E. M. v. MARCHTHAL.

MACHINE FOR PRODUCING PRINTED MATTER.

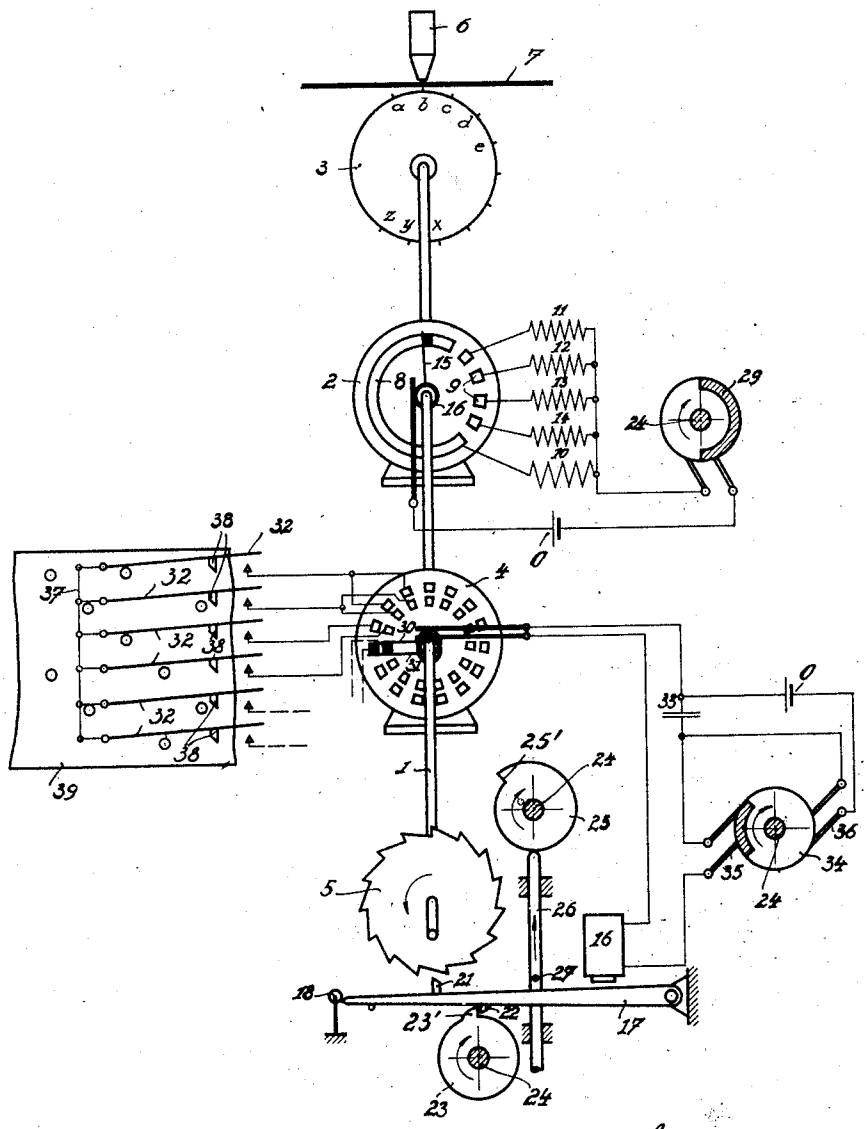
APPLICATION FILED MAR. 18, 1912.

1,054,582.

Patented Feb. 25, 1913

6 SHEETS—SHEET 1.

Fig. 1



Witnesses
Emanuel M. Zensler
Elsie Swenson

Inventor
Eduard Maximilian Marchthal
by
Attys

E. M. v. MARCHTHAL.

MACHINE FOR PRODUCING PRINTED MATTER.

APPLICATION FILED MAR. 18, 1912.

1,054,582. **Patented Feb. 25, 1913.**

6 SHEETS—SHEET 2.

Fig. 2

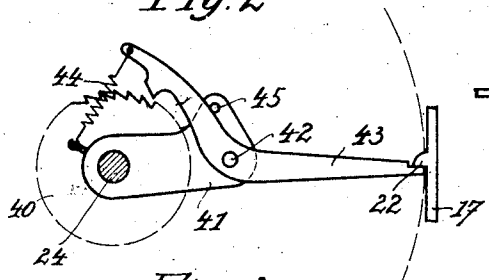


Fig. 3

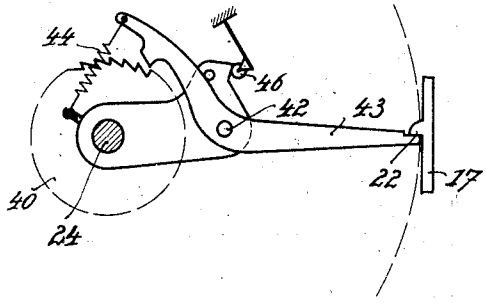
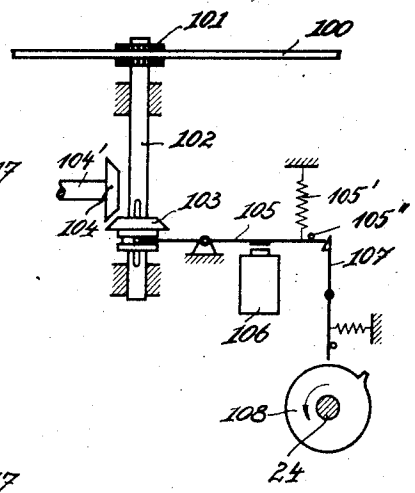


Fig. 7



Witnesses

Emanuel M. Fenster

Elsie Swenson

Inventor

Eduard Max von Marchthal

by

Attys

E. M. v. MARCHTHAL.

MACHINE FOR PRODUCING PRINTED MATTER.

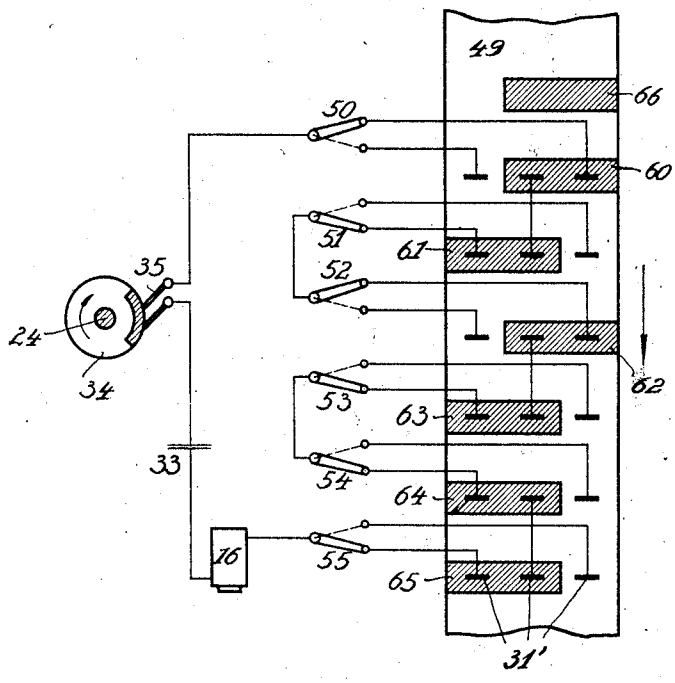
APPLICATION FILED MAR. 18, 1912.

1,054,582.

Patented Feb. 25, 1913

6 SHEETS—SHEET 3.

Fig. 4



Witnesses
Emanuel M. Jensen
Elsie Swenson

Inventor
Edward Marck von Marchthal
by
Attys

E. M. v. MARCHTHAL.

MACHINE FOR PRODUCING PRINTED MATTER.

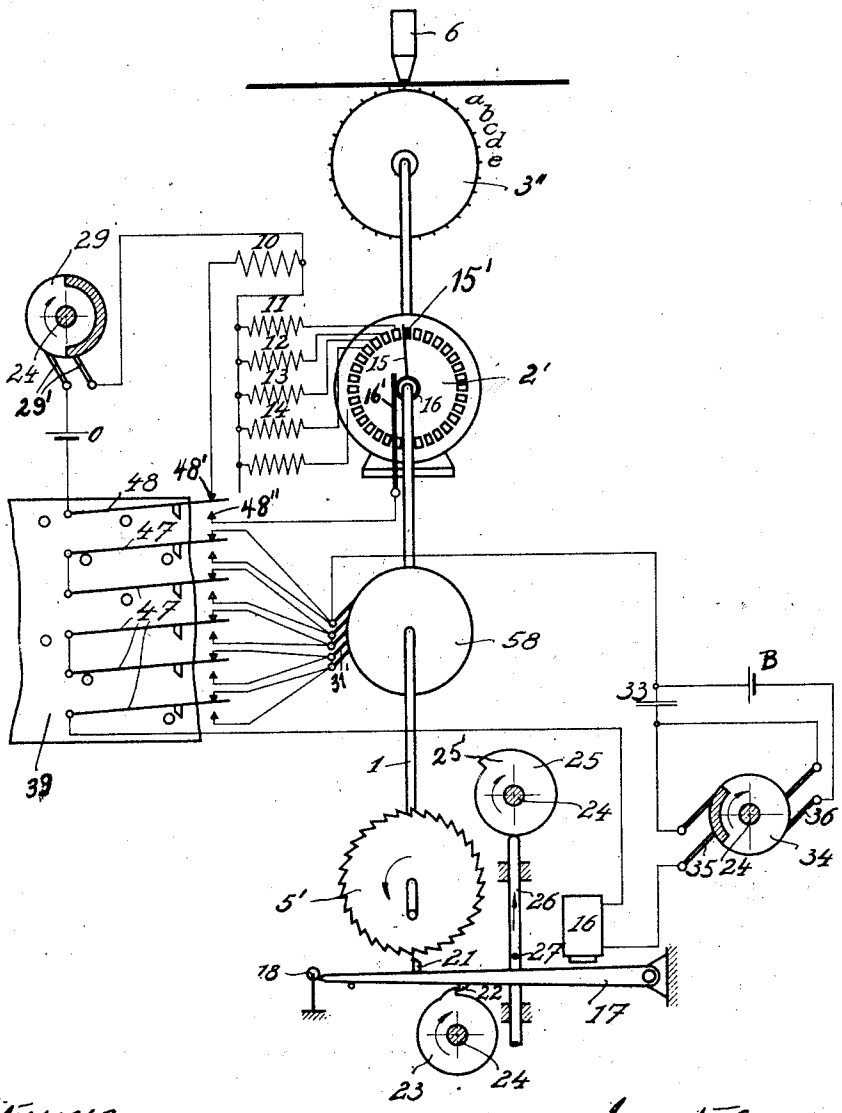
APPLICATION FILED MAR. 18, 1912.

1,054,582.

Patented Feb. 25, 1913.

6 SHEETS—SHEET 4.

Fig. 5



Witnesses

Emanuel M. Jenatin

Elsie Swenson

Inventor

Eduard Marek von Marchthal

by

Attys

E. M. v. MARCHTHAL.

MACHINE FOR PRODUCING PRINTED MATTER.

APPLICATION FILED MAR. 18, 1912.

1,054,582.

Patented Feb. 25, 1913.

6 SHEETS—SHEET 5.

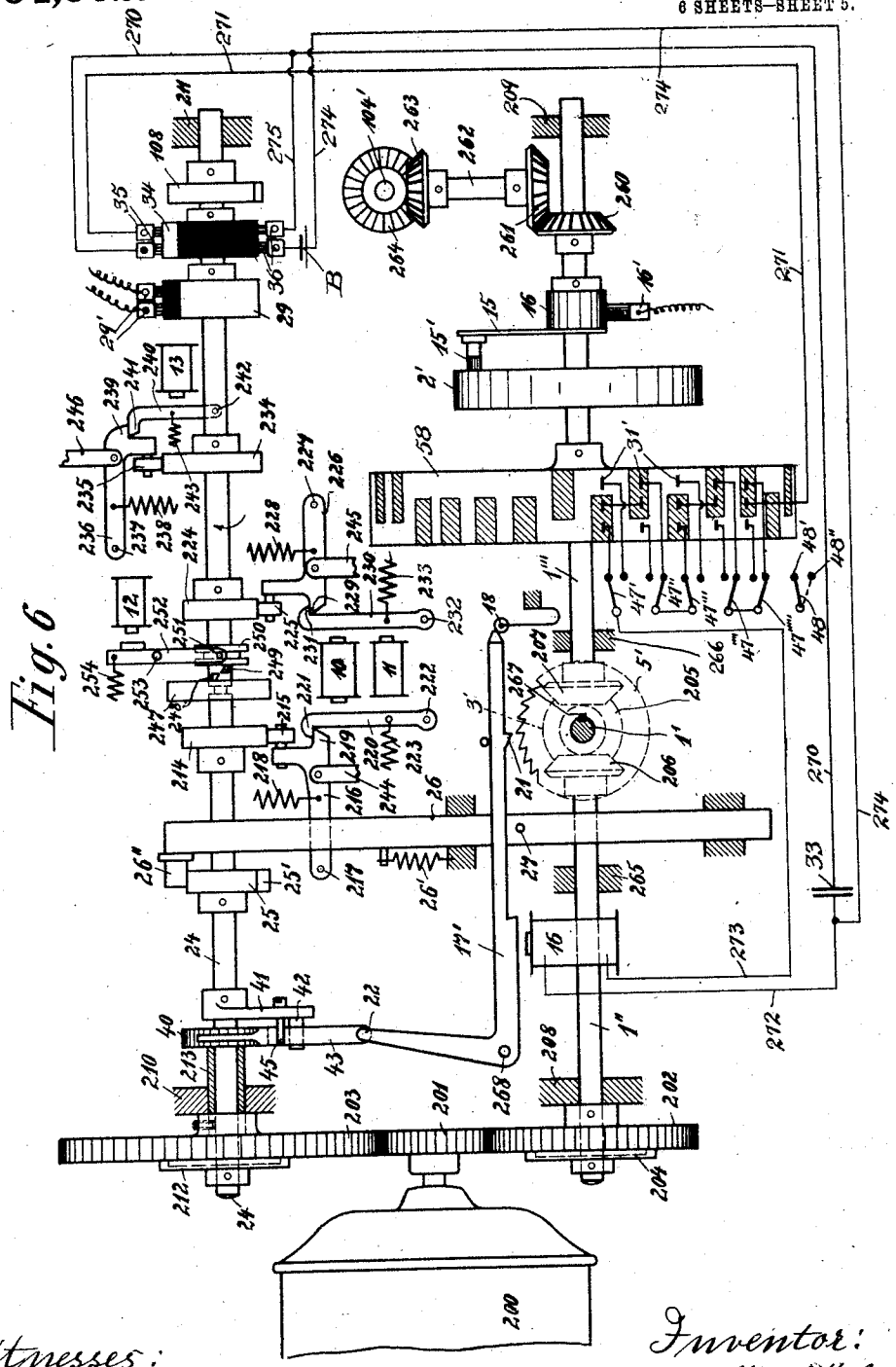


Fig. 6

Witnesses:
H. Alfred Janke
E. M. Fenester.

Inventor:
Eduard Marck von Marchthal
by Knight Bros
their attorneys.

E. M. v. MARCHTHAL.

MACHINE FOR PRODUCING PRINTED MATTER.

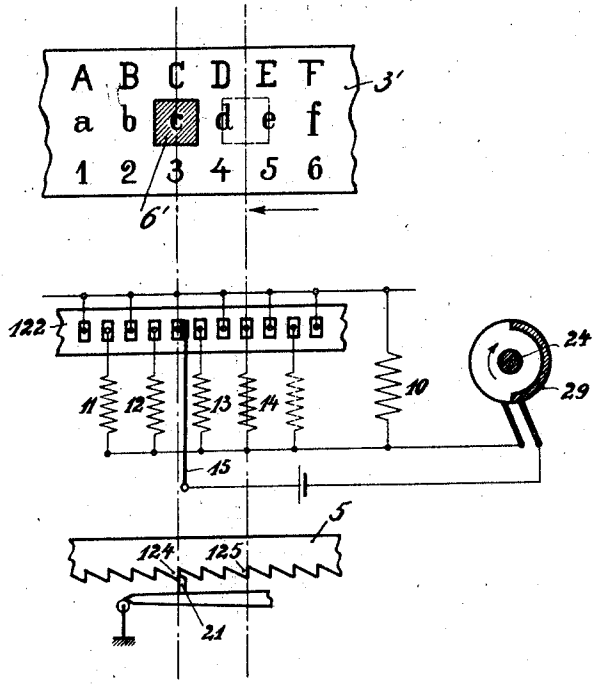
APPLICATION FILED MAR. 18, 1912.

1,054,582.

Patented Feb. 25, 1913.

6 SHEETS—SHEET 6.

Fig. 8



Witnesses:
Emanuel M. Denekin
Elsie Swenson

Inventor
Eduard Maria von Marchthal
by Steinmetz & Bros
Attys

UNITED STATES PATENT OFFICE.

EDUARD MAREK v. MARCHTHAL, OF VIENNA, AUSTRIA-HUNGARY, ASSIGNOR TO SIEMENS & HALSKE, A. G., OF BERLIN, GERMANY, A CORPORATION OF GERMANY.

MACHINE FOR PRODUCING PRINTED MATTER.

1,054,582. Specification of Letters Patent. Patented Feb. 25, 1913.

Application filed March 18, 1912. Serial No. 684,454.

To all whom it may concern:

Be it known that I, EDUARD MAREK VON MARCHTHAL, a citizen of the Empire of Austria-Hungary, and residing at Vienna, Austria-Hungary, have invented certain new and useful Improvements in Machines for Producing Printed Matter, of which the following is a specification.

My invention relates to machines for producing printed matter.

The object of my invention is an improved controlling mechanism for machines of this character which may be operated as well by hand from a key board as also by a perforated strip, in which in known manner perforations are provided in suitable combination to represent the equivalents for letters and other signs employed in printing, such as spaces, carriage movement, line shift, and the like.

The particular purpose of my invention is to control as many different functions of the above character in the machine with the least possible number of holes of which the hole combinations in the strip are composed.

The essential features of my improved machine made with these objects in view are as follows:—The machine is controlled by a shaft, hereinafter called the controlling shaft, which by its position determines the operation of the machine for the time being. It carries a type-wheel and a so-called controlling disk; in each position of the type-wheel a different type is opposite the printing hammer, and the controlling disk starts in each position a predetermined operation. An auxiliary force executes the prepared operation and prints the type which is set. The controlling shaft is constantly driven and stopped each time in the requisite position by the keyboard or by the register band.

Some illustrative embodiments of my invention are represented as an example in the accompanying drawings, wherein:—

Figure 1 is a diagrammatical illustration of one of the forms of my controlling mechanism, which shows in particular the arrangement of the electrically operating elements. Figs. 2 and 3 are elevations showing two forms of a locking device of the working shaft, and Fig. 4 is a diagram showing a preferred form of the controlling collector; Fig. 5 is a diagrammatical illustration of an improved form over that shown in Fig. 1, likewise showing the particular arrangement of the electrically operating elements. Fig. 6 shows diagrammatically the entire controlling mechanism covered by my invention to illustrate how the different mechanisms shown in the other figures are interconnected. Fig. 7 is a diagrammatical illustration of the manner in which movements of larger or smaller extent of various elements may be obtained from the controlling mechanism shown in the preceding figures. Fig. 8 is a diagram showing the relative positions of the type-wheel, controlling collector and the ratchet adapted for one form of the invention.

Referring firstly to Fig. 1 the controlling shaft 1 can be driven through the medium of a friction clutch (not shown) by a motor which tends to rotate it constantly. For stopping the controlling shaft in a predetermined position I provide the ratchet 5 fast on it, and a locking lever 17 whose detent 21 engages therewith as soon as the arresting magnet 16 is energized. A snap roller 18 secures the locking lever in its two positions. The lever carries in addition a second detent 22 which, when the detent 21 engages the ratchet, releases the cam 23. This cam is fast on a shaft 24, herein called the working shaft. It is likewise driven through the medium of a friction clutch (not shown) which slides when the detent 22 prevents the cam 23 rotating, but which nevertheless imparts a torque sufficient to enable the working shaft to drive all the operative members of the machine. This drive takes place through the medium of detachable clutches, so that only that operative member is driven by the working shaft whose clutch is engaged. The cam 25 is also fast on the working shaft. As soon as this cam has rotated so far that its projection 25′ reaches a slide 26, the latter is moved downward against the action of a spring, not shown, acting in the direction of the arrow and by means of its pin 27 removes the locking lever 17 from the ratchet 5 of the controlling shaft before the shaft 24 has rotated one complete revolution. The projection 23′ of the cam 23 then abuts against the detent 22, so that the working shaft is stopped again after one revolution. Which operations are performed by the working shaft during this revolution is determined by a number of magnets 10, 11, 12, 13, 14, of which only a few are given a function in the drawings (see Fig. 6) while

the remainder are shown connected to the controlling disk merely to indicate that quite a number of magnets may thus be controlled for the performing of the manifold functions necessary in a machine of the character described. As soon as one of these is energized it throws into engagement one of the clutches by which the motion of the working shaft is imparted to the various operative members as will be explained later with reference to Fig. 6. For example, the controlling magnet 10 starts printing and feed, while the magnet 11 brings about word-spacing; the magnet 12 brings about longitudinal displacement of the type-wheel on the controlling shaft, and the magnet 13 the return of the carriage. Magnet 14 and further magnets which are shown may be connected as pointed out above with similar devices for controlling other functions of the machine. This feature constitutes one of the principal advantages of my novel mechanism, because of permitting the control of a great number of different functions and mechanisms from one controlling shaft.

The magnets may drive the operative parts directly without an auxiliary force in so far as their force suffices therefor. They are connected into circuit by the controlling disk 2 which, in this illustrative embodiment, constitutes a stationary controlling collector whose brush-arm 15 rotates with the shaft 1. The windings of the magnets 10 to 14 are connected with the segments of the collector; the current flows from the battery O to the slip-ring 16 connected with the brush-arm 15, over the segment located directly under the brush to the magnet connected therewith, and over a rotating switch 29 back to the battery. This rotating switch is mounted on the working shaft 24 and closes the circuit only when this shaft has begun to rotate, which takes place only when the controlling shaft is stationary, and thus interrupts the circuit before the controlling shaft rotates again. Its purpose is to avoid the temporary excitation of all the controlling magnets during the rotation of the controlling shaft and sparking due to breaking the circuit at the controlling collector.

The types $a, b, c \ldots \ldots x, y, z$ are provided on the periphery of the type-wheel 3. That type which is exactly in front of the printing hammer 6 is printed on the sheet of paper 7 when the hammer strikes. The types are arranged in several rows one above another so that when the type-wheel is axially shifted a short distance on the shaft 1 a different row of types is placed in front of the hammer. This shifting of the type wheel is not shown in the drawings, since it does not form part of my present invention and since it in no way aids the explanation and understanding of it. In all positions of the controlling shaft in which a type is located in front of the hammer the brush-arm 15 conducts the current to the long contact segment 8 which is connected with the magnet 10 and brings about printing and feed. When the brush-arm is on one of the contacts 9, however, no printing takes place as the electromagnets 11 to 14 connected with these contacts bring about other operations. Therefore, that part of the type-wheel which is opposite the hammer in these positions of the controlling shaft is provided with no types.

A second stationary collector 4, herein called the combination collector, is for energizing the arresting magnet 16 when the controlling shaft is in one exactly predetermined position. Its segments are arranged in pairs, and two brushes 30 and 31 which rotate with the controlling shaft slide over them. The segments are connected to the combination switches 32 in such manner that the brushes 30, 31 are connected in each position with a different pair of switches, by which they can be connected to a common line 37. In the illustrative embodiment six switches 32 are shown; as fifteen different combinations each comprising two members can be formed with six members, the collector has fifteen pairs of contacts; a condenser 33 which is connected with the two brushes 30 and 31 over the arresting magnet 16 and over two sliding contacts 35 is used as the source of current. A second rotating switch 34 which rotates with the working shaft 24 connects these sliding contacts in its rest position. The circuit is closed at the moment when the brushes 30 and 31 contact two contact-pieces whose appertaining switches are closed. The arresting magnet 16 is then energized for a short time by the condenser 33 and the locking lever 17 stops the controlling shaft and releases the working shaft. The latter shaft closes the circuit for the controlling magnets by means of the switch 29, charges the condenser over the sliding contact-pieces 36 by means of the switch 34, and releases the controlling shaft by means of the cam 25.

In order to stop the controlling shaft in a predetermined position two of the combination switches 32 must be closed, which can be done either by hand or by a register band. The switch arms carry projections 38 which slide over the traveling register band 39. As soon as a hole in this band arrives under them they enter into the same, whereby the switch in question is closed by gravity or other suitable means known in the art.

As long as the working shaft 24 is arrested by the locking lever 17 the friction clutch through the medium of which it is driven must slide. The entire energy which otherwise serves for driving the operating members is constantly dissipated. Furthermore, the torque constantly exercised on the shaft

causes a considerable pressure between the cam 23 and the detent 22, so that an appreciable force is requisite for withdrawing this detent. For this reason it is preferable to connect a detachable coupling between the working shaft and its driving member. Fig. 2 shows such a coupling. The ratchet 40 is constantly driven and rotates loosely on the working shaft 24. The arm 41 carrying a pin 42 and a spring 44 is fast on the working shaft. A locking lever 43 having one end formed as a pawl is fulcrumed on the pin 42 and under the influence of the spring 44 tends to engage in the teeth of the ratchet, but as a rule it is prevented from so doing by the detent 22 of the lever 17; as soon as this is retracted, however, the locking lever 43 engages with the ratchet, is driven thereby and with it the arm 41 and the working shaft 24. As soon as one revolution is finished the lever 43 is stopped by the detent 22; owing to the arm 41 rotating further the lever 43 is then removed from the ratchet, the spring 44 is tensioned and the working shaft 24 remains stationary. If this shaft were now no longer subjected to any torque the spring would tend to bring about the engagement of the pawl and ratchet, and continuous rattling of the two parts one on the other would be caused. This is avoided when a sliding clutch (represented at 212, Fig. 6) between the working shaft and the drive constantly transmits a torque sufficient for keeping the spring 44 tensioned. In order that it be not tensioned too much and that the line from the axis of the shaft 24 passing through the fulcrum 42 to the point of contact of the lever 43 with the stop 22 be not materially bent, I provide on the arm 41 a stop 45 against which the lever 43 bears.

The sliding clutch which may be of any suitable construction requires only little friction as it does not transmit the torque to the operative members of the machine; it can be entirely dispensed with when the arm 41 is held in its disconnected position by a snap roller 46, as shown in Fig. 3.

The six combination switches 32 and the combination collector 4 in the described illustrative embodiment enable the shaft to be stopped in fifteen different positions. The number of positions and the manysidedness of the machine is, however, materially increased when the switches 32 are formed as double pole switches and when, instead of two, any desired number of them are reversed for each symbol or character. When six double pole switches are provided $2^6=64$ various controlling positions are possible.

Fig. 4 shows how the combination collector is formed and connected with the double pole switches in this case. The pivot points of switches 51 and 52 and of 53 and 54 are electrically connected respectively with each other. The combination collector 58, shown in Fig. 5, a part of whose developed periphery 49 comprising the segments 60 to 66 is shown in Fig. 4, rotates on the shaft 1 in the direction indicated by the arrow under the stationary brushes 31'. Of these there are in all eighteen, *i. e.* one set of three for each of the double pole switches 50 to 55. The two outer brushes of each set are connected with the contact-pieces of a double pole switch, and the middle brush conducts the current to the next segment of the collector, as clearly shown. The segments are so arranged on the collector that they connect either the one or the other of the two outer brushes of one set with the middle one and, as will be readily understood, the circuit is closed when each of the six switch-levers is directly connected over one of its contact-pieces and a brush to a segment of the collector. In the drawing the collector is shown in a position in which the circuit is closed when the switches are in the position shown. The current flows as follows:— from one pole of the condenser 33 over the pair of brushes 35 and the switch 34 to the double pole switch 50, then over the segments 60 and 61 to the double pole switch 51, to the double pole switch 52, over the segments 62 and 63 and the double pole switches 53 and 54 to the segments 64 and 65, over the double pole switch 55 and the arresting magnet 16 and back to the other pole of the condenser. Consequently, by employing double pole switches 50 to 55 instead of the simple switches 32, the number of possible positions of the controlling shaft is increased from fifteen to sixty-four. Now when some of these positions are used in the above-described manner for adjusting and printing types, and others for adjusting operations, a part of the type-wheel remains empty as shown in Fig. 1. This is undesirable because the type-wheel should be of as small diameter as possible on account of a clean impression, and consequently its periphery must be utilized as fully as possible. This defect is obviated when the number of type-adjustments is made equal to the number of the working adjustments (in the present instance thirty-two adjustments of the type-wheel and thirty-two adjustments of the controlling disk) and these are arranged alternately over the periphery of the controlling shaft. The types are in this event distributed uniformly on the type-wheel, and the periphery of the type-wheel can be fully utilized. Such an arrangement is shown in Fig. 8 in which the type-wheel, the controlling collector and the ratchet for arresting the controlling shaft are shown developed. The type-wheel 3' has the types arranged in three rows one above another, the top one

having, for example, capital letters, the second small letters and the third numerals. By shifting the type-wheel axially on the shaft each of the three rows can be brought in front of the printing hammer whose position is indicated by the cross-hatched square 6'. The type-wheel 3' rotates with the controlling shaft, as also the brush-arm 15 and the ratchet 5. The brush-arm 15 slides over the segments of the stationary controlling collector 122 (Fig. 8). All those segments located in the extension of the middle line of a type of the type-wheel are connected with the printing and feed magnet 10, while the intermediate segments are connected to the controlling magnets 11, 12, 13, 14 . . . In the drawing it is assumed that the tooth 124 of the ratchet 5 is held by the detent 21. The letter *c* is under the printing hammer and a segment connected with the printing and feed magnet 10 is under the sliding contact 15. As soon as the working shaft 24 begins to rotate this magnet is energized over the switch 29, and the letter *c* is printed. But if the controlling shaft is stopped at the tooth 125, for example, the printing hammer is between the two letters *d* and *e*, as indicated by a dotted line in the drawing. An impression is not made as the sliding contact 15 does not conduct the current to the printing and feed magnet 10, but to the magnet 14 which starts any other operation of the machine.

The arrangement shown in Fig. 8 can be advantageously employed both together with a combination collector according to Fig. 1 and also with one according to Fig. 4. Such an arrangement can be improved still more, as represented in Fig. 5. The improvement consists in the ratchet 5' for stopping the controlling shaft having only half as many teeth, in the illustrative embodiment thirty-two, instead of sixty-four, and in the machine nevertheless possessing the same number of functions. Namely, of the six combination switches only five are used for determining the arresting positions of the controlling shaft, these switches being designed 47 on the drawing. These five combination switches thus give only thirty-two arresting positions: in the case of each of them, however, both the type-wheel 3'' is adjusted to a type and the controlling collector 2' to a controlling magnet, and for determining whether an impression of the type or the excitation of this controlling magnet is to take place the sixth combination switch 48 is used. In the position shown in the drawing this switch closes the circuit of the printing and feed magnet 10. As soon as the controlling shaft 1 stops and the working shaft 24 begins to rotate the rotating switch 29 closes a circuit from one pole of the battery 0, switch 48, printing and feed magnet 10, switch 29 and the other pole of the battery, and a type is printed and the carriage is fed. If the switch 48 is placed by the pressure of a key not shown or by the register band on its lower contact-piece, on the other hand, the current does not flow over the magnet 10 but over the controlling collector 58 and one of the controlling magnets 11, 12, 13 . . . . which releases a different predetermined operation in the machine.

If the machine is used for particular purposes, frequently elements are necessary which sometimes have to move a larger and sometimes a smaller distance. These members are driven according to my invention by the controlling shaft. Fig. 7 shows one illustrative embodiment the connection of which in the remainder of the machine is shown in Fig. 6. The rack 100 is to be moved forward a predetermined distance, it may be to draw the paper-carriage up to a predetermined point, or to adjust slides serving for justification, or for other purposes. It meshes with a pinion 101 keyed on a shaft 102. On this shaft is splined conical friction wheel 103 which can be brought into engagement by a two-armed lever 105 with a second friction wheel 104 fast on a shaft 104'. The latter shaft is positively driven by the controlling shaft as will be explained later on with reference to Fig. 6. As long as the two-armed lever 105 is pulled by a spring 105' against its stop 105'' the friction wheel 103 is inoperative. As soon as an electromagnet 106 which is connected to one of the contact pieces of the controlling collector is energized, however, owing to the controlling shaft being stopped in a predetermined position, the lever 105 is tilted and the two friction wheels are coupled together. The coupling is maintained after the magnet is deënergized because the lever 105 is held by a catch 107. Then, as soon as the controlling shaft begins to rotate again, the shaft 102 is also driven and consequently the rack 100 is moved by the pinion 101 until the controlling shaft stops again. As the controlling shaft can be stopped at any desired place the rack 100 can be shifted any desired distance. After this motion has ended the friction clutch connecting the two shafts 104 and 102 must be disengaged; to this end, a cam 108 mounted on the working shaft is provided which temporarily releases the catch 107, so that the lever 105 is pulled by its spring back into its rest position before the controlling shaft begins to rotate again. When it first stops and the friction clutch is engaged, the catch 107 is released for a short time; but as the magnet 106 is still energized, the lever 105 remains in its engaged position.

In Fig. 6 is illustrated how the several devices described hereinbefore are arranged

in coöperative relation to each other. The electromotor 200 drives by means of pinion 201 two gear wheels 202 and 203. Gear wheel 202 carries friction coupling 204 which may be of any suitable construction known in the art, which connects the gear wheel in turn with the controlling shaft, hereinbefore (for instance in Figs. 1 and 5) designated 1. In the actual machine, this controlling shaft as shown in Fig. 6, is subdivided into three portions 1′, 1″, 1‴, which are connected with each other by means of three bevel wheels 205, 206, 207, of equal size so that these three sections rotate with equal speed and so far as their function is concerned operate as one single shaft. Section 1′ of the controlling shaft stands vertical and has bevel wheel 205 and ratchet wheel 5′ splined to it, so that section 1′ may be longitudinally shifted in order to permit the shifting of the type wheel 3′, relatively to the hammer 6′ (see Fig. 8). Type wheel 3′ is also shown in dotted lines on shaft 1′ in Fig. 6. Bevel wheel 205 is in mesh with the two bevel wheels 206 and 207 which are keyed respectively to sections 1″ and 1‴ of the controlling shaft. Section 1″ runs in the bearings 208 and 265 and is connected through coupling 204, previously mentioned, with gear wheel 202. Section 1‴ runs in bearings 266 and 209 and carries the combination collector 58 (see also Fig. 5) on which the brushes 31′ slide. These brushes are arranged in five rows, three brushes in each row, as is shown at 31′ in Fig. 6, where the brush holders are omitted to render the illustration clearer. The brushes are connected with double pole switches 47′, 47″, 47‴, 47⁗, 47⁗′, the detail operation and connection of which has been described with reference to Fig. 4 but which connection is also shown in Fig. 6. Each position of the double pole switches 47′, etc., corresponds with a certain position of the combination collector 58 at which the circuit is closed. Shaft section 1‴ also carries brush holder 15 which glides over the contacts of the controlling collector 2′ which are connected with electro-magnets 10, 11, 12 and 13 in the manner shown in Fig. 5. Arm 15 is electrically connected with slip ring 16 which receives current from the fixed brush 16′.

The large gear wheel 203 carries bushing 213 which carries at its inner end ratchet wheel 40 shown in detail in Figs. 2 and 3. Gear wheel 203 is besides connected with working shaft 24 by means of a light friction coupling 212. Bushing 213 and shaft 24 as shown, are concentrically arranged and shaft 24 is supported by bearings 210 and 211. Shaft 24 carries arm 41 on the pivot pin 42 of which is mounted lever 43 which coöperates with ratchet wheel 40 as described with reference to Figs. 2 and 3. Working shaft 24 also carries the two rotating switches 29 and 34. Switch 29 cooperates with the brush pair 29′ and switch 34 with the brush pairs 35 and 36, as shown in Fig. 5. On shaft 24 are also mounted a number of cam disks and eccentrics which operate the several elements of the machine.

The arrangement shown in Fig. 6 operates as follows: The motor 200 permanently rotates through gear wheels 201 and 203, bushing 213 and thus ratchet wheel 40. Also by means of the light friction coupling 212 a slight torque is transmitted to working shaft 24. This torque, however, is counteracted by stop 22 of lever 17′ which is the equivalent of lever 17 in Figs. 1 and 5 and which is distinguished from the latter merely by its bell crank shape. Lever 17′ is pivoted at 268 and is capable of being held in two positions by means of spring controlled roll 18. By means of gear wheel 202 all three sections 1′, 1″, 1‴ of the controlling shaft are driven through the friction coupling 204 so that they rotate permanently. It may now be assumed that double pole switches 47′, 47″, etc., and also switch 48 are brought into the position shown in Fig. 6 by striking a key or through the action of the perforated strip 39 (Fig. 5). As soon as now combination collector 58 gets into the position shown in Fig. 6, a circuit is closed for the arresting magnet 16. The current thereby flows from the condenser 33 over conductor 272, magnet 16, conductor 273 to the first double pole switch 47′, thence to the left hand brush 31′ of the first row, to the segment, then in contact with the brush, thence over the middle brush of the first row to the middle brush of the second row, through the second segment to the right hand brush of the second row, then over switches 47″, 47‴ to the left brush of the third row, contact segment, middle brush of third row, middle brush of fourth row, right brush of fourth row, switches 47⁗ and 47⁗′, right brush of fifth row, middle brush of fifth row, conductor 271, brushes 35 (which are then connected by rotating switch 34), conductor 270 back to the condenser 33. The arresting magnet 16 is energized thereby and attracts its lever 17′ so that its detent 21 engages with ratchet wheel 5′ which rotates as previously mentioned with section 1′ of the controlling shaft. Thereby all three sections 1′, 1″ and 1‴ of the controlling shaft are arrested and the friction coupling 204 slips. By such movement of lever 17′ lever 43 (see also Fig. 2) is released so that it can fall under the tension of spring 44 into ratchet wheel 40 whereby it couples working shaft 24 with bushing 213 so that now working shaft 24 is positively driven. Dur-

ing its rotation shaft 24 causes rotating switch 29 to make electric connection between its two brushes 29'.

In the present description, it is assumed now that change-over switch 48 (Fig. 5) is in contact with its upper contact 48'. Rotating switch 29 then causes the closing of a circuit which energizes printing and feeding magnet 10 which is shown in Fig. 6 without its electric connection. For the printing of the adjusted type an eccentric 214 is provided on shaft 24. With this eccentric coöperates roller 215 which is carried by a lever 216 pivoted at 217. Lever 216 is pressed into contact with eccentric 214 by means of spring 218. Moreover lever 216 is normally locked by a pawl 220, so long as its nose 221 is in engagement with a corresponding member 219 of lever 216. Pawl 220 is pivoted at 222 and held in engagement with nose 219 by means of a spring 223. As soon as magnet 10 is energized it attracts pawl 220 and thereby releases lever 216 which now is brought into operative control of eccentric 214. Lever 216 has pivotally attached to it a rod 244 which is suitably connected with a printing hammer 6 (not shown), so that the latter is operated thereby to print the type. The feeding of the paper carriage is effected by means of eccentric 224 likewise mounted on working shaft 24. A lever 226 pivoted at 227, carries a roller 225 which is held in engagement with eccentric 224 by means of spring 228, lever 226 however being like 216 held in inoperative position by means of pawl 230 which engages lever 226 with its nose 231. Also pawl 230 is attracted by magnet 10 when the latter is energized so that also lever 226 is released and brought into operative engagement with its eccentric 224 so that the carriage may be operated by a rod 245 pivotally attached to lever 226. The carriage like the printing hammer has been omitted in Fig. 6, since their detail construction is immaterial for the explanation of the present invention. Of course eccentrics 214 and 224 are timed relatively to each other so that the printing and feeding do not occur at the same time but successively.

If now change-over switch 48, Fig. 5, is drawn onto its contact 48'', the current closed by rotating switch 29, is not conducted through magnet 10 but to the controlling collector 2' by way of brush 16', slip ring 16, brush arm 15 and brush 15' as is also clear from Fig. 5. Now as soon as working shaft 24 has rotated far enough so that its rotating switch 29 connects the two brushes 29' the current is conducted from controlling collector 2' to one of the other magnets 11, 12 and 13, as the position of brush arm 15 may be. If for instance magnet 11 should be energized it attracts pawl 230 already mentioned in connection with magnet 10 (Fig. 6). In this case the carriage is fed by means of eccentric 224 so that a space is produced for instance between two words. If, on the other hand, for instance electromagnet 12 receives current, section 1' of the controlling shaft is shifted longitudinally. This may take place for instance by means of eccentric 247 which is loosely mounted on working shaft 24 but prevented from axial movement thereon. This eccentric carries a detent 248 which coöperates with a detent 249 fastened on a collar 250 splined on shaft 24. This collar is axially movable by means of lever 252 which is spring controlled by means of spring 254, and operated against the tension of this spring by means of magnet 12 when the latter is energized as mentioned before. Spring 254 normally holds the two detents 248 and 249 out of engagement. If now magnet 12 is energized lever 252 rocks on its pivot 253 and thereby throws the two detents into engagement and causes the rotation of cam or eccentric 247. This part of the structure is illustrated only thus far since the connection between the eccentric and shaft section 1 may be of any convenient form to bring about the desired result. The last mentioned construction is immaterial to the present invention. It may be stated merely that by the shifting of shaft section 1' the type wheel, a fraction of which is shown at 3' in Fig. 8, is axially shifted with shaft section 1' so that the different sizes of type or numerals may be brought into line with the printing hammer. A particular convenient arrangement is shown in my U. S. application, Serial No. 711,047 filed July 22, 1912.

When a line of the printed matter to be produced is completed the carriage must be returned for the starting of the subsequent line as is usual in typewriting machines and machines of this character. This operation is effected by the eccentric 234 and by its cooperating cam roller 235. The roller is carried by lever 236 pivoted at 237 and is held in contact with cam or eccentric 234 by means of spring 238. Coöperation between cam roller 235 and eccentric 234, however, is prevented so long as the nose 241 of pawl 240 is in engagement with nose 239 of lever 236. Pawl 240 is held in this engaging position by means of spring 243. Now as soon as electromagnet 13 which is in operative distance from pawl 240 is energized when the controlling collector 2' (Fig. 5) closes the circuit for this magnet, pawl 240 is drawn off nose 239 so that eccentric 234 can operate lever 236 and so that its movement in turn can be transmitted by means of rod 246 pivotally attached to lever 236 to the carriage. The detail construction of the connection between lever 236 and the car-

riage is, as the carriage itself, not shown since it does not form any part of my invention. The illustration in Fig. 6 of the various movements which control the movement of the main elements such as the paper carriage, the hammer and the like, are only shown so far as their connection with the subject matter of my present invention is concerned, and it may be stated that in the same manner in which the eccentrics and movements just described are controlled from working shaft 24 any suitable number of similar eccentrics may be arranged on this shaft for controlling devices connected with the machine and necessary for its operation. Such eccentrics are controlled by electromagnets in the manner just described, the magnets being energized by the circuit arrangements shown in Fig. 5, which, together with the arrangement in Fig. 6, illustrate the general principle on which my invention is based.

Working shaft 24 further carries a snail cam 25, Fig. 6, the elevated portion of which is denoted with 25′ in Figs. 5 and 6. In Fig. 5 the connection between this cam and lever 17 has been illustrated merely diagrammatically to indicate that there is a mechanical connection between lever 17 and the cam, whereas in Fig. 6, the actual movement as employed in the machine is illustrated. In this latter figure it will be noted a longitudinally sliding bar 26 is disposed adjacent to and in parallel to the plane of cam 25 and is also located adjacent to lever 17′. The bar is spring controlled as shown at 26′ so that roller 26″ attached at its upper end maintains contact with snail cam 25. Adjacent to lever 15 bar 26 carries a pin 27 in the path of which lever 17′ is located when bar 26 moves longitudinally. The arrangement of the elements just described is such that when lever 17′ is in engagement at 21 with ratchet wheel 5′ as previously described, it is disengaged therefrom by pin 27 of bar 26 when the latter is drawn upward by elevated portion 25′ of cam 25 when the latter rotates with shaft 24. This releases the controlling shaft which as previously described was locked by lever 17′ through the energizing of magnet 16. The releasing of this shaft and a drawing upward of lever 17′ simultaneously throws portion 22 of lever 17′ into the path of lever 43 which rotates with working shaft 24 and upon engagement of lever 23 with stop 22, the former disengages its other end from ratchet wheel 40 and thereby uncouples working shaft 24 from bushing 213 and thus from gear wheel 203. In the mean time the rotating switch 34 which has rotated with shaft 24 has, during its rotation recharged condenser 33 by closing a circuit through battery B over brushes 36 (Fig. 5). The controlling shaft drives with its section 1‴ a pair of miter gears 260 and 261 which transmit the rotation to another pair of miter gears 263 and 264. Miter gear 264 is fastened on shaft 104′ previously mentioned with reference to Fig. 7 where the other end of shaft 104′ is shown. This other end, as Fig. 7 illustrates, carries a friction bevel wheel 104 for the purpose previously described. Now working shaft 24 carries a cam disk 108 also previously described in connection with Fig. 7. This disk is shown in Fig. 6 near the right hand end of shaft 24. Whenever a coupling between friction wheels 103, and 104, in Fig. 7, has been brought about by magnet 106, this coupling is loosened at the desired moment by means of cam disk 108 in the manner previously described.

I claim:—

1. In a machine of the character described, the combination, with a controlling shaft drive, of a typewheel operatively connected therewith, a controlling disk operatively connected with the controlling shaft, a plurality of electromagnets, for controlling the functions of the machine according to the position for the time being of the controlling shaft, controlled by said controlling disk, a ratchet fast on the controlling shaft and locking mechanism for locking the said ratchet; a combination collector comprising contact segments; an electric circuit comprising an arresting magnet for actuating the said locking mechanism, and brushes adapted to contact said segments; and a plurality of combination switches electrically connected with said segments for closing said circuit.

2. In a machine of the character described, the combination, with a controlling shaft drive, of a type-wheel operatively connected therewith, a controlling disk operatively connected with the controlling shaft, a plurality of electromagnets for controlling the functions of the machine according to the position for the time being of the controlling shaft controlled by said controlling disk, a ratchet fast on the controlling shaft, and locking mechanism for locking the said ratchet; a combination collector comprising a plurality of segments fast on said shaft, a plurality of sets of brushes in operative relation to the segments, a plurality of double pole combination switches connected in series, the two contacts of each double pole switch being connected to two brushes of one of said sets of brushes, one of which two brushes of each set is connected by one of said segments to a third brush of another set; a source of current, and an arresting magnet in series with the said double pole switches and the source of current for actuating the said locking mechanism.

3. In a machine of the character described, the combination, with a controlling shaft

drive, of a type-wheel operatively connected therewith, a controlling disk operatively connected with the controlling shaft, a plurality of electromagnets for controlling the functions of the machine according to the position for the time being of the controlling shaft controlled by said controlling disk, a ratchet fast on the controlling shaft, and locking mechanism for locking the said ratchet: a combination collector comprising a plurality of segments fast on said shaft, a plurality of sets of three brushes in operative relation to the segments, a plurality of double pole combination switches connected in series, the two contacts of each double le switch being connected to two outer brushes of one of said sets of brushes, the middle brush of each set of brushes being connected with the middle brush of an adjacent set, and each segment being adapted to contact two brushes of one set of brushes simultaneously; a source of current, and an arresting magnet in series with the said double pole switches and the source of current for actuating the said locking mechanism.

4. In a machine of the character described, the combination, with a controlling shaft drive constantly subjected to a torque, of a type-wheel operatively connected therewith, a controlling disk carrying contact-pieces, a brush-arm slidable over the said contact-pieces, a ratchet fast on the controlling shaft, a working shaft constantly subjected to a torque, an arresting member on the working shaft, and a locking device for locking the said ratchet and simultaneously temporarily releasing said arresting member; and a plurality of electromagnets connected to said contact-pieces for controlling the operation of the working shaft.

5. In a machine of the character described, the combination, with a controlling shaft drive constantly subjected to a torque, of a type-wheel operatively connected therewith, a stationary controlling disk carrying contact-pieces, a brush-arm fast on the controlling shaft and slidable over the said contact-pieces, a combination collector comprising a plurality of segments fast on said shaft, a ratchet fast on the controlling shaft, a working shaft constantly subjected to a torque, an arresting member on the working shaft, and a locking device for locking the said ratchet and simultaneously temporarily releasing said arresting member, and for locking the said arresting member and simultaneously releasing the said ratchet; means driven by the working shaft for actuating the locking device and thereby arresting said arresting member, a plurality of electromagnets connected to said contact-pieces for controlling the operation of the working shaft; an electric circuit comprising an arresting magnet for releasing said locking device from said arresting member, and brushes adapted to contact with said segments: and a plurality of combination switches electrically connected with said segments for closing said circuit.

6. In a machine of the character described, the combination, with a controlling shaft drive constantly subjected to a torque, of a type-wheel operatively connected therewith, a stationary controlling disk carrying contact-pieces, a brush-arm fast on the controlling shaft and slidable over the said contact-pieces, a combination collector comprising a plurality of segments fast on said shaft, a ratchet fast on the controlling shaft, a working shaft, a member constantly subjected to a torque and loose on the working shaft, a spring-pulled coupling mounted on the working shaft and adapted to engage said member, and a locking device for locking the said ratchet and simultaneously allowing said coupling to engage with said member; a plurality of electromagnets connected to said contact-pieces for controlling the operation of the working shaft; an electric circuit comprising an arresting magnet for actuating said locking device, and brushes adapted to contact with said segments, and a plurality of combination switches electrically connected with said segments for closing said circuit.

7. In a machine of the character described, the combination, with a controlling shaft drive constantly subjected to a torque, of a type-wheel operatively connected therewith, a stationary controlling disk carrying contact-pieces, a brush-arm fast on the controlling shaft and slidable over the said contact-pieces, a combination collector comprising a plurality of segments fast on said shaft, a ratchet fast on the controlling shaft, a working shaft constantly subjected to a torque, an arresting member on the working shaft, and a locking device for locking the said ratchet and simultaneously temporarily releasing said arresting member; a plurality of electromagnets connected to said contact-pieces for controlling the operation of the working shaft; an electric circuit comprising a condenser, an arresting magnet for actuating said locking device, and brushes adapted to contact with said segments; means comprising a source of current and a switch actuated by the working shaft for charging said condenser; and a plurality of combination switches electrically connected with said segments for closing said circuit.

8. In a machine of the character described, the combination, with a controlling shaft drive constantly subjected to a torque, of a type-wheel operatively connected therewith, a stationary controlling disk carrying contact-pieces, a brush-arm fast on the controlling shaft and slidable over the said con-

tact-pieces, a combination collector comprising a plurality of segments fast on said shaft, a ratchet fast on the controlling shaft, a working shaft constantly subjected to a torque, an arresting member on the working shaft, and a locking device for locking the said ratchet and simultaneously releasing said arresting member; a plurality of electromagnets connected to said contact-pieces for controlling the operation of the working shaft; an electric circuit comprising a source of current, a switch actuated by the working shaft, an arresting magnet for actuating said locking device, and brushes adapted to contact with said segments; and a plurality of combination switches electrically connected with said segments for closing said circuit.

9. In a machine of the character described, the combination, with a controlling shaft drive, of a type-wheel operatively connected therewith, a controlling disk operatively connected with the controlling shaft, a plurality of electromagnets, controlled by said controlling disk, for controlling the functions of the machine according to the position for the time being of the controlling shaft, a ratchet fast on the controlling shaft, and locking mechanism for locking the said ratchet; a combination collector comprising contact segments; an electric circuit comprising an arresting magnet for actuating the said locking mechanism, and brushes adapted to contact said segments; and a plurality of combination switches electrically connected with said segments for closing said circuit, an operative member, a clutch member driven by the controlling shaft, a shaft adapted to drive the said operative member, a clutch member carried by the latter shaft and adapted to coact with the former clutch member, and means comprising a magnet controlled by the controlling disk for causing the latter clutch member to coact with the former clutch member.

10. In a machine of the character described, the combination, with a controlling shaft drive constantly subjected to a torque, of a type-wheel operatively connected therewith, a stationary controlling disk carrying contact-pieces, a brush-arm fast on the controlling shaft and slidable over the said contact-pieces, a ratchet fast on the controlling shaft, a working shaft constantly subjected to a torque, an arresting member on the working shaft, and a locking device for locking the said ratchet and simultaneously temporarily releasing said arresting member; a plurality of electromagnets connected to said contact-pieces for controlling the operation of the working shaft; an electric circuit comprising an arresting magnet for actuating said locking device, and brushes adapted to contact with said segments; and a plurality of combination switches electrically connected with said segments for closing said circuit, an operative member, a clutch member driven by the controlling shaft, a shaft adapted to drive the said operative member, a clutch member carried by the latter shaft and adapted to coact with the former clutch member, and means comprising a magnet controlled by the controlling disk for causing the latter clutch member to coact with the former clutch member.

11. In a machine of the character described, the combination, with a controlling shaft drive constantly subjected to a torque, of a type-wheel operatively connected therewith, a stationary controlling disk carrying contact-pieces, a brush-arm fast on the controlling shaft and slidable over the said contact-pieces, a ratchet fast on the controlling shaft, a working shaft constantly subjected to a torque, an arresting member on the working shaft, and a locking device for locking the said ratchet and simultaneously temporarily releasing said arresting member; a plurality of electromagnets connected to said contact-pieces for controlling the operation of the working shaft; an electric circuit comprising an arresting magnet for actuating said locking device, and brushes adapted to contact with said segments; and a plurality of combination switches electrically connected with said segments for closing said circuit, an operative member, a clutch member driven by the controlling shaft, a shaft adapted to drive the said operative member, a clutch member carried by the latter shaft and adapted to coact with the former clutch member, and spring-pulled means comprising a magnet controlled by the controlling disk for causing the latter clutch member to coact with the former clutch member, detent means for temporarily keeping the clutch members engaged, and means actuated by the working shaft for actuating the detent means and disengaging the clutch members.

In testimony whereof I sign my name to this specification in the presence of two witnesses.

EDUARD MAREK v. MARCHTHAL.

Witnesses:
A. FUNK,
ADA MARIA BERGER.