J. M. HOUSEL.

DRIVING MECHANISM FOR MACHINES FOR DRILLING, TAPPING, &c.

APPLICATION FILED JULY 28, 1914.

1,160,607.

Patented Nov. 16, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

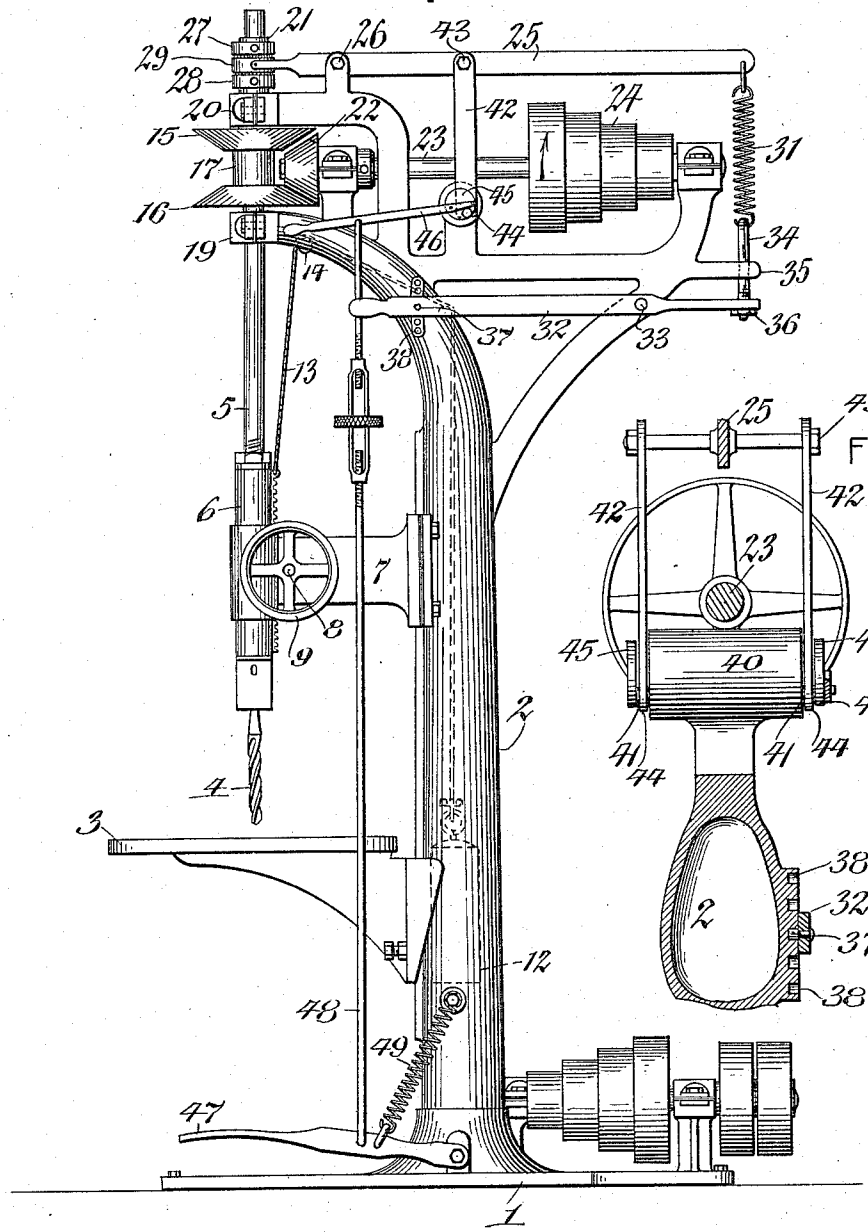


Fig. 4.

WITNESSES.

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2 SHEETS—SHEET 2.

Fig. 2.

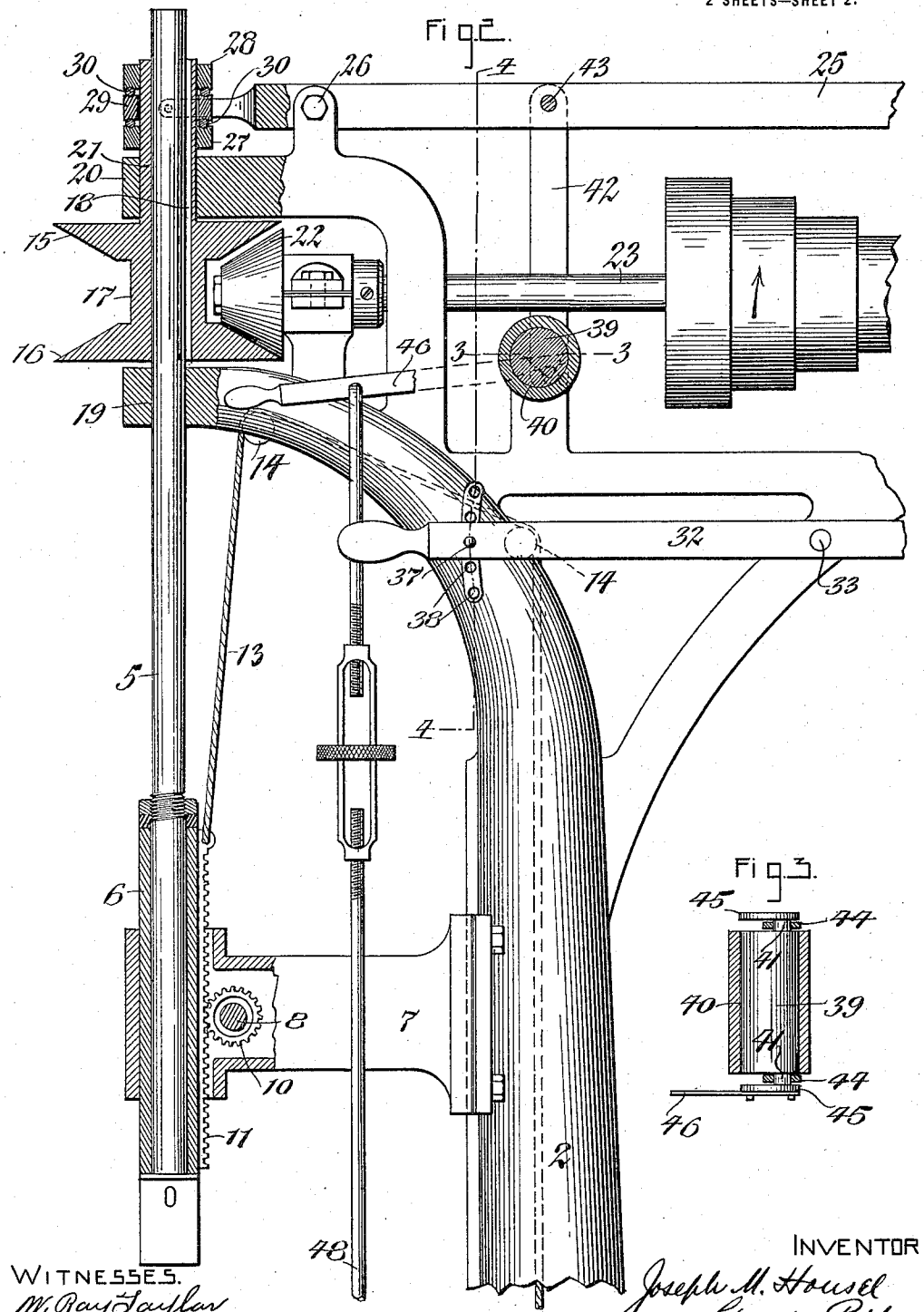


Fig. 3.

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UNITED STATES PATENT OFFICE.

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DRIVING MECHANISM FOR MACHINES FOR DRILLING, TAPPING, &c.

1,160,607. Specification of Letters Patent. Patented Nov. 16, 1915.

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To all whom it may concern:

Be it known that I, JOSEPH M. HOUSEL, a citizen of the United States, residing at Bradford, in the county of McKean and State of Pennsylvania, have invented new and useful Improvements in Driving Mechanism for Machines for Drilling, Tapping, &c., of which the following is a specification.

This invention relates to a press or machine for drilling, tapping, finishing and similar work and has for its object to provide a machine of this character which is comparatively simple in construction, which can be readily operated for either turning the tool forwardly or backwardly, which is operated frictionally so that when the tool meets with unusual resistance the driving connection between the same and the source of power will slip and thereby avoid breakage, and which can be readily adjusted so that the friction of the driving mechanism can be either increased or decreased to suit the character of the work which is being done.

In the accompanying drawings: Figure 1 is a side elevation of a machine embodying my improvements. Fig. 2 is a fragmentary vertical section, partly in elevation, of the upper part of the machine. Fig. 3 is a fragmentary horizontal section taken in line 3—3, Fig. 2. Fig. 4 is a fragmentary vertical transverse section taken in line 4—4, Fig. 2.

Similar characters of reference indicate corresponding parts throughout the several views.

Although the main frame of this machine may be of any suitable construction that shown in the drawings comprises a base 1 and a hollow column 2 rising from the base. The work to be drilled, tapped or finished is supported upon a table 3 mounted on the front side of the column and the tool 4 which operates upon the work piece is mounted upon the lower end of an upright operating or tool shaft 5 which is capable of rotation upon its axis and also movable vertically in order to adopt the tool to the work. As shown in the drawings, the lower part of the tool shaft is journaled in a vertically movable shifting sleeve 6, so as to be capable of turning therein but compelled to move vertically therewith, this shifting sleeve being guided in an arm 7 projecting forwardly from the column above the table. The vertical motion of the shifting sleeve may be effected in any suitable manner, for instance, by means of a horizontal adjusting shaft 8 journaled in the arm 7 and provided with a handle 9 for turning the same and also with a pinion 10 which engages with a gear rack 11 on the adjusting sleeve, as shown in Figs. 1 and 2. The shifting sleeve and the parts mounted thereon may be counterbalanced by a weight 12 arranged in the hollow column and connected with the shifting sleeve by means of a line, cord or similar flexible member 13 which passes around guide rollers 14 on the upper part of the column.

My improvements relate more particularly to a frictional driving mechanism whereby the tool shaft may be turned either forwardly or backwardly and the following description will therefore relate to these improvements: 15, 16 represent upper and lower driven friction wheels which are arranged one above the other, these wheels being beveled so that the upper friction wheel has the form of a downwardly tapering cone and the lower friction wheel the form of an upwardly tapering cone. These two friction wheels are arranged upon an upright hub or sleeve 17 which is preferably formed in one piece with these friction wheels and which is mounted on the adjacent part of the tool shaft and connected therewith by means of a spline 18, so that the friction wheels and the hub and the tool shaft upon which these parts are mounted are compelled to turn together but are capable of sliding axially relatively to one another. Below the lower friction wheel is a bearing 19 on the upper part of the column in which the adjacent part of a tool shaft is journaled and above the upper friction wheel is another bearing 20 on the column in which an upper extension 21 of the friction wheel hub is journaled.

22 represents a friction driving pinion, preferably of conical form, which is arranged between the rear parts of the upper and lower driven friction wheels. This friction pinion is mounted on the front end of a driving shaft 23 which is journaled horizontally and lengthwise in bearings on the upper part of the main frame, motion from any suitable prime mover being transmitted to the driving shaft preferably by means of a belt passing around a cone pulley 24 on

the rear part of the driving shaft. Upon raising both friction wheels so that the lower one engages the underside of the driving pinion and the upper one is disengaged therefrom, the tool shaft is turned forward with the tool mounted thereon for operatively engaging the work piece. Upon lowering the friction wheels so that the upper one engages with the upper side of the friction pinion and the lower one is disengaged from this pinion the tool shaft will be turned backwardly for disengaging or running the tool out of the work piece.

Means are provided whereby both friction wheels are yieldingly held in an elevated position so that in a normal position of the parts the tool and tool shaft will always turn forwardly. Various means may be provided for accomplishing this purpose but those shown in the drawings are suitable and comprise a horizontal shifting lever 25 arranged lengthwise above the upper part of the main frame and pivoted between its front and rear arms on the adjacent part of the main frame by a transverse bolt 26, so that this lever swings vertically. The front arm of this lever is operatively connected with the upper extension of the hub of the friction wheels, so that these parts are compelled to move vertically together while permitting the friction wheels to turn independently of the shifting lever. This connection preferably comprises upper and lower bearing collars 27, 28 secured one above the other on the hub extension 21, and an intermediate bearing ring 29 arranged between the upper and lower bearing collars and engaging therewith by means of interposed bearing balls 30 and pivotally connected with the forked front part of the shifting lever. A ball thrust bearing is thus formed between the shifting lever and the hub of the friction wheels which causes the latter to rise and fall upon rocking the shifting lever but still permitting these wheels to turn freely independently of this lever.

31 represents a spring having its upper end connected with the rear arm of the shifting lever so as to exert a constantly downward pull on the same and an upward pull on the friction wheels for holding the lower friction wheel yieldingly in engagement with the underside of the driving friction pinion. The tension of this spring is so adjusted that the tool will be turned forwardly under normal conditions with sufficient power to operate upon the work piece as required, but if the tool should become stuck or reach the end of its work, as in the case of a screw cutting tap, at which time the tool encounters an abnormal resistance, the forward rotation of the tool will be arrested and the driving friction pinion will merely slip on the lower friction wheel, thereby preventing breakage of any parts. When doing comparatively light work, the tension of this spring is adjusted so that slippage of the driving pinion on the lower driven friction wheel will occur if only a moderate additional resistance is offered beyond that which is present during the normal operation of the tool on the work piece, but if comparatively heavy drilling, tapping or similar work is being done the tension upon this spring may be increased so that it will require a much greater resistance to the forward movement of the tool before slippage of the driving friction pinion on the lower friction pinion occurs. Various means may be provided for adjusting the tension of this spring but those shown in the drawings are preferably so designed that the workman can vary the tension of this spring quickly and accurately while the machine is running and while the operator is standing in front of the machine where he can observe the action of the tool on the work piece. The preferred means for this purpose which are shown in Figs. 1, 2 and 4, comprise a vertically swinging adjusting lever 32 pivoted on the upper part of the main frame by means of a pin 33 or otherwise, so that the rear arm thereof is arranged below the tension spring and the front arm thereof is arranged above the work table and adjacent parts. The rear arm of the adjusting lever is adjustably connected with the lower end of the tension spring by means of a tension rod 34 sliding vertically through a guide 35 on the upper part of the main frame and connected at its upper end with the lower end of the tension spring while its lower end is provided with a screw nut 36 bearing against the underside of the rear adjusting lever. The front arm of the adjusting lever is provided with a laterally projecting locking pin 37 which is adapted to engage with one of a plurality of locking openings 38 arranged in a row on the adjacent part of the main frame concentric with the pivot of this lever. By deflecting the front arm of the adjusting lever laterally outward sufficient to disengage this locking pin from the respective locking recess with which it is in engagement and then raising or lowering this arm and reëngaging its locking pin with one or another of the remaining locking openings, it is possible to vary the tension of this spring while the machine is running, so that the required pressure may be applied by the lower driven friction wheel against the driving friction pinion for controlling the driving connection between these parts and the time when slippage between the same occurs in accordance with the character of the work which is being operated upon. In addition to varying the tension of this spring by turning the adjusting lever, a further adjustment of this spring independently of this lever may be

effected by tightening or loosening the screw nut 36 arranged on the tension rod and engaging with the rear arm of the adjusting lever.

When it is desired to turn the tool shaft and tool backwardly as is the case when unscrewing a tap from the work piece or withdrawing a drill from the opening when this work is done, this is accomplished by raising the rear arm of the shifting lever in opposition to the resistance of the tension spring to a sufficient extent so that the lower friction wheel is disengaged from the friction pinion and the upper friction wheel is engaged therewith. The means for effecting this reversal in the movement of the tool shaft is preferably so designed that this operation may be effected manually. In its preferred form, this manual reversing mechanism comprises a horizontal rocking crankshaft 39 journaled transversely in a bearing 40 on the upper part of the main frame below the driving shaft and provided at its opposite ends with two cranks or pins 41 mounted eccentrically relatively to the axis of this shaft, said cranks or eccentric pins being arranged in line with each other.

42, 42 represent two links arranged in an upright position on opposite sides of the driving shaft and pivotally connected at their upper ends with the rear arm of the shifting lever by means of a horizontal transverse bolt 43 and each link being connected with one of the cranks of the crank shaft by providing the lower end of each link with a fork 44 which rests on the upper side of one of these crank pins, as shown in Figs. 2, 3 and 4. The lower ends of these links are confined on the crank pins by retaining disks 45 arranged on the outer ends of the crank pins and engaging with the outer sides of the links. In the raised position of the friction wheels the crank pins of the rock shaft are arranged slightly below a horizontal line drawn through the axis of this shaft but upon turning this shaft so that its crank pins move upwardly, the rear arm of the shifting lever will be raised and the front arm thereof lowered, thereby engaging the upper friction wheel with the top of the friction pinion and disengaging the lower friction wheel therefrom for causing a reversal in the movement of the tool shaft when it is desired to back up the tool. Extending forwardly from one of the retaining disks, preferably the right-hand one, is a hand lever 46 which may be grasped by the hand of the operator for effecting backward rotation of the tool shaft when desired. This may also be accomplished by foot pressure, in order to leave the hands free to attend to the work on the table or for other purposes. This is accomplished by mounting a vertically swinging treadle 47 on the base of the frame and connecting this treadle by means of an upright shipper rod 48 with the hand lever 46. It is therefore possible to reverse the rotation of the tool shaft either by pulling down the handle 46 with one hand of the operator or pressing the treadle 47 by means of a foot. When the hand and foot of the operator are both removed from the hand lever and treadle, the same are raised and yieldingly held in an elevated position by means of a spring 49 connecting the treadle with the adjacent part of the column, so that the eccentric or crank shaft is turned in the direction for lowering the rear arm of the shifting lever and causing the tool shaft to be turned forward by engagement of the lower friction wheel with the driving friction pinion.

By the use of this machine, tapping, drilling and similar work may be effected very quickly and economically and as danger of breakage is practically eliminated by reason of the friction driving gear between the source of power and the working tool breakage of any part of the machine or spoiling of the work is eliminated so that there is no loss on this account, therefore increasing the output of the machine.

As a whole, the machine is very simple in construction, it has no delicate parts which are liable to get out of order and therefore requires a minimum expense for maintaining the same in running condition.

I claim as my invention:

1. A machine of the character described, comprising a main frame, a vertical operating shaft, two driven friction wheels mounted one above the other on said shaft so as to turn therewith, a driving friction pinion arranged between said friction wheels, yielding pressing means for holding the lower one of said friction wheels in engagement with the underside of said friction pinion, and means for manually lowering the upper one of said friction wheels into engagement with the upper side of said friction pinion.

2. A machine of the character described, comprising a main frame, a vertical operating shaft, two driven friction wheels mounted one above the other on said shaft so as to turn therewith, a driving friction pinion arranged between said friction wheels, yielding pressing means for holding the lower one of said friction wheels in engagement with the underside of said friction pinion, means for manually lowering the upper one of said friction wheels into engagement with the upper side of said friction pinion, and means for adjusting the tension of said pressing means.

3. A machine of the character described, comprising a main frame, an upright operating shaft journaled on said frame and capable of vertical movement relatively thereto, upper and lower driven friction wheels

having a hub which is splined on said shaft, a spring device operating to hold said driven friction wheels yieldingly in an elevated position in which the lower friction wheel engages said pinion while the upper friction wheel is disengaged therefrom, and manually operated means for lowering said friction wheels so that the upper friction wheel engages the pinion and the lower friction wheel is disengaged therefrom.

4. A machine of the character described, comprising a main frame, an upright operating shaft journaled on said frame and capable of vertical movement relatively thereto, upper and lower driven friction wheels having a hub which is splined on said shaft, a spring device operating to hold said driven friction wheels yieldingly in an elevated position in which the lower friction wheel engages said pinion while the upper friction wheel is disengaged therefrom, said spring device comprising a lever pivoted on said frame to swing vertically and operatively connected with said hub and a spring connecting with said lever, and manually operated means for lowering said friction wheels so that the upper friction wheel engages the pinion and the lower friction wheels is disengaged therefrom.

5. A machine of the character described comprising a main frame, an upright operating shaft journaled on said frame and capable of vertical movement relatively thereto, upper and lower driven friction wheels having a hub which is splined on said shaft, a spring device operating to hold said driven friction wheels yieldingly in an elevated position in which the lower friction wheel engages said pinion while the upper friction wheel is disengaged therefrom, said spring device comprising a lever pivoted between its front and rear arms on said frame to swing vertically and having its front arm operatively connected with said hub, and a spring connected with said rear arm, and manually operated means for lowering said friction wheels so that the upper friction wheel engages the pinion and the lower friction wheel is disengaged therefrom.

6. A machine of the character described, comprising a main frame, an upright operating shaft journaled on said frame and capable of vertical movement relatively thereto, upper and lower driven friction wheels having a hub which is splined on said shaft, a spring device operating to hold said driven friction wheels yieldingly in an elevated position in which the lower friction wheel engages said pinion while the upper friction wheel is disengaged therefrom, said spring device comprising a lever pivoted on said frame to swing vertically, upper and lower bearing collars secured to said hub, an intermediate bearing ring arranged between said bearing collars and connected with said lever, a spring connected with said lever, and manually operated means for lowering said friction wheels so that the upper friction wheel engages the pinion and the lower friction wheel is disengaged therefrom.

7. A machine of the character described, comprising a main frame, an upright operating shaft journaled on said frame and capable of vertical movement relatively thereto, upper and lower driven friction wheels having a hub which is splined on said shaft, a spring device operating to hold said driven friction wheels yieldingly in an elevated position in which the lower friction wheel engages said pinion while the upper friction wheel is disengaged therefrom, said spring device comprising a shifting lever pivoted between its front and rear arms on said frame to swing vertically and having its front arm operatively connected with said hub, a spring connected with said rear arm, an adjusting lever pivoted on said frame and connected with said spring, means for holding said adjusting lever in different positions, and manually operated means for lowering said friction wheels so that the upper friction wheel engages the pinion and the lower friction wheel is disengaged therefrom.

8. A machine of the character described, comprising a main frame, an upright operating shaft journaled on said frame and capable of vertical movement relatively thereto, upper and lower driven friction wheels having a hub which is splined on said shaft, a spring device operating to hold said driven friction wheels yieldingly in an elevated position in which the lower friction wheel engages said pinion while the upper friction wheel is disengaged therefrom, said spring device comprising a shifting lever pivoted between its front and rear arms on said frame to swing vertically and having its front arm operatively connected with said hub, a spring connected with said rear arm, an adjusting lever pivoted on said frame and connected with said spring, and means for holding said adjusting lever in different positions comprising a locking pin arranged on the adjusting lever and adapted to engage with one or another of a row of openings in said frame, and manually operated means for lowering said friction wheels so that the upper friction wheel engages the pinion and the lower friction wheel is disengaged therefrom.

9. A machine of the character described, comprising a main frame, an upright operating shaft journaled on said frame and capable of vertical movement relatively thereto, upper and lower driven friction wheels having a hub which is splined on said shaft, a shifting lever pivoted on the main frame

and operatively connected with said hub, a spring connected with the shifting lever and operating to turn the same in the direction for raising said friction wheels, and means for turning said shifting lever in a direction for lowering said friction wheels, comprising a horizontal shaft journaled on the main frame and provided with a crank, a link extending from said crank to said shifting lever, and manual means for turning said crank shaft.

10. A machine of the character described, comprising a main frame, an upright operating shaft journaled on said frame and capable of vertical movement relatively thereto, upper and lower driven friction wheels having a hub which is splined on said shaft, a shifting lever pivoted on the main frame and operatively connected with said hub, a spring connected with the shifting lever and operating to turn the same in the direction for raising said friction wheels, and means for turning said shifting lever in a direction for lowering said friction wheels, comprising a horizontal shaft journaled on the main frame and provided with a crank, a link extending from said crank to said shifting lever, and manual means for turning said crank shaft, comprising a handle connected with said crank shaft and a treadle connected with said handle.

11. A machine of the character described, comprising a main frame, an upright operating shaft journaled on said frame and capable of vertical movement relatively thereto, upper and lower driven friction wheels having a hub which is splined on said shaft, a shifting lever pivoted on the main frame and operatively connected with said hub, a spring connected with the shifting lever and operating to turn the same in the direction for raising said friction wheels, and means for turning said shifting lever in a direction for lowering said friction wheels, comprising a horizontal shaft journaled on the main frame and provided with a crank at its opposite ends, links extending from said cranks to said shifting lever, and manual means for turning said crank shaft.

Witness my hand this 22nd day of July, 1914.

JOSEPH M. HOUSEL.

Witnesses:
H. M. WICK,
E. J. JONES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."