Nov. 12, 1935. G. B. PICKOP 2,020,374

TOOL FOR WORKING CONCRETE AND THE LIKE

Filed March 28, 1935 2 Sheets-Sheet 1

Fig. 1.

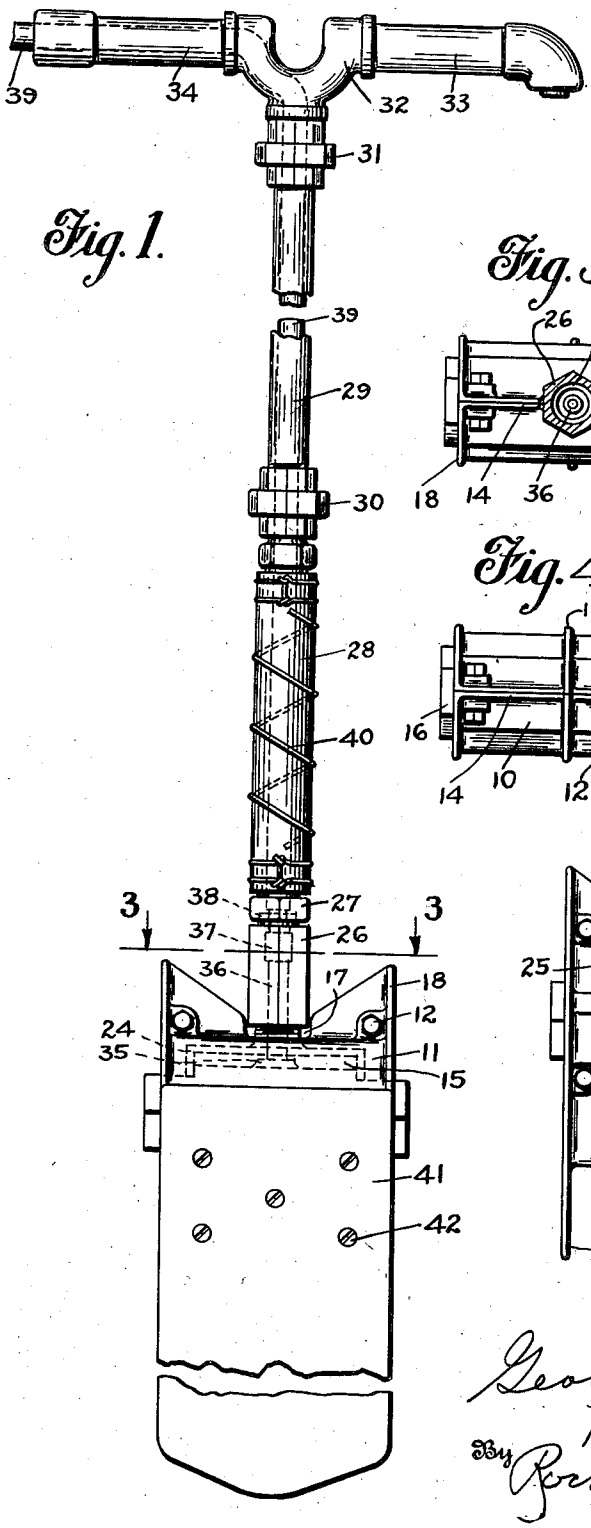


Fig. 3.

Fig. 4.

Fig. 5.

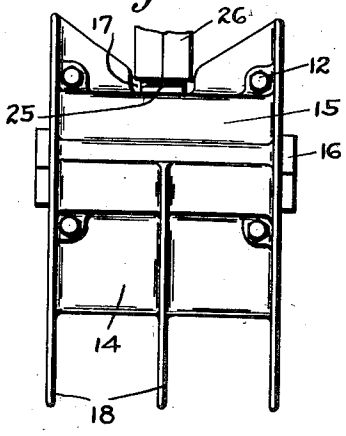
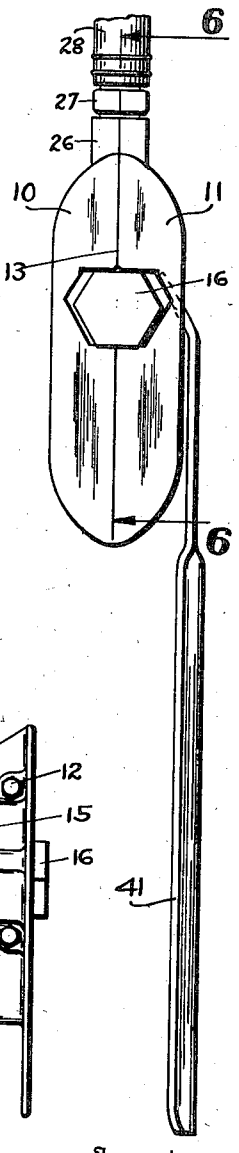


Fig. 2.



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Filed March 28, 1935 2 Sheets-Sheet 2

Fig. 6.

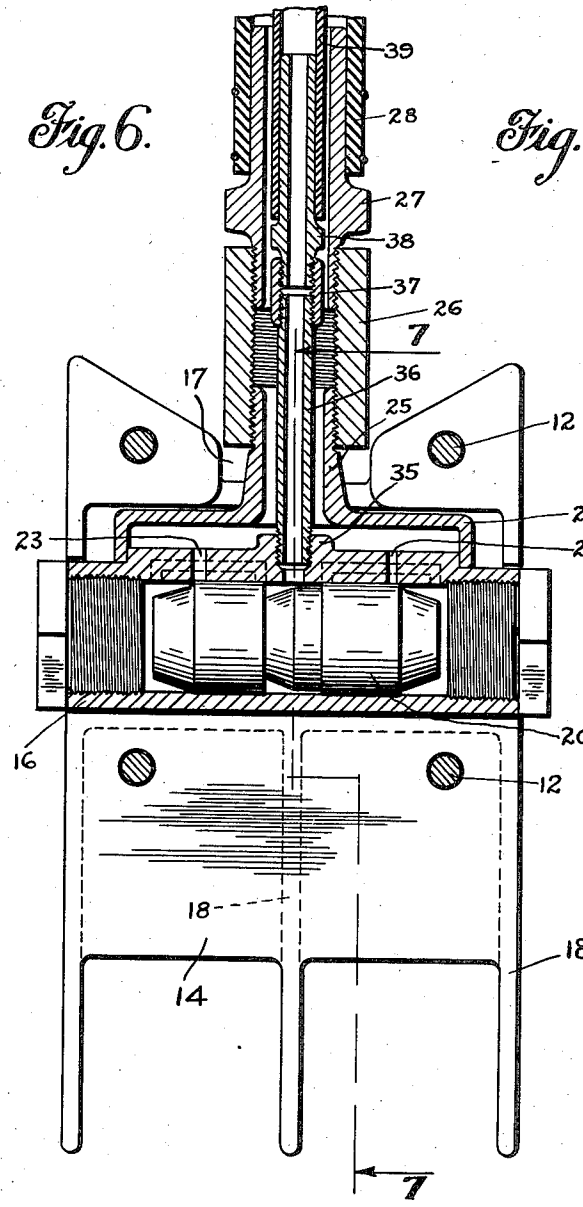
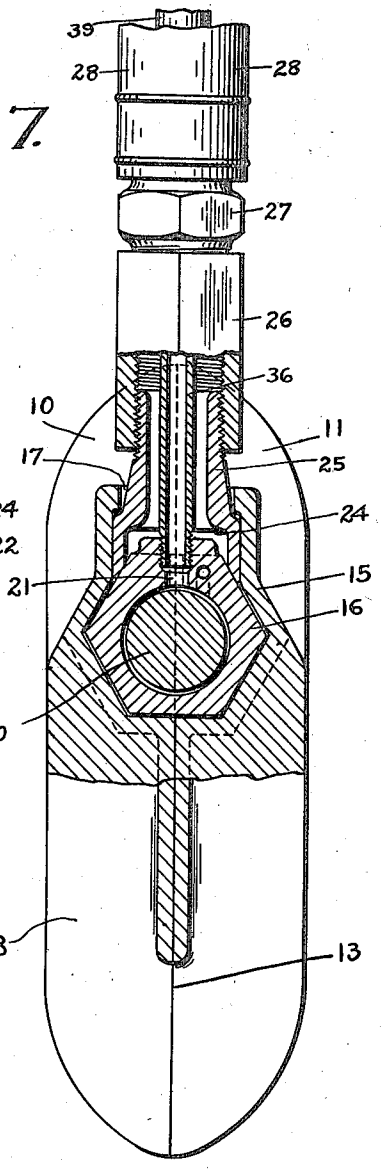


Fig. 7.



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UNITED STATES PATENT OFFICE

2,020,374

TOOL FOR WORKING CONCRETE AND THE LIKE

George B. Pickop, New Haven, Conn.

Application March 28, 1935, Serial No. 13,439

17 Claims. (Cl. 259—72)

This invention relates to so-called vibrator spades, and more particularly to a device for spading or compacting concrete after the latter has been poured into forms such as is usually done in the building of retaining walls, building walls, roadways, or the like, in order to settle and condense the plastic mass so that it will, after it is set, be free from such imperfections as sand holes, air cavities, or the like. In general the tool consists of a member adapted to sink into the mass of concrete and to be vibrated therein in such a manner as to deliver a kinetic blow for condensing and consolidating the mass. This member not only serves as a tool to work against the mass, but also serves as the housing for the vibrator and is supported upon the end of a tubular handle through which the motive fluid is led to the vibrator and also through which the exhaust is carried from the vibrator.

By this provision the tool is permitted to work its way into the mass of concrete to any desired depth, as the handle may be extended to any practical length, and the lower portion of the handle as well as the tool itself may be covered by the concrete when the tool sinks therein without interfering with the operation of the device. As will be apparent as the description proceeds, the vibrator itself is completely enclosed so that there will be no danger of any foreign particles entering the vibrator cylinder even when the tool is completely buried in the mass.

In the past the tools which have been employed for this purpose have sometimes been so constructed that a casing or housing is inserted into the concrete, this housing containing a vibrating or oscillating member which is propelled from a motor supported above the concrete mass. This requires a relatively long flexible shaft extending from the motor down to the vibratory member, and is also subject to other disadvantages. Other tools which have been employed for a similar purpose provide an unbalanced rotating member which is lowered into the concrete mass and operates by a gyratory motion to work against the mass. Such a member must necessarily make an opening of considerable size to work itself into the mass, and naturally leaves when it is withdrawn an opening or void which must be filled by the sumping of the concrete therein when the tool is withdrawn.

The present device aims to provide a tool which shall have one or more flat blades to work against the concrete mass and also provide means for housing or carrying the vibrator, while at the same time make as small an opening as possible in the mass so that little movement of the concrete will be necessary to fill the opening after the tool is withdrawn.

One object of the invention, therefore, is the provision of a tool for condensing or compacting concrete, which shall operate to deliver a kinetic blow against the concrete over a considerable area, and at the same time shall have a relatively small displacement.

Another object of the invention is the provision of a condensing or compacting tool of the class described which shall be supported by a relatively long handle so that it may be lowered into the concrete mass and in which provision shall be made for mounting the motor, in this instance a vibrator, within the tool itself.

Another object of the invention is the provision of a compacting or condensing tool carrying a vibrating motor, which tool and motor shall be capable of operating when completely buried within a mass of concrete and which is supported at the end of a relatively long tubular handle through which the power is conducted to drive the motor, and by which the tool may be manipulated.

A still further object of the invention is the provision of a compacting tool of the character described which may be carried upon the end of a relatively long handle, which handle is insulated from the tool so that the vibrations in the latter will not be transmitted to the handle itself.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the drawings:

Fig. 1 is an elevational view of a vibrator spade embodying my invention;

Fig. 2 is a side elevational view of the tool portion of the same;

Fig. 3 is a sectional view on line 3—3 of Fig. 1;

Fig. 4 is a bottom plan view of the tool;

Fig. 5 is a side elevational view with the auxiliary spade element removed.

Fig. 6 is a sectional view on line 6—6 of Fig. 2; and

Fig. 7 is a sectional view on line 7—7 of Fig. 6.

To illustrate a preferred embodiment of my invention, I have shown a condensing or compacting tool, the body of which is preferably made in two halves, 10 and 11, which are held together by means of the bolts 12 and which meet along the plane of the line 13.

As shown more particularly in Figs. 6 and 7, each half of the tool body comprises a flat plate 14 provided adjacent its upper end with an out-

wardly projecting enlargement 15 which is interiorly hollow to provide a chamber for the vibrator casing 16. At the upper portion of this chamber an opening 17 is provided to permit connection of the handle of the tool with the vibrator casing, as will be hereinafter described.

Upon the plates 14 are provided a number of fins or vane-like members 18, which may be in the form of flat blades and which extend transversely to the plate-like members 14. As shown, three of these members are provided, one at each side edge and one at approximately the center of the member 14. It will be understood, of course, that these members upon one of the plates 14 or one half of the tool register with those upon the other half to form the oval-shaped blade-like members shown in side elevation in Figs. 2 and 7.

The chamber 15 is of such a size that the vibrator casing 16 will fit snugly and be held tightly therein when the nuts are tightened upon the bolts 12, so that the vibrations imparted to the vibrator casing will be transmitted to the body of the tool.

The vibrator, which in this instance is mounted in the compacting tool, comprises the casing 16, which, as shown more especially in Fig. 6, extends across the tool at right angles to the plane of the members 18. Within the casing is the usual piston 20 which is operated by a fluid under pressure, usually compressed air, the casing having an inlet opening 21 for the admission of the motive fluid, and exhaust ports 22 and 23 to permit the exhaust of the motive fluid after it has been used. The vibrator may be of the springless type similar to that shown in my application, Serial No. 3,991, filed January 29, 1935. It will be noted, however, that in this instance the exhaust ports 22 and 23 are both located upon the upper side of the casing adjacent the inlet port 21. A cover 24 is secured as by welding or the like to the upper portion of the casing to cover the exhaust ports so as to prevent the entry of foreign particles therein.

Extending upwardly from the cover 24 is a tubular sleeve or nipple 25, to which is threadedly connected a collar 26. A second nipple 27 is connected at the upper end of the collar, and extending upwardly from this nipple is a short length of flexible hose 28 to the upper end of which is connected a rigid pipe or tubular handle 29. This handle 29 is preferably provided in sections having unions 30 and 31 at each end thereof so that by providing additional sections or lengths the handle can be extended or shortened to any desired length. At the upper end of the pipe 29 there is provided a T 32 to which are connected the hollow handle members 33 and 34 which may be grasped by the operator to carry or manipulate the tool.

The inlet opening 21 of the vibrator casing is provided in a threaded boss 35, to which is connected a nipple 36 joined by a collar 37 to a second nipple 38, to which is connected a length of rubber hose 39 which extends upwardly through the tubular member 29 and out through the handle 34 to be connected to the source of compressed air or other motive fluid. It will be seen that as the tubular connections to the inlet opening 21 are smaller than the tubular connections to the cover 24, the exhaust fluid issuing from the ports 22 and 23 will be permitted to pass upwardly through the handle 29 about the hose 39 and its associated parts, that is to say, the motive fluid will be conducted to the vibrator through the hose 39 and the nipple 36, and the exhaust from the vibrator will pass upwardly about these members but within the tubular handle member 29.

Upon the flexible tube 28 may be mounted a spiral wire guard 40 which will serve to prevent the collapse of this tubular member when it is covered by the concrete mass. This member serves to insulate from the handle the vibrations of the tool, and also enables the tool to work out of alinement with the handle so that the tool may work its way around any boulders or other obstructions which may be found in the mass, and provides a much more advantageous structure than one wherein the handle is made rigid with the tool.

If desired an auxiliary spade member or blade 41 may be secured upon the enlarged portion 15 of the body of the tool to extend downwardly therefrom, the blade 41 being preferably corrugated, as shown in Fig. 2, and being connected to the tool in such a way that it projects laterally from the body thereof. In this position the blade 41 may work against the side of the form when the body of the tool is embedded in the mass. It will be understood, of course, that the tool may be used with or without the blade 41, this blade being secured to the body of the tool by screws or bolts 42 so that it may readily be removed if its use is not desired.

From the foregoing description it will be seen that I have provided a concrete tool having relatively flat blades thereon which are vibrated in such a manner that their flat surfaces are caused to work against the mass laterally to produce a paddling action which will be very effective to compact and condense the mass, while at the same time the tool has a relatively small displacement so that it will displace a relatively small quantity of the concrete when working into and out of the same. This is due to the fact that the body of the tool is for the most part composed of the flat plates 14 and the transverse plates or vane members 18. The plates 14 are, of course, flat except for the enlargement necessary to provide the chamber for the vibrator casing. Moreover, the vibrator casing is entirely enclosed, the only communication therewith being through the long tubular handle 29, so that no foreign particles will be permitted to enter the casing, even when the tool itself is buried in the mass, as it will be in operation.

It will also be seen that the plates 14 with their associated parts are the parts of the tool which will be subject to wear, and these parts may be economically made and replaced, as the bolts 12 permit them to be readily taken apart and new ones placed about the vibrator casing. As the vibrator casing is tightly gripped between the plates, the blows of the piston will be transmitted to the tool and will effect a very efficient condensing and compacting of the mass. The vibrator may be operated at a relatively high speed, it being found practical to use a vibrator capable of delivering 7300 blows per minute. This speed can be reduced to an idling speed of 300 blows per minute by control of the supply of the fluid.

While I have shown and described a preferred embodiment of my invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the appended claims.

What I claim is:

1. A tool for compacting concrete or the like

comprising a body member adapted to enter the concrete mass, flat blade-like members carried by the body member, and a vibrator carried by the body member at a level between the upper and lower ends of the blade-like members and adapted to move the flat sides of the blade-like members against the mass.

2. A tool for compacting concrete or the like comprising connected substantially parallel blade-like members adapted to be embedded in the concrete, and a reciprocating vibrator secured to said members intermediate their upper and lower ends and operating transversely to the plane of said members to move the flat sides thereof against the mass.

3. A tool for compacting concrete or the like comprising a body member adapted to enter the mass and having substantially parallel blade-like paddle members secured thereto, and a vibrator housed within the body member below the upper ends of the paddle members and designed to move said paddle members flatwise against the mass.

4. In a tool for compacting concrete or the like, a vibrator having a casing provided with contiguously located inlet and exhaust ports, a member secured to the casing and enclosing said ports, a tubular member connected to said enclosing member to conduct motive fluid to, and exhaust fluid from, said vibrator, and blade members secured to the vibrator casing and extending transversely thereto to be moved flatwise against the concrete mass.

5. In a tool for compacting concrete or the like, a vibrator having a casing provided with inlet and exhaust ports, means for enclosing said ports, a single handle member connected to said enclosing means to extend substantially at right angles to the axis of the vibrator, said handle member having passages therewithin to conduct motive fluid to, and exhaust fluid from, said vibrator, and blade members secured to the vibrator casing and extending transversely thereto to be moved flatwise against the concrete mass.

6. In a tool for compacting concrete or the like, a vibrator having a casing provided with inlet and exhaust ports, means for enclosing said ports, a single handle member connected to said enclosing means and disposed at substantially right angles to the vibrator axis, said handle member having passages therewithin to conduct motive fluid to, and exhaust fluid from, said vibrator, blade members secured to the vibrator casing and extending transversely thereto to be moved flatwise against the concrete mass, and said handle member being rigid for the greater part of its length but having a flexible section therein adjacent the vibrator.

7. In a tool for compacting concrete or the like, a vibrator, a pair of body elements embracing and rigidly secured to the vibrator whereby the latter is clamped between the body elements, and flat blade-like members secured to the body elements to extend transversely of the vibrator axis.

8. In a tool for compacting concrete or the like, a vibrator having a casing and reciprocating piston therein, a pair of body elements secured to said vibrator in embracing relation thereto, and each of said body elements comprising a flat plate-like member having blade members secured thereto to extend transversely of the vibrator axis.

9. In a tool for compacting concrete or the like, a fluid pressure operated vibrator comprising a casing and a reciprocating piston therein, flat blade-like members secured to the casing to extend above and below the same and to extend transversely thereof so as to be moved flatwise against the mass, and means to conduct motive fluid to, and exhaust fluid from, the vibrator.

10. In a tool for working a mass of concrete or the like, a vibrator casing and a reciprocating piston therein, a flat blade-like member secured to the vibrator body to extend substantially transversely to the axis of the vibrator, and tubular members secured to said vibrator body to carry pressure fluid to and from the vibrator, and one of said tubular members serving as a handle for the tool.

11. In a tool for working a mass of concrete or the like, a vibrator body, a plurality of substantially parallel blade-like members secured to the body, a reciprocating piston within the vibrator and operating in a direction transverse to said blade-like members, and tubular members secured to said vibrator to carry the pressure fluid to and from the same, and one of said tubular members being enclosed within the other.

12. In a tool for working a mass of concrete or the like, a vibrator body, a plurality of substantially parallel blade-like members secured to the body, a reciprocating piston within the vibrator and operating in a direction transverse to said blade-like members, and tubular members secured to said vibrator to carry the pressure fluid to and from the same, one of said tubular members being enclosed within the other, and said outer tubular member comprising a rigid element having a flexible section adjacent the tool and serving as a handle for the tool.

13. In a tool for working a mass of concrete or the like, a blade member for insertion into the mass, a vibrator unit rigidly secured directly to the blade member, said vibrator unit comprising a piston reciprocating in a direction at right angles to the plane of the blade member, and a handle member secured to the vibrator unit whereby the latter serves to connect the handle member with the blade, and said handle member having a passage therein to carry pressure fluid to the vibrator.

14. A tool for working concrete or the like comprising a body member consisting of a pair of plate-like elements, said elements having hollow enlarged portions oppositely facing to provide a chamber, a vibrator casing disposed in said chamber and clamped between the body elements, a plurality of substantially parallel blades secured to the body elements and extending transversely of the axis of the vibrator, and means to convey pressure fluid to the vibrator.

15. A tool for working concrete or the like comprising a body member consisting of a pair of plate-like elements, said elements having hollow enlarged portions oppositely facing to provide a chamber, a vibrator casing disposed in said chamber and clamped between the body elements, a plurality of substantially parallel blades secured to the body elements and extending transversely of the axis of the vibrator, means to convey pressure fluid to the vibrator, and a spade element adapted to be secured to one of the body elements to extend downwardly therefrom.

16. In a tool for compacting concrete or the like, a vibrator having a casing provided with inlet and outlet ports, means for enclosing said ports, tubular means connected to said enclosing means to conduct motive fluid to, and exhaust fluid from, said vibrator, and blade members secured to the vibrator casing having flat faces ex-

tending substantially transversely to the casing, and said blades extending above and below the vibrator casing whereby the latter acts on an intermediate part of the blade.

17. A tool for compacting concrete or the like comprising connected, substantially parallel blade-like members adapted to be embedded in the concrete, a reciprocating vibrator secured to said members to operate transversely to the plane thereof to move the flat faces of the members against the mass, and said vibrator acting on an intermediate portion of said blade-like members between the ends thereof.

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