Sept. 15, 1925.

1,553,845

F. V. E. BARDOL

ROTARY ASPHALT CUTTER

Filed May 28, 1920

2 Sheets-Sheet 1

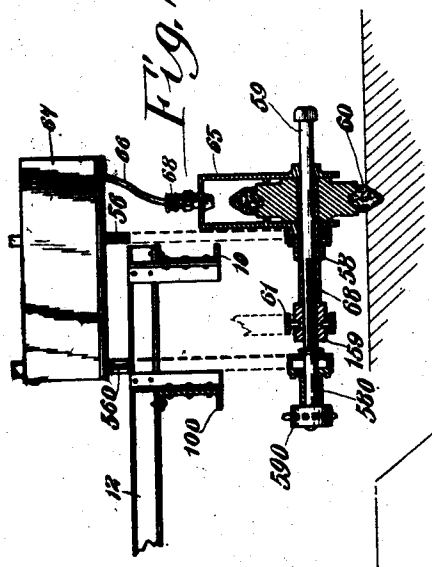


Fig. 2.

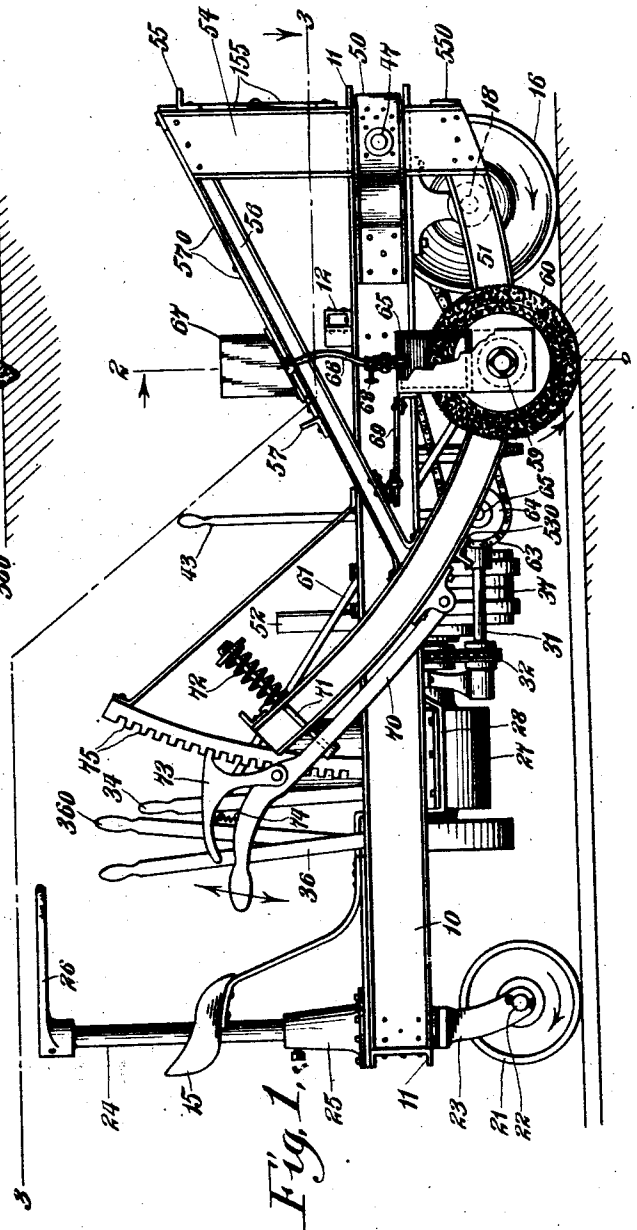


Fig. 1.

Inventor
Frank V. E. Bardol
by Geyer & Popple
Attorneys.

Sept. 15, 1925. 1,553,845

F. V. E. BARDOL

ROTARY ASPHALT CUTTER

Filed May 28, 1920 2 Sheets-Sheet 2

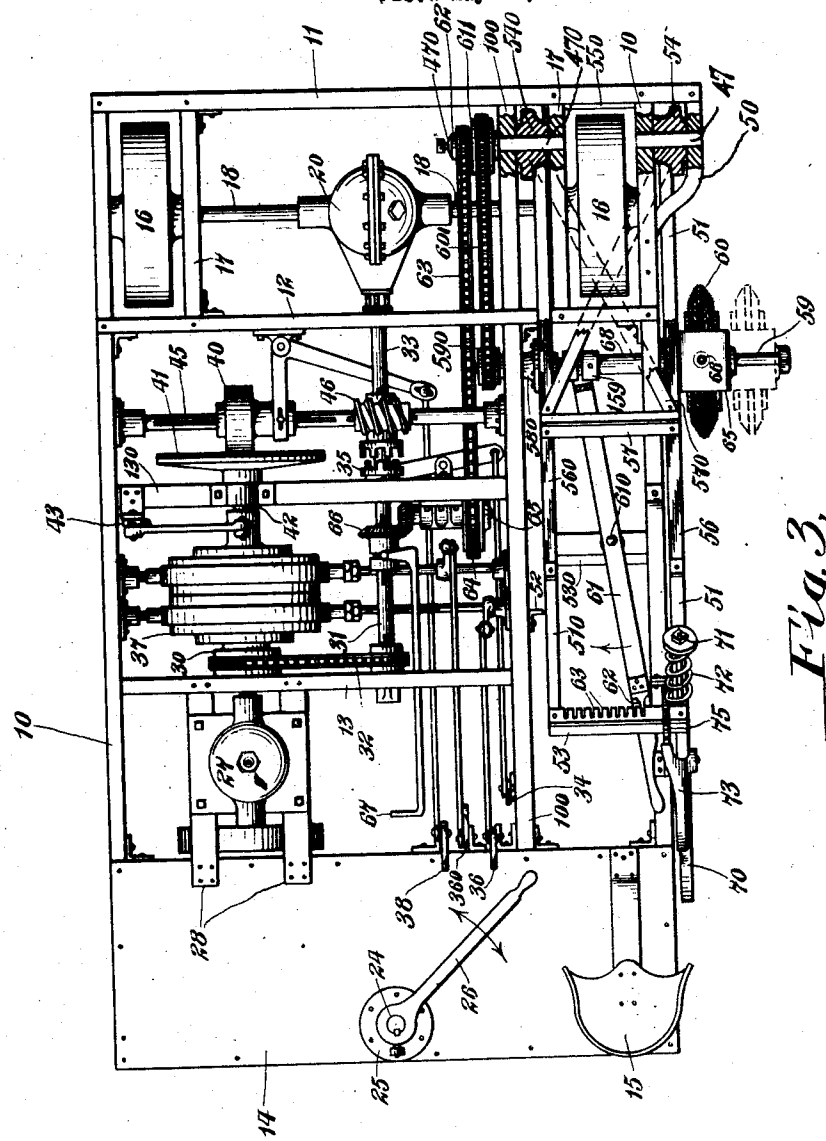


Fig. 3.

Inventor
Frank V. E. Bardol
by Geyer & Popp
Attorneys.

Patented Sept. 15, 1925. 1,553,845

# UNITED STATES PATENT OFFICE.

FRANK V. E. BARDOL, OF BUFFALO, NEW YORK, ASSIGNOR TO BUFFALO EQUIPMENT & CONSTRUCTION COMPANY, INC., OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

## ROTARY ASPHALT CUTTER.

Application filed May 28, 1920. Serial No. 385,044.

*To all whom it may concern:*

Be it known that I, FRANK V. E. BARDOL, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Rotary Asphalt Cutters, of which the following is a specification.

This invention relates to a portable machine for cutting grooves or slits in asphalt street pavements, for the purpose of removing bad parts or worn out patches in the same, preparatory to repairing said patches by filling the same with new asphalt. The machine is also adapted for cutting long, rectangular sections of asphalt pavement preparatory to digging a trench in the same for the purpose of burying water or gas pipes or electric conduits and is also adapted to trim or grind off uneven lumps or protuberances which project from the pavement or the curbing which bounds the same, or from paving stones such as are used adjacent to the street car tracks of municipal street railways.

It is the object of the invention to produce a machine whereby this work may be accomplished quickly, easily, economically and with a minimum expenditure of manual labor.

In the accompanying drawings:

Figure 1 is a side elevation of the complete rotary asphalt cutter. Figure 2 is a fragmentary vertical transverse section thereof taken on line 2—2, Fig. 1. Figure 3 is a horizontal section thereof taken on line 3—3, Fig. 1.

Similar characters of reference indicate corresponding parts throughout the several views.

The working parts of this asphalt cutter are mounted on a wheeled carriage or truck whereby the same may be transported from the plant or storage place to the job where the work is to be done, also from one job to another, and also along the asphalt pavement which is to be cut. The main frame of this carriage may be of any suitable construction but, in its preferred form, the same, as shown in the drawings, comprises three main longitudinal beams or sills 10, 10 and 100 which extend the full length of the machine; two transverse sills 11, 11 which connect opposite ends of the main sills; a comparatively long transverse sill 12 which extends the full width of the machine adjacent to the front end thereof; and a pair of intermediate, shorter transverse sills 13 and 130 which extend across the machine between the intermediate longitudinal sill 100 and one of the side longitudinal sills 10. At the rear end of the machine is preferably arranged a small platform 14 which is suitably bolted to the upper faces of the rear sills and which is adapted to carry the various paraphernalia (not shown), such as the tool box, ignition apparatus, spare engine parts, etc., with which these machines are usually equipped when they go out on a job. This platform also carries a suitable seat 15 upon which the operator sits while operating the machine. The rolling support for this frame preferably comprises two front traction wheels 16, 16, which are comparatively large in diameter and each of which is arranged between the front part of one of the main longitudinal sills 10 and a short, supplemental longitudinal sill 17, each of which extends rearwardly from the front transverse sill 11 back to the intermediate, transverse sill 12. These wheels are both mounted on an axle 18 which is journaled transversely in bearings on the adjacent parts of the respective main sills 10 and auxiliary sills 17 and is centrally preferably provided with a differential gearing 20, so as to permit the whole machine to be moved about with great freedom. Underneath the rear part of the main frame is arranged a steering wheel 21 which is comparatively small in diameter and has its horizontal axle or pintle 22 journaled in bearings at the lower end of a fork 23 which latter is secured to the lower end of an upright steering post or shaft 24. The latter is journaled in an upright bearing 25 on the adjacent part of the main frame and is provided at its upper end with a steering arm or tiller 26 whereby this shaft and the steering wheel 21 may be turned by the operator for directing the course which the wheeled carriage or truck should take over the surface of the ground.

On this frame are mounted the means whereby the carriage may be propelled either forwardly or backwardly and at different speeds for transporting the machine at the most efficient speed from the plant to the job and to different places about the job.

Also mounted on this frame is the mechanism which is adapted to cut or grind off the surface of the asphalt, curbing or roadway. The means for propelling the carriage and controlling its movements may be variously constructed and form no part of the present invention, but as shown in the drawings, these elements are preferably organized as follows:

27 represents a prime mover which is mounted on the rear part of the main frame of the machine on hanger straps 28 whose opposite longitudinal ends are suitably secured to the main frame of the machine. This prime mover preferably consists of an explosive, hydrocarbon engine, although any other suitable motor may be employed for this purpose.

On the main longitudinal driving shaft of this engine is arranged a high speed driving sprocket wheel 30, which drives a high speed jack shaft 31 through a high speed chain belt 32. This jack shaft may be coupled up to the main propeller shaft 33 of the machine by shifting a high speed lever 34 which is adapted to throw a toothed clutch 35 into or out of engagement with a companion toothed clutch mounted on the propeller-shaft 33, this clutch being adapted to be coupled up, for instance, when the whole machine is to travel at high speed from the plant to the job where it is to be employed. Forward slow speed and reverse speed is controlled by a pair of control levers 36 and 360 which are adapted to operate to contract suitable brake bands of a planetary transmission gear housing 37, while the degree of or amount of speed is controlled by a speed control lever 38 which operates to shift a frictionally driven wheel 40 toward or from the axis of a large, disk, friction-driving wheel 41 which is secured to the front, stub shaft 42 of the planetary transmission housing 37. A small, remote lever 43 is pivoted to the main frame of the machine adjacent to this transmission housing 37 and operates to disconnect or unclutch the stub shaft 42 from the transmission when the high speed toothed clutch 35 is in engagement and when also, of course, the friction wheels 40 and 41 are thereby rendered inoperative. When, however, the toothed clutch 35 is disengaged and the remote lever 43 is thrown to its engaged position, then the power is transmitted through the said friction wheels 40 and 41 and thence to a transverse shaft 45 which operates to drive the propeller shaft 33 through the medium of a worm 46, said transverse shaft 45 being suitably journaled in bearings secured to the main frame of the machine.

Journaled transversely on the main frame of the machine at one of the front corners thereof, are a pair of heavy, co-axial cutter frame shafts 47 and 470, the inner cutter frame shaft 470 being supported in bearings secured to the inner supplemental sill 17 and the inner longitudinal sill 100, while the outer cutter frame shaft 47 is supported in bearings secured to one of the outer longitudinal sills 10 and to a supplemental, channel iron bracket 50, whose opposite ends are suitably secured to the front transverse sill 11 and to the said outer, longitudinal sill 10. Pivoted to these co-axial cutter frame shafts 47 and 470 is a cutter frame, which is thereby constrained to swing in a vertical plane relatively to the main frame of the machine.

This cutter frame receives a considerable strain while in use and hence is preferably of box form and suitably trussed to prevent distortion, the same being preferably constructed as follows:

Arranged against the outer side of and close to the adjacent longitudinal sill 10 is an inclined, outer cutter-frame beam 51 which is of curved form, as shown in the drawings. Arranged parallel to this inclined beam 51 is another or companion inclined cutter frame beam 510, which is situated between the said longitudinal outer sill 10 and the intermediate longitudinal sill 100 and is disposed comparatively close to the latter and is guided in its vertical movement by a vertical cutter frame guide 52 which is secured to said sill 100 and bears against the outer face of said inner, inclined beam 510. These two companion inclined beams are transversely tied together and braced by means of an upper, end tie bar 53 and an intermediate lower tie bar 530. To the forward ends of said inclined cutter frame beams 51 and 510 are secured upright struts 54 and 540 which are centrally pivoted to the aforedescribed cutter frame shafts 47 and 470. These upright struts are suitably connected together by upper and lower tie bars 55 and 550, respectively, and are suitably braced or stiffened by diagonal truss bars 155 in a manner common to this form of construction and similar to the manner in which ordinary truss bridges are constructed. The upper extremities of these struts 54 and 540 are connected to the forward upper ends of a pair of inclined brace bars 56 and 560 whose lower rear ends are secured respectively to the upper faces of the cutter frame beams 51 and 510, and are suitably tied together by a transverse tie bar 57 and also provided with suitable truss bars 570 to prevent twisting strains from distorting the cutter frame.

Journaled in bearings 58 and 580 on the main cutter frame beams 51 and 510, as best shown in Fig. 2, is a transversely disposed cutter shaft 59 whose inner end is provided with a sprocket wheel 590. The latter is power driven by a chain belt 601 whose forward turn engages with a comparatively

large sprocket wheel 611 which is journaled on the inner, cutter frame shaft 470, and is thereby arranged co-axially with respect to the whole cutter frame. In other words, the distance between the axes of the sprocket 590 and the large sprocket 611 never changes, irrespective of the position of the cutter frame. Secured in any suitable manner to the comparatively large sprocket wheel 611 is a comparatively small sprocket wheel 62 which is driven by a chain belt 63 whose rear turn engages with a driving sprocket 64. The latter is mounted on a transverse, cutter-driving, stub shaft 65 which is suitably journaled on the main frame of the machine in a transversely disposed suitable bearing block. The inner end of this stub shaft carries a bevel pinion gear which is adapted to engage with a bevel gear 66 that is slidably mounted on the high speed jack shaft 31, said bevel gear 66 being adapted to be thrown into or out of engagement with the said bevel pinion of the stub shaft 65 by means of a cutter operating shift lever 67. When the said shift lever has been moved forwardly into the position shown in the drawings, then power from the prime mover 27 is transmitted to the hereinbefore-mentioned cutter shaft 59, whereas when said shift lever 67 is moved rearwardly, then no power is transmitted to the aforesaid cutter shaft. It is understood, of course, that in the actual machine, every one of the manually operated, power-controlling levers operates to control the flow of power through a friction and not a positive clutch, but, in the drawings, empirical and more graphic clutches or power controlling apparatus are illustrated (as for instance, the shiftable bevel gear 66), inasmuch as these details form no part of the present invention, and the drawings are more easily understood where these details are shown in empirical form.

Slidably splined on the cutter shaft 59 is a cutter sleeve 68 whose inner end is provided with a cutter shift collar 159 while the outer end of said sleeve carries an abrasive cutter or rotatable grinder 60, which is adapted to cut into or grind off the surface of the paving or the curbing upon which it is operating. This cutter is adapted to be adjustably shifted horizontally and longitudinally on the shaft 59 by means of a cutter-shifting lever 61 whose lower bifurcated end is provided with inwardly extending shift studs which engage with the aforesaid cutter shift collar 159. Centrally this cutter-shifting lever 61 is pivoted at 610 to the lower tie bar 530 of the cutter frame, while its upper, rear end carries a tooth or upwardly-extending detent finger 62, which is adapted to engage with any one of a number of transversely disposed teeth of a shifting lever segment 63. The latter is formed on the forwardly extending flange of the upper, rear, tie bar 53 of the cutter frame. The engagement of said detent finger 62 with any one of the teeth of said segment 63 is effected in a resilient manner by reason of the fact that the lower part of said cutter-shifting lever is so connected with the shift collar 159 and with its central pivot 610, that the rear end of said cutter-shifting lever tends constantly to resiliently move upwardly. To disengage said lever, it is merely necessary for the operator to press downwardly upon the rear end of said lever, whereupon he is enabled to move the same transversely one way or the other until he has suitably, transversely positioned the rotatable cutter 60 relatively to the machine proper. The operator then relieves said cutter-shifting lever of its downward pressure, which permits the rear end of the same, by reason of its resilience, to spring upwardly into engagement with a suitable adjacent tooth of the segment 63.

Where the asphalt pavement, which is being cut or ground off, is comparatively hard or granular, the rotatable cutter 60 is preferably, as shown in the drawings, composed of an abrasive material, such as carborundum, coarse sandstone or the like. In very hot summer weather, however, or when the pavement is very homogeneous, soft and sticky, it is preferable to replace the carborundum wheel with a hardened steel, toothed, milling cutter, the peripheral edge of the same being of the same cross section as that of the abrasive wheel shown in the drawings, i. e. of V shaped cross section. But in either case, there is always present the tendency of the asphalt to clog or gum up the cutting edges of the cutter (for the cutting action of the milling cutter is identical with that of the abrasive wheel except as to the size of the cutting tooth). Consequently, it has been found necessary in practice, to meet this condition if the machine is to be used continuously. This is accomplished by enclosing the upper periphery of the rotatable cutter 60 in a hood 65 which is supplied with a small but constant and sufficient amount of naphtha gasoline, kerosene or other suitable hydrocarbon solvent. The latter is supplied to said hood through a flexible tubing 66 whose upper end tubularly connects with the bottom of a storage reservoir 67, the flow of the fluid being regulated by a suitable fluid control valve 68. The whole hood is caused to move longitudinally along the cutter shaft 59, whenever the rotatable cutter is moved, by reason of the fact that the lower part of said hood is slidably journaled on the slide sleeve 68 of said cutter and the lower side walls of said hood bear against the opposite end faces of said cutter. The hood is prevented from any tendency to tip or to move circumferen-

tially with said cutter, by reason of a torque link 69 whose forward end is pivoted to the upper, rear corner of said hood and whose rear end is loosely pivoted to an adjacent portion of the cutter frame.

The whole cutter frame is, as described, capable of a vertical movement relatively to the main frame of the machine. The relative position thereof is adjusted in the following manner:

Pivoted at its front end to the under, rear side of the inclined outer cutter-frame beam 51 is a depressing lever 70, whose extreme rear end is provided with a suitable handle so as to enable the operator of the machine to conveniently either raise or depress the said lever. Passing slidably through the said inclined beam 51 and through the said depressing lever 70, is a bolt 71 whose head bears against the lower face of said depressing lever. A very stiff compression spring 72 is interposed between the nut of said bolt and the upper, adjacent face of the inclined beam 51. Rearwardly of said compression spring, said depressing lever 70 is provided with a T-shaped retaining dog 73 whose lower end or arm is pivoted to said lever and whose rear end or arm is subjected to a resilient upward pressure by reason of a small compression spring 74 which is interposed between said rear arm and the upper face of said depressing lever 70. The tip or the nose of the upper arm of said retaining dog 73 is adapted to engage with any one of a plurality of square-shaped notches of an arcuate, depressing lever segment 75, which is suitably secured and braced to the main frame of the machine.

In operating the machine, the operator steers the same by means of the tiller arm 26 and controls the forward speed and reverse by means of levers 36 and 360, and regulates the amount of the speed by shifting lever 38. For very high forward speeds, as when going to the job from the plant, he couples up clutch 35 by shifting lever 34 and uncouples the planetary transmission by moving the remote lever 43. When he is ready to commence the cutting operation, he shifts lever 67, which causes the rotary cutter 60 to rotate on its axis. If the cutter tends to gum up, he turns the fluid valve 68 and permits a sufficient amount of hydrocarbon solvent from the tank 67 to drip onto the rotary cutter. If he wishes to adjustably move the cutter transversely, he presses upon the rear end of the cutter-shifting lever 61 which causes the same to become disengaged from its toothed segment 63. Then when the said lever has been properly shifted, it automatically returns to engagement with the said segment. The whole cutter frame and rotary cutter are raised or depressed by disengaging the retaining dog 73 and moving the depressing lever 70. When the cut is first being started, the operator is not obliged to press down upon this depressing lever for any considerable period. Instead he forcibly pushes downwardly the depressing lever 70 against the pressure of the spring 72 and then allows the dog 73 to snap into an adjacent notch of the segment 75. This will cause the downward pressure on the rotary cutter to be maintained so long as the stored-up pressure in the said spring 72 lasts. The curved frame beam 51 is restrained against lateral movement by engagement of this beam with the adjacent longitudinal sill 10 of the main frame of the machine. Where the pavement is very soft and sticky but without an excessive amount of sand or grit embedded therein, it is desirable to replace the rotary grinder by a toothed milling cutter. In either case, however, the cut made in the pavement is of V shape, so that the clogging of the cutter is reduced to a minimum. It is obvious also that this machine may be used, not only for cutting slits in the pavement, but also for trimming or grinding off rough knobs, corners of protuberances which project either from the pavement or from the curbing which bounds the pavement or from such cut stones as are commonly employed next to the rails of city street car tracks. Where the machine is to be used as a cold surfacer (that is to dress down or smooth the finished street) it is of course preferable to use a much wider abrasive wheel than that shown in the drawings, which is only suitable for removing comparatively small protuberances.

I claim as my invention:

A rotary asphalt cutter comprising a portable chassis, a cutter frame, a cutter shaft journaled thereon, a power driven rotatable cutter longitudinally slidable on said cutter shaft, a hood which receives a portion of the periphery of said cutter and which is arranged to move longitudinally with said cutter, a torque link pivoted at opposite ends to said hood and to the cutter frame, and means for supplying said hood with liquid.

FRANK V. E. BARDOL.