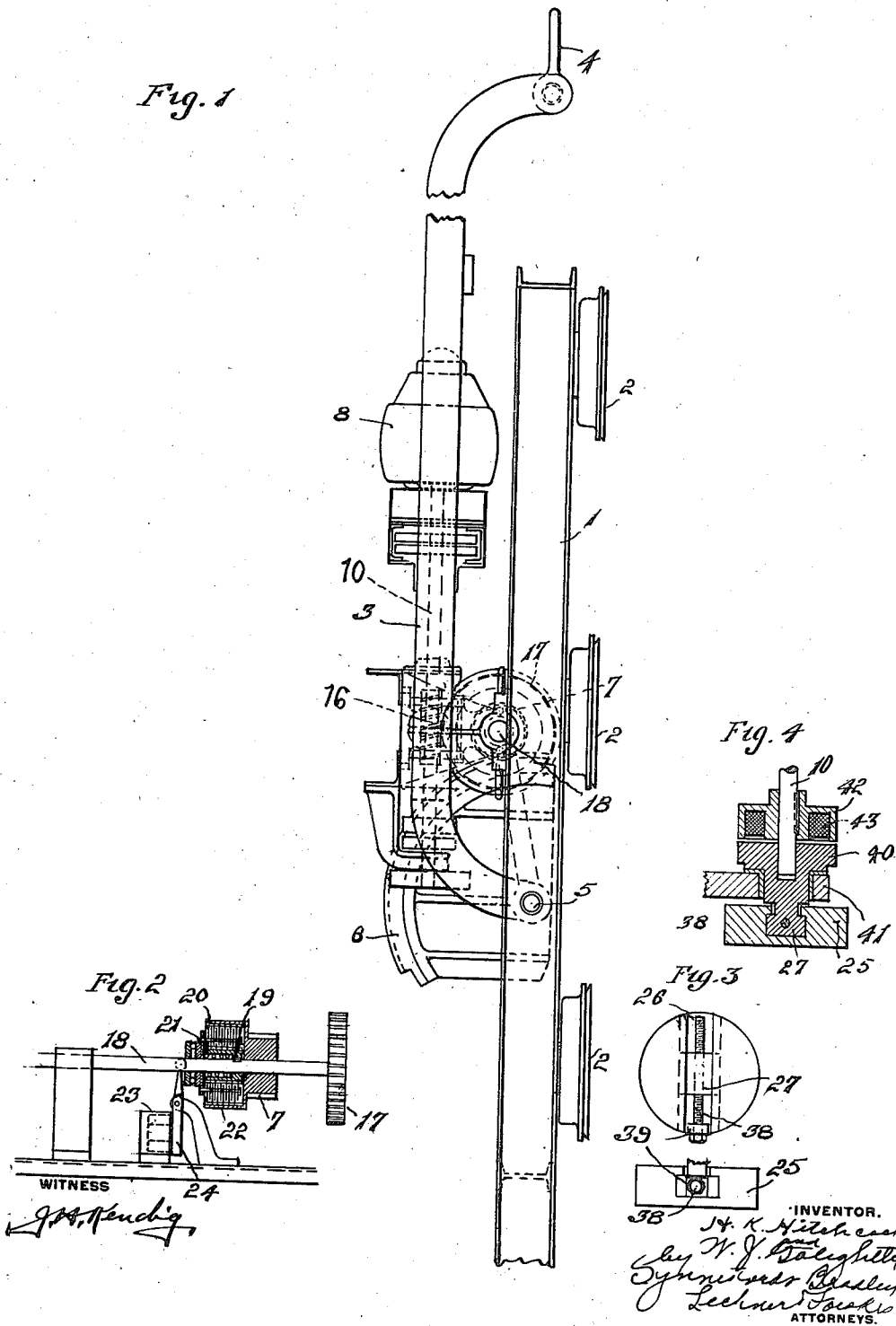


H. K. HITCHCOCK & W. J. GOLIGHTLY,
 VACUUM LIFTING APPARATUS.
 APPLICATION FILED JULY 18, 1917.

1,296,079.

Patented Mar. 4, 1919.
 4 SHEETS—SHEET 1.

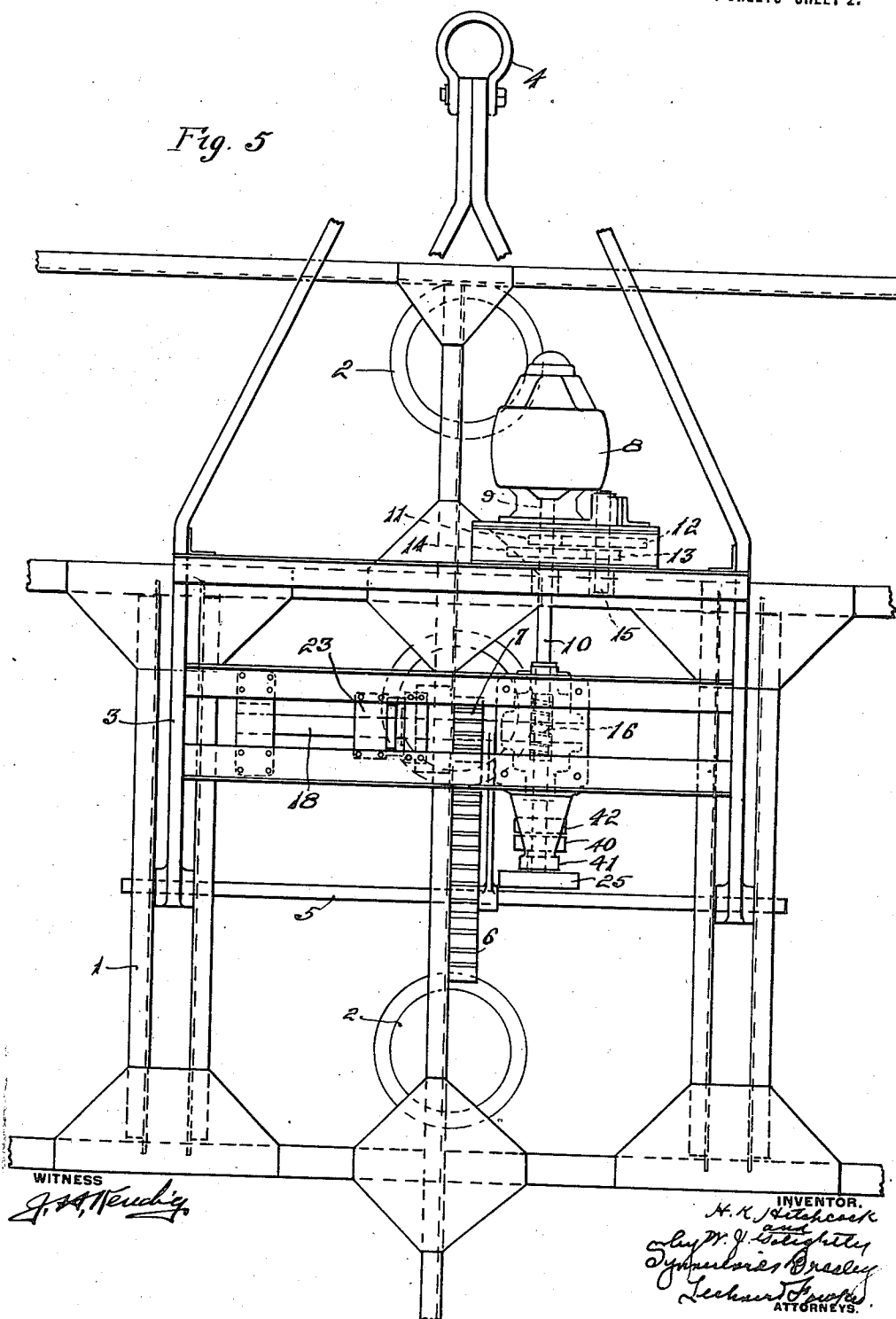


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Fig. 5

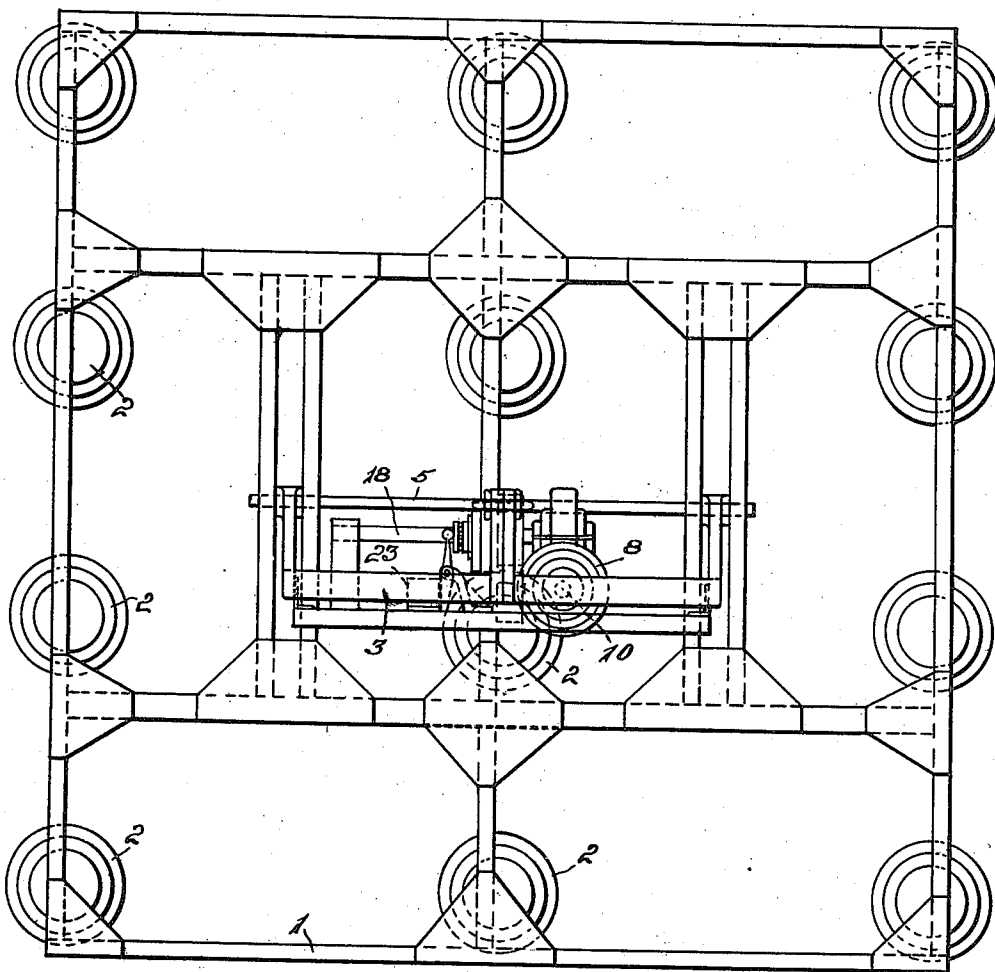


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Fig. 6



WITNESS

John H. Hendry

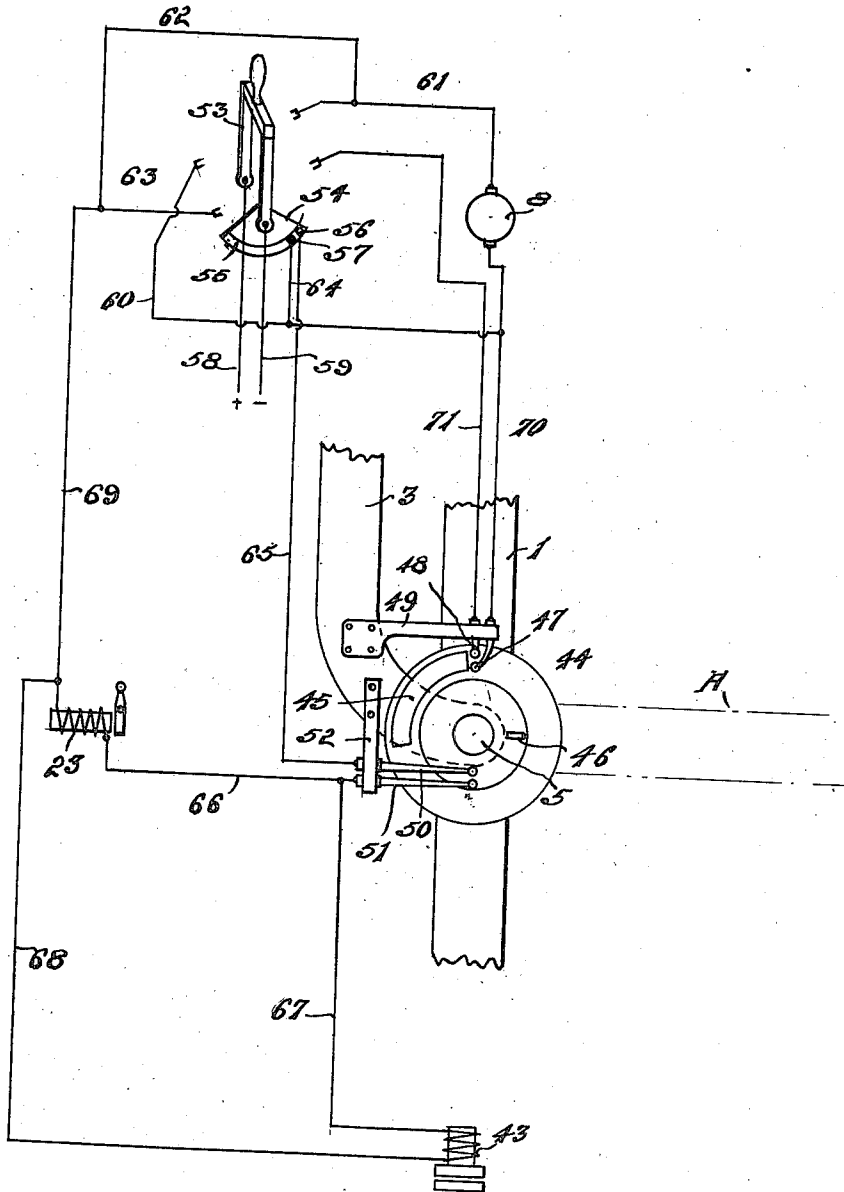
INVENTOR.

*H. K. Hitchcock
and W. J. Golightly
by *James H. Bradley*
Lehnert & Fawkes
ATTORNEYS.*

1,296,079.

4 SHEETS--SHEET 4.

Fig 7



WITNESS

J. H. Kendrick

INVENTORS

INVENTORS
H. K. Hitchcock
and
M. G. Halighly
Sigsbee, Ford, Bradley
Lechner & Fowler,
ATTORNEYS.

UNITED STATES PATENT OFFICE.

HALBERT K. HITCHCOCK, OF PITTSBURGH, PENNSYLVANIA, AND WILLIAM J. GOLIGHTLY, OF KOKOMO, INDIANA, ASSIGNORS TO PITTSBURGH PLATE GLASS COMPANY, A CORPORATION OF PENNSYLVANIA.

VACUUM LIFTING APPARATUS.

1,296,079.

Specification of Letters Patent.

Patented Mar. 4, 1919.

Application filed July 18, 1917. Serial No. 181,232.

To all whom it may concern:

Be it known that we, HALBERT K. HITCHCOCK and WILLIAM J. GOLIGHTLY, both citizens of the United States, residing, respectively, at Pittsburgh, in the county of Allegheny and State of Pennsylvania, and Kokomo, in the county of Howard and State of Indiana, have invented certain new and useful Improvements in Vacuum Lifting Apparatus, of which the following is a specification.

The invention relates to vacuum lifting apparatus for handling sheets of glass. It has for its principal objects; the provision of improved means for securing the movements of the tilting frame; the provision of improved means for avoiding jar or accident in case the operating motor is not stopped at exactly the right point; and the provision of improved means on the apparatus whereby the positioning of the glass in the plaster of the grinding table is facilitated. One embodiment of the invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a side elevation of the apparatus, the lower portion of which is broken away; Fig. 2 is a sectional side elevation of a detail; Fig. 3 shows in plan and side elevation the vibrator employed; Fig. 4 is a section through the vibrator of Fig. 3; Fig. 5 is a rear elevation of a portion of the apparatus on an enlarged scale as compared with Fig. 1; Fig. 6 is a plan view of the apparatus with the tilting lifting frame moved from the vertical position of Fig. 1 to a horizontal position; and Fig. 7 is a diagrammatic view of the wiring.

The apparatus is designed for carrying sheets of glass, particularly plate glass, from point to point and for setting them in the plaster upon the grinding tables preparatory to the grinding operation. The body of the apparatus comprises a supporting frame adapted to be suspended from above upon a crane, and a lifting frame provided with the usual vacuum cups which is pivoted to the supporting frame and may occupy either a vertical position or a horizontal position, the latter position being the one assumed when the sheet of glass is being positioned upon a grinding table. In order to tilt the lifting frame with respect to the supporting frame an electric motor is provided, which motor operates through a train

of gearing including a friction drive, so that no jarring or injury to the apparatus is occasioned when the frame reaches the extreme of its tilting movement with the motor still in operation. The train of gearing includes reducing means comprising a set of spur gears and a worm gear. The motor also drives a vibrating device which is adapted to give the lifting frame lateral movement back and forth to facilitate the setting of the sheet of glass in the plaster, and clutch means are provided so that either the friction drive or the vibrator may be thrown out of connection or connected at will.

Referring to Fig. 1, the reference numeral 1 indicates the lifting frame provided with the plurality of vacuum cups 2, and 3 is the supporting frame having the loop 4 at its upper end for connection with a crane or other suitable transferring mechanism. The method of construction of the two frames will be understood by reference to Figs. 5 and 6, both frames being built up of commercial sections secured together in any suitable manner. The lifting frame 1 is connected to the supporting frame by means of the pivot bar 5 and is provided with a segmental gear 6 driven from the spur gear 7 carried upon the supporting frame 3.

The frame 3 carries the electric motor 8 which drives the spur gear 7 through a train of reducing gearing shown in Figs. 1, 5 and 6. The shaft 9 of the motor (Fig. 5) drives the shaft 10 through the spur gears 11, 12, 13 and 14, the gears 12 and 13 being carried by the counter-shaft 15. The shaft 10 is provided with a worm 16 shown in dotted lines in Figs. 1 and 4 and this worm drives a worm wheel 17 carried on the shaft 18 at right angles to the shaft 10.

The shaft 18 carries the spur gear 7 heretofore referred to as meshing with the segmental gear 6, and also carries the friction driving means, such mechanism being shown in detail in Fig. 2. The shaft 18 has keyed to it a sleeve 19 which carries one set of friction disks. This set of friction disks is normally forced to the left by means of the spring 20 in the sleeve 19, which spring carries the plate 21 and the bolts attached thereto and secured to the friction disks to the left. The spur gear 7 has an integral sleeve 22 carrying the other set of friction

disks, so that with the arrangement above specified, the spur gear 7 is normally frictionally driven from the shaft 18. In order to release this friction drive it is necessary to move the plate 21 to the right to compress the spring 20 and move the disks carried by the inner sleeve 21 away from the other disks, and this is accomplished by means of the solenoid 23 operating upon the end of the lever 24. When the solenoid is energized the upper end of the lever 24 is moved to the right, thus releasing the friction connection. Any type of friction drive might be employed at this point, no claim of novelty being made for the particular connection illustrated and described.

Figs. 3 and 4 illustrate in detail the vibrator device, which vibrator device is located at the lower end of the shaft 10 (Fig. 5). The vibrator comprises a disk 25 provided with a transverse undercut slot 26 in which is slidably mounted a block 27. This block is adjustable transversely of the disk by means of a screw 38 passing through a lug 39 integral with the disk. The block 27 has integral with it the disk portion 40 in which the lower end of the shaft 10 turns loosely (Fig. 4), such disk portion resting upon the bearing 41 secured to the supporting frame 3. Also mounted upon the shaft and keyed thereto, is the armature 42 provided with the winding 43. When the winding 43 is energized by the passage of current the disk 40 is drawn up close to it and the two rotate together, thus rotating the disk 25. If the block 27 is eccentric with respect to the disk 25 a lateral vibratory movement is imparted to the apparatus when the passage of current through the winding 43 is stopped, the disk 40 no longer turns with the disk 42 and the rotation of the disk 25 is discontinued. The armature and the construction above described thus provides a magnetic clutch which can be thrown into and out of operation at will.

The vibrator is employed when the lifting frame 1 is in horizontal position with the glass carried thereby in position in the plaster. At such time the armature 42 is energized and the rotation of the motor causes the shaft 10 to rotate at a high speed, thus rotating the vibrator disk 25 and giving the frame a lateral vibratory movement tending to settle the glass in the plaster. At this time, while the vibratory motion is being imparted to the frame the solenoid 23 shown in Fig. 2 is energized, thus releasing the magnetic clutch at this point so that there is no tendency to rotate the lifting frame, and the motor acts entirely as a motive force for operating the vibrator. The vibrator is operated only when it is desired to set the glass in the plaster and at other times the armature 42 is not energized and the vibrator disk 25 remains stationary. The util-

ity of the vibrator device will be apparent, as will also that of the friction drive shown in Fig. 2, which friction drive operates to prevent jarring when the lifting frame reaches the end of its travel, and also permits the driving connection to be broken when it is desired to operate the motor to secure the vibration. Other advantages incident to the construction will be readily apparent to those skilled in the art.

The electrical connections are illustrated in Fig. 7, wherein the frame 1 is shown as provided with an insulating plate 44 carrying a contact plate 45 and a contact bar 46, while the frame 3 is provided with a pair of contacts 47 and 48 mounted upon the arm 49, and with another pair of contacts 50 and 51 mounted upon the arm 52. The arrangement is such that when the frame 1 reaches a horizontal position the winding of the solenoid 23 is automatically placed in circuit to release the clutch shown in Fig. 2, while at the same time the winding 43 of the clutch shown in Fig. 4 is also placed in circuit to secure the operation of the vibrator, so that the motor is relieved of all work except the operation of the vibrator. The movement of the controlling switch to its neutral position cuts off all current to the motor, while a further movement to its other extreme position causes a reversal of the path of the current through the motor and cuts off the supply of current to the clutch winding.

The foregoing operation will be understood by further reference to Fig. 7, wherein the switch 53 is shown as carrying a sector 54 having a contact plate 55 which is engaged by the contact members 56 and 57. If the switch 53 is moved from the neutral position shown to its left hand position, current passes from the lead 58 to the lead 59 via the wire 60, the motor 8 and the wires 61, 62 and 63, thus causing the rotation of the frame 1 in a clockwise direction from the position shown in Fig. 1 to the dotted line position indicated at A.

When the frame 1 arrives at the position A the contact bar 46 engages the contacts 50 and 51, thus causing a flow of current through the windings 23 and 43. This flow of current from the lead 58 to the lead 59 occurs through the wires 60 and 64, the plate 55, the contacts 56 and 57, the wire 65, the contacts 50 and 51 and the wires 66, 67, 68, 69 and 63, the windings 43 and 23 being arranged in parallel as will readily be apparent by inspection. This flow of current causes the release of the clutch shown in Fig. 2, and the engagement of the clutch shown in Fig. 4, so that the motor operates only the vibrator.

The movement of the switch 53 to the neutral position shown, cuts off the current to all parts of the apparatus so that the motor and the vibrator are stopped. A further

movement of the switch 53 to the right causes the reversal of the motor, the current at such time flowing from the lead 58 to the lead 59 via the wire 61, motor 8, wire 70, contact 47, plate 45, contact 48, and wire 71, so that the frame 1 is swung in a counter-clockwise direction until the parts reach the position shown in Fig. 7, at which time the contact plate 45 is moved out of contact with the contact members 47 and 48 and the supply of current to the motor thus automatically cut off.

What we claim is:

1. In combination in vacuum lifting apparatus, a supporting frame, a lifting frame pivoted thereto and provided with vacuum lifting means, a motor carried by one of said frames, and a vibrator carried by one of said frames and driven by the motor.
2. In combination in vacuum lifting apparatus, a supporting frame, a lifting frame pivoted thereto and provided with vacuum lifting means, a motor carried by one of said frames, and means driven by the motor for vibrating the lifting frame in a horizontal plane.
3. In combination in vacuum lifting apparatus, a supporting frame, a lifting frame pivoted thereto and provided with vacuum lifting means, a motor and connections for tilting the lifting frame, and a vibrator driven by said motor.
4. In combination in vacuum lifting apparatus, a supporting frame, a lifting frame pivoted thereto and provided with vacuum lifting means, a motor and connections for tilting the lifting frame, a clutch in said connections, a vibrator driven by said motor, and means for releasing the clutch.
5. In combination in vacuum lifting apparatus, a supporting frame, a lifting frame pivoted thereto and provided with vacuum lifting means, an electric motor for tilting the supporting frame, and means for automatically cutting off the supply of current to the motor when the lifting frame reaches a substantially vertical position.
6. In combination in vacuum lifting ap-

paratus, a supporting frame, a lifting frame pivoted thereto and provided with vacuum lifting means, a motor and connections for tilting the lifting frame, a clutch in said connections, and means operated by the movement of the lifting frame for disconnecting the said clutch when the lifting frame reaches substantially a horizontal position.

7. In combination in vacuum lifting apparatus, a supporting frame, a lifting frame pivoted thereto and provided with vacuum lifting means, a motor and connections for tilting the lifting frame, a clutch in said connections, a vibrator, a second clutch connection between the motor and vibrator, and means operated by the movement of the lifting frame for throwing out the first clutch and throwing in the second clutch when the lifting frame arrives at substantially a horizontal position.

8. In combination in vacuum lifting apparatus, a supporting frame, a lifting frame pivoted thereto and provided with vacuum lifting means, an electric motor for tilting the supporting frame, and means operated by the movement of the lifting frame for cutting off the supply of current to the motor when the lifting frame reaches its upright position.

9. In combination in vacuum lifting apparatus, a supporting frame, a lifting frame pivoted thereto and provided with vacuum lifting means, a motor and connections for tilting the lifting frame, a clutch in said connections, a vibrator driven by said motor, a second clutch between the motor and vibrator, and means for operating the said clutches.

10. In combination in vacuum lifting apparatus, a supporting frame, a lifting frame pivoted thereto and provided with vacuum lifting means, a motor and connections for tilting the lifting frame, a vibrator driven by the motor and a releasable clutch between the motor and vibrator.

HALBERT K. HITCHCOCK.
WILLIAM J. GOLIGHTLY.