F. J. BACKSCHEIDER.

PORTABLE ELECTRICAL TOOL.

APPLICATION FILED FEB. 8, 1909.

964,197.

Patented July 12, 1910.

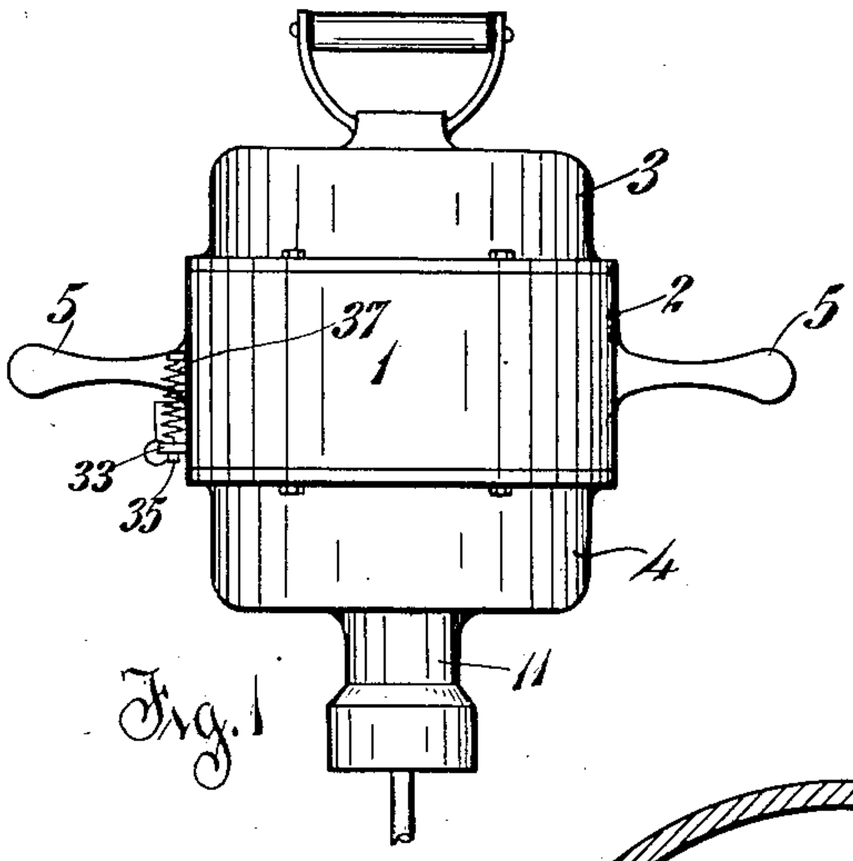


Fig. 1

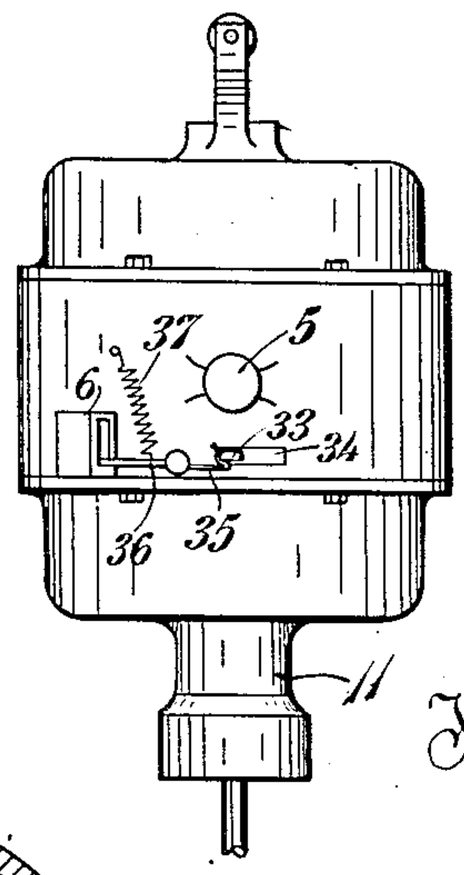


Fig. 2

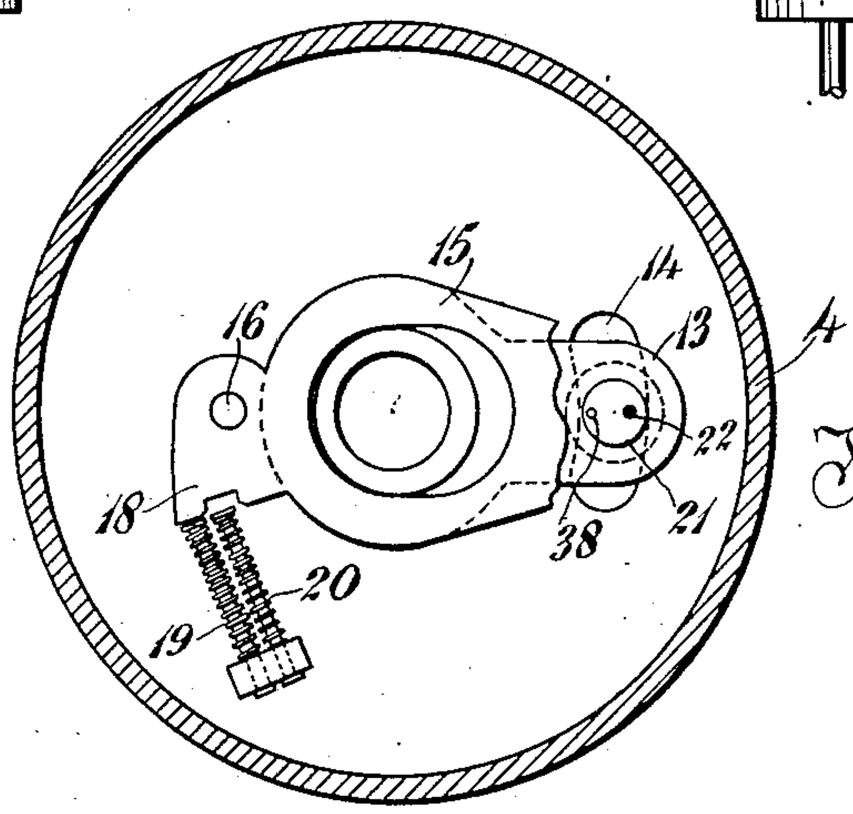


Fig. 5

Fig. 3

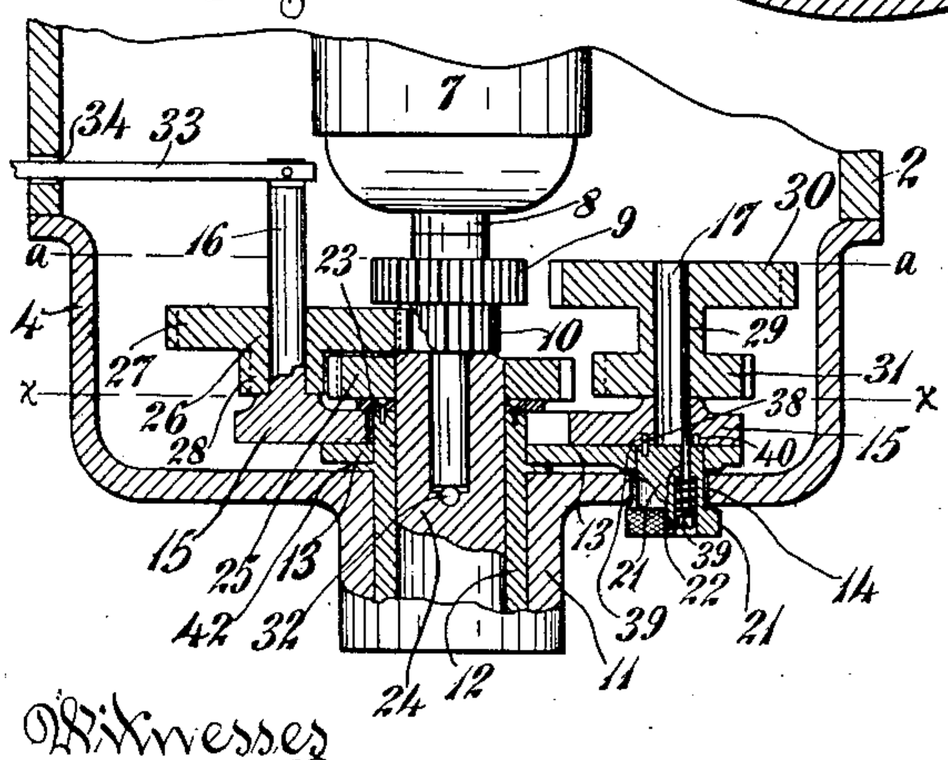
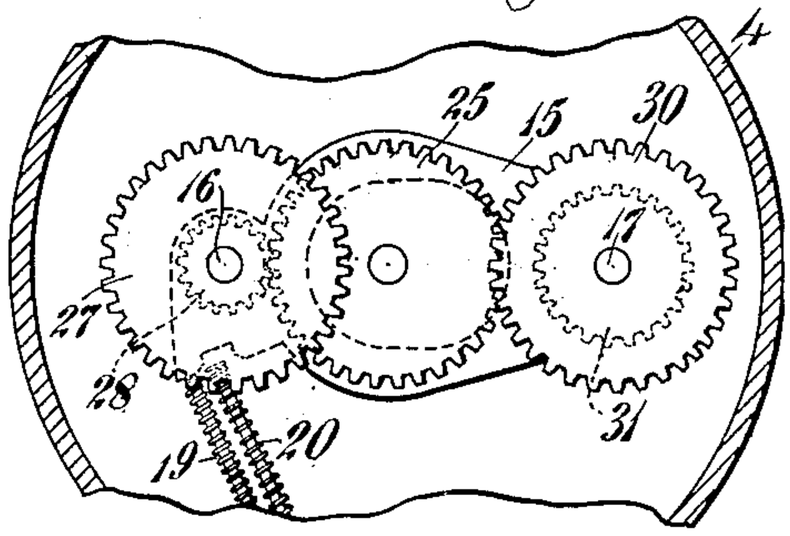


Fig. 4



Witnesses

Oliver W. Harman

Bessie R. Beall

Inventor

Frank J. Backscheider,

By Arthur H. Ewald,

Attorney.

UNITED STATES PATENT OFFICE.

FRANK J. BACKSCHEIDER, OF CINCINNATI, OHIO.

PORTABLE ELECTRICAL TOOL.

964,197. Specification of Letters Patent. Patented July 12, 1910.

Application filed February 8, 1909. Serial No. 476,809.

To all whom it may concern:

Be it known that I, FRANK J. BACKSCHEIDER, a citizen of the United States, residing in Cincinnati, in the county of Hamilton and State of Ohio, have invented a certain new and useful Improvement in Portable Electrical Tools, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

In portable electrical tools, especially in such tools when used in drilling, it frequently happens that the drill or other tool becomes stalled in its work, and as a result the operating motor becomes overloaded, a short circuit is formed, and the armature is burned out. To prevent such overload falling on the motor, fuses are generally employed, and such fuses, by themselves being burned out, relieve the armature of any overload and consequent damage upon the stalling of the tool. The frequent annoyance of replacing a burned out fuse, however, results in a tendency to make use of a fuse which will not burn out readily, and the effect of this is to throw the overload on the motor burning out the armature when the tool becomes stalled. Electrical devices have frequently been used to prevent any overload damaging the armature by means of which when the current is increased to a point at which an overload is imminent, resistance is automatically shunted into the circuit to prevent damage to the armature. But such electrical devices are not found to operate with sufficient rapidity, and the short circuit is apt to occur before the current can be cut down by the resistance.

It is one of the objects of my invention to provide a mechanical construction which shall automatically operate the switch controlling the current to break the circuit the moment the tool becomes stalled and the motor is obliged to carry more than the normal current. This object I accomplish through the agency of the intermediate gearing between the armature shaft and tool as hereinafter fully shown, and it is a further object of my invention to furnish a simple and expeditious means for throwing the gearing appropriate for the different speeds in and out of mesh as either a high or low speed is required.

In the drawings Figure 1 is an elevation of my improved electrical drill. Fig. 2 is another elevation showing the switch release. Fig. 3 is a central longitudinal section of the chuck end of my improved drill. Fig. 4 is a cross section on line *a—a* of Fig. 3 with the armature shaft and its pinions removed. Fig. 5 is a cross section on line *x—x* of Fig. 3.

The numeral 1 indicates the casing, which is composed of the cylindrical or middle part 2, and the end parts 3 and 4, said end parts being attached to the middle part by screws, as shown, or otherwise. The middle part 2 is provided with the operating handles 5—5 which are immovably attached to said part 2. The switch for controlling the current is inclosed in the box 6, also attached to said part 2. The numeral 7 indicates an armature, of ordinary construction, having a shaft 8 carrying the pinions 9 and 10. The chuck end 11 has the bushing 12 extending into interior of the casing as shown in Fig. 3. Fitting snugly around said bushing, and bearing on a retaining flange 42 of said bushing is the plate 13, said plate being provided with an arm extending over the slot 14 in the front wall of said casing. Also around said bushing, but fitting loosely, the opening being in the form of an ellipse as shown in Fig. 5, is the movable frame 15, carrying the pintles 16 and 17 at its two ends. The end of said frame carrying the pintle 16 is shaped into the notched head 18 to bear at all times against one or the other of the adjusted tension springs 19 and 20 for the purpose hereinafter set forth. Through the slot 14 in the casing, and through an opening near the end of the plate 13, adapted to fit it snugly, extends the shank of the turnbutton 21, to which the end of said frame 15 bearing the pintle 17 is eccentrically attached by means of the end 22 of said pintle which is turned down and extends through said button.

Upon the upper end of the bushing 12 is the collar 23 the function of which is to prevent the displacement of the plate 13, and the frame 15 and to secure to said frame a free horizontal movement as well as to form a subjacent bearing for the spindle gear hereinafter described.

The drill spindle 24 extending through the bushing 12 has keyed on its upper end the spur gear 25. Loosely mounted on the pintle 16 is the double gear 26 comprising the

spur gear 27 adapted to intermesh the pinion 10 on the armature shaft, and the pinion 28 adapted to intermesh with the spur gear 25 on the drill spindle. Similarly mounted on the pintle 17 is the double-gear 29, comprising the spur gear 30, adapted to intermesh with the pinion 9 on the armature shaft, and the pinion 31 adapted to intermesh with the spur gear 25 on the drill spindle. The lower end of the armature shaft is journaled in the upper end of the drill spindle as shown and turns on the antifriction ball 32.

Attached to the upper end of the pintle 16 is the arm 33 which extends through a slot 34 in the casing as shown in Fig. 2. The outer end of this arm is suitably shaped and serves as a catch for the hook 35 on the end of the switch lever 36. The spring 37 is adapted to throw the switch lever to the "off" position as soon as the catch is released.

The turnbutton 21 is adapted by turning to throw into mesh with the armature shaft and drill spindle gearing either of the double gears 26 or 29, by reason of the permanence of its radius from the common axis of said shaft and spindle, which is maintained by the plate 13, and because of the eccentric attachment of the frame 15 to the shank of said button, and the elliptical opening of said frame. The operating speed of the drill or other tool is thus changed merely by turning said button. To prevent the disengagement of either set of gearing, however, after it has been thrown into mesh, I lock the frame 15 into either position by means of the pin 38 and the spring 39 about the reduced end 22 of the pintle 17 to which it is secured by a nut as shown in Fig. 3, which pin is adapted to engage openings 40 and 41 suitably located in the frame 15. By drawing the button slightly outward against the spring 39, the engagement of pin 38 is released and the button may then be turned to throw into mesh either set of gearing; upon being released the spring causes the pin to engage the appropriate opening thus locking the frame 15 and the required gear in the desired position.

The operation of my invention is as follows: When either set of gearing is thrown into mesh as above set forth, the head 18 of the frame 15 is brought to bear against one of the springs 19 or 20, as clearly shown in Figs. 4 and 5, and the other is opposite the notch in said head so as to offer no resistance against the movement of the frame 15 against the bearing spring. Each of these springs is adjusted to the rated horse power of the tool at the operating speed effective when its correlated gearing is in mesh.

Assume now the parts to be in the position shown in the drawings Figs. 3, 4 and 5. So long as the drill or other tool works freely, the tension of the spring 19 holds the frame 15 and consequently the gearing in a fixed relationship with the common axis of the armature shaft and drill spindle. Should the tool become stalled, however, and the gear 25 thus cease to revolve normally the resistance either will cause the field to rotate in the opposite direction, which the operator's grasp of the handles will prevent it from doing, or the pinion 28, mounted on the frame 15, will be compelled to turn around the said gear 25 with a planetary motion which the mounting of said frame, the slot 14 in the casing, and the overload on the spring 19 will permit it to do. This movement of the frame, however, carrying with it the arm 33, releases the catch from engagement with the hook 35 and the switch lever 36 is immediately thrown to the "off" position by the spring 37, thus disconnecting the current and relieving the armature of any overload. Precisely the same result follows the stalling of the tool when the opposite set of gearing is in mesh and the spring 20 is opposed to the movement of the frame 15.

Having thus described my invention what I claim as new and desire to secure by Letters Patent, is:

1. In a device of the character specified, the combination with a driving shaft and a driver shaft, of yieldably mounted intermediate power transmission, and means for controlling the power supply actuated by the movement of said yieldably mounted transmitter around the axis of the member with which it engages.

2. In a device of the character specified, the combination with a driving shaft and a driven shaft, of yieldably mounted intermediate power transmission, means for holding the axis of said yieldably mounted transmitter normally in a fixed relation to the axis of the member with which it engages and means for controlling the power supply actuated by the movement of said yieldably mounted transmitter around the axis of the member with which it engages.

3. In a device of the character specified, the combination with a driving shaft and a driven shaft, of yieldably mounted intermediate power transmission, and a switch for controlling the current actuated in disconnecting by the movement of said yieldably mounted transmitter around the axis of the member with which it engages.

4. In a device of the character specified, the combination with a driving shaft and a driven shaft, of yieldably mounted intermediate power transmission, means for holding the axis of said yieldably mounted transmitter normally in a fixed relation to the axis of the member with which it engages, and a switch for controlling the current actuated in disconnecting by the movement

of said yieldably mounted transmitter around the axis of the member with which it engages.

5. In a device of the character specified, the combination with a driving shaft and a driven shaft, of a rock-frame, a plurality of back gears, said back gears being mounted with fixed axes on said frame, and so located that one at a time may be thrown into operative communication between said driving and driven shafts, means for holding the axis of the operative back gear normally in a fixed relation to the axis of the gear with which it intermeshes and means for controlling the power supply actuated by the movement of the axis of the operative back gear around the axis of the gear with which it intermeshes.

6. In a device of the character specified, the combination with a driving shaft and a driven shaft, of a movable frame, a plurality of back gears, said back gears being mounted with fixed axes on said frame, and so located that one at a time may be thrown into operative communication between said driving and driven shafts and a switch for controlling the current actuated in disconnecting by the movement of the operative back gear around the axis of the gear with which it intermeshes.

7. In a device of the character specified, the combination with a driving shaft and a driven shaft, of a movable frame, a plurality of back gears, said back gears being mounted with fixed axes on said frame, and so located that one at a time may be thrown into operative communication between said driving and driven shafts, means for holding the axis of the operative back gear normally in a fixed relation to the axis of the gear with which it intermeshes, and a switch for controlling the current actuated in disconnecting by the movement of the operative back gear around the axis of the gear with which it intermeshes.

8. In a device of the character specified, the combination with the driving shaft and a driven shaft, of a rock-frame, a plurality of double back gears, said back gears being mounted with fixed axes on said frame, and being arranged for different speeds, and so located that one at a time may be thrown into operative communication between said driving and driven shafts, means for throwing said speed gears in and out of operative communication between said driving and driven shafts, means for holding the axis of the operative back gear normally in a fixed relation to the axis of the gear with which it intermeshes and means for controlling the power supply actuated by the movement of the axis of the operative back gear around the axis of the gear with which it intermeshes.

9. In a device of the character specified, the combination with a driving shaft and a driven shaft, of a movable frame, a plurality of double-back gears, said back gears being mounted with fixed axes on said frame, and being arranged for different speeds, and so located that one at a time may be thrown into operative communication between said driving and driven shafts, means for throwing said speed-gears in and out of operative communication between said driving and driven shafts, and a switch for controlling the current actuated in disconnecting by the movement of the axis of the operative back-gear around the axis of the gear with which it intermeshes.

10. In a device of the character specified, the combination with a driving shaft and a driven shaft, of a movable frame, a plurality of double-back-gears, said back-gears being mounted with fixed axes on said frame, and being arranged for different speeds, and so located that one at a time may be thrown into operative communication between said driving and driven shafts, means for throwing said speed-gears in and out of operative communication between said driving and driven shafts, means for holding the axis of the operative back-gear normally in a fixed relation to the axis of the gear with which it intermeshes, and a switch for controlling the current actuated in disconnecting by the movement of the operative back-gear around the axis of the gear with which it intermeshes.

11. In a device of the character specified, the combination with a driving shaft and a driven shaft, of a movable frame, a plurality of speed gears mounted on said frame, a turnbutton with center at a fixed distance from the axes of the gear with which said speed gears intermesh, said frame being eccentrically mounted on said button, so that by turning said button said speed gears may be thrown alternately in and out of operative communication between said driving and driven shafts, means for locking said frame into position when either of said speed gears is in mesh and means for controlling the power supply actuated by the movement of the axis of the operative speed gear around the axis of the gear with which it intermeshes.

12. In a device of the character specified, the combination with a driving shaft and a driven shaft, of a movable frame, a plurality of double-back gears, said back-gears being mounted with fixed axes on said frame, and being arranged for different speeds, and so located that one at a time may be thrown into operative communication between said driving and driven shafts, a turnbutton, means for maintaining permanent radii between the axis of said button and the axes of the gears with which said speed gears intermesh, said frame being eccentrically

mounted on said button, so that by turning said button said speed gears may be thrown alternately in and out of operative communication between said driving and driven shafts, means for locking said frame into position when either of said speed-gears is in operation, means for holding the axis of the operative back-gear normally in a fixed relation to the axis of the gear with which it intermeshes and means for controlling the power supply actuated by the movement of the axis of the operative back gear around the axis of the gear with which it intermeshes.

13. In a device of the character specified, the combination with a driving shaft and a driven shaft, of a movable frame, a plurality of double-back-gears, said back-gears being mounted with fixed axes on said frame, and being arranged for different speeds, and so located that one at a time may be thrown into operative communication between said driving and driven shafts, a turnbutton, means for maintaining permanent radii between the axis of said button and the axes of the gears with which said speed gears intermesh, said frame being eccentrically mounted on said button, so that by turning said button said speed-gears may be thrown alternately in and out of operative communication between said driving and driven shafts, means for locking said frame into position when either of said speed-gears is in operation, means for holding the axis of the operative back-gear normally in a fixed relation to the axis of the gear with which it intermeshes, and a switch for controlling the current actuated in disconnecting by the movement of the operative back-gear around the axis of the gear with which it intermeshes.

14. In a device of the character specified, the combination with a driving shaft and a driven shaft, of a movable frame, a plurality of double-back-gears, said back-gears being mounted with fixed axes on said frame, and being arranged for different speeds, and so located that one at a time may be thrown into operative communication between said driving and driven shafts, a turnbutton, means for maintaining permanent radii between the axis of said button and the axes of the gears with which said speed gears intermesh, said frame being eccentrically mounted on said button, so that by turning said button said speed-gears may be thrown alternately in and out of operative communication between said driving and driven shafts, means for locking said frame into position when either of said speed-gears is in operation, a plurality of tension springs equal in number to the speeds obtainable by means of said speed-gears, said springs being so arranged as to bear each individually on said frame when a correlated speed-gear is in operation, and being each adjusted to the rated horse-power when said correlated gear is in operation, to hold the axis of the operative back-gear normally in a fixed relation to the axis of the gear with which it intermeshes and means for controlling the power supply actuated by the movement of the axis of the operative back gear around the axis of the gear with which it intermeshes.

15. In a device of the character specified, the combination with a driving shaft and a driven shaft, of a movable frame, a plurality of double-back-gears, said back-gears being mounted with fixed axes on said frame, and being arranged for different speeds, and so located that one at a time may be thrown into operative communication between said driving and driven shafts, a turnbutton, means for maintaining permanent radii between the axis of said button and the axes of the gears with which said speed-gears intermesh, said frame being eccentrically mounted on said button, so that by turning said button said speed-gears may be thrown alternately in and out of operative communication between said driving and driven shafts, means for locking said frame into position when either of said speed-gears is in operation, a plurality of tension springs equal in number to the speeds obtainable by means of said speed-gears, said springs being so arranged as to bear each individually on said frame when a correlated speed-gear is in operation, and being each adjusted to the rated horse-power when said correlated gear is in operation, to hold the axis of the operative back-gear normally in a fixed relation to the axis of the gear with which it intermeshes, and a switch for controlling the current actuated in disconnecting by the movement of the operative back-gear around the axis of the gear with which it intermeshes.

16. In a device of the character specified, the combination with a driving shaft and a driven shaft, of a movable frame, a plurality of double-back-gears, said back-gears being mounted with fixed axes on said frame, and being arranged for different speeds, and so located that one at a time may be thrown into operative communication between said driving and driven shafts, a turnbutton, means for maintaining permanent radii between the axis of said button and the axes of the gears with which said speed gears intermesh, said frame being eccentrically mounted on said button, so that by turning said button said speed-gears may be thrown alternately in and out of operative communication between said driving and driven shafts, means for locking said frame into position when either of said speed-gears is in operation, a plurality of tension springs equal in number to the speeds obtainable by

means of said speed-gears, said springs being so arranged as to bear each individually on said frame when a correlated speed-gear is in operation, and being each adjusted to the rated horse-power when said correlated gear is in operation, to hold the axis of the operative back gear normally in a fixed relation to the axis of the gear with which it intermeshes, and a switch for controlling the current, with a catch on said frame for locking the switch, whereby upon the movement of said frame against the pressure of said tension spring the switch will be operated.

FRANK J. BACKSCHEIDER.

Witnesses:
BESSIE A. BEALL,
EARL W. GRIFFIN.

Correction in Letters Patent No. 964,197.

It is hereby certified that in Letters Patent No. 964,197, granted July 12, 1910, upon the application of Frank J. Backscheider, of Cincinnati, Ohio, for an improvement in "Portable Electrical Tools," an error appears in the printed specification requiring correction, as follows: Page 2, line 97, the word "driver" should read *driven;* and that the said Letters Patent should be read with this correction therein, that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of August, A. D., 1910.

[SEAL.]

F. A. TENNANT,

Acting Commissioner of Patents.