July 7, 1953 C. A. LOWE 2,644,379

PAVING MACHINE

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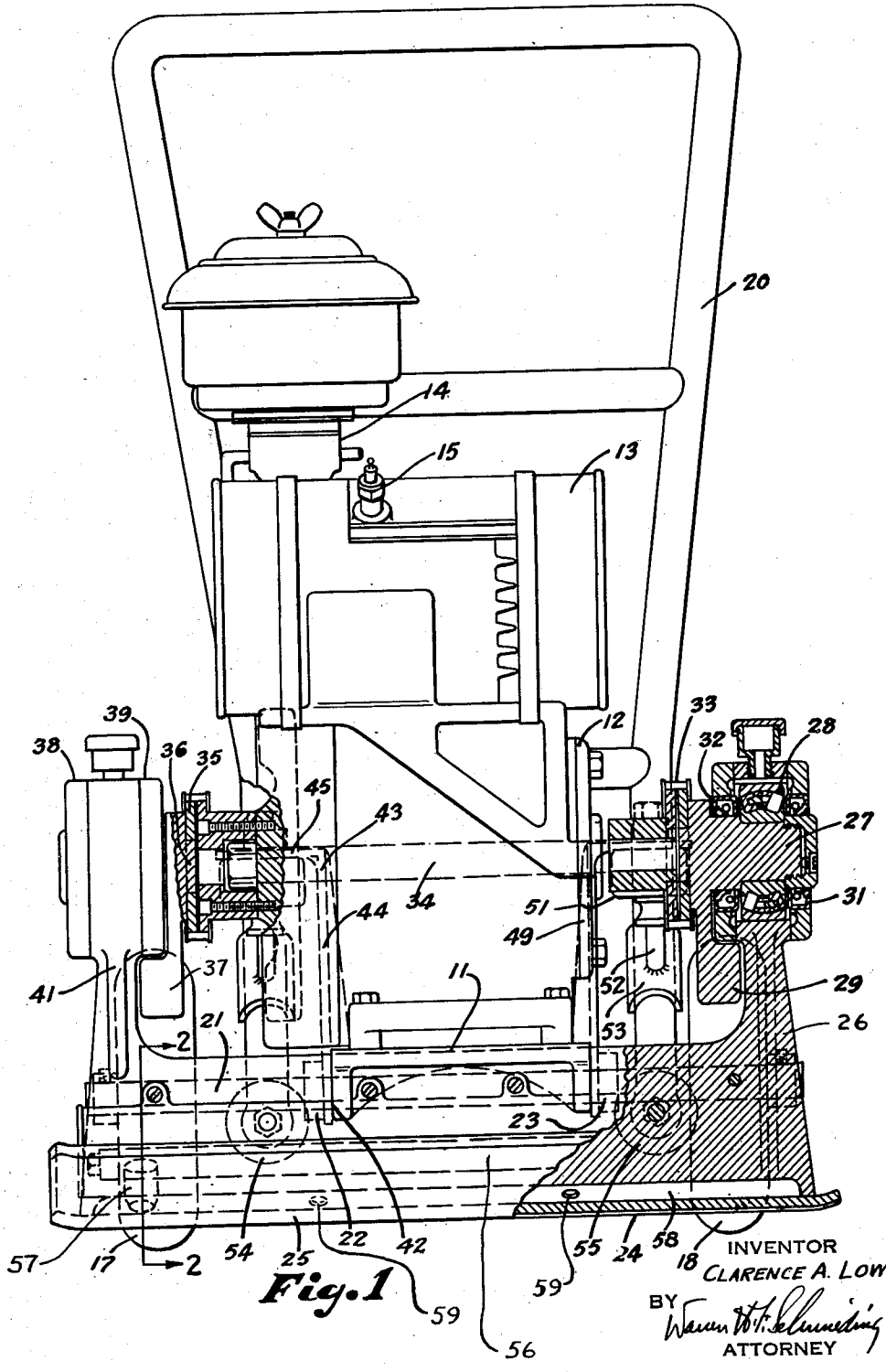


Fig. 1

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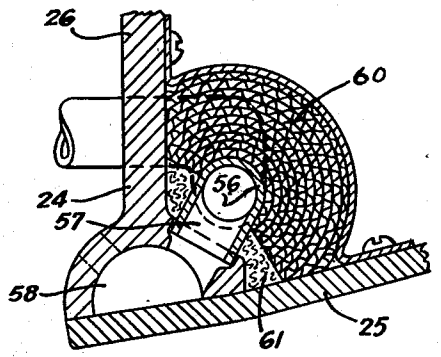


Fig. 2.

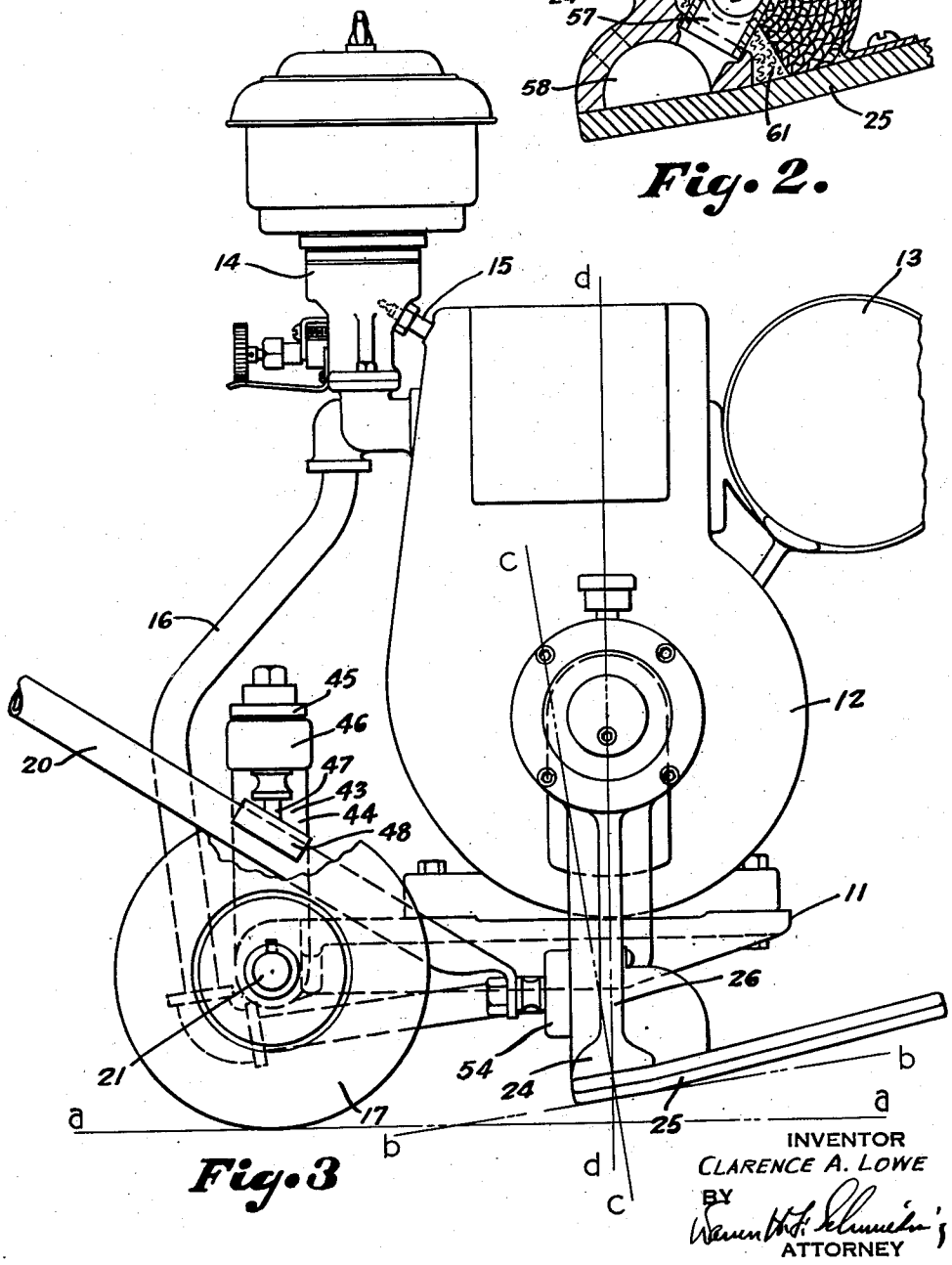


Fig. 3

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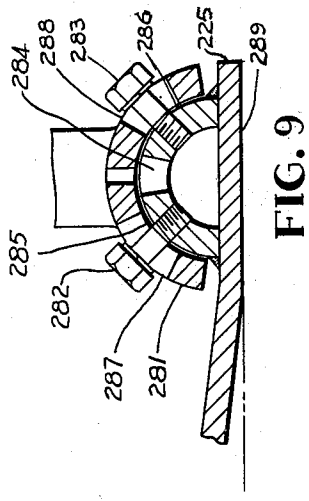


FIG. 9

FIG. 4

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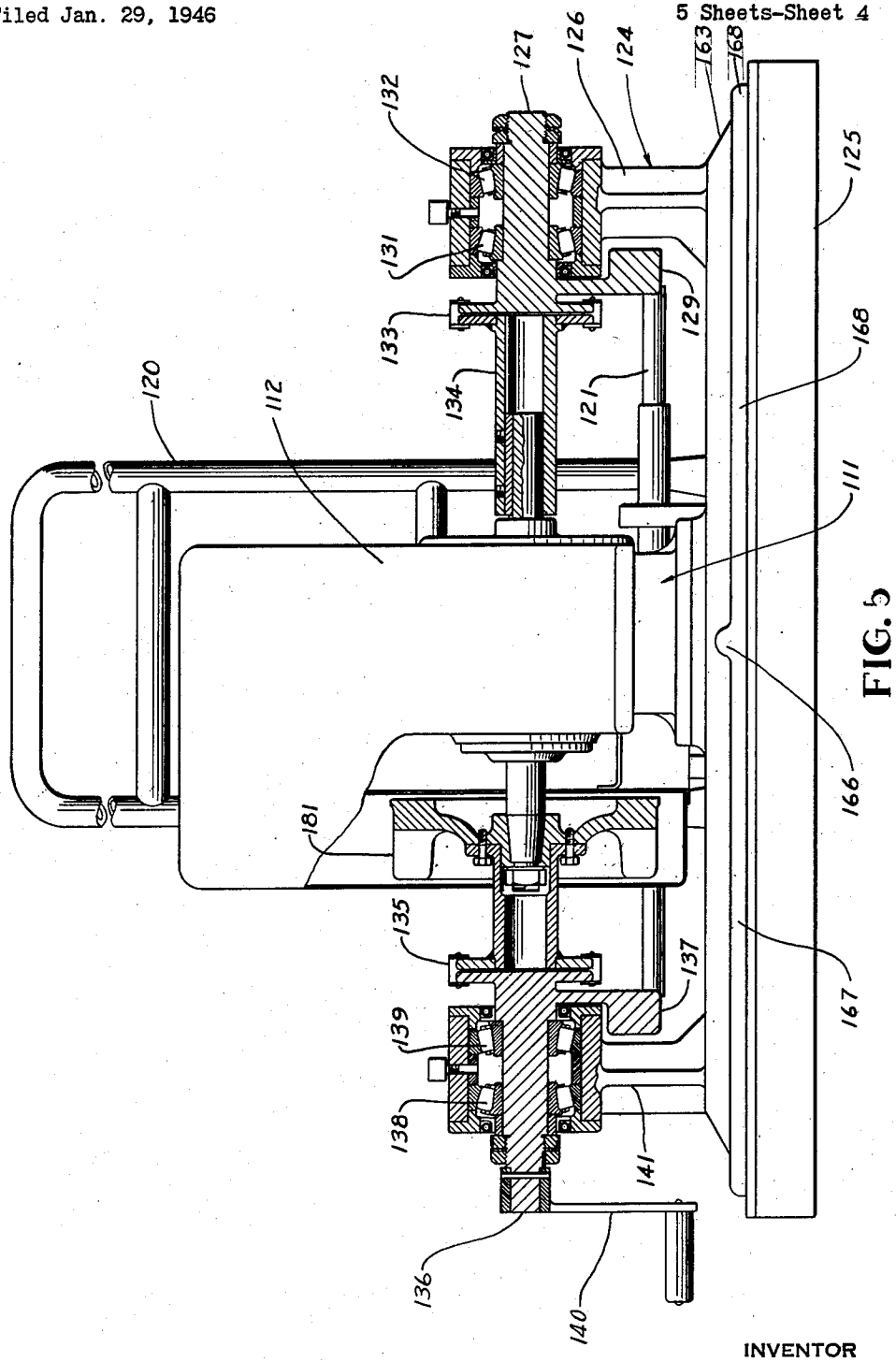


FIG. 5

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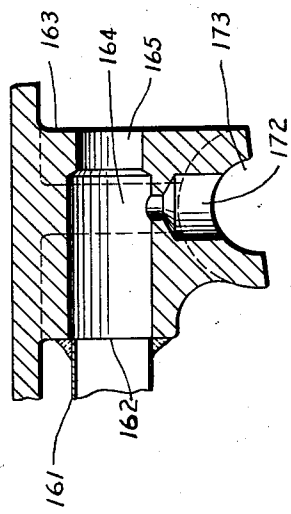


FIG. 8

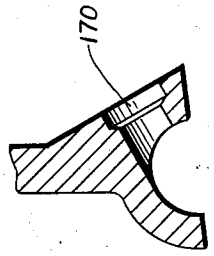


FIG. 7

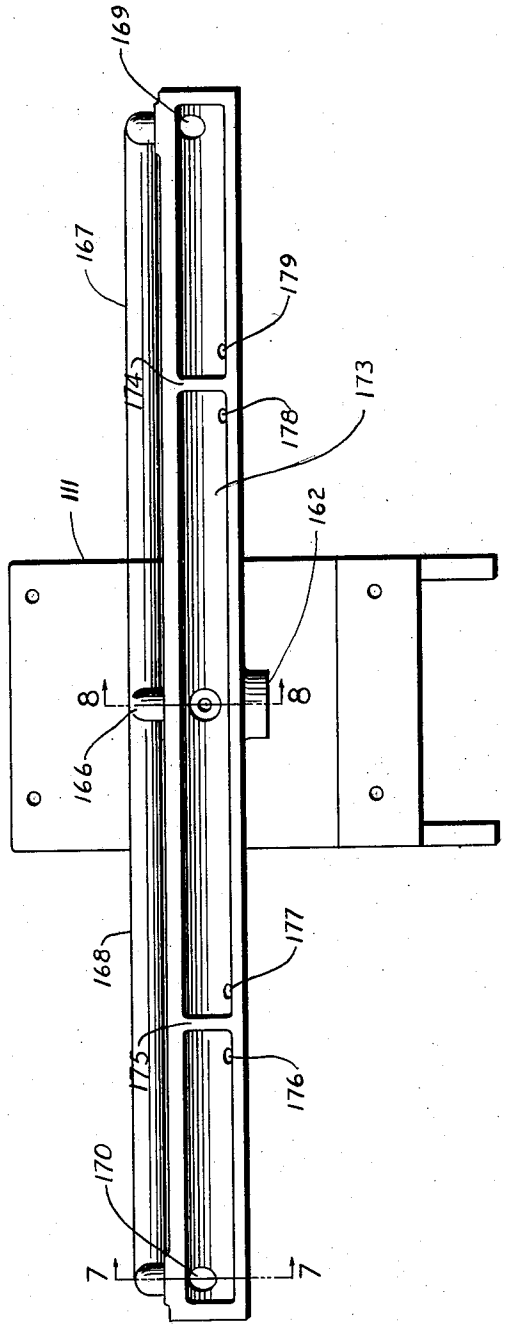


FIG. 6

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UNITED STATES PATENT OFFICE

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PAVING MACHINE

Clarence A. Lowe, Columbus, Ohio

Application January 29, 1946, Serial No. 644,071

8 Claims. (Cl. 94—48)

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The invention described in this application relates to a paving machine and specifically to such apparatus especially useful for compressing paving material after the surface has been laid.

Heretofore it has been usual to use a heavy roller for the purpose of compressing paving material. Reliance has heretofore been placed almost wholly upon the weight of the roller for producing the desired effect. By reason of the great weight of such rollers, considerable power is necessary to move the roller over the surface to be compressed. I have devised a machine capable of being operated by a relatively low powered gasoline motor assisted by a relatively slight physical effort on the part of the operator. In my improved machine compression of the paving material is accomplished by a jumping or pounding movement of the contact element or shoe so that the paving material is tamped into place instead of being rolled into place by a relatively heavy roller. While attempts have heretofore been made to devise such a machine, no one has, so far as I am aware, devised a machine capable of efficient operation.

One of the objects of my invention therefore is the provision of a paving machine of relatively light weight capable of being by a single operator assisted by a relatively low powered engine.

A further object of my invention is the provision of a practical paving machine capable of compressing paving material by a tamping or pounding action.

A further object of my invention is the provision of means for operating such a tamping device through the co-operation of a rotatably mounted weight moving in an eccentric path and a prime mover.

A further object of my invention is the provision of means for heating efficiently a contact element of a tamping device through the exhaust gases of a gasoline motor used to operate the tamping device.

A further object of my invention is to provide improved means for easily moving such a device to places at which it is desired to use it.

One of the features of my invention is the provision of a rotatably mounted weight moving in an eccentric path which is driven by a relatively low powered gasoline motor so that revolving of the weight causes a jumping action of the machine and causes the shoe of the machine to contact the pavement in a series of hops or jumps giving a pounding action.

A further feature of my invention is the design

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of the shoe so that the exhaust gases from the gasoline motor pass efficiently into and through the shoe and thus the shoe is heated efficiently at the point at which it contacts with the paving material. This heating aids in setting the material by reason of the fact that the material is heated at the same time that it is pounded into place.

A further feature of my invention is the specific connection between the driving motor and the eccentric weight.

Further objects and features of the invention will be apparent from the subjoined specification and claims when considered in connection with the accompanying drawings disclosing two embodiments of my invention which are shown and described solely for the purpose of illustration.

In the drawings:

Fig. 1 is a view of one embodiment mainly in front elevation but having parts broken away and parts shown in section;

Fig. 2 is a fragmentary view in section taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a view in side elevation having parts of the handle, part of the gasoline tank, and a portion of one of the tires broken away;

Fig. 4 is a view in side elevation of another paving machine illustrating a different embodiment of my invention;

Fig. 5 is a view in front elevation of the machine of Fig. 4, parts having been broken away and parts shown in section in order to show further details of construction;

Fig. 6 is a view in bottom plan of the machine shown in Figs. 4 and 5;

Fig. 7 is a view in section of a fragment of the device of Fig. 4, taken substantially on the line 7—7 of Fig. 6 but showing the fragment in upright position;

Fig. 8 is a view in section of a fragment of the device of Fig. 4, the section being taken on the line 8—8 of Fig. 6 but Fig. 8 showing the fragment in upright position; and

Fig. 9 is a view in section of an alternative form of device similar to that shown in Figs. 4 to 8 inclusive, but provided with means for adjusting the angle of the contact element.

Referring in detail to the drawings and especially to Figs. 1 and 3, it may be seen that I have shown a support or carriage frame generally designated 11. Supported on this carriage is a gasoline motor 12 having a gasoline supply tank 13, a carburetor 14 and other necessary accessories, such as a spark plug 15 and an exhaust

manifold 16. As may be now understood, this gasoline motor and accessories may if desired supply a large portion of the weight which is required for the tamping action which I use to compress the paving material. The frame 11 is carried and arranged to be rolled upon pneumatic wheels 17 and 18 connected to the carriage 11 by means of an axle 21, which is mounted in suitable bearings such as 22 and 23, secured to said carriage 11.

I provide means for tamping the paving material. This means includes a tamping device, an eccentric weight and a prime mover cooperating with the weight for operating the tamping device which will all be hereinafter described. A tamping member generally designated as 24 includes a shoe 25 and an upright standard 26. The standard 26 supports a stub shaft 27. The stub shaft 27 is driven from the motor 12 and while as suggested above the tamping member 24 and the standard 26 supports the shaft 27, it is to be clearly understood that the member 24 and standard 26 are not driven or rotated by the shaft 27 but that the shaft 27 rotates freely within a self aligning bearing unit 28 which is carried by the standard 26. As shown, the stub shaft 27 has an eccentric weight 29 formed integrally with it. The weight 29 during operation of the paving machine is continuously rotated by the motor 12.

The stub shaft 27, itself, is provided with grease seals 31 and 32. The stub shaft 27 is driven through a flexible coupling 33, such as a gear driven by a chain from a crank shaft 34 which is in turn driven by the motor 12. The opposite end of the shaft 34 drives a stub shaft 36 through a chain coupling 35, the stub shaft 36 carrying an eccentric weight 37 and corresponding substantially to the stub shaft 27, and the coupling 35 and weight 37 corresponding substantially to the coupling 33 and the weight 29, respectively. The stub shaft 36 is supported from the carriage 11 through a self aligning bearing unit (corresponding to the bearing 28) positioned within a standard 41.

The couplings 33 and 35, herein shown, are of the well known type, in which toothed sprockets are carried by each shaft 34, 27 and 36, there being a sprocket at each end of crank shaft 34. Each of the sprockets has the same diameter and each has the same number of teeth. The sprocket, at the left end of crank shaft 34, as viewed in Fig. 1, and the sprocket on shaft 36 form one pair, while the sprocket at the right end of shaft 34 and that on shaft 27 form another pair. A chain, similar to a bicycle chain, is wrapped completely about each pair of sprockets, each of the pins of the chain resting between the next adjacent teeth of a sprocket of both pairs of sprockets.

The revolving of the weights 29 and 37, by reason of inertia, causes a periodic jumping up and moving forward of the member 24. Thus the whole unit including the shoe 25 is carried up and forward and then drops down and pounds upon the pavement.

It is to be understood that the motor 12 supplies the motive force for causing the jumping of the machine and thus for moving it forward. Because of the relatively light weight of the machine, about 200 pounds, a relatively small motor is capable of performing this function. In addition, due to the fact that the machine is designed to pound the paving material rather than to roll it, the relatively light weight machine is capable of producing as satisfactory results as a much heavier roller would produce. The operator is able with relatively small physical effort to control the machine and steer it by means of the handle 20.

It is to be especially noted that the crank shaft 34 is not connected directly to the stub shafts 27 and 36 but that the stub shafts 27 and 36 driven by the shaft 34 by means of the chain couplings 33 and 35. The chain couplings 33 and 35 provide a more or less resilient coupling so that the entire shock due to the eccentric rotation of the weight 29 is not transmitted to the crank shaft 34 and to the motor. Moreover, the chain drive allows a certain degree of misalignment between the shafts 34 and 27 and in view of the eccentric weight and the self aligning bearing 28, the stub shaft 27 may at times and to a limited degree vary from direct alignment with the shaft 34. This construction allows the maintenance of less strict tolerances. It also prevents undue strain upon the shafts 27, 34 and 36 and upon the motor 12. Without these features, it is impossible, I believe, to produce a satisfactory device of this sort inasmuch as the vibration due to the rotation of the eccentric weight 29 creates strains not only in the motor 12 but also in the shafts 27, 34 and 36 such that those parts will soon fatigue and break or become inoperative.

I also provide means by which the shock of the jumping action is cushioned and is thus not transmitted directly to the operator. Secured to the carriage 11 as at 42 is an angle brace 43 having a vertical portion 44 and a horizontal portion 45. The horizontal portion 45 is secured by a rubber mounting 46 (see Fig. 3) and a strut 47 to a half sleeve 48 welded to the handle 20. A similar arrangement including a brace 49, a rubber mounting 51, a strut 52 and a half sleeve 53 is provided on the opposite side of the carriage. The handle 20 at its opposite lower ends is secured by rubber mountings 54 and 55 to the tamping member 24.

I provide means whereby the contact element or member of the tamping device is heated. As will be understood, the shoe 25 is the contact element of the tamping device and is arranged to tamp the paving material into place. For the purpose of heating the tamping device, the exhaust gases of the motor are conducted to the tamping member 24. Thus the exhaust manifold 16 is connected at its lower end to a tubular passageway 56 which is shown in Figs. 1 and 2. This tubular passageway is connected, as by an inlet passage 57, with a relatively large size space 58 formed adjacent to the lower portion of the shoe 25. The heated gases after flowing through portions of the space 58 may escape through exhaust ports 59. Thus this portion of the shoe is always heated by the exhaust gases. The action of the heat together with the tamping of the shoe causes a more efficient and better setting of the paving material. In order to conserve the heat, I provide an insulation 60 of asbestos material suitable for that purpose and a further insulation 61 of rock wool.

In the embodiment of my invention illustrated in Figs. 4 to 8, inclusive, I have shown a support or carriage generally designated 111. Supported on this carriage 111 is a gasoline motor 112. The carriage 111 is provided with pneumatic wheels such as 117 which are carried by an axle 121. The tamping device comprises a tamping member generally designated 124 which carries a

shoe 125 and is provided with a leg 126. The leg supports a stub shaft 127, the stub shaft 127 being driven by the motor 112. The stub shaft 127 rotates freely within the member 124 within a pair of roller bearings 131 and 132, the bearing unit including these roller bearings being carried by the member 124. The shaft 127 carries an eccentric weight 129. The stub shaft 127 is driven through a chain coupling 133 from a tubular shaft 134 which forms an extension of the crank shaft and is thus driven by the motor 112. The opposite end of the crank shaft has a tubular extension which drives a stub shaft 136 through a chain coupling 135, the stub shaft 136 carrying an eccentric weight 137. The stub shaft 136 is supported by the carriage 111 through a roller bearing unit including bearings 138 and 139, the unit being mounted in a leg 141 which is supported on the member 124. The roller bearing units 131, 132, 138 and 139 prevent any lateral or side to side swinging of the stub shafts 127 and 136. A handle 120 is connected to the carriage 111 in a manner similar to that in which the handle 20 of the first embodiment illustrated is connected. A starting crank 140 is also provided.

The exhaust gases from the motor 112 are led by a pipe or conduit 161 to a port 162 formed in a lower casting 163 connected to the foot 125. The port 162 is extended as a bore 164 and forms an outlet port 165 which is connected by a pipe 166 having branch pipes 167 and 168 which are in turn connected to inlet ports 169 and 170. The bore 164 is connected by a port 172 with a half round hollow 173 extending throughout the length of the casting 163. However, partitions 174 and 175 are provided in this casting member 163. Outlet ports 176, 177, 178 and 179 are provided so that the exhaust gases coming from the exhaust manifold of the engine and passing through the pipe 161 into the bore 164 and thence through the port 172 and the hollow portion may pass out through the ports 177 and 178. Other portions of the exhaust gases pass through the port 165 and thence through the pipe 167, the inlet port 169 and the outlet port 179. Still another portion of the exhaust gases pass through the outlet 165, the manifold 168, the inlet port 170, and out through the port 176. The length of the portion of the shaft 134 to the right of the motor 112 counter-balances the extra weight of the fly wheel 181.

It will be noted that in Fig. 3 the line *a—a* represents the pavement. In the position shown, the machine is resting on the wheels 17 and 18 and is held manually by the operator through the handle 20. If, by means of the handle 20, the machine is tipped forward on to the wheels 17 and 18, so that the surface *b—b* rests on the pavement, the wheels 17 and 18 will be raised entirely from the ground, a distance of about ¾ of an inch. Such a position (i. e. when the surface *b—b* is contacting the pavement) is the operating position. It will be noted that in this position a line such as *c—c* perpendicular to the surface *b—b* passes to the rearward of the center of gravity of the motor 12. As shown, this is approximately at an angle of 7° from a line such a *d—d* passing through the center of gravity. The fact that the center of mass of the motor is ahead of the center of the shoe portion which lies in plane *b—b*, said shoe portion maintains the wheels 17 and 18 off of the ground when the machine is in operating position. The greater the angle made by the lines *c—c* and *d—d*, the faster the machine will move forward in operation and the smaller the angle the slower the machine will move forward in operating as a tamping device. Thus in operation the machine will move at a rate of speed varying from 5 to 50 feet per minute depending upon the angle formed between the lines *c—c* and *d—d*. It will be noted also that the forward end of the shoe 25 is inclined upward from the bearing surface *b—b*. This inclination of the forward end of the shoe 25 is to provide a preliminary treatment for the untamped paving material ahead of the tamping machine, i. e. as the machine moves forward, in order to prevent ridges in the tamped paving material.

Referring now to Fig. 4 it may be seen that the line *a—a* representing the pavement on which the machine is resting contacts only the rearward end of the shoe 125. The machine is thus in a position in which it is being moved either from the tamping position in which the surface *b—b* is flush upon the pavement to the transporting position in which only the wheels 117 contact the pavement, or from the transporting position to the tamping position. It will be noted that in this embodiment also the line *c—c* perpendicular to the tamping surface *b—b* is at an angle of about 7° from the line *d—d* passing through the center of gravity of the motor so that center of gravity of the motor is ahead of the perpendicular line *c—c*. It will be noted also that the forward end of the shoe 125 forms a preliminary treating surface inclined upward slightly from the surface *b—b*.

In the embodiment shown in Fig. 9, the shoe 225 is adjustable relative to the support of the carriage. It will be seen that I have provided an intermediate half sleeve 281 which is adjustably bolted by the requisite number of bolts 282, 283, etc. to the shoe member 225, a lengthened opening 284 being provided in the member 225 so as to allow the heated gases to pass from one portion of the shoe to the other. The surfaces 285 and 286 are formed as arcs of circles, each having a radius of substantially the same length so that these surfaces conform substantially to each other no matter what is the adjustment between them. Slots 287 and 288 lengthwise along the arc are provided for the bolts 282 and 283 to allow adjustment. It is clear that by this arrangement I am able to adjust the angle of the tamping surface so as to increase or decrease as desired the forward movement of the machine.

It is to be understood that the machine shown in Figs. 4 to 8 inclusive is a larger and heavier machine than that shown in Figs. 1 to 3 inclusive, but features of either machine may be incorporated in the other as desired.

It is believed that the operation of the above described embodiments of my invention will be understood from the description. Referring to Figs. 1 to 3 it may be seen that by means of the handle 20, an operator may push the machine wherever desired, rolling it forward upon the wheels 17 and 18, in the same manner as a wheelbarrow. When it is desired to tamp any paving surface, the motor 12 is started, causing the rotation of the shaft 34 and the stub shaft 27. This causes a rotation of the eccentric weight 29 and causes the tamping unit 24 to jump up and down and pound the pavement, packing the paving material as the machine is moved forward by the jumping movement itself. The heat from the exhaust going into the foot aids in properly setting the pavement.

The operation of the device shown in Figs. 4 to 8, inclusive, is substantially the same as that shown in Figs. 1 to 3 inclusive. The arrangement of the flow of exhaust gases provides for better distribution of heat to the contact element. Also the disadvantage of unbalanced weight is avoided. The inclined roller bearings 131, 132, and 138 and 139 aid the chain couplings 133 and 135 in eliminating strains which might unduly fatigue the various shafts.

It is to be especially noted that the eccentric weights in both embodiments of my invention are not carried by the bearings of the gasoline motor, but on the contrary are carried by separate bearings and they are connected to the crank shaft of the gasoline motor by flexible couplings so that the stresses due to the revolution of the eccentric weight are not transmitted directly to the crank shaft of the internal combustion motor. In connection with the embodiment of Figs. 4 to 8, inclusive, it may be noted that by means of the supply of exhaust gases to separated ports in the contact member and separation of these various portions of the exhaust gases, each to flow in its separate path within the contact member more even distribution of heat is possible and the entire contact member is heated. It is also to be noted that in connection with the embodiment shown in Figs. 4 to 8, inclusive, the stub shaft for the eccentric weight is mounted in a pair of inclined roller bearings which take all of the stresses and prevent oscillation of the stub shaft longitudinally.

It is to be understood that the above described embodiments of my invention are for the purpose of illustration only and various changes may be made therein without departing from the spirit and scope of my invention.

I claim:

1. A machine for compacting aggregates or paving material comprising a supporting frame, a prime mover mounted on said frame, a tamping member including a shoe adapted to contact the surface to be compacted and carried by said frame, said shoe having a pivotal connection for adjusting the shoe with respect to the tamping member to provide for varying the position of the shoe in relation to the center of mass of the prime mover and a rotatably mounted weight supported by said frame in a forward position relative to the tamping member and driven by said prime mover, said weight being mounted so that upon rotation it moves in a path which imparts a lifting action to the machine carrying it forward in a series of jumping movements which provide a tamping action of said shoe compressing the surface with which it comes in contact, the magnitude of the movements of the machine depending upon the position of said shoe with respect to said prime mover.

2. A tamping machine comprising, in combination a tamping shoe; a prime mover including a rotating shaft, said prime mover being rigidly attached to and above the shoe; bearing support means carried by and above the shoe; shaft means journaled in the bearing support means and arranged in longitudinal alignment with the prime mover shaft; flexible connecting means between said shaft means and the prime mover shaft; eccentric weight means on and actuated by the shaft means, said shoe being relatively narrow with respect to its length forming an elongated substantially flat tamping surface and said prime mover shaft and said shaft means being arranged substantially parallel with the length of said surface, the center of mass of the aforementioned elements, carried by the shoe, lying to one side of a vertical plane perpendicular to said tamping surface and extending lengthwise of the shoe and intersecting the shoe at a point midway of the width of said surface.

3. A tamping machine as defined in claim 2 in which the prime mover is an internal combustion engine having an exhaust outlet, and the shoe is formed with a duct having an inlet and an outlet; and an exhaust pipe connected between the exhaust of the internal combustion engine and the inlet of the duct for conducting hot exhaust gases to the shoe.

4. A tamping machine comprising, in combination a tamping shoe; a prime mover including a rotating shaft said prime mover being rigidly attached to and above the shoe; bearing support means carried by and above the shoe; shaft means journaled in the bearing support means and arranged in longitudinal alignment with the prime mover shaft; flexible connecting means between said shaft means and the prime mover shaft; eccentric weight means on and actuated by the shaft means, said shoe being relatively narrow with respect to its length forming an elongated substantially flat tamping surface and said prime mover shaft and said shaft means being arranged substantially parallel with the length of said surface, the center of mass of the aforementioned elements, carried by the shoe, lying to one side of a vertical plane perpendicular to said tamping surface and extending lengthwise of the shoe and intersecting the shoe at a point midway of the width of said surface; and a handle connected with the machine for guiding the same.

5. A tamping machine comprising in combination a shoe having an elongated and narrow tamping surface; spaced bearing supports arranged along the length of the shoe and carried by and above the shoe; a separate shaft journaled in each of the bearing supports, the axis of said shafts being substantially parallel of the length of said surface; an eccentric weight on each of said shafts; a prime mover including a rotating shaft, said prime mover being rigidly attached to and above the shoe, the prime mover shaft and the eccentric shafts being substantially axially aligned; a flexible coupling between the prime mover shaft and the eccentric shafts; the center of mass of the aforementioned elements, carried by the shoe, lying to one side of a vertical plane perpendicular to said tamping surface and extending lengthwise of the shoe and intersecting the shoe at a point midway of the width of said surface.

6. A tamping machine comprising, in combination a tamping shoe; a prime mover including a rotating shaft, said prime mover being rigidly attached to and above the shoe; bearing support means carried by and above the shoe; shaft means journaled in the bearing support means and arranged in longitudinal alignment with the prime mover shaft; flexible connecting means between said shaft means and the prime mover shaft; eccentric weight means on and actuated by the shaft means, said shoe being relatively narrow with respect to its length forming an elongated substantially flat tamping surface and said prime mover shaft and said shaft means being arranged substantially parallel with the length of said surface, the center of mass of the aforementioned elements, carried by the shoe, lying to one side of a vertical plane perpendic-

ular to said tamping surface and extending lengthwise of the shoe and intersecting the shoe at a point midway of the width of said surface; and a handle connected with the machine for guiding the same.

7. A tamping machine comprising in combination, an elongated and narrow tamping shoe; a support pivotally mounted on and above the shoe; means for rigidly attaching the support in adjusted position on the shoe; a prime mover including a rotating shaft, said prime mover being rigidly attached to the support above the shoe; bearing means carried by the support and above the shoe; shaft means journaled in the bearing support means and arranged in longitudinal alignment with the prime mover shaft; flexible connecting means between the shaft means and the prime mover shaft; eccentric weight means on and actuated by the shaft means, the axis of said prime mover shaft and said shaft means being arranged substantially parallel with the length of said surface, the center of mass of the aforementioned elements, carried by the shoe, lying to one side of a vertical plane perpendicular to said tamping surface and extending lengthwise of the shoe and

intersecting the shoe at a point midway of the width of said surface.

8. A tamping machine as defined in claim 7 in which the prime mover is an internal combustion engine having an exhaust outlet, and the shoe is formed with a duct having an inlet and an outlet; and an exhaust pipe connected between the exhaust outlet of internal combustion engine and the inlet of the duct for conducting hot exhaust gases to the shoe.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,550,102	Schlueter	Aug. 18, 1925
1,657,727	Stubbs	Jan. 31, 1928
1,819,866	Cameron	Aug. 18, 1931
1,876,271	Baily	Sept. 6, 1932
2,018,294	Baily	Oct. 22, 1935
2,209,656	Mall	July 30, 1940
2,215,455	Abernathy et al.	Sept. 24, 1940
2,223,024	Beierlein	Nov. 26, 1940
2,255,342	Baily	Sept. 9, 1941