, 1921.

3 SHEETS—SHEET 1.

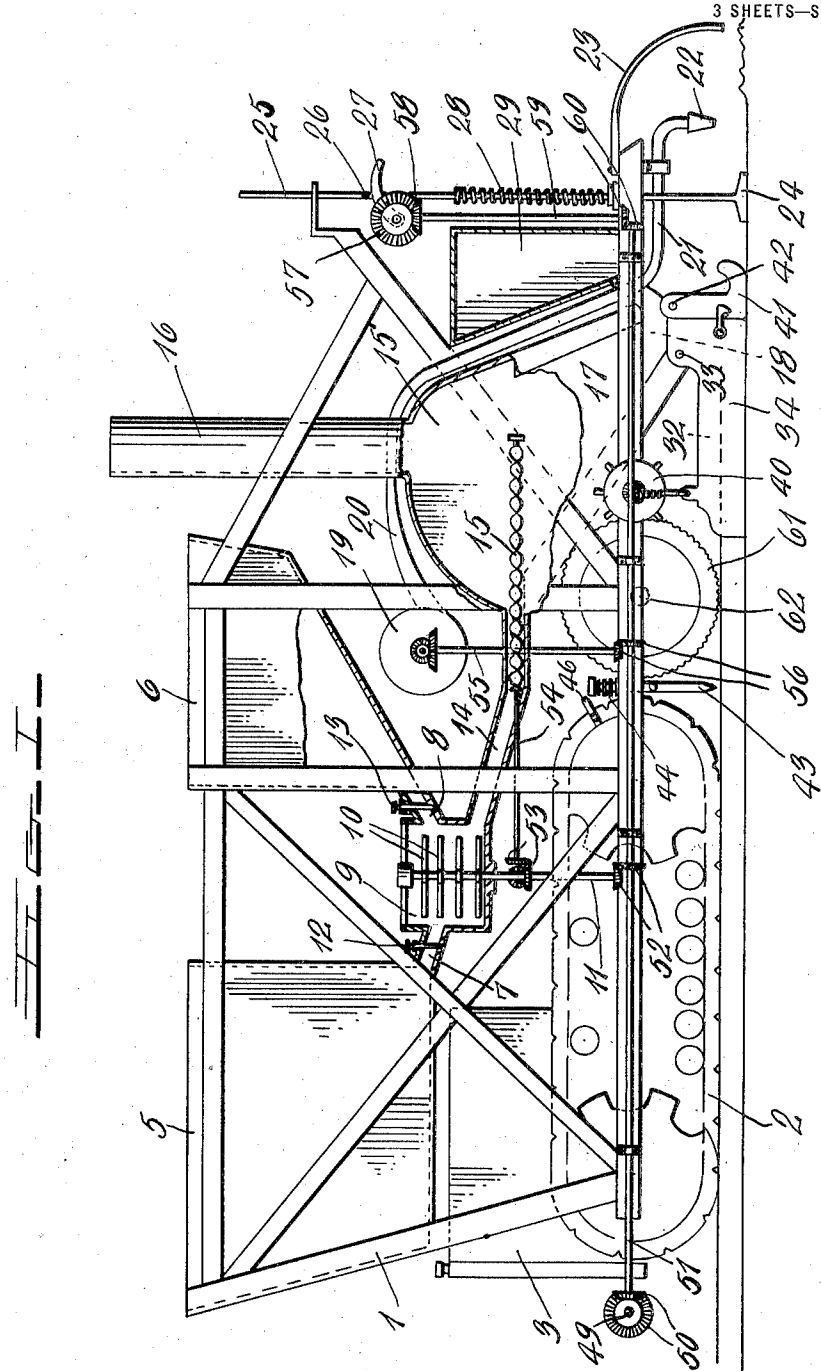

FIG. 1.

Inventor

Stephen F. Austin

By Wilkinson & Giusta.

Attorneys.

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3 SHEETS—SHEET 2.

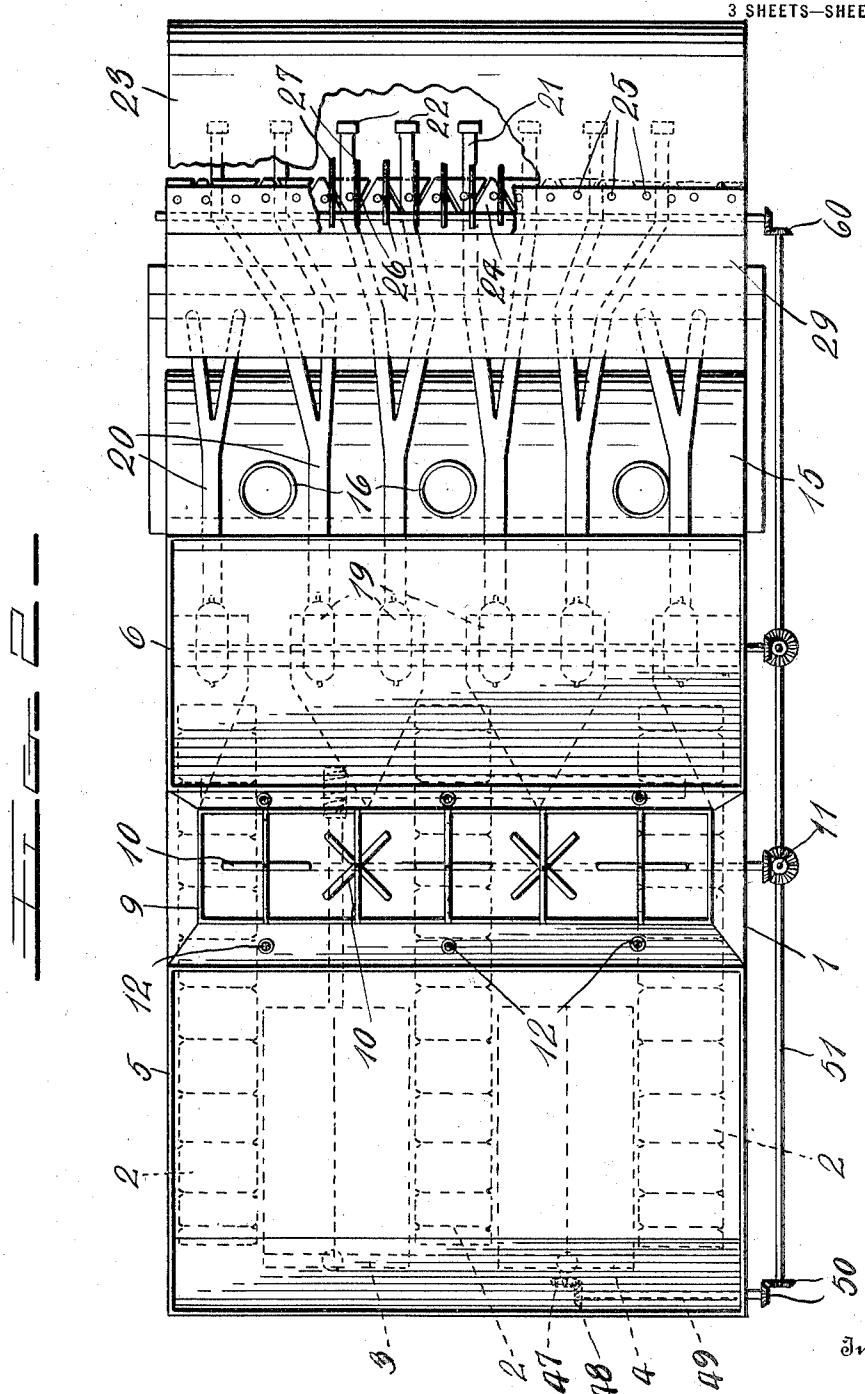

FIG. 2.

Inventor

Stephen F. Austin

By Wilkinson & Giusta

Attorneys

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3 SHEETS—SHEET 3.

FIG. 3

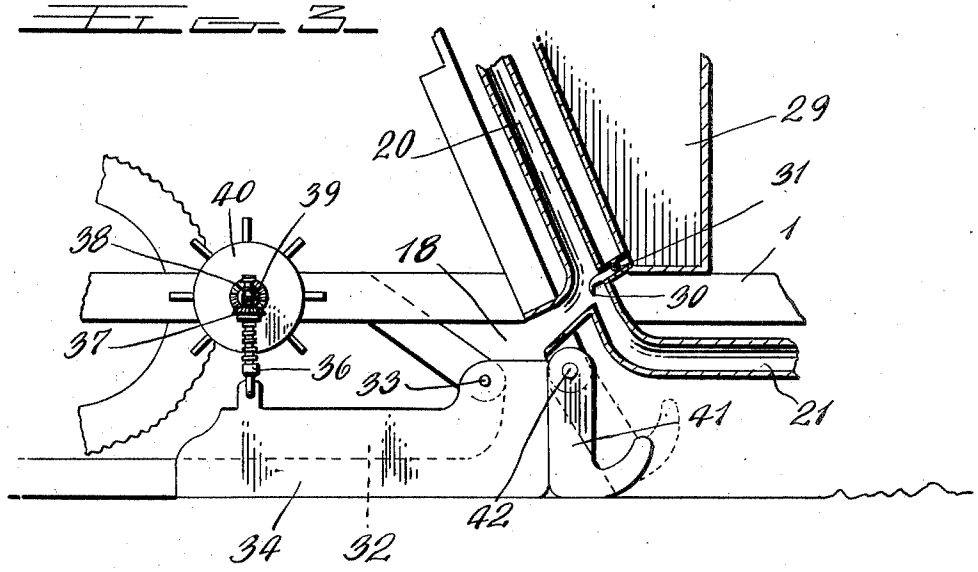
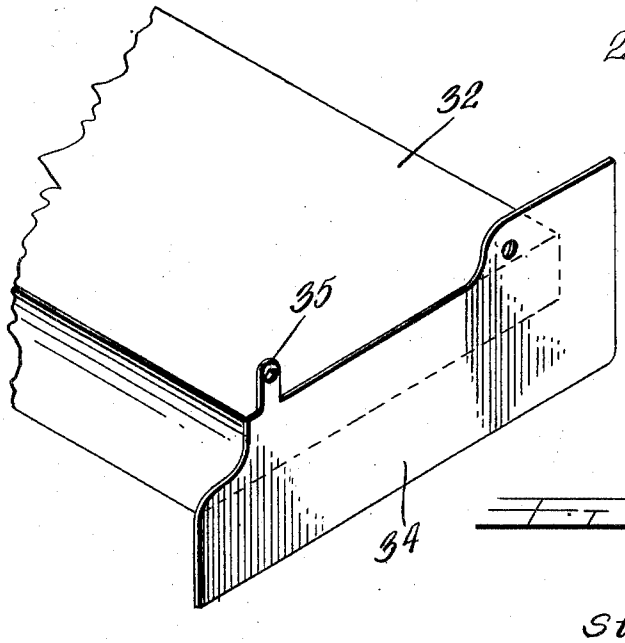


FIG. 4



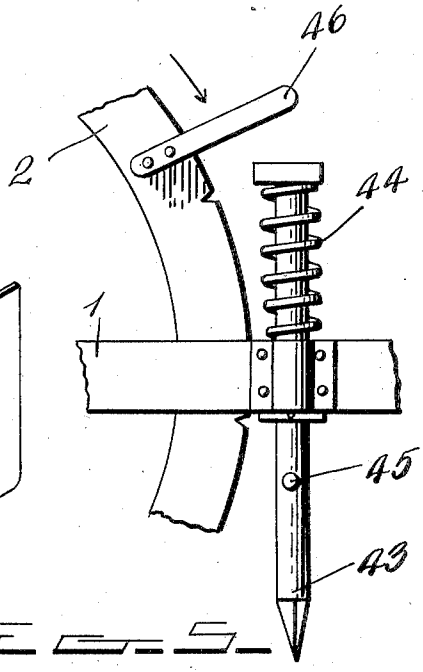


FIG. 5

Inventor

Stephen F. Austin

By Wilkinson & Gusta

Attorneys.

UNITED STATES PATENT OFFICE.

STEPHEN F. AUSTIN, OF SAN ANTONIO, TEXAS.

ROAD-BUILDING MACHINE.

1,399,681. Specification of Letters Patent. Patented Dec. 6, 1921.

Application filed October 1, 1920. Serial No. 413,953.

To all whom it may concern:

Be it known that I, STEPHEN F. AUSTIN, a citizen of the United States, residing at San Antonio, in the county of Bexar and State of Texas, have invented certain new and useful Improvements in Road-Building Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to road building machines, and has for an object to provide a machine the material for which may be drawn from the surface soil of the particular locality in which the machine is operating, and which is adapted to transform this material into a substance of a baked earthen character in a condition in every way desirable for road building purposes.

Another object of the invention is to produce an improved machine in which are grouped the various mechanisms for preparing the road surface, fusing the surface soil and compacting the fused material on to the roadbed, after which it may be cut into blocks or otherwise treated to allow for contraction and expansion.

Another object of the invention is to provide improved steps and processes in a method for building roads which enables me to utilize the surface soil in various localities throughout the country for producing an inexpensive road having excellent tractive qualities.

The invention will be more fully understood after reference to the accompanying drawings, in which like parts are indicated by similar reference symbols throughout the several views, and in which:—

Figure 1 is a view in side elevation, with parts shown in section, of an improved machine for building roads as constructed in accordance with the present invention.

Fig. 2 is a plan thereof, also with certain parts broken away.

Fig. 3 is an enlarged fragmentary view, partly in elevation, and partly in section, showing portions of the furnace, fuel tank and tamping shoe.

Fig. 4 is a fragmentary perspective view of the tamping shoe; and

Fig. 5 is a detail of the cutter operating mechanism.

The drawings show only one embodiment of which the invention is susceptible, and referring more particularly to the same 1 designates generally a framework which is moved along by the action of the caterpillar tractors 2, which may be provided in any suitable number and connected to be driven from one or more engine plants, two of which, designated 3 and 4, being illustrated. Of course other devices than the caterpillar tractors may be employed, but I conceive that such driving mechanism will be more effective and desirable. Inasmuch as they distribute the weight of the various parts of the machine over a relatively great area of the surface of the newly constructed road, and will therefore minimize any tendency to create inequalities in the road surface while the latter is in the process of formation. These tractors will probably be sufficient to support the entire structure of the framework 1 and all of the various groups of mechanisms associated with the machine; but it will be obvious that, if found necessary or desirable in any particular instances, other wheels or forms of support may be added.

The machine is built to receive a material hopper 5 located probably at the rear thereof, and a solid fuel hopper 6 forwardly of the hopper 5. These two hoppers are so related that they may deliver through chutes 7 and 8, respectively, to a mixing tank 9 situated between them, and equipped with agitators 10, in any suitable number and of an appropriate construction.

In the instance shown in the drawings, the agitators 10 comprise horizontally extending beaters rotating from vertically arranged shafts 11, which extend downwardly through the base of the tank 9, and receive gearing by which motion is transmitted to the various agitators. As appears in Fig. 2, the beaters of adjacent agitators are so set that a substantially inter-meshing action occurs as the beaters rotate in order to more thoroughly accomplish the action for which these parts are provided.

Gates 12 and 13 act to control the delivery of the material on the one hand and the solid fuel on the other to the mixing tank 9, and in certain instances later to be described the gate 13 will be fully closed in order that the delivery of the solid fuel may be discontinued. In the latter instance fuel oil will supplant the use of the solid fuel.

The mixing tank 9 is arranged to expel its

product through a chute 14, the material being caught by a screw or other conveyer 15 having one end disposed in the chute and another in a reduction or blast furnace 15′ placed at the forward portion of the machine. The furnace 15′ is of any usual type, being provided with a stack 16 and with a fire chamber 17, beneath which is an opening 18 for the exit of fused material on to the prepared roadbed, and for the introduction of blasts of air furnished by blowers 19 and delivered through conduits 20. The conduits 20 divide at a point adjacent the lower portion of the furnace, and each branch 21 thereof extends forwardly to nozzles 22 which are directed downwardly and are designed to deliver a heated blast against the roadbed. The blast is delivered beneath a hood 23, forming the foremost part of the machine, which hood serves to retain the heat and to provide a confined space in which the roadbed may be put in a fused condition by action of the blasts prior to being treated by the stamps 24 which are located just rearwardly of the nozzles 22. These nozzles and stamps are provided in any suitable number, and as shown in Fig. 2 the stamps are preferably of substantially triangular form, being placed in alternate reverse directions so that they all inter-fit in a single row extending transversely of the machine.

Shafts 25 carry the stamps 24 and are equipped with pins 26, which project in the path of a rotary cam 27. Coil springs 28 act to bring the stamps 24 down against the road surface as soon as the cam 27 becomes disengaged from the pin 26 after raising the same.

A fuel oil tank 29 is placed forwardly of the furnace 15, and has a nozzle 30 extending from its lower end into the divided portion of the blast conduit 20. The action of the blast will in a well known manner serve to pick up the fuel oil from the nozzle 30, by which the blast becomes carbureted and forms an ignitable mixture. A control device 31 is provided for regulating the quantity of fuel oil passing to the nozzle 30, or for shutting it off when its use is not desired.

A tamping shoe 32 extends beneath the furnace and has its forward end pivoted thereto, as indicated at 33. The shoe is composed of a heavy bar of metal, carrying one or more side plates 34 which prevent the lateral sliding away of the surface material. In case the machine is made of sufficient width to encompass the entire road surface, two such plates 34 will be provided at opposite ends of the shoe so that both sides of the road will be effectually retained; but in case it is not advisable to make these machines large enough to lay the complete width of the road, and it becomes necessary to lay the road in sections laterally, then a single plate 34 will be provided which will move along in a path conforming to one side of the road at which the machine is performing its work.

The rear end of the shoe 32 is provided with one or more pins 35 to receive the lower ends of threaded shafts 36 which extend through bevel gears 37. The gears 37 mesh with like gears 38 on horizontally extending shafts 39, which carry the hand wheels 40. These hand wheels 40 preferably are arranged at the side of the machine framework for convenient operation. By turning the wheels in the desired direction, the threaded shafts 36 may be moved vertically up or down in the pinions 37, and consequently the shoe is raised or lowered at its rear end. This device is especially useful in placing the desired degree of compression upon the material.

In front of the shoe 32 is a toe 41, pivoted at 42 to an appropriate portion of the machine, so that it may swing up and forwardly in the manner indicated in dotted lines in Fig. 3. By virtue of the pivot points 33 and 42 the shoe and toe may be caused to diverge apart, giving access to a crow-bar that often is useful in dislodging material from the furnace throat 18 when the same has been allowed to cool.

The toe 41 forms an abutment forwardly of the throat 18 of the furnace, against which the material descending through such throat may engage and be guided as the same is ejected.

One or more knives 43, or other desirable mechanism, is employed for cutting the roadway into sections to allow for expansion and contraction. These knives, as shown in the drawings, are fitted to reciprocate vertically and are held in the upward position by means of springs 44. Pins 45 projecting from the knives are arranged to encounter one or more arms 46 moving with the tractors in the direction indicated by the arrow in Fig. 5. The springs 44 are compressed by the consequent downward movement of the knives 43 through the material of the road surface, and subsequently when disengagement is had between the arms 46 and pins 45 such coil springs will come into effect and restore the knives 43 to the initial upper position. The arrangement is, of course, such as to cause the road surface to be cut at intervals that may be necessary to preserve it intact.

It is not important as to how the various mechanisms are actuated, but for convenience one of the power plants, say 4, may be arranged to drive all such mechanisms. For this purpose the pinion 47 is provided on the shaft of this power plant to mesh with a bevel pinion 48 on a transversely extending shaft 49. Bevel pinions 50 transmit motion from the shaft 49 to a longitudinally extending shaft 51, which serves the various

mechanisms. The shaft 51 and the shafts 11 of the agitation devices are connected through the medium of bevel pinions 52, while bevel pinions 53 cause the driving of the conveyer shaft 54. The blowers 19 are driven by suitable gearing from a vertically extending shaft 55, which is turned through the action of bevel pinions 56. The cam 27 for the stamps rotates with a bevel gear wheel 57, meshing with a pinion 58 on a vertically extending shaft 59, driven in a similar manner from the shaft 51 through the intermediary of bevel pinions 60.

A wheel 61 is journaled on a shaft 62, extending in rear of the shafts 39, and has its periphery resting upon the recently laid surface of the road. The periphery of the wheel 61 is corrugated or roughened in any suitable manner in order to impart to the upper surface of the roadway, before the same completely hardens, a roughened character so as to increase the tractive effect. This roughening of the road surface is particularly desirable, inasmuch as the chemical structure of the same will render it smooth and possibly more favorable to the skidding of vehicles than is desirable in a roadway.

The various steps and processes of the improved method of forming roadways, and the operation of the above described machine, are substantially as follows:—

The machine is driven over the road surface and from time to time the top soil or uppermost stratum of the ground where the machine is operating is resorted to for material, and such material is placed in requisite quantities in the hopper 5. Lignite will probably be placed in the hopper 6 as the solid fuel, although it may be necessary to add quantities of coke thereto in order to secure the requisite high temperature in the blast furnace. However, coke itself, soft coal, anthracite, fuel oil or crude oil will all under appropriate circumstances fulfill the functions equally well.

The gates 12 and 13 are opened to allow desired quantities of the material from the hopper 5 and the fuel from the hopper 6 to enter the tank 9, when they are properly mingled together and discharged through the chute 14 to the conveyer 1, by which such commingled fuel and material reach the blast furnace 15. At the same time the blowers 19 are delivering upwardly through the mouth 18 of the furnace a blast of air necessary to support the combustion of the fuel and required for the fusion of the surface material. As this fusion takes place the melted surface material descends through the throat 18 of the furnace and between the toe 41 and upwardly turning end of the shoe 32. Thus the molten material is directed to the roadbed which has previously been prepared by the action of the blast 22 and stamps 24. The blast 22 heats the roadbed and converts a small top crust of the same into porcelain, glass or analogous material, so that it will resist the action of, and keep out moisture.

The stamps 24 of course form a hardened bed to receive the plastic surface material. As the material descends it is smoothed out by the action of the shoe 32, which tamps it tightly against the roadbed and forms a surface of the requisite density. The shoe 32 is preferably made of sufficient size to retain the heat in the material long enough to allow of its compression to a comparatively great degree. The wheel 61 following the shoe will impose on the surface of the road a corrugated or roughened character, as above referred to, and the knives 43 will cut the road surface into separated blocks, each of itself being capable of expansion and contraction.

Any soil, gravel, sand, clay, etc., may be used as the material for the hopper 5, and, of course, the soils of various localities throughout the country vary in the proportion and presence of these materials and others of analogous character; but the treatment of the same in the blast furnace has the effect to evolve a road material which will probably be in most cases a baked earthen product, although it may in other cases be a porcelain or glass, depending upon the character of the soil where the machine is operating.

The apparatus may also be used without requiring solid fuel inasmuch as the oil in the fuel tank at the forward part of the machine forms a combustible mixture with the air delivered from the blowers which passes the nozzle prior to its entrance up through the throat of the furnace. In case of operation with fuel oil the material is fed in the same way to the furnace but the gate leading from the solid fuel hopper is closed.

I wish it to be understood that I may make various modifications and changes in the steps and processes of the improved method above described, and in the construction of the machine and its manner of operation, without departing from the spirit of my invention, provided such changes and modifications fall within the scope of the appended claims.

Having thus described my invention what I claim and desired to secure by Letters Patent of the United States is:

1. The herein described method of forming roads which consists in preparing a road bed by heating the same to form a crust, then roughening said crust, and subsequently laying a surface carpet on the bed so treated, substantially as described.

2. The herein described method of making roads which consists initially in removing the top soil to provide a road bed, sub-

sequently heating such road bed to form a crust thereon impervious to moisture, roughening said crust and finally laying a surface carpet upon the road bed so treated, substantially as described.

3. The method as herein described for making roads which consists in removing a portion of the top surface of the soil to expose a road bed, directing a hot blast downwardly against the upper surface of the road bed to form a fused crust thereupon, subsequently roughening such road bed with the crust thus formed, and finally laying a surface carpet on the road bed thus produced, substantially as described.

4. The herein described method of building roads which consists in preparing a road bed, laying a baked earthen carpet thereon, and roughening the surface of such carpet, substantially as described.

5. The herein described method of building roads which consists in utilizing the soil of the locality in which the road is being built by fusing the same under a temperature to convert such soil into a baked mass, distributing the mass as a surface carpet on the road to be formed, and imposing on the surface of the said mass a roughened character, for tractive purposes, substantially as described.

6. The herein described method of building roads which consists in mixing portions of hard fuel together with portions of soil, subsequently delivering the commingled product to a blast furnace, fusing in the furnace the soil whereby to convert the same into a substance of a substantially baked earthen character, laying the substance thus formed in the furnace as a surface carpet on the road, and dividing the same at suitable intervals to allow of contraction and expansion, substantially as described.

7. The herein described method of building roads which consists in removing a portion of the top surface to provide a road bed, heat treating the road bed to provide a crust impervious to moisture, stamping the road bed thus treated, mixing soil together with fuel and delivering the same to a blast furnace, fusing the soil in the furnace to provide a baked earthern crust, delivering the crust onto the road bed, imparting a roughened surface to the said crust, and dividing the crust into blocks, substantially as described.

8. A machine for building roads comprising means for heat treating the road bed, stamps adapted to compact the road bed after being heat treated, and means for laying a surface carpet over the road bed so treated, substantially as described.

9. A machine for building roads comprising means for directing a heated blast against the upper surface of a road bed, stamps behind said means for compacting the road bed thus treated, and means behind said stamps for laying a surface carpet on the heated and compacted road bed, substantially as described.

10. A machine for building roads comprising blast nozzles extending transversely across the front end of the machine and adapted to direct heated blasts downwardly upon the upper surface of the road bed, a hood extending about the nozzles, means to compact the road bed thus treated, and means to lay a surface carpet on the heat treated and compacted road bed, substantially as described.

11. A machine for building roads comprising a blast furnace movable along the roadway, means for firing said furnace, means for supplying soil to said furnace to be converted thereby into a fused carpet substance for the roadway, and means for tamping said substance on the roadway as the machine progresses, substantially as described.

12. A machine for building roads comprising a framework, means for moving said framework along the road to be built, a hopper on said framework for containing top soil, a blast furance on the framework adapted to receive the top soil from said hopper, means for firing the furnace, and tamping means for receiving the fused top soil from the furnace and compacting the same into a suitably dense surface carpet, substantially as described.

13. A machine for building roads comprising a blast furnace, means for feeding top soil to said blast furnace to be converted into a baked earthen crust, tamping means for receiving the said crust from the furnace and compacting the same into a surface carpet for the roadway, and means for roughening the upper surface of the carpet, substantially as described.

14. A machine for building roads comprising a blast furnace, means for furnishing top soil thereto, means for firing said furnace, tamping means for receiving the fused top soil from the furnace and for compacting the same into a suitably dense surface carpet, means for roughening the upper surface of the carpet, and means for dividing the carpet at suitable intervals, substantially as described.

15. A machine for building roads comprising a framework, tractors for driving said framework, a blast furnace carried by said framework, a material hopper also carried by said framework, a solid fuel hopper supported by the framework near said material hopper, a mixing chamber located between said hoppers, means for delivering in regulated quantities the material and solid fuel to said mixing chamber, agitators operating in said mixing chamber, a chute plac-

ing said mixing chamber in communication with the furnace, means for furnishing a blast to said furnace, a tamping bar for receiving the material from said furnace and compressing the same, and means for roughening and dividing the road, substantially as described.

16. A machine for building roads comprising a framework, tractors for supporting and driving said framework, a blast furnace on said framework, material and solid fuel hoppers on said framework, a mixing chamber for receiving material and fuel for said hoppers, conveying means for delivering the commingled material and fuel to said furnace, means for supplying a blast of air to said furnace, blast nozzles at the front of the apparatus, a hood covering said blast nozzles, stamps behind said nozzles, a tamping bar hingedly mounted beneath the throat of the furnace, a toe hinged in front of the tamping bar and spaced therefrom, means for adjusting the rear end of the tamping bar, and means for roughening and dividing the roadway, substantially as described.

STEPHEN F. AUSTIN.