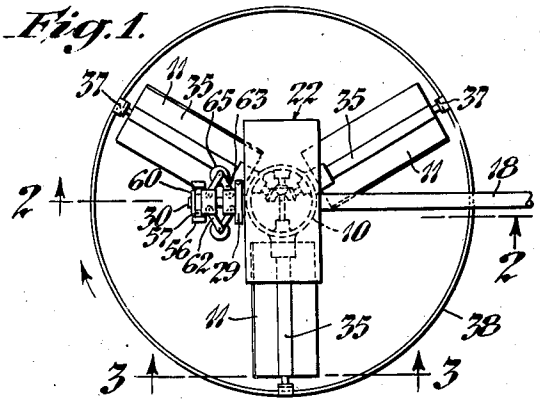
May 3, 1949. J. O. HUFFMAN 2,468,981

TROWELING MACHINE

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Fig. 1.



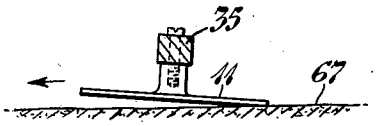


Fig. 3.

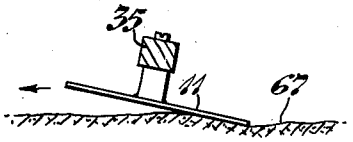


Fig. 4.

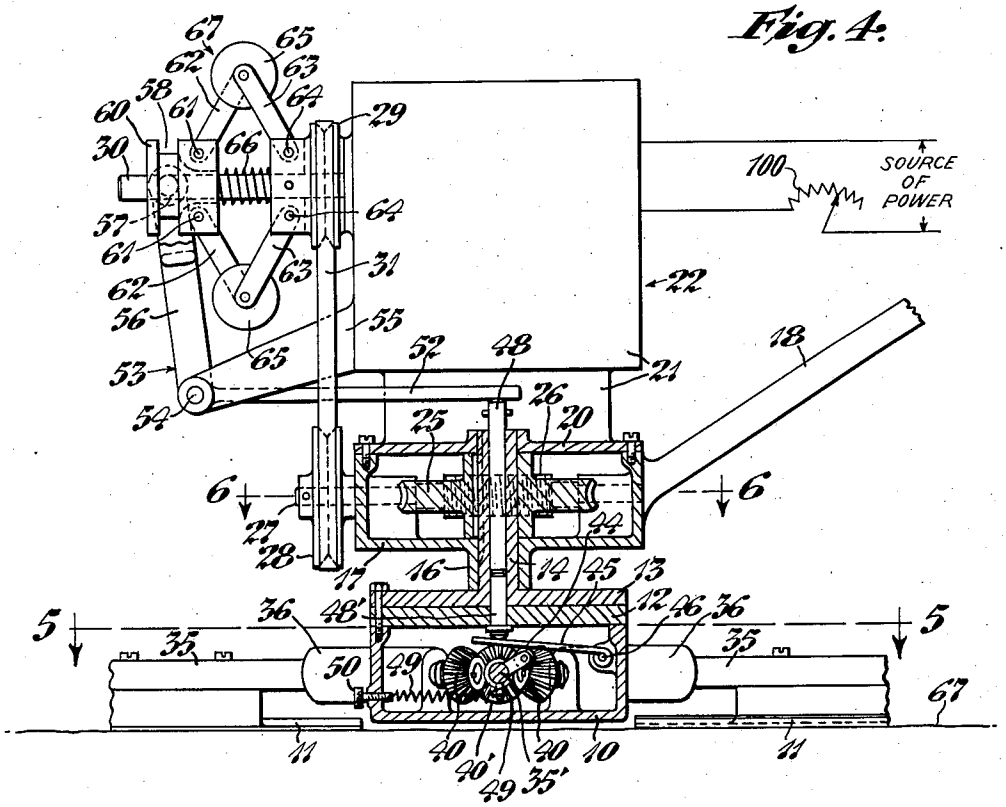


Fig. 2.

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Fig. 5.

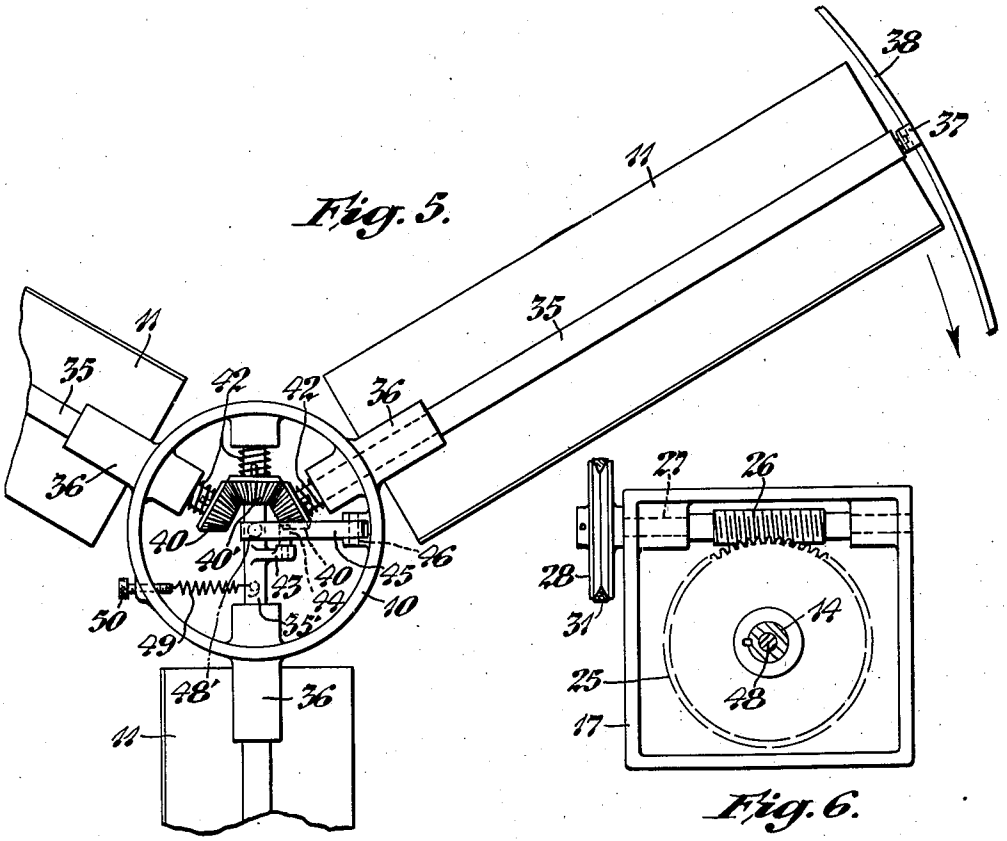


Fig. 6.

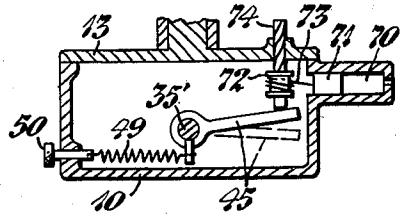


Fig. 7.

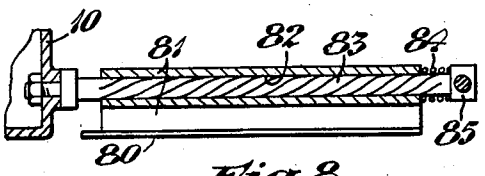


Fig. 8.

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UNITED STATES PATENT OFFICE

2,468,981

TROWELING MACHINE

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Application October 29, 1946, Serial No. 706,479

4 Claims. (Cl. 94—45)

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My invention relates generally to troweling machines adapted for use in smoothing and finishing concrete floors, driveways, and other flat surfaces. Specifically, the invention pertains to a troweling machine having a plurality of rotary trowel members adapted to force stones or aggregate into the concrete, or other plastic mass, and to smooth or finish the surface of the mass.

One object of the invention is to provide a machine of the character refered to in which the trowel members are rotated by a suitable prime mover, and in which the trowel members are adapted to be inclined at various angles with respect to the surface of the concrete mass to effect a rough troweling and a finish troweling of the mass.

Another object is to provide a machine of the type indicated in which the angularity or inclination of the trowel members is controlled by the speed of rotation of the trowel members, so that by varying the speed of the prime mover the inclination of the trowel members may be varied automatically in accordance with the requirements, and thus the necessity of providing separate manually-operated means for adjusting the setting of the trowel members is avoided.

Another object is to provide in a machine of the class specified having governor means responsive to change in the speed of the prime mover for automatically changing the inclination of the trowel members.

Another object is to provide a portable troweling machine which is relatively simple in construction, easily operated, and highly efficient in performing its intended function.

Further objects of the invention are set forth in the following specification, which describes several preferred embodiments of the machine, by way of example, as illustrated by the accompanying drawings. In the drawing:

Fig. 1 is a plan view of my improved troweling machine;

Fig. 2 is an enlarged side elevation of the machine, shown part-sectional on line 2—2 of Fig. 1;

Fig. 3 is a vertical sectional view, taken on line 3—3 of Fig. 1, and illustrating one of the trowel members as inclined to a slight angle;

Fig. 4 is a view similar to Fig. 3 but showing the trowel member tilted to a greater angle;

Fig. 5 is a plan view of the lower part of the machine, shown part-sectional on line 5—5 of Fig. 2;

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

Fig. 7 is a cross-sectional view of the lower part

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of the machine, showing an alternative means for effecting adjustment of the trowel members; and,

Fig. 8 shows an alternative means for tilting the trowel members.

Referring first to Figs. 1 to 6 of the drawings, my improved troweling machine includes a circular box-like housing 10, which is supported slightly above the floor or other surface to be troweled by the trowel members 11 in the manner to be later explained. The housing 10 has a removable cover 12, and fastened to the cover is a drive-plate 13 having a central tubular spindle 14. Surrounding the spindle 14, with its end resting upon the drive-plate 13, is a boss 16 forming part of a gear-box or casing 17 to which a handle 18 is secured, said handle providing a means for pushing, pulling, and guiding the machine along the concrete mass, it being noted that the trowel members 11 rest directly upon the concrete mass.

Fastened to the open upper end of the casing 17 is a plate 20, which forms the base of a frame 21 which supports a prime mover or power unit 22, which may be an internal combustion engine or an electric motor. The power unit 22 is adapted to rotate the housing 10 and trowel members 11 through driving connections to be next described. Keyed to the tubular spindle 14 is a worm wheel 25, which is adapted to be rotated by a worm 26 fast on a horizontal shaft 27 journaled in bearings in the casing 17. The shaft 27 projects beyond one side of the casing 17 and carries a grooved pulley 28, which is driven from a grooved pulley 29 fast on the output shaft 30 of the power unit 22 by means of a V-belt 31. When the shaft 30 is driven, rotary motion is transmitted to the spindle 14 through the medium of the pulleys 29 and 28, belt 31, worm 26, and worm wheel 25, and the housing 10 and trowel members 11 are thus rotated with respect to the concrete mass. The speed of the power unit may be controlled by a suitable throttle or rheostat, as shown at 100 in Fig. 2.

Any suitable number of rectangular plate-like trowel members 11 may be provided, and each member is carried by a shaft 35 which projects radially from the housing 10 and which is adapted to oscillate in suitable bearings 36. The outer reduced ends of the radial shafts 35 are adapted to turn in brackets 37, which are fastened to a guard ring 38 arranged concentric with the axis of rotation of the housing 10. Referring to Figs. 2 and 5, which show only three troweling members, the shafts 35 carry bevel gears 40 at their inner ends within the housing 10, the bevel gear

40' of one shaft 35' constituting the drive gear and the bevel gears 40 of the other shafts 35 each meshing with this drive gear. The several gears 40 and 40' are keyed to their respective shafts, and are normally held in meshing engagement by springs 42. The shaft 35' and its trowel member 11 are adapted to be turned by means to be next described, and the turning movement of the shaft is transmitted to the other shafts 35 through the meshing bevel gears 40' and 40, so that all the trowel members are tilted simultaneously in the same direction and to the same degree. The shaft 35' is adapted to be turned automatically by means to be next described.

The shaft 35' is provided with an arm 43 having a roller 44 at its end, which is engaged by a finger 45 pivoted at 46 within the housing 10 and resting against the roller. The finger 45 is adapted to be pivoted downwardly to depress the arm 43 and turn the shaft 35' in clockwise direction, as viewed in Fig. 2, by means of a plunger 48 slidable vertically in the bore of the tubular spindle 14 with its lower end resting upon the finger. The plunger 48 may be made in two parts, as herein shown, with the lower part, designated 48', slidably mounted in the cover plate 12, so that other travel assemblies of different sizes, or other attachments, may be substituted for the one illustrated, such assemblies, or attachments, also having short plunger parts which may be inserted into the lower end of the spindle 14. The construction is such that attachments may be connected to the drive plate 13 without interfering with the plunger 48. When the plunger 48 is forced downwardly, its lower end 48' engages with and depresses the finger 45 tending to tilt the same in order to rotate the shaft 35', whereby the trowel members are tilted. A coil spring 49 is provided to rotate the shaft 35' in the same direction, and serves as a preloading means to aid in overcoming the weight of the machine when resting upon the trowel members. One end of the spring is connected to a stud 50, adjustably screwed into a role in the side of the housing 10 for varying the action of the spring.

The plunger 48 is depressed by one arm 52 of a bell-crank lever 53 pivoted at 54 to a bracket 55 projecting laterally from the frame 21. The bell-crank lever 53 has a substantially vertical arm 56 having an upper yoke end, the sides of which carry rollers 57 engageable in the opposite sides of a peripheral groove 58 formed in a collar 60 slidably mounted on the shaft 30. Pivoted at 61 to the collar 60 are arms 62 having their outer ends pivoted to similar arms 63, which, in turn, are pivoted at 64 to the hub of the grooved pulley 29. At the outer pivoted ends of the arms 62 and 63 are weights 65, which are adapted to move radially outward under the influence of centrifugal force to move the collar 60 toward the pulley 29 against the action of a spring 66 interposed between the collar and pulley.

The collar 60, arms 62 and 63, and weights 65 constitute a governor 67, and when the speed of the power unit is increased by manipulating the throttle or rheostat toward the maximum position, the governor acts through the bell-crank lever 53, plunger 48, finger 45, and arm 43 to turn the shaft 35', together with the shafts 35, to tilt the several trowel members 11 from the position shown in Fig. 3 to that illustrated in Fig. 4. Conversely, when the speed of the power unit is decreased, the weights 65 of the governor 67 will be moved inwardly by the spring 66, and, through the instrumentalities above described, the shafts 35' and 35 and the several trowel members 11 will be moved to the position shown in Fig. 3 by the weight of the machine when resting on the trowel members.

It will be understood that when the trowel members are in the relation shown in Figs. 3 and 4 they are adapted to perform various troweling operations from the rough troweling for forcing the stones or aggregate down into the concrete mass, to the finishing of the concrete, or other mass.

Referring now to Fig. 7 of the drawings, my invention contemplates the provision of an alternative means for effecting the turning of the shaft 35'. In this modified structure, the governor mechanism, the bell-crank lever and the plunger, and associated parts described in connection with the embodiment illustrated in Figs. 1 to 6 are dispensed with and a simplified means employed for the purpose. The housing 10 has a radially extending cylindrical chamber 70 formed in its side wall, and slidable in the chamber is a weight 71 which is connected to a pulley 72 by a cord or cable 73. The pulley 72 is formed on a stud-shaft 74 having a screw-thread of steep pitch adapted to be screwed up and down in a vertical hole in the drive plate 13. When the speed of the power unit 22 is increased, the weight 71 will move radially outward under the influence of centrifugal force to unwind the cable 73 from the pulley 72 to rotate the latter in a direction to unscrew the shaft 74 from the screw-threaded hole, and cause the lower end of this shaft to force the finger 45 downwardly, as shown by dash lines, and thus turn the shafts 35' and 35 in a direction to increase the angle of inclination of the trowel members. When the speed of the power unit is decreased, the angle of inclination of the trowel members 11 will also be decreased.

Fig. 8 shows a further modification diagrammatically in which the trowel members 80 are carried by brackets 81 having longitudinal bores 82 which are provided with rifling. The brackets 81 are disposed on stationary spirally-grooved rod-like supports 83 projecting radially from the housing 10. The interengaging rifling and spiral grooves of the brackets 81 and supports 83 are employed for the purpose of causing the brackets, together with their trowel members 80, to be tilted with respect to the supports when the brackets are forced outwardly along the supports under the influence of centrifugal force, when the power unit 22 and housing 10 are rotating at a relatively high rate of speed. Springs 84 disposed between the brackets 81 and collars 85 on the ends of the supports 82 serve to return the parts to first position wherein the trowel members 80 are tilted to a slight angle of inclination.

While I have herein shown and described my improved troweling machine as embodied in three preferred forms of construction, by way of example, it will be understood that other modifications may be made in the structure thereof without departing from the spirit or scope of the invention. Therefore, without limiting myself in this respect, I claim:

1. In combination with a troweling machine of the type including a plurality of trowel members revolvable about a common axis and in which each of the trowel members is tiltable on an axis extending radially of the axis of revolution: a

variable speed power means connected to said trowel members for revolving said trowel members; a tilting mechanism connected to each of said trowel members for tilting the same; a governor connected to said driving means and having a member movable in response to variations in speed of said driving means; and means interconnecting the movable member of said governor with said tilting mechanism for tilting said trowel members to various angles in response to variations in speed of said driving means.

2. In combination with a troweling machine of the type including a plurality of trowel members revolvable about a common axis and in which each of the trowel members is tiltable on an axis extending radially of the axis of revolution: a variable speed power means connected to said trowel members for revolving said trowel members; a tilting mechanism connected to each of said trowel members for tilting the same; a governor connected to said driving means and having a member movable in response to variations in speed of said driving means; and means interconnecting the movable member of said governor with said tilting mechanism for simultaneously tilting all of said trowel members to various angles in response to variations in speed of said driving means.

3. A troweling machine including: a rotatable housing; radially extending tiltable shafts on said housing; a trowel member carried by each of said shafts; intermeshing gears on said shafts disposed within said housing; means on one of said shafts for turning said shaft to various angles to thereby simultaneously tilt all of said trowel members to a corresponding angle; variable speed power means connected to said housing for rotating said housing and said trowel members; speed responsive means connected to said power means; and means connecting said speed responsive means to all of said shafts for turning said shafts to various angles in response to variations in the speed of said power means.

4. A troweling machine including: a rotatable housing; radially extending tiltable shafts on said housing; a trowel member carried by each of said shafts; intermeshing gears on said shafts disposed within said housing; means on one of said shafts for turning said shaft to various angles to thereby simultaneously tilt all of said trowel members to a corresponding angle; variable speed power means connected to said housing for rotating said housing and said trowel members; speed responsive means connected to said power means; a gear on each of said shafts intermeshed with the gears of the other shafts; a crank on one of said shafts for turning one of said shafts to thereby simultaneously tilt all of said trowel members; and plunger means interposed between said speed responsive means and said crank for actuating said crank to different angles in response to variations in speed of said power means.

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