Feb. 28, 1939. A. W. MALL 2,148,765

MASS AND FORM VIBRATOR

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Fig. 2.

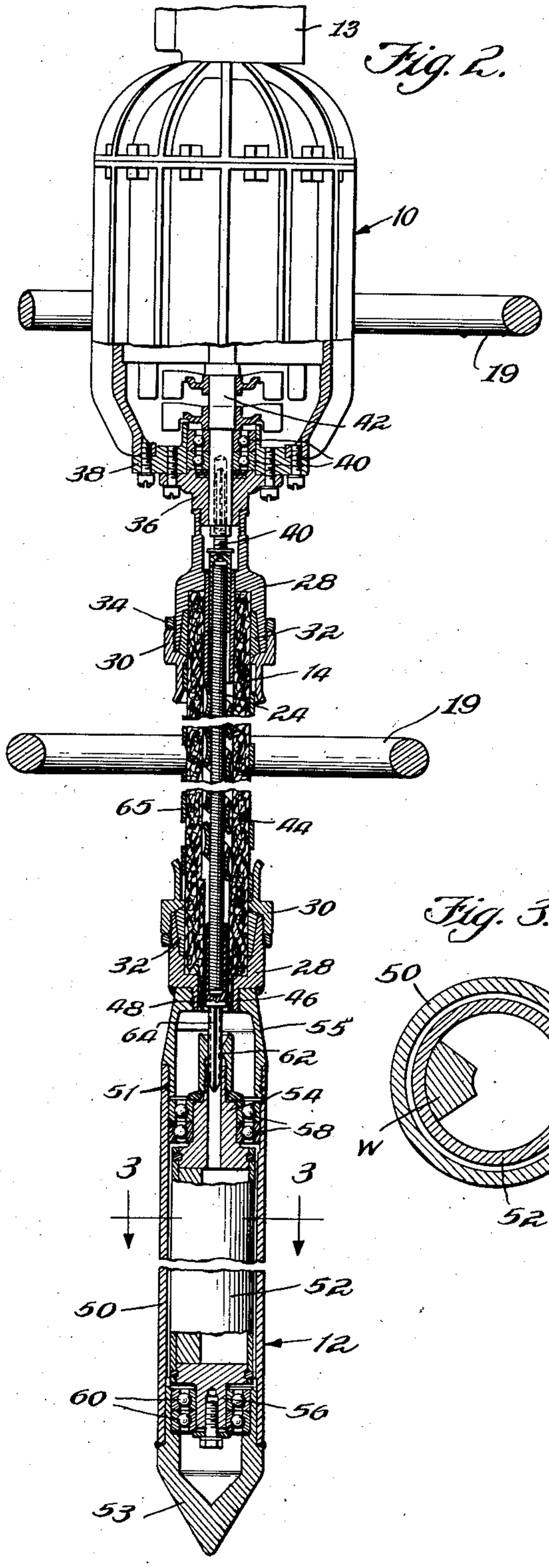

Fig. 1.

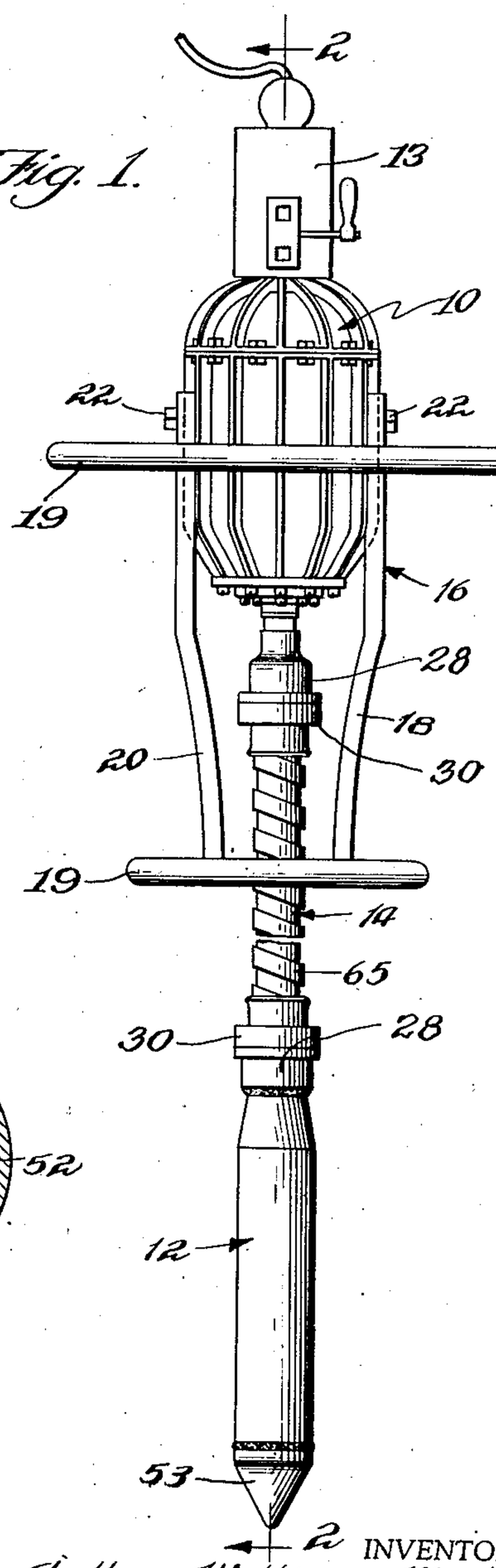

Fig. 3.

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Fig. 4.

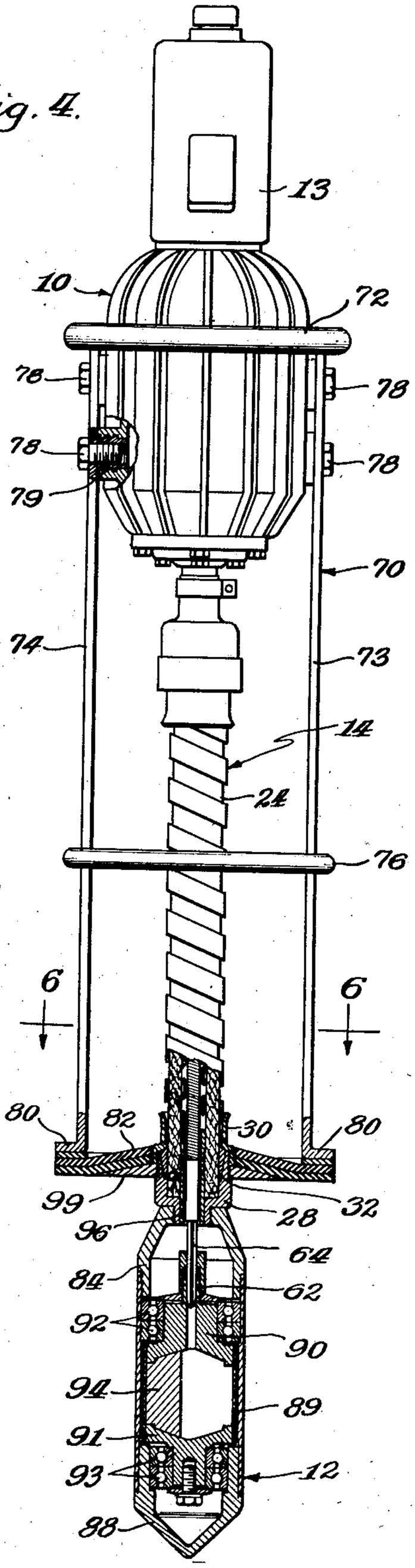


Fig. 5.

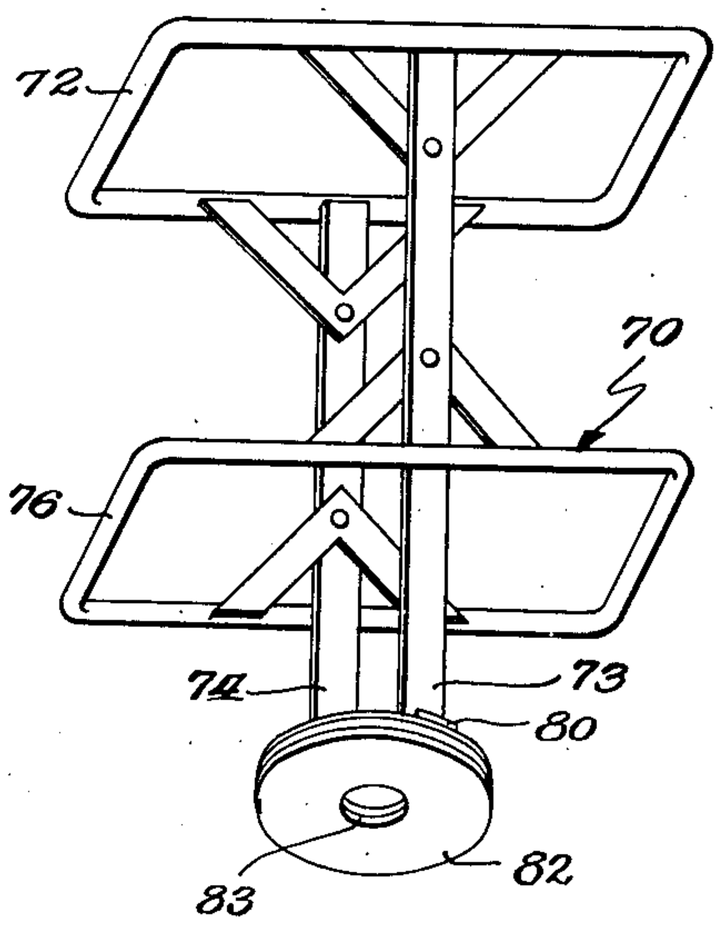
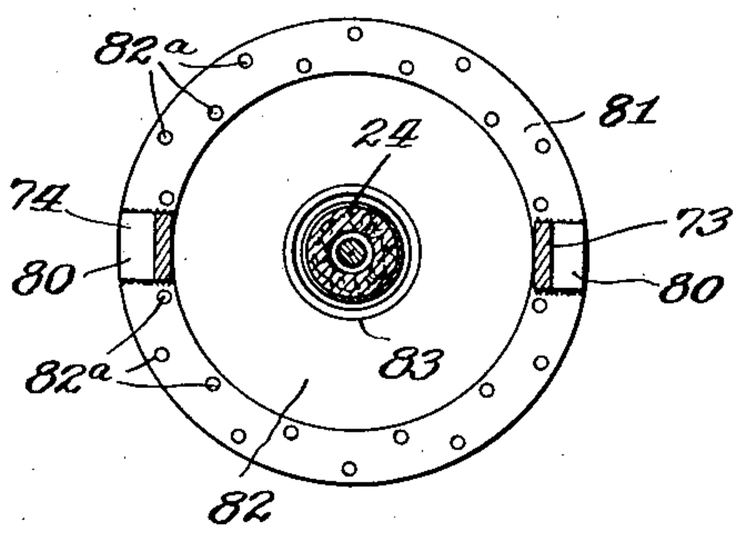


Fig. 6.



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2,148,765

MASS AND FORM VIBRATOR

Arthur William Mall, Chicago, Ill.

Application April 25, 1935, Serial No. 18,269

10 Claims. (Cl. 259—1)

My invention relates to apparatus for compacting plastic materials.

My invention relates more particularly to improvements in mass and form vibrators and like devices.

In the construction of concrete building walls, dams, roadways and the like, it has been the practice after the concrete has been poured to manually tamp the same in order to settle the plastic mass and form structures free from the usual imperfections, such as sand holes, air cavities and the like. While such methods of tamping have in the main proven satisfactory, yet there are a number of disadvantages connected therewith, such as the expense of hand labor, and the time consumed in the operations. Further, the finished concrete structures do not always possess the density desired.

By means of the herein described method and apparatus plastic masses may be continuously agitated as poured into the stationary mold forms to thoroughly compact and settle the same and form structures free from air or sand cavities or other imperfections that usually occur in hand tamped concrete operations.

It is, therefore, a principal object of my invention to provide an improved portable mechanism that may be introduced directly into the plastic mass to firmly compact or agitate the same during the pouring operations.

A further object is to provide a mechanically operated tamping mechanism that may be conveniently suspended above the mold forms and readily moved from one position to another in the concrete mass during the pouring operations.

A further object of my invention is to provide an improved vibrator so constructed that an off-balance weight may provide the vibratory action, yet in which the weight is so balanced and journalled that it will produce good results with a minimum of power applied.

A further object of my invention is to provide an improved construction and mounting for the off-balance weight within a totally enclosed protecting shell.

A further object of my invention is to provide in a concrete vibrating machine an arrangement of parts and a construction whereby the highest possible horse power may be obtained in a machine of the lightest weight.

A further object of my invention is to provide convenient carrying mechanism for machines of this type so that the same can easily be handled by a pair of operators.

A further object of my invention is to provide an improved guide mechanism adjacent the lower end of the flexible shaft for assisting the operator in guiding the vibratory member to its desired location.

The invention disclosed herein consists of an encased vibratory member adapted to be inserted in a mass of plastic material such as concrete, having a shaft flexibly connected to a source of power such as an electric motor for vibrating the member, suitable suspension means being provided for the apparatus in order that the encased vibratory member may be inserted in and withdrawn from the plastic mass at will.

Other objects and advantages will be more apparent from the following description, reference being had to the accompanying sheet of drawings upon which

Fig. 1 is a side elevational view of the vibrator, suspending medium and motor;

Fig. 2 is a vertical sectional view taken generally on the lines 2—2 of Fig. 1;

Fig. 3 is a horizontal sectional view through the vibrator means and enclosing shell taken on the lines 3—3 of Fig. 1;

Fig. 4 is a side elevational view of a modified form of vibrator, suspending medium and motor, with portions thereof broken in section to more clearly show other parts;

Fig. 5 is a view in perspective of the supporting member for the mechanism; and

Fig. 6 is a sectional view taken on the lines 6—6 of Fig. 4.

In the drawings, I have shown one form of construction wherein I employ a motor 10, vibrator 12 and a suspending medium 14 in the form of a flexible shaft therefor.

The motor which I employ is preferably a 3 H. P. motor which is in a totally enclosed re-enforced aluminum housing that is dust and vapor-proof and is made to stand rough handling. I have protected this motor against burnout due to low voltage or single phasing by a special electrical tripping device on the switch 13 which automatically opens the circuit if there is something wrong. Due to this feature, I have practically eliminated all motor burnout trouble in this form of vibrator.

I provide a support member 16 having a pair of brackets 18 and 20 secured to the motor housing by suitable bolt members 22, and provided with hand wheels 19.

The member 14 may be formed of a flexible fabric housing 24 and a flexible driving shaft 26.

The housing 24 is secured at its upper end in a

coupler 28 forming with a screw-threaded lower end to receive a collar member 30 and a rubber bushing 32 to securely fasten the same to the housing 24. After the parts have been connected together, a lock ring 34 is placed about the same to secure the joint. The upper end of coupler 28 is internally threaded to engage a lower collar 36 secured to an end bracket 38 in the lower end of motor 10. The collar 36 supports a pair of ball-bearing members 40 within which the end of motor shaft 42 is journalled.

The lower end of shaft 42 carries a drive nut 43 to receive a rigid tip 44 on the end of flexible driving member 24. Coiled flat spring members 44 positioned within the housing 24 serve to space the flexible shaft 24 from the side walls of the fabric housing. The lower end of housing 24 may be provided with a similar coupling 28, collar 30 and bushing 32. The lower coupler 28, however, is externally threaded at 46 and engages in an opening 48 in the upper end of the shell 50 of the vibrator 12.

The vibrator member 52 may be in the form of a cylinder having reduced upper and lower end portions 54 and 56 adapted to be suitably journalled in sets of ballbearing members 58 and 60 located in the upper and lower ends of the shell 50 respectively. The member 52 may be hollow and provided upon one side with an offset weight which extends throughout the length thereof. The upper end 54 of the vibrator member 52 may be provided with a drive nut 62 to receive the lower splined tip 64 that is secured to the flexible driving member 24.

The vibrator shell 50, as previously described, may be constructed of a hollow steel cylinder 51, a lower or pointed nose portion 53, and an upper portion 55, all suitably connected together and welded.

A flat spiral spring member 65 is adapted to be coiled about the flexible housing 14 being fastened at its upper end within the upper collar 30 and at its lower end within the lower collar 30.

From the foregoing description it will be apparent that a sturdy, well constructed connection has been provided between the portable motor 10 and the vibrator 12. The length of the housing 14 and flexible driving shaft 24 may be varied depending upon the condition and type of work which it is desired to be used for.

It will be noted that with my improved construction both the flexible shaft and the housing may be rigid in a suspended position, but the driving shaft is free to slide in and out of the driving nut at the vibrator so that the vibrations are not transmitted to the motor and the bearings of the motor. It may further be seen that the flexible shaft housing is held or clamped in a flexible manner by using the rubber bushings I have shown. This prevents the vibrations from being transmitted from the vibrator to the driving shaft and the motor. It will be obvious that thus the wear and tear on the motor which causes the motor to burn out and the motor bearings to deteriorate, is largely eliminated.

In operating my improved device I place the vibrator in the concrete at an angle of 45 degrees and start the motor. The length of time required to vibrate the mass satisfactorily depends on the amount of slump. If concrete is too wet it is difficult to apply the vibration energy to the concrete. In other words, it is hard to put the vibrator held in the air. Therefore, the concrete mix should be dryer when vibrated than when placed by hands. A 3¼" vibrator sends out waves in all directions for 18 inches or more so that the vibrator should be placed in the concrete every three feet. It is necessary to stop vibrating in a given spot when the water starts to bubble up. It is unnecessary to thrust the vibrator into the concrete and make a lot of hard work of an easy job. The active vibrator soon digs itself in. It is necessary when the vibrator is covered to hold back on the flexible shaft so that it doesn't go down too deep. A vibrator absorbs three times as much power when revolved and immersed in no slump concrete as in the air. A preferable motor speed should be 3000 to 4500 R. P. M. Higher speed is naturally harder on the vibrator and shaft.

It will be evident that with the vibrator I have devised, the possibility of destroying the shell 50 or damaging the same in operation, such as is done in devices in the past, is entirely eliminated. By the provisions of efficient bearing members such as I provided, the operation is smooth and the device may be used indefinitely without showing signs of wear.

In Figs. 4, 5 and 6, I have illustrated a modified form of my invention wherein I provide a motor 10, vibrator 12, flexible shaft 14 and a supporting member 70. In this embodiment of my invention, I provide the supporting member 70 with an upper rectangularly-shaped handle 72 that may be securely welded or otherwise fastened to the vertical members 73 and 74 of the member 70. I provide a similar rectangularly-shaped handle member 76 welded or otherwise secured to the vertical members 73 and 74 at a point adjacent their lower end. The upright bars 73 and 74 may be rigidly fastened to the motor casing by suitable screw members 78 which extend through openings 79 in the uprights, and are screw-threadedly fastened in the motor housing. The lower ends of the uprights are outwardly turned as at 80 and provide a support to which a ring member 81 may be secured. The ring member 81 provides a support for a pair of rubber disk members 82, the disk members being fastened thereto by a plurality of rivets 82*a*.

The disk members have an axial opening 83 therein through which the flexible shaft 14 is adapted to extend and which, in preferred form, shows the disk members encircling the collar member 30 of the lower end of the flexible shaft. A saucer-shaped thrust disk 99 may be provided, rigidly fastened between the end of collar 30 and coupler 28, and the disk members may rest upon this collar.

Thus, in the embodiment which I have shown, the vibrator is mounted at the end of the flexible shaft, directly below the flexible guide members 82. Thus it will be obvious that the vibrator may be guided in its course by the fact that the shaft passes through the openings in the guides 82. With this construction, it is possible for the shaft to vibrate and for the vibrator therebelow to perform its function. However, the vibrations set up will be largely taken up by the disk members and thus will not be transmitted to the motor.

With this construction, it will be obvious that the vibrator can be set in position entering a mass to be worked upon, and the same will gradually work itself down until the disk members 82 rest upon the top of the concrete. Thus it can be seen that operators will get a momentary rest while the machine is operating and will thus be better able to handle a machine efficiently over

a period of time. As previously pointed out, the amount of work which can be accomplished depends upon the weight of the motor and vibrator and the horsepower required. Naturally, the heavier the apparatus the more fatiguing will be the operation upon the operators. Therefore, with this construction it can be seen that a heavier apparatus may be employed because of the fact that the operators will have intervals of rest during its operation.

I have shown a modified form of vibrator member 12 which may comprise generally the cap 84, cylindrical shell 86 and nose member 88. These parts may be welded or otherwise suitably secured together to form a rigid housing. The vibratory member may comprise a cylindrical shell 89 having the reduced upper and lower ends 90 and 91 suitably mounted in the housing 12 in upper and lower ballbearing members 92 and 93. The vibrator is provided with an offset weight member 94 rigidly secured in the shell 89. The vibratory member is adapted to be driven, as previously described, by the tip 64 secured to the lower end of the flexible shaft, which tip engages in a suitable drive nut 62 secured to the upper end of the vibrator member.

In the connection between the end of the flexible shaft and the vibrator, I have shown the coupling 28 screw-threadedly mounted in the upper end of member 84, connected to the collar 30 and fastened to the end of the fabric housing of the shaft by the rubber bushing 32. As a further fastening means between the coupler and the housing 24, I provide a tubular member 96 rigidly secured in the coupler 28 and formed with external downwardly pointed teeth 97. This member is adapted to be inserted into the flexible housing and thus form a rigid grip between the bushing 32 and the teeth 97.

While I have illustrated and described a specific embodiment and a modified form of my invention, it will be apparent to those skilled in the art that numerous changes and modifications may be made in the specific details shown and I do not wish to be limited in any particular; rather what I desire to secure and protect by Letters Patent of the United States is:

1. In apparatus of the class described, the combination of a portable motor, a supporting bracket having a pair of spaced circular hand wheels secured thereto, a flexible shaft extending downwardly from said motor, a flexible housing therefor, a cylindrical shell secured to the lower end of said shaft housing, a cylinder having an off-balance weight journalled therein and a driving connection between said cylinder and said flexible shaft.

2. In apparatus of the class described, the combination of a portable enclosed electric motor, a supporting bracket having a pair of circular handwheels secured thereto, a removable flexible shaft extending from said motor, a flexible housing therefor, a cylindrical shell secured to the lower end of said shaft housing, said housing having collars for attachment to said motor and said shell, an off-balance weight journalled in said shell, ballbearing members comprising said journals and a movable driving connection between said weight and said flexible shaft.

3. In apparatus of the class described, the combination of a portable enclosed electric motor, an enclosed switch therefor positioned thereon, a supporting bracket having a pair of circular hand wheels secured thereto, a flexible shaft extending downwardly from said motor, a flexible housing therefor, said housing having collars at both ends, a cylindrical shell secured to the collar at the lower end of said shaft housing, a rotatable member having an off-balance weight journalled in said shell and a loose driving connection between said member and said flexible shaft.

4. In apparatus of the class described, the combination of a portable motor, a supporting bracket secured to the housing of said motor, said bracket having a pair of rectangularly-shaped handle members secured thereto, a flexible shaft extending downwardly from said motor within said bracket, a flexible housing for said shaft, a flexible guide member at the lower end of said bracket through which said housing extends, a cylindrical shell secured to the lower end of said housing, an off-balance weight journalled therein and a driving connection between said weight and said flexible shaft.

5. In apparatus of the class described, the combination of a portable motor, a supporting bracket secured to the housing of said motor, said bracket having a pair of rectangularly-shaped handle members secured thereto, a flexible shaft extending downwardly from said motor within said bracket, a flexible housing for said shaft, a flexible guide member comprising a circular disk at the lower end of said bracket through which said housing extends, a cylindrical shell secured to the lower end of said housing, an off-balance weight journalled therein and a driving connection between said weight and said flexible shaft.

6. In apparatus of the class described, the combination of a portable enclosed electric motor, a flexible shaft extending downwardly from said motor, a flexible housing therefor, a supporting bracket secured to the housing of said motor, said bracket having a pair of spaced supporting handles thereon, a guide disk at the lower end of said bracket, said shaft adapted to be extended through said disk, a weight housing secured to the lower end of said shaft housing, an off-balance weight journalled therein and a driving connection between said weight and said flexible shaft.

7. In apparatus of the class described, the combination of a portable enclosed electric motor, a flexible shaft extending downwardly from said motor, a flexible housing therefor, a supporting bracket secured to the housing of said motor, said bracket having a pair of spaced supporting handles thereon, a flexible guide disk at the lower end of said bracket, said disk having an axial opening therethrough, said shaft adapted to be extended through the opening in said disk, a weight housing secured to the lower end of said shaft housing, an off-balance weight journalled therein and a driving connection between said weight and said flexible shaft.

8. The combination with a vibrating mechanism of the type having a motor, a housing therefor, a vibrator shell, a vibrator therein, a flexible drive from said motor to said vibrator and a flexible housing for said driveshaft, of handle means adapted to be secured to the exterior wall of said motor including a pair of downwardly extending brackets, a hand-wheel secured to said brackets at a point adjacent the motor, and a hand-wheel secured to said brackets and surrounding said flexible housing and flexible shaft at a point adjacent the upper end of said vibrator casing.

9. The combination with a vibrating mechanism of the type having a motor, a housing therefor, a vibrator shell, a vibrator therein, a flexible

drive from said motor to said vibrator, and a flexible housing covering said drive, of a supporting member adapted to be bolted to the exterior housing of said motor, said supporting member including an upper rectangularly-shaped handle member, a similar rectangularly-shaped handle member secured thereto at a point adjacent the upper end of said vibrator shell, and a disc member secured thereto at a point adjacent the connection of the flexible housing to the vibrator shell.

10. The combination with a vibrating mechanism of the type having a motor, a housing therefor, a vibrator shell, a vibrator therein, a flexible drive from said motor to said vibrator, and a flexible housing covering said drive, of a supporting member adapted to be bolted to the exterior housing of said motor, said supporting member including an upper rectangularly-shaped handle member, a similar rectangularly-shaped handle member secured thereto at a point adjacent the upper end of said vibrator shell, and a disc member secured thereto at a point adjacent the connection of the flexible housing to the vibrator shell, said disc member including a pair of rubber discs having an axial opening therethrough through which said flexible shaft housing extends and by means of which vibrations of the flexible housing will be prevented from being carried upwardly to said handle members.

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