

S. H. KEEFER.
 VARIABLE SPEED CONTROLLING DEVICE FOR ELECTRIC MOTORS.
 APPLICATION FILED OCT. 13, 1909.

953,468.

Patented Mar. 29, 1910.

2 SHEETS—SHEET 1.

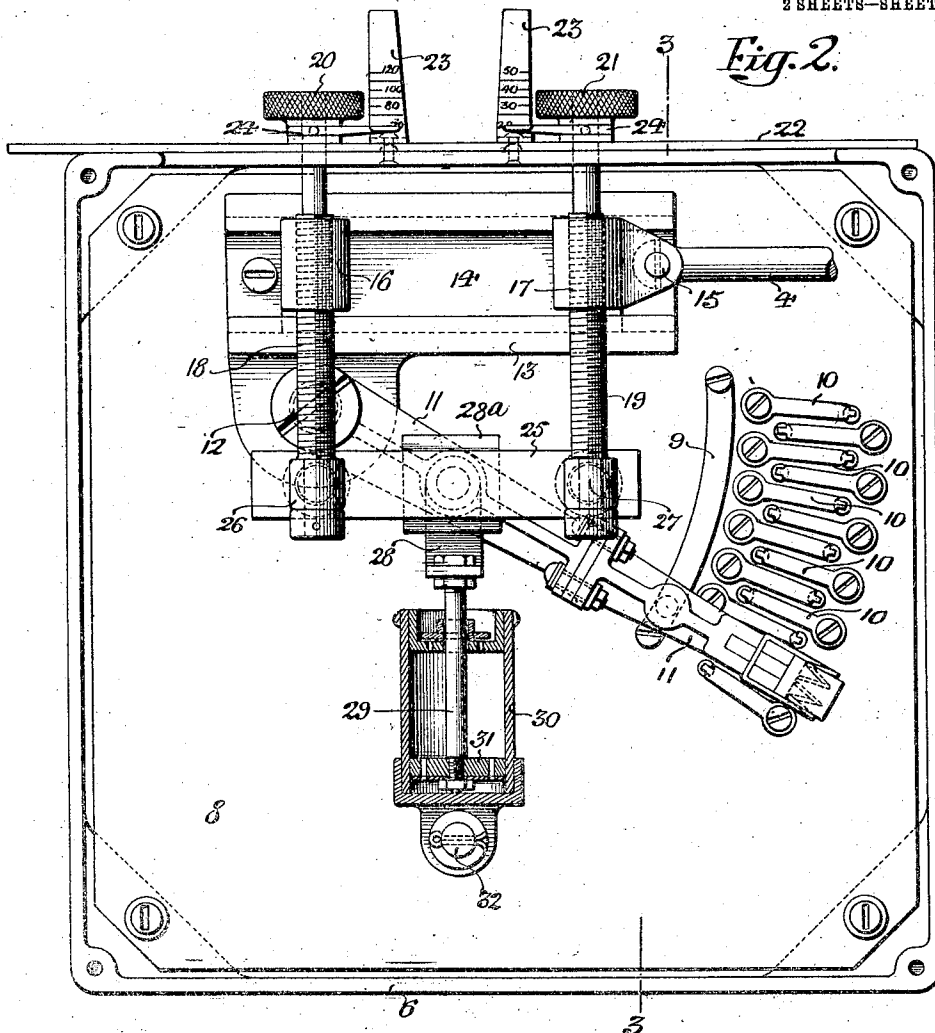
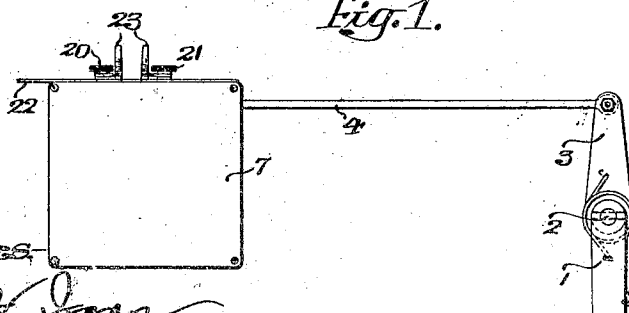


Fig. 1.



Witnesses
 John H. Jones
 William H. Burrows

Inventor
 Samuel H. Keefer
 by his Attorneys
 Howson & Howson

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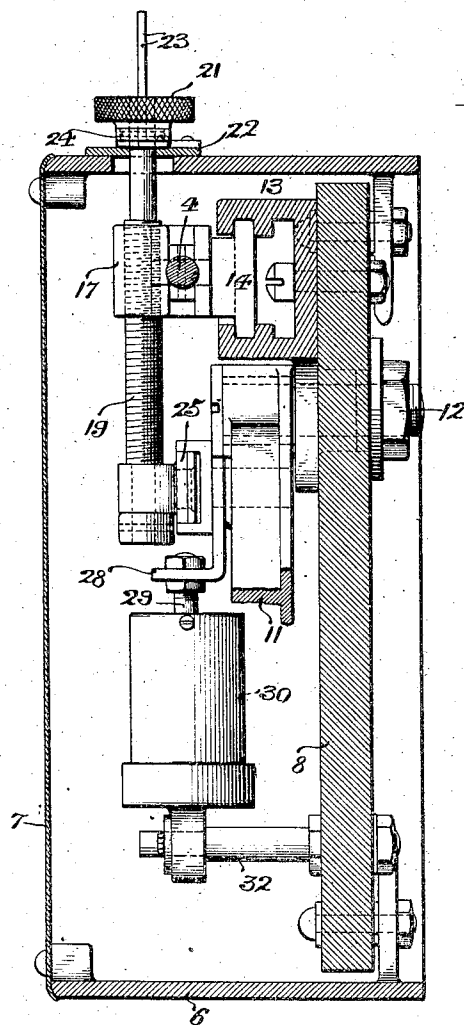


Fig. 3.

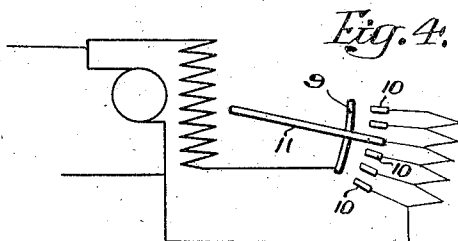


Fig. 4.

Witnesses
Louis H. Jones,
Will A. Burrows

Inventor
Samuel H. Keefer
 by his Attorneys—
Hewson + Hewson

UNITED STATES PATENT OFFICE.

SAMUEL H. KEEFER, OF PLAINFIELD, NEW JERSEY.

VARIABLE-SPEED-CONTROLLING DEVICE FOR ELECTRIC MOTORS.

953,468.

Specification of Letters Patent. Patented Mar. 29, 1910.

Application filed October 13, 1909. Serial No. 522,417.

To all whom it may concern:

Be it known that I, SAMUEL H. KEEFER, a citizen of the United States, residing in Plainfield, New Jersey, have invented certain Improvements in Variable-Speed-Controlling Devices for Electric Motors, of which the following is a specification.

This invention relates to that class of automatically actuated electric switches, particularly designed for use in connection with a motor driven machine such as a planer or printing press, in which one member of the machine is periodically reciprocated or oscillated;—one object of the invention being to provide an efficient, relatively simple, and conveniently adjustable, assemblage of parts whereby the movable member of such machine may be caused to operate the motor-controlling switch so as to vary the speed of the motor.

I further desire to provide a substantial mechanical device for connecting the movable member of a switch with the device whereby it is actuated, by which it shall be possible to adjust at will the position of the movable switch member upon its series of contacts, and also to adjust the number of such contacts which shall be engaged by said switch member at each movement thereof.

Another object of the invention is to provide a switch controlling device for use in connection with a continuously operating variable speed shunt or compound wound motor whose construction shall be such that the number of parts required for rendering possible the desired variations and adjustment of the speed of said motor, shall be reduced to a minimum.

These objects and other advantageous ends I secure as hereinafter set forth, reference being had to the accompanying drawings, in which,

Figure 1 is a front elevation of my invention on a reduced scale, showing it as connected to the dog-actuated arm of the machine with which it is used. Fig. 2, is a front elevation on an enlarged scale illustrating the detail construction of my invention. Fig. 3, is a vertical section on the line 3-3, Fig. 2, and Fig. 4, is a diagram showing the electrical connection of the switch.

In such machines as motor driven planers, the power for reciprocating the platen is provided by a shunt or compound wound motor whose armature turns continuously in the same direction and whose speed may be

varied to drive said platen at different speeds on its forward and reverse strokes. The variation in speed is customarily obtained by varying the field strength of the motor, and my present invention consists of a device interposed between the field controlling switch and the movable member of the motor driven machine, for accomplishing the objects heretofore noted.

In Fig. 1 of the above drawings, 1 represents an arm either directly actuated by the platen of the motor driven machine or connected thereto by suitable means so as to be periodically actuated. This arm is fixed to a spindle 2 to which is also fixed a second arm 3, connected by a link 4 with the switch controlling mechanism hereinafter described and which is contained within a box 6, tightly closed by a removable cover 7. This controlling mechanism consists of a slab or plate 8 of insulating material mounted within the box 6 and having fixed to it a contact segment 9 with a series of contact plates 10 connected in any of the ways well known in the art to the shunt field circuit of the motor to be controlled. A contact arm 11 is pivoted at 12 to the slab 8 and carries a brush capable of engaging and electrically connecting any one or two of the contact plates 10 with the contact segment 9. For mechanically connecting this contact arm 11 with the link 4 so that it will be actuated by movement thereof, I mount upon the slab 8 a guideway 13 in which is a slide 14 connected by a pin 15 to the link 4; the arrangement being such that said slide is free to move transversely within the box 6 in line with or parallel to the link 4. Said slide carries two lugs 16 and 17, through each of which extends a vertically threaded hole or passage for the reception of adjusting screws 18 and 19 which are of such length as to project through a transverse slot in the top side of the box 6;—their upper ends having fixed to them heads, respectively indicated at 20 and 21. An elongated plate 22 is placed on the top of the box 6 so as to cover this slot and it is provided with suitable openings for the passage of the screws 18 and 19 which serve to hold it in place.

Each of the heads 20 and 21 is provided with an indicator or pointer 21, loosely mounted on its neck and designed to cooperate with a scale 23 carried by the plate 22; the construction being such that each

head and the screw attached thereto may be turned without turning its pointer. A cross head 25 is pivotally connected to collars 26 and 27 respectively mounted on the lower ends of the two screws 18 and 19, and is also slidably connected to the contact arm 11 through the medium of a block 28^a, and by means of a bar 28, to the piston rod 29 of a dash pot 30. This latter is of the well known oil film type, containing a piston 31 attached to said rod 29 and in the present instance is mounted upon the slab 8 through the medium of a pin 32, in such manner as to be free to oscillate in a plane parallel to the plane of the arm 11.

As will be understood by those skilled in the art, the field strength of the motor and hence its speed, is dependent upon the particular one of the contact plates 10 connected by means of the contact arm 11 with the segment 9 and it is obvious that by proper manipulation of either of the screws 18 or 19 said contact arm may be brought into any desired position upon the contact plates 10 and segment 9. If, for example, it be desired that the platen shall be driven at the rate of fifty feet per minute in one direction, and eighty feet per minute in the opposite direction, the two heads 20 and 21 are turned until their pointers 24 respectively stand opposite the numerals 50 and 80 on the scales 23. As a result of this adjustment one end of the cross head 25 is somewhat elevated and instead of being horizontal as in the figure, is inclined at an angle of about 30° to the horizontal. The contact arm 11 is therefore moved upwardly by the adjustment some distance away from the lower end of its path of movement, and when the link 4 is reciprocated by the periodic engagement of the platen dogs with the arm 1 or with the parts connected thereto, the slide 14 with its attached screws 18 and 19 and the cross head 25, are similarly reciprocated in a direction determined by the guide 13. Owing to the inclination of said cross head, the contact arm 11 is caused to oscillate over the contact plates 10 and the segment 9 to an extent depending upon the degree of such inclination; the apparatus being so calibrated that when in its lower position, the arm permits such a current to flow through the field of the motor as will give the speed indicated by one of the pointers 24 while the platen is being moved in one direction, and when in its upper position causing said motor to drive the platen in the opposite direction at the rate indicated by the other pointer.

Under operating conditions the link 4, and hence the slide 14, are moved a constant distance at each reciprocation of the platen, regardless of the distance traveled and of its speed. By means of the screws, however, it is possible to vary not only the particular

set of contacts swept over at each movement of the arm 11, but also to vary the number of such contacts engaged at each movement.

The dash pot 30 acts in the well known manner to provide the necessary mechanical resistance to the movement of the various parts.

By means of the apparatus heretofore described it will be noted that the arm 11 passes directly from those contact plates corresponding to one speed of the motor, to those corresponding to another desired motor speed in such a manner as to speed up or slow down said motor to the desired point, without the intermediate and unnecessary variations of speed commonly caused if two field switches are used to control the motor. Moreover, the speed of the platen can be accurately and quickly adjusted to any desired rate since the device is so constructed that the speed of the motor is made to directly depend upon the inclination given to the cross head 25.

While I preferably employ the above described device in connection with planers and printing presses possessing reciprocating members to which it is desirable to impart different speeds, I may without departing from my invention, use any equivalent mechanism for accomplishing the same result or apply it to other machines in which it is required that a part shall move in two directions at different speeds.

I claim;—

1. The combination of an electric switch having a series of contacts and a contact member movable over the same, with means for transmitting movement to said contact member from an actuating device, the same including an adjustable member having a slidable connection with the contact member under operating conditions for varying the number of contacts engaged by said latter member when it is moved.

2. The combination of an electric switch having a series of contacts and a movable member capable of engaging the same, with an actuating member having a constant throw for actuating said movable switch member, and a device connecting said switch member and the actuating member for varying the throw of the switch member, said device including a cross head; with a bar co-acting therewith and angularly disposed relatively to the switch member.

3. The combination of an actuating member having a constant throw, a series of contacts, a movable switch member capable of engaging said contacts, and a device including a reciprocable bar and means for varying the angle of said bar for connecting said actuating member with the movable switch member for varying the particular contacts engaged by the latter when it is moved.

4. The combination of an actuating mem-

ber having a constant throw, a series of contacts, a movable switch member capable of engaging said contacts, and a device including two parts free to slide upon one another
 5 under operating conditions for connecting said actuating member with the movable switch member in order to vary the particular contacts engaged thereby, said means being also adjustable to vary the throw of
 10 the movable switch member.

5. The combination of an electric switch having a series of contacts and a contact member capable of engaging any of said contacts, a member having a constant throw
 15 for actuating said movable switch member, and means for adjusting at will the throw of the latter member and also the particular contacts engaged thereby under operating conditions, said means including a cross
 20 head having a rectilinear motion; with a member slidably connected to said cross head and attached to the contact member.

6. The combination with an electric switch having a series of contacts and a movable
 25 member, of a cross head slidably connected to said member, means for adjusting the angular position of said cross head relatively to the switch member, and means for periodically actuating the cross head to move
 30 said switch member.

7. The combination with an electric switch having a series of contacts and a movable member, of a cross head slidably connected to said member, means for adjusting the
 35 angle of the cross head relatively to said switch member, and means for imparting movement to the cross head.

8. The combination with an electric switch having a series of contacts and a movable
 40 member, a cross head slidably connected to said member, a screw for adjusting the angle of the cross head relatively to the switch member, and means operatively connected to the cross head for transmitting movement to
 45 the switch member.

9. The combination with an electric switch having a series of contacts and a movable member, of a cross head slidably connected to said member, two screws connected to the cross head and capable of varying its angle
 50 to the switch member, with means for imparting movement to the cross head to cause it to actuate the switch member.

10. The combination of a supporting structure having an electric switch consisting of a series of contacts and a movable
 55 member, a guideway, a slide movable in the guideway and connected to a source of power, two screws mounted on the slide, with a cross head connected to said screws,
 60 and means for connecting said cross head and the movable switch member.

11. The combination of a supporting structure having an electric switch consisting of a series of contacts and a movable
 65 member, a slide movable in the guideway and connected to a source of power, two screws mounted on the slide, a cross head connected to said screws, means for connecting said cross head and the movable member,
 70 means for adjusting either of the screws, and a scale for each screw.

12. The combination of a supporting structure having an electric switch consisting of a series of contacts and a pivotally
 75 mounted arm, a block carried by said arm, a cross head slidable in said block, screws connected to the opposite ends of said cross head, a slide carrying said screws, a guideway for the slide, means for reciprocating
 80 said slide, and means for adjusting either screw at will to vary the throw of the switch arm.

In testimony whereof, I have signed my name to this specification, in the presence of
 85 two subscribing witnesses.

SAMUEL H. KEEFER.

Witnesses:

GEO. B. WEAN,
 C. W. BEITER.