

June 9, 1936.

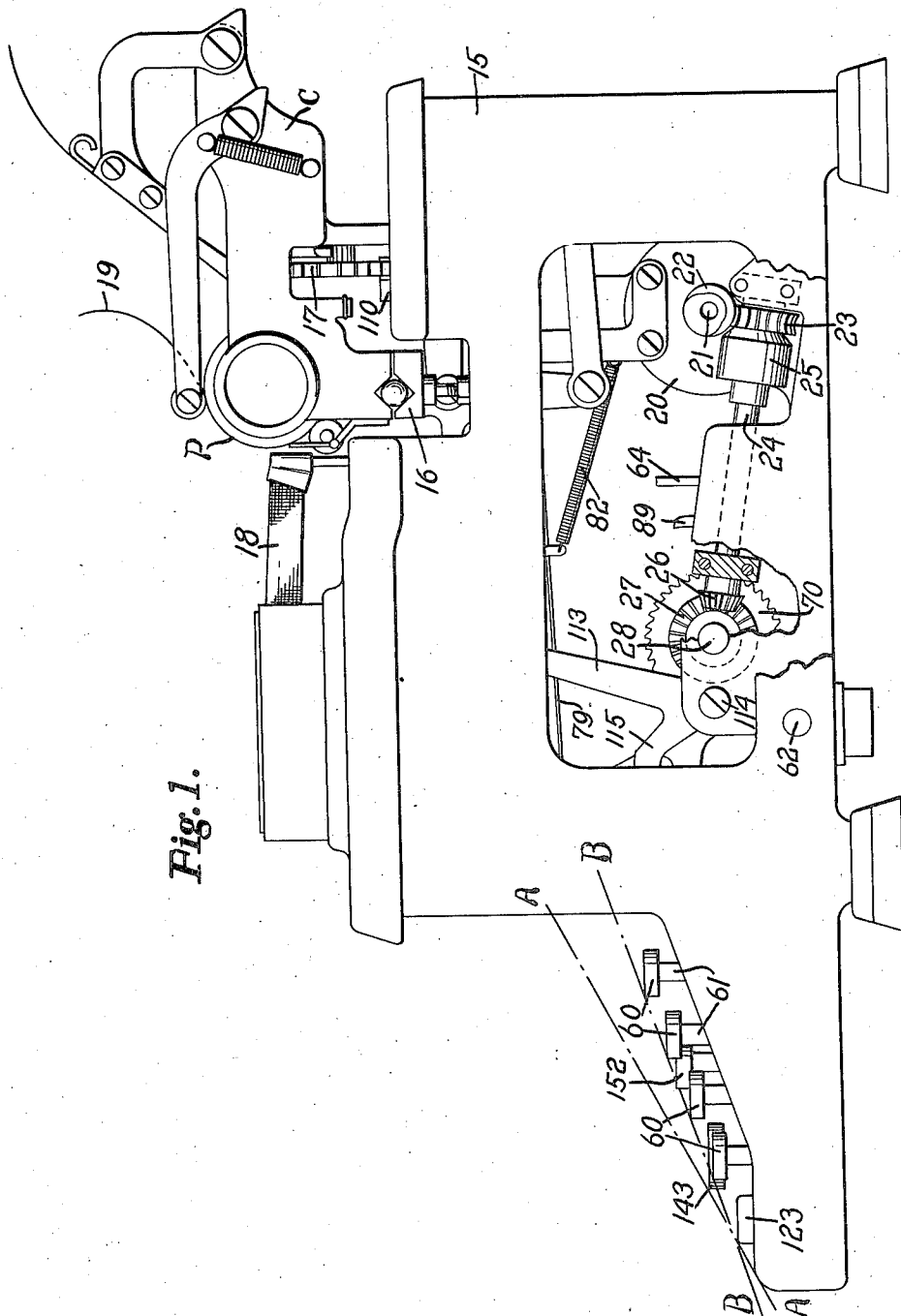
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2,043,393

POWER OPERATED TYPEWRITER

Filed Jan. 25, 1930

7 Sheets-Sheet 1



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June 9, 1936.

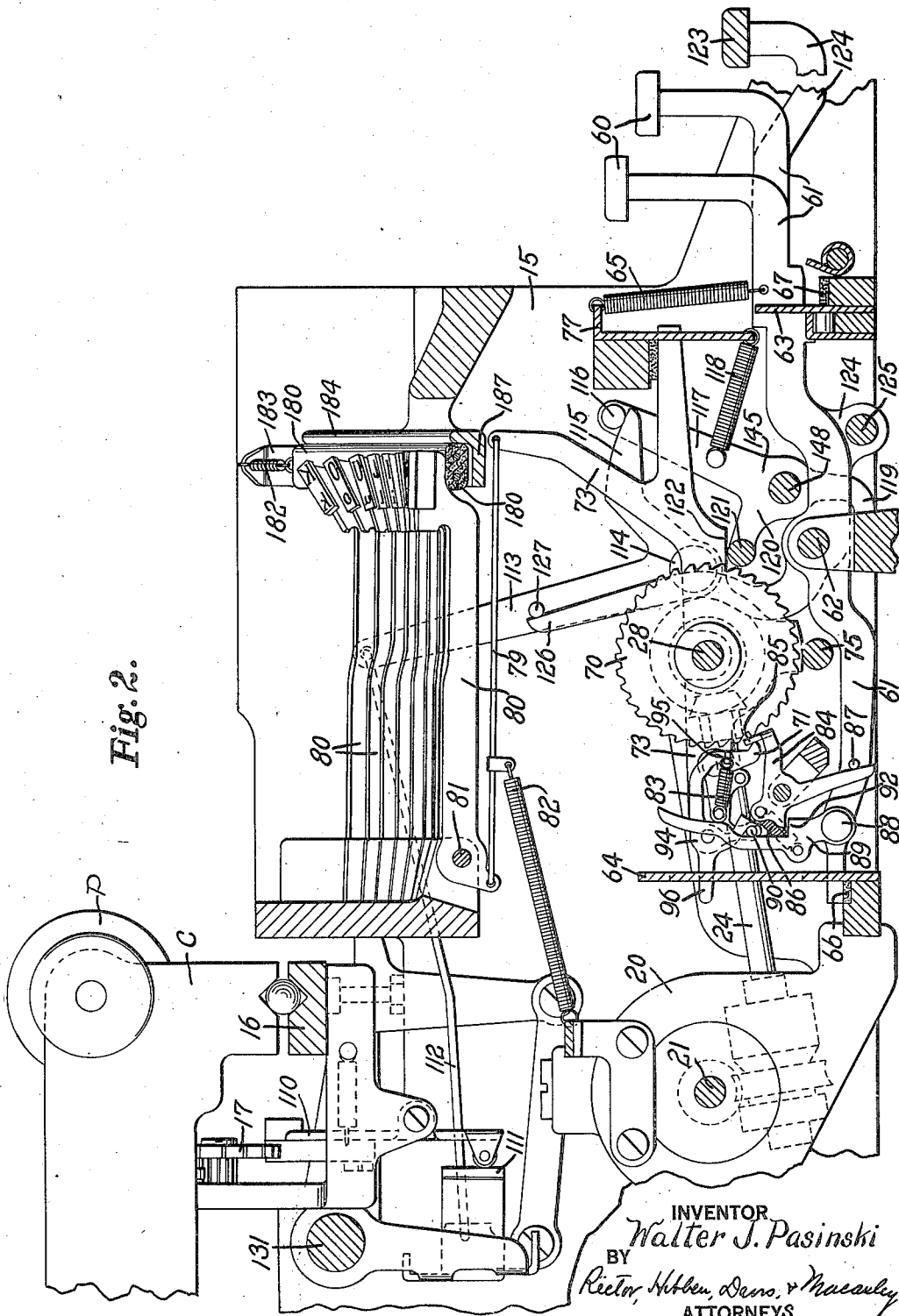
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POWER OPERATED TYPEWRITER

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7 Sheets-Sheet 4

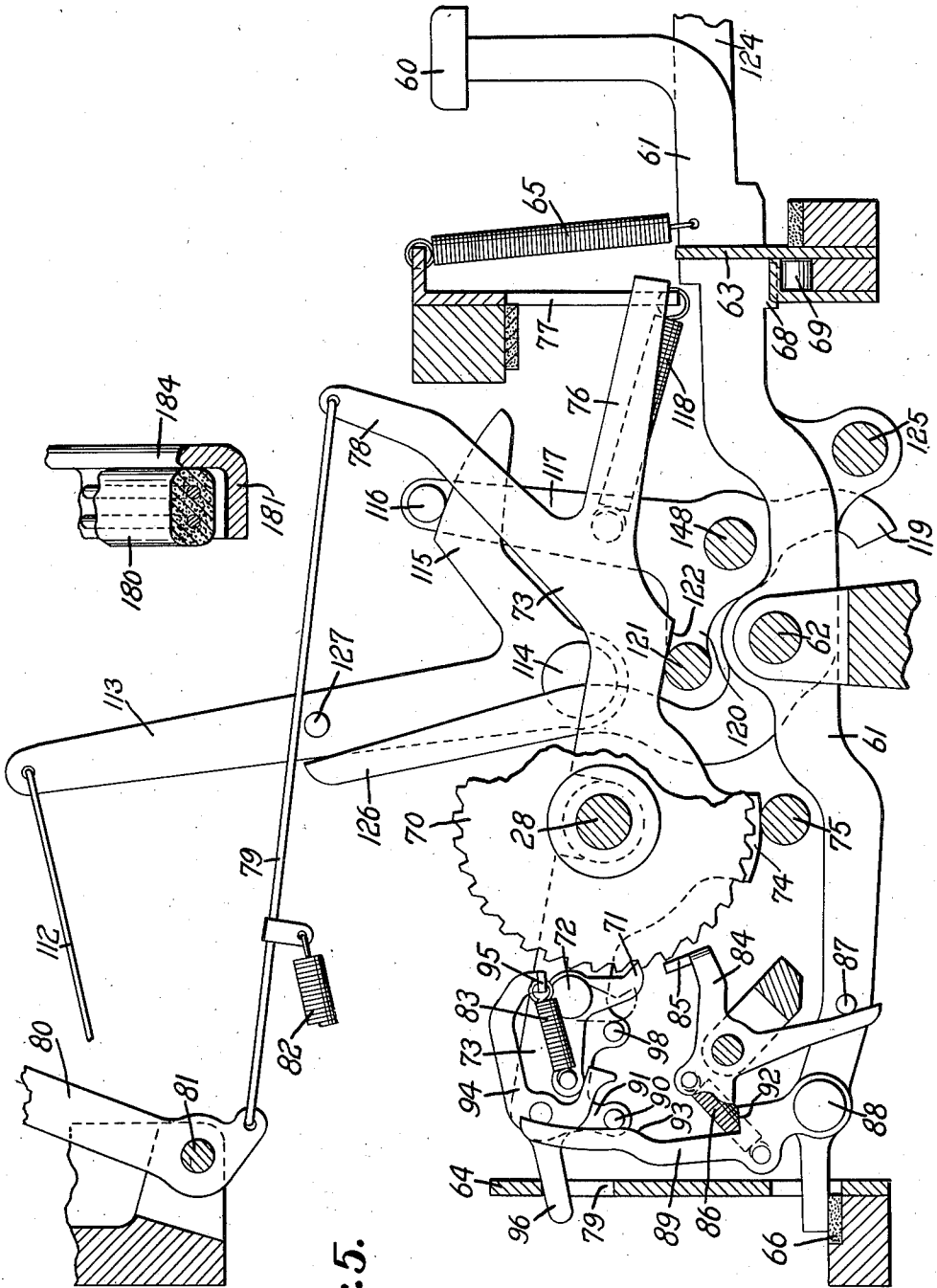


Fig. 5.

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POWER OPERATED TYPEWRITER

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7 Sheets—Sheet 5

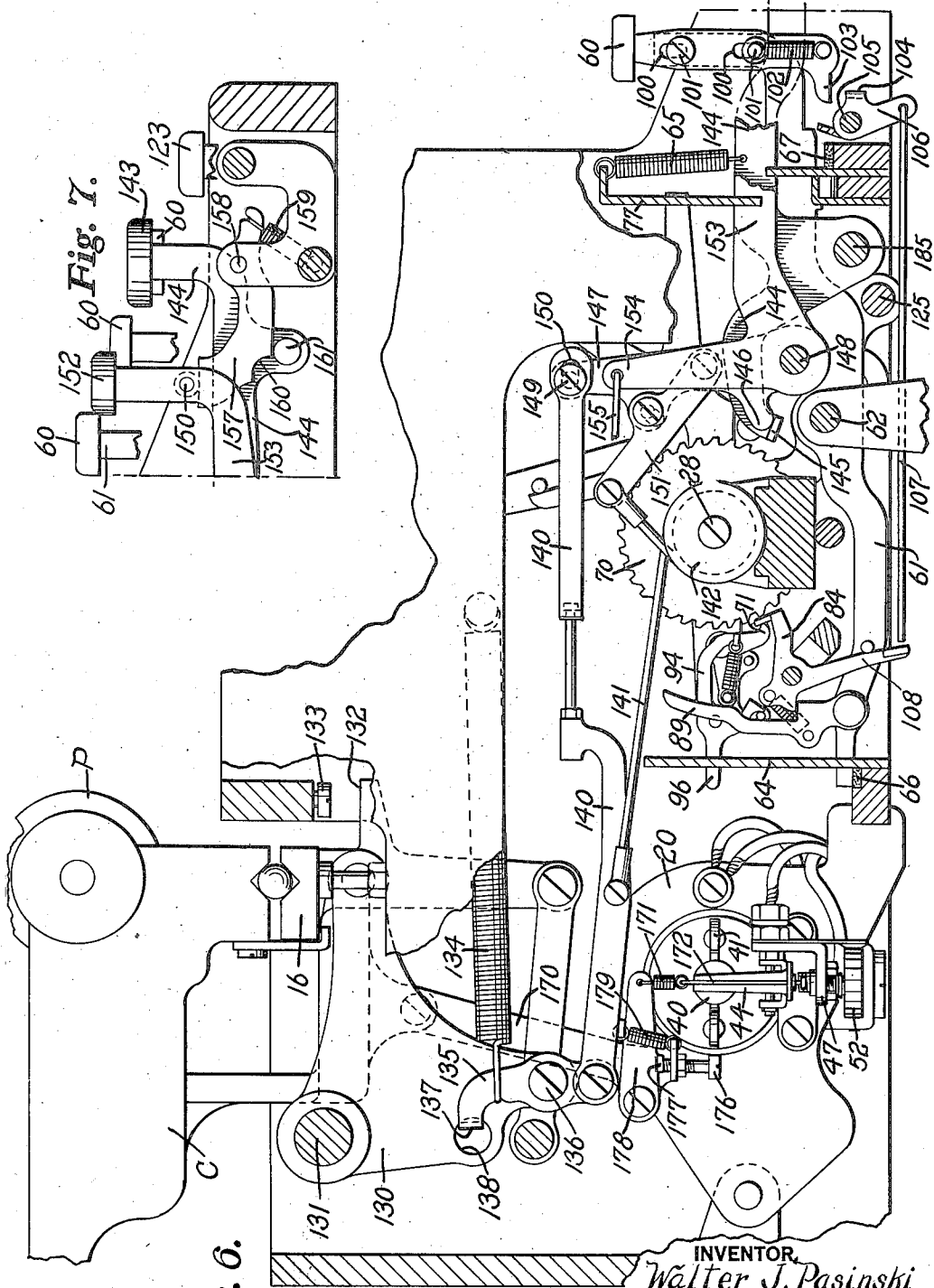


Fig. 6.

Fig. 7.

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POWER OPERATED TYPEWRITER

Filed Jan. 25, 1930

7 Sheets-Sheet 6

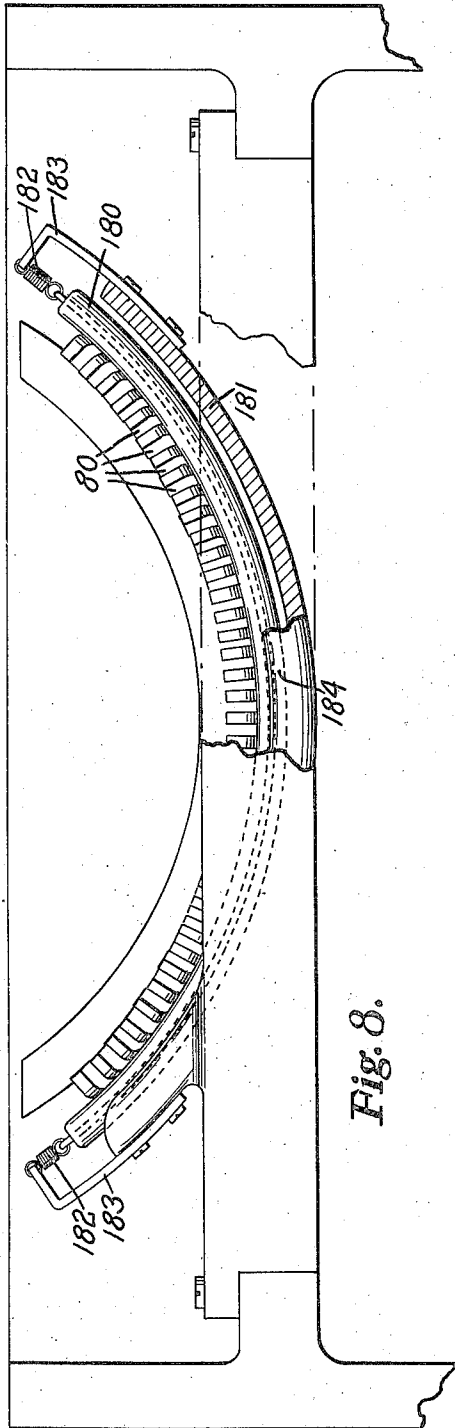


Fig. 8.

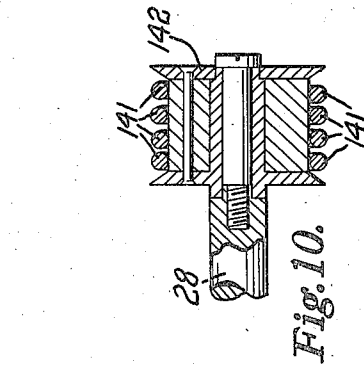


Fig. 10.

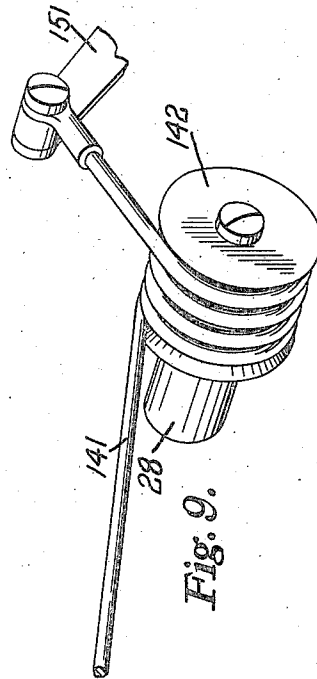


Fig. 9.

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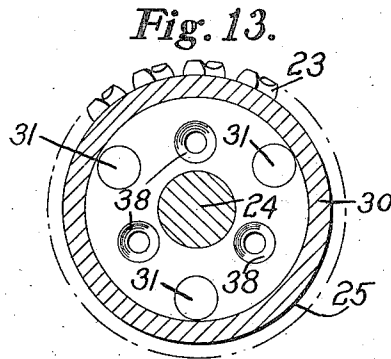
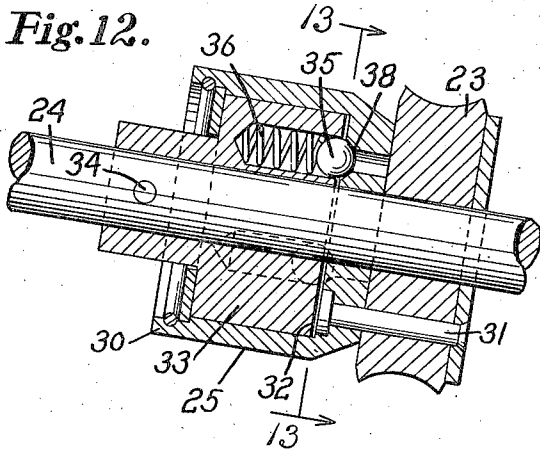
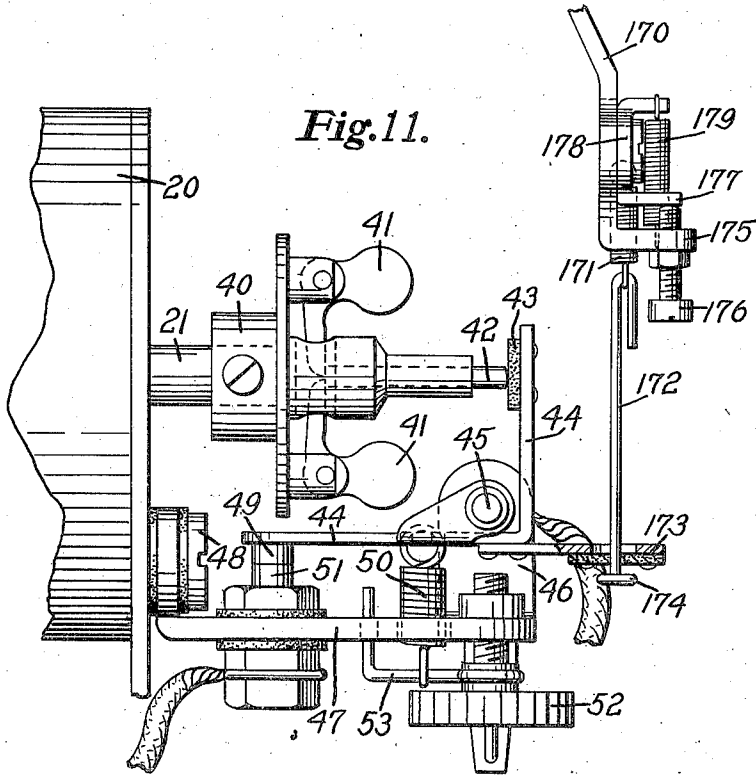
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7 Sheets-Sheet 7



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# UNITED STATES PATENT OFFICE

2,043,393

## POWER OPERATED TYPEWRITER

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Application January 25, 1930, Serial No. 423,338

29 Claims. (Cl. 197—17)

This invention relates to a power operated typewriter.

The general object of the invention is to provide an improved typewriter of this type, some of the more particular objects being to provide:

A machine that will have an extremely light key depression and a short key stroke;

A machine having an improved driving connection for the type bar action which will enable the type bars to be quickly connected and disconnected to the power drive;

A machine that will print characters of uniform distinctness independently of the nature of the key depression and independently of whether large or small characters are printed;

A machine that can be operated by the operators of present-day key driven machines without any substantial change in the finger movements required;

A machine that can be operated with increased speed owing to the use of an improved means for preventing type rebound;

A machine in which automatic and successive printing impressions may be made by holding keys depressed; and

A machine having an improved means for shifting the platen by power.

Other objects and advantages of the invention will appear from the specification and drawings.

An embodiment of the invention is shown in the accompanying drawings in which

Figure 1 is a right side elevation of the typewriter with certain portions cut away to show the power drive.

Fig. 2 is a partial section and elevation taken from the left-hand side of the machine showing the parts in normal condition.

Fig. 3 is an enlarged partial section and elevation showing the position of parts when one of the keys has been depressed but before the type bar has been moved.

Fig. 4 is an enlarged sectional view of the improved interlock between the keys.

Fig. 5 is a view similar to Fig. 3 showing the position of the parts after the key that was depressed has been restored to normal and illustrating also how the type bars are power driven to printing position.

Fig. 6 is another sectional elevation taken from the left side of the machine showing various parts not shown in Fig. 2.

Fig. 7 is a partial sectional elevation of the keys that control the platen shift.

Fig. 8 is a partial front elevation and section

of the improved construction for preventing rebound of the type bars.

Fig. 9 is a detailed perspective of the driving drum for the platen shift.

Fig. 10 is a section through the drum of Fig. 9.

Fig. 11 is a partial rear elevation of the motor governor.

Fig. 12 is a sectional view of the automatic releasing clutch through which power is transmitted to the machine.

Fig. 13 is a sectional view on the line 13—13 of Fig. 12.

The typewriter is provided with a frame 15 (Fig. 1) supporting a raceway 16 on which is mounted a traveling paper carriage C supporting a platen P. The carriage is moved across the machine in the usual manner under the control of an escapement mechanism including a ratchet wheel 17, the details of the escapement mechanism not having been illustrated or described as such mechanisms are well known in the art. The machine is provided with the usual printing ribbon 18 against which the type bars strike to record an impression on the paper 19 that is held about the platen P.

### Power drive

The machine is preferably driven by an electric motor 20 (Fig. 1) on the armature shaft 21 of which is a worm 22 meshing with a worm wheel 23. The worm wheel 23 drives a shaft 24 through a releasing clutch 25, the shaft 24 having a bevel gear 26 on its end meshing with another bevel gear 27 on the main drive shaft 28 of the machine. When the typewriter is being operated the motor drives the main drive shaft 28 continuously through the connections above described.

The releasing clutch 25 is provided in order to prevent damage to the machine in the event it should become jammed in any way, such an expedient being desirable because of the relatively light construction of many of the typewriter parts. The construction of this clutch is shown in detail in Figs. 12 and 13. The clutch includes a housing 30 constituting a driving member fixed to the worm wheel 23 by means of rivets 31 or the like. Fitting into the circular interior 32 of the housing is a cylindrical collar 33 constituting the driven member of the clutch, said member being fixed to the shaft 24 by a pin 34. The collar 33 rotates with the shaft 24 while the clutch housing 30 rotates with the worm wheel 23 which is loose on shaft 24. These driving and driven parts are held in driving



engagement by means of steel balls 35, normally projected by springs 36 to the position shown in Fig. 12 where the balls are partly in the openings 37 in the collar 33 and partly in  
 5 countersunk recesses or openings 38 in the bottom of the interior of the housing 30. This construction enables the worm wheel 23 to drive the shaft 24 under all normal conditions but, if a resistance should be encountered above a  
 10 predetermined amount the steel balls 35 will ride out of the recesses and allow the motor to rotate without driving the machine.

The speed of the motor is regulated by a governor illustrated in detail in Fig. 11. Fixed to  
 15 the armature shaft 21 is a collar 40 carrying a pair of centrifugal members 41 bearing against the end of a plunger 42 slidably mounted in an extension of the collar 40. The plunger 42 bears against an insulating plate 43 on the end of an  
 20 angular switch arm 44 pivoted at 45 on a lug 46 projecting upward from a stationary support 47 bolted to but insulated from the motor housing by a bolt 48. The switch arm carries a contact  
 25 49 urged by a spring 50 attached to the switch arm into engagement with stationary contact 51 mounted on and insulated from the support 47. The tension of spring 50 may be varied by means  
 30 of an adjustable thumb nut 52 mounted in the support 47, one end of spring 50 being connected to an arm 53 carried by said nut.

As the speed of the motor increases the centrifugal members 41 fly outward and push the  
 35 plunger 42 to the right as viewed in Fig. 11. This moves the switch arm 44 clockwise and tends to separate the contacts 49 and 51 thereby opening the motor circuit and shutting off the supply of current to the motor. The motor speed  
 40 then decreases until the centrifugal members 41 move back to normal to allow the switch contacts to close. This action takes place very rapidly, the contacts vibrating back and forth to maintain just the proper amount of current to  
 45 enable the speed of the motor to remain substantially constant. Different constant speeds can be had by adjusting the tension of spring 50. While this form of governor is preferred it is to be understood that any other suitable type could be used.

#### Keys and keyboard

50 The keys 60 (Fig. 2) are carried on the ends of key levers 61 pivoted on a shaft 62 supported by the machine frame. These levers are guided at their front by slots in a comb plate 63 and at  
 55 their rear by slots in a second comb plate 64. Each lever is urged counterclockwise by a spring 65 the rear ends of the levers normally resting against a cushion 66. The clockwise movement of the key levers is limited by a strip of cushioning material 67 located in front of the machine as illustrated in Figs. 2 and 3.

It has been found that operators of key driven typewriters do not always take kindly to power  
 60 operated machines because of the different key action encountered in manipulating the keys of a power driven machine. Operators of key driven machines are used to a key depression of  
 65 about one-half inch ( $\frac{1}{2}$ "') and to having each row of keys about one-half inch ( $\frac{1}{2}$ "') higher than the other. A long key stroke is not desirable in power driven machines, a stroke of  $\frac{3}{8}$ "' being enough, for example, in the present machine. But, heretofore, the keyboards of power  
 70 operated machines have been made with substantially the same inclination as key operated

machines, that is, each row of keys is  $\frac{1}{2}$ "' higher than the row below it. The result has been that the operators tend to stub their fingers on the upper rows of keys. This objection has been  
 5 overcome in the present machine by changing the inclination of the keyboard so that each row of keys is only as much higher than the next lower row as the distance of the key depression. For example, in the present machine the key depression is  $\frac{3}{8}$ "' and each succeeding row of keys  
 10 is made  $\frac{3}{8}$ "' higher than the next lower row. The operators of key operated machines are used to holding their hands in a certain position for a relatively steep keyboard. They will tend to hold their hands in this same position when  
 15 transferred to power operated machines. This means that their finger tips will be farther above the upper rows of keys in the present machine than really necessary but the result will be that their fingers can move substantially the same  
 20 distance as if they were operating a key operated machine. This improvement is an important one in the success of power operated machines as it solves a problem that, so far as known, has not heretofore been solved and one that has been a  
 25 practical obstacle, interfering with the introduction of power operated typewriters.

In order that only one key may be depressed at a time, an interlocking means is provided  
 30 which is illustrated in detail in Fig. 4. Each key lever is provided with a tapered projection 68 which, when its key is depressed, moves downward between steel rollers 69 as illustrated for the middle type bar in Fig. 4. These rollers are  
 35 positioned in a channel in the frame of the machine, the rollers being confined so that there is just enough space between the whole series to partly admit one of the tapered projections 68 at a time. When one of the keys is depressed, as  
 40 shown in Fig. 4, the rollers on both sides of the depressed key are held in engagement with each other. If an attempt is made to depress another key its projection 68 cannot enter between the rollers and depression of the second key will be prevented until the first key is restored. This  
 45 prevents more than one type bar from being connected to the power drive at the same time. An important advantage of this construction of interlock is that the tapered projections 68 do not move down past the centers of the rollers 69  
 50 and hence when a second key is depressed the rollers tend to exert a camming action on the projection 68 of the first key. In other words, the depression of a second key tends to restore the first key and this promotes rapid operation  
 55 by making the keyboard flexible. At the same time depression of a second key before the first is restored is prevented.

#### Driving connections for type bars

60 In order that the type bars may be driven to printing position they must be momentarily connected to the power drive and a novel construction has been provided for this purpose.

Mounted on the continuously rotating drive  
 65 shaft 28 is a series of ratchet wheels 70 there being a ratchet wheel for each type bar. Each type bar is driven to printing position by being momentarily connected to its ratchet wheel. Inasmuch as connections for each bar are similar,  
 70 a description of the connections for only one bar will be given, it being understood that similar constructions are provided for each bar.

Each type bar can be connected to its ratchet wheel 70 by means of a pawl 71 (Fig. 2). The  
 75

pawl 71 is pivoted at 72 (Fig. 5) to a lever 73 that rocks about the axis of shaft 28, the lever having a downwardly extending projection 74 provided with an arcuate edge resting on a cross shaft 75. The lever is guided at its front by a projection 76 operating in a slot in a comb plate 77. The lever 73 has an upwardly extending projection 78 to which one end of a link 79 is connected, the other end of the link being connected to one end of a type bar 80 pivoted at 81. The link 79 is urged to the left in Fig. 2 by a spring 82 which also acts to urge the lever 73 counterclockwise.

The pawl 71 is urged counterclockwise toward a position for engaging its ratchet wheel 70 by means of a spring 83 (Figs. 2 and 3) but the pawl is normally prevented from engaging the ratchet wheel by a detent 84 having a lip 85 that projects in front of the nose of the pawl (Fig. 2). The detent 84 is urged counterclockwise into position for blocking the pawl 71 by a spring 86, the counterclockwise movement of the pawl being limited by a stud 87 on the key lever 61. Pivoted at 88 on the rear of the key lever 61 is a releasing dog 89 which is urged clockwise by the same spring 86 that urges the detent 84 counterclockwise, the movement of the dog 89 being limited by a stud 90 on a projection 91 on the lever 73 (Fig. 5). The releasing dog has a shoulder 92 adapted to engage a projection on the detent 84.

When the key lever 61 is rocked clockwise by depression of its key, the releasing dog 89 moves upwardly whereupon its shoulder 92 engages the projection on the detent 84 and rocks the latter clockwise to remove its lip 85 from in front of the nose of the dog 71. When this occurs the spring 83 snaps the pawl 71 into engagement with the rotating ratchet wheel 70 (Fig. 3) and the lever 73 is moved clockwise. This movement, which is quite sudden, continues until the type bar reaches approximately the position shown in Fig. 5 whereupon the driving connection is disabled. The type bar and associated parts have enough momentum by that time to cause the bar to continue its movement against the light tension of spring 82 until it reaches printing position.

An important advantage that is to be observed at this point is that the engagement between the pawl and the ratchet wheel takes place independently of the character of the key depression. No matter whether the key depression is light or heavy, quick or slow, or even if it is not quite complete, the type bar is, nevertheless, always connected to the ratchet wheel in the same manner. This promotes uniformity of type bar action and is particularly advantageous over constructions in which movement of the key levers moves a member into engagement with a power drive. In the latter case, if a key is moved down slowly, or not quite completely, the engagement is not perfect and chattering may occur, or the type bar action may not be what it should be. In the present case, the spring 83 acts uniformly as soon as the pawl 71 is released and this action is independent of the nature of the key lever movement. Furthermore, the action of the spring becomes increasingly effective as the pawl moves into engagement with the ratchet wheel because the leverage of the spring on the pawl increases as the pawl rotates about its pivot.

It will be noted by referring to Fig. 5 that, as the rear end of lever 73 is raised, the stud 90 on the projection 91 on lever 73 contacts a bend or shoulder 93 on the releasing dog 89 which causes

the dog 89 to be rocked counterclockwise to move the shoulder 92 out from under the projection on the detent 84. This releases the detent 84 which is then returned by spring 86 back to normal position.

The driving connections are disconnected as follows: Pivoted on the end of the lever 73 is an irregular shaped reversing or disconnecting member 94 the forward end of which has a lug 95 to which one end of the spring 83 controlling the dog 71 is connected. Movement of member 94 in a clockwise direction under the urge of spring 83 is normally limited by stud 90 which engages a projecting arm integral with member 94 (Fig. 3). The member 94 has a tail piece 96 operating in a slot 97 (Fig. 3) in the comb plate 64. When the lever 73 is rocked clockwise to drive the type bar to printing position, and as the parts reach the position of Fig. 5, the tail piece 96 of the member 94 contacts the top of the slot 97 whereupon the member 94 is rocked or flipped counterclockwise. This swings the spring 83 across the center of the pivot 72 of the dog 71 so that the spring then tends to rock the dog clockwise out of engagement with the ratchet wheel 70. The dog is positively, quickly and completely knocked out of engagement with the ratchet wheel by the projecting portion 99 of the member 94 which moves from the position of Fig. 3 to that of Fig. 5 and, during this movement, strikes the lower face of the rear extension of the pawl 71 with a hammer like action at about the time or shortly after the direction of action of the spring 83 is changed. The action is very rapid, the member 94 being almost instantaneously turned through the position indicated in Fig. 5. The pawl is thus hit or knocked out of engagement with the ratchet wheel.

An important advantage of this construction is that the driving engagement is maintained for a maximum period during the movement of the type bar action and the disconnection is then made instantaneously. This maintains an efficient driving engagement throughout the movement of the type bar action and the sudden disconnection prevents chattering as the parts are disengaged. By reversing the direction of action of spring 83 as the pawl 71 is disengaged, the pawl is firmly held out of engagement with the ratchet wheel after it is disconnected which prevents accidental re-engagement until the time arrives when such re-engagement is wanted.

As previously mentioned the momentum of the parts causes the type bar to be carried on to printing position and as soon as this has occurred the spring 82 acts to return the parts to normal during which movement the lever 73 swings counterclockwise.

As the lever 73 swings counterclockwise toward normal the member 94 moves with it and, as the parts approach normal, the tail piece 96 engages the bottom of the slot 97 whereupon the member 94 is flipped clockwise to its normal position which swings the spring 83 back across the pivot 72 of the dog 71 so that the spring 83 again acts to urge the dog toward engagement with the ratchet wheel, such engagement being prevented, however, by the lip 85 of the detent 84 which, being in normal position, blocks the pawl and holds it in inactive position.

An advantage to be noted is that a type key can be depressed a second time slightly before the type action for said key returns to normal. When a key is depressed and the type action moves to printing position, the stud 90 cams the

member 89 counterclockwise so as to disengage the shoulder 92 from the detent 84. This prevents more than one movement of the type bar action by one depression of the type key. As the type bar action returns to normal and the arm 73 moves counterclockwise, the stud 90 moves downward below the shoulder 93 on member 89. Referring to Fig. 3, it will be observed that there is some distance between the shoulder 93 and the lower position of the stud 90. As soon as the stud 90 passes the shoulder 93 on the downward movement of the arm 73, the arm 89 is free to be moved back to normal position by its spring. Accordingly, the key lever will be reconnected with the detent 84 slightly before the arm 73 returns to normal. While this will be only a fraction of a second before arm 73 reaches its normal position, it, nevertheless, promotes more speedy action.

From the description given it will thus be clear that when a key is depressed, the type bar corresponding to the key is connected to a continuously rotating ratchet wheel, which drives the type bar toward printing position, the type bar being automatically disconnected just prior to the time it reaches printing position. The connection for each type bar is individual and the construction is such that connection and disconnection can be made very rapidly and efficiently and without requiring anything but a very light key depression because the depression of the key operates only very light parts.

Referring to Fig. 5, as the member 94 is swung to the position indicated, the spring 83 is flipped counterclockwise. This change in the position of the spring 83 acts, of course, to hold the pawl 71 out of engagement with the ratchet wheel, but, as the arm 73 is returned to normal under the influence of spring 82, the direction of action of the spring 83 is again reversed so that it acts to move the pawl toward the ratchet wheel. The spring 82 which was tensioned by power when the type bar was driven to printing position is strong enough to move the arm 73 completely to normal position and to turn member 94 to the position of Fig. 2. This is a decided advantage over constructions which require that springs used in connection with the driving connections be tensioned by the depression of the type keys, thereby making the depression of such keys more difficult.

It is to be observed that only one printing impression will take place no matter how long the key is depressed because, as long as the key remains depressed, the shoulder 92 is above the detent 84 and the detent 84 cannot be released to release the dog 71. In order to make a second impression it is necessary to permit the key to return to normal in order for the releasing dog 89 to move back to the position of Fig. 1 where its shoulder 92 is under the projection on the detent 84.

#### *Automatic repeat print*

It is often desirable to make a series of impressions of the same character as for example, a series of dashes, a series of stars, a series of ciphers, etc. This is usually accomplished by repeated depressions of the same key but the present machine has a novel provision whereby, by special manipulation of a given key, repeated operations of the type bar corresponding to said key may be had very rapidly and as long as desired. Provision may be made for having repeat print operations for any key or for all keys but since the construction for each key is similar,

the mechanism for only one key will be described.

Referring to Fig. 6, it will be noted that the key 60 in this figure is mounted on its lever 61 by a pin and slot connection, a key stem being provided with slots 100 operating over pins 101 on the key lever. The key is urged upwardly by a spring 102 which is strong enough to transmit all ordinary depressions of the key to the key lever without allowing any relative movement between the key and lever.

When the key is given a continuous push, the lever 61 is first arrested by the cushion 67 after which the key will move relative to the key lever. When this occurs a rearwardly projecting lug 103 on the key stem strikes a bail 104 pivoted on the shaft 105 and rocks the bail clockwise. Connected to an arm 106 of the bail is a push rod 107 adapted to contact a projecting arm 108 on the detent 84. It will be apparent that, when the push rod is moved to the left as viewed in Fig. 6, the detent 84 will be rocked clockwise to release the dog 71 and, as long as the parts are held in this position, the detent cannot move back to normal. Accordingly, when the lever 73 returns to normal after having driven the type bar to printing position and when the member 94 is tripped so as to throw the spring 83 to the position of Fig. 2, the dog 71 will immediately engage its ratchet wheel 70 again and the type bar will be again driven to printing position, this operation continuing as long as the key is held depressed. The type bar is thus driven rapidly to printing position to make a series of impressions, it being understood that the carriage is moved one letter space between each impression.

The operator is thus enabled to make a series of impressions very rapidly and without any effort on his part other than holding the key in depressed position. This not only makes the operation of the machine easier, but it makes it very much more rapid in doing this kind of work.

#### *Escapement mechanism*

As previously mentioned, the paper carriage is moved across the machine under the control of an escapement mechanism including a ratchet wheel 17. This ratchet wheel is controlled by escapement dogs 110 (Fig. 2) that are operated by an escapement bail 111, the construction being very similar to that employed on a Royal typewriter. In order for the carriage to be letter spaced the bail must be moved to the right as viewed in Fig. 2 and, for this purpose, a link 112 is connected to it, the other end of the link being connected to one end of a lever 113 pivoted at 114. This lever has a cam projection 115 adapted to be engaged by a stud 116 on an arm 117, the arm being urged clockwise by a spring 118 and being limited in its movement by the engagement of a projection 119 with a part of the machine frame. In the construction shown, the arm 117 is an extension of a side piece 120 supporting a bail 121 which is connected to a second side piece (not shown) on the opposite side of the machine. The bail extends across the machine and under abutment projections 122 on all the arms 73.

It will be evident from the above that, when one of the arms 73 is rocked clockwise to move its type bar to printing position, the bail 121 will be moved downwardly to swing the arm 117 counterclockwise. The stud 116 then cams the projection 115 to rock the arm 113 clockwise, thereby pulling on the link 112 and moving the escapement bail 111 to permit movement of the carriage by the usual spring drum. The carriage is thus

letter spaced each time a type bar is moved from printing position.

The carriage can also be letter spaced by means of the spacing bar 123 carried by two side arms 124 of which one is shown in Fig. 2. These side arms are pivoted on the shaft 125 and the right hand one has an extension 126 projecting up along the lever 113 and positioned to engage a stud 127 on said lever. When the spacing bar is depressed, the projection 126 is rocked to the right as viewed in Fig. 2. It contacts the stud 127 and moves the lever 113 clockwise to operate the escapement bail.

#### *Power operated platen shift*

Each type bar carries a large character as well as a small one, the parts being normally positioned so that the small characters are printed. When large characters are desired, the platen is moved upward relative to the type bars so that when the type bars are moved to printing position the large characters will strike the platen instead of the small ones. In the machine illustrated, the platen is moved relative to the type bars by power, which relieves the operator of having to supply the force by depression of a key.

Referring to Fig. 6, the carriage C with the platen P is supported on side plates 130 pivoted at 131. By rocking these plates counterclockwise, the carriage can be moved upward from its Fig. 6 position, the upward movement being limited by a projection 132 that engages an adjustable stop screw 133 on the typewriter frame. The side plates are normally urged counterclockwise by a spring 134 connected at one end to the machine frame and at its other end to a lever 135 pivoted at 136 to one of the side plates 130 and having a lip 137 projecting into a hole 138 in the side plate. This spring is not strong enough to raise the platen, but it counteracts some of the weight of the carriage and platen and assists in making the raising operation easier. It also affords a yielding connection that serves a purpose that will be later described.

The side plates 130 are rocked counterclockwise to raise the platen by means of a link 140 that is pulled to the right as viewed in Fig. 6 by means of a flexible cable 141 wound around a drum 142 on the main drive shaft 28 of the machine. This cable is normally loose on the drum, but it may be tightened by depression of a platen shift key in the following manner.

The platen shift key 143 shown in Fig. 7 is carried by a lever 144 pivoted on the shaft 135 and provided with a lateral lug 145 adapted to engage a projection 146 on a lever 147 pivoted on the shaft 148. This lever 147 carries a pin 149 operating in a slot 150 in the end of the link 140 so that the lever has a slight movement relative to said link. The lever 147 has an arm 151 mounted rigidly on it, the other end of the flexible cable 141 being connected to the arm 151. When the platen shift key is depressed, the lever 147 is rocked clockwise carrying the arm 151 with it which tightens the cable about the drum. The drum immediately grips the cable and pulls the link 140 to the right. This rocks the side plates 130 counterclockwise and raises the platen to its upper position. When the key is released the cable is loosened and the platen returns to its lower position under its own weight and the weight of the paper carriage. A pin and slot connection between arm 151 and lever 147 permits adjustment of slack in cable 141 (Fig. 6).

The pin and slot connection between the lever

147 and the link 140 permits the lever to move relative to the link to tighten the cable about the drum, but in the event the drum does not operate to raise the platen the platen may be raised by hand through continued depression of the platen shift key which causes the stud 149 to contact the end of the slot 150 and move the link 140 to the right to raise the platen.

If it is desired to hold the platen in raised position during a number of operations of the type 10 keys, the platen shift key must be held depressed in which case the drum must rotate relative to the flexible cable. Such action is permitted and successful operation is obtained by choosing the right materials, it having been found that by making 15 the drum out of a self-lubricating fibre and by making the cable out of raw hide the cable will operate to raise the platen and, at the same time, will permit enough slipping to occur to enable the drum to rotate when the platen shift key is held 20 depressed.

Provision is made for locking the platen shift key is depressed position and for this purpose a supplementary key 152 is provided mounted on a lever 153 pivoted on shaft 148. This lever has 25 an arm 154 connected to a wire 155 that controls certain parts of the machine whose functions it is not necessary to describe in the present application.

Referring to Fig. 7, the key lever 153 carries a 30 stud 150 adapted to engage the end of a latch 157 pivoted at 158 to the machine frame and urged clockwise by a spring 159. This latch has a notch 160 adapted to engage over a stud 161 on the lever 144 of the platen shift key 143. 35 When the key 152 is depressed the stud 150 contacts the edge of latch 157 which in turn contacts the stud 161 and moves the platen shift key lever 144 downwardly. This movement continues until the latter has been moved to its operated 40 position whereupon the notch 160 in the latch 157 slips over the stud 161 and locks the lever 144 in lowered position. In order to release the lever 144, it is merely necessary to depress the platen shift key 143 which moves the stud 161 45 downwardly a slight distance and thereby releases the latch 157 which is snapped to its upper or released position by the spring 159. This extra movement of the platen shift key is permitted by the yielding action of the spring 134 and arm 50 135 (Fig. 6) to the side plates of the platen shift frame. Although the platen cannot move up any farther, the spring 139 will yield so that the key 143 can be depressed. This spring also absorbs the shocks of violent key depressions. 55

#### *Automatic control to obtain uniform printing impressions*

It will be apparent that, when the platen is in the position where the large characters are oper- 60 ative, more force will be required to obtain a printing impression than when the small characters are employed. It is highly desirable to have all the printing impressions uniform. The present machine is provided with a construction 65 for automatically increasing the force with which the type bars are moved to printing position when the large characters are employed.

Connected to a portion of the platen frame that is raised as the platen is moved to its upper 70 position is a link 170 (Fig. 6) that is, in turn, connected through a spring 171 (Fig. 11) to a rod 172 projecting through an extension 173 of the switch arm 44 of the speed regulator of the electric motor. The rod 172 has a head 174 which, 75

when the rod is raised contacts the extension 173 to move the switch arm. When the platen is raised, the link 170 is raised with it which raises the rod 172 and rocks the switch arm 44 counter-clockwise. This tends to increase the resistance to the centrifugal action of arms 41 and increase the speed of the motor, which, of course, increases the speed of the main drive shaft of the machine. It will be evident that, when the type bars are connected to ratchet wheels that are being driven at a higher rate of speed, the type bars will be thrown to printing position with more force than under conditions when the ratchet wheels are revolving more slowly. In other words, when the platen is raised to its upper position the motor is speeded up slightly to impart more driving force to the type bars so that the printing impression of the large type will be the same as that of the small type, the entire operation being automatic.

This automatic control of the speed of the motor can be varied through its connection illustrated in Fig. 11. The link 170 has an offset portion 175 carrying an adjustable screw 176 that contacts a lug 177 (Fig. 6) on an arm 178 pivoted on the link 170. The arm is urged into engagement with the screw by a spring 179. By adjusting the screw 176, the distance of the head 174 below the extension 173 can be varied so as to vary the effect of the raising of the link 170 on the switch lever.

#### *Type rebound preventer*

In order that the manner in which the type rebound preventer cooperates to increase the speed of the machine may be understood, some of the difficulties encountered with typewriter constructions will be explained.

In key operated machines, the keys are driven to printing position by the force of the key depression and they are returned by springs. The rapidity of action of a machine usually depends upon the rapidity with which the type bars are returned to normal by the springs. If quick action is desired, the springs must be made strong. On the other hand, if the springs are made strong the key action becomes difficult. Also, when the springs are made strong the type bars often rebound when they are brought back to normal with the result that they interfere with one another and jamming occurs.

In power operated machines, hard key action is not such an obstacle because the type bars are moved to position by power. The returning springs may be made relatively strong, but when they are made strong, the rebound becomes greater and much difficulty is encountered in jamming. This rebound action is one of the limiting factors in the speed of a machine.

In the present machine, a construction has been provided which eliminates this rebound and enables a very rapid action to be secured.

Referring to Figs. 2 and 8, a rebound strip or cradle 180 is provided which is arcuate in shape and which is positioned immediately above an arcuate frame member 181. This rebound strip is made of cushioning material so that it will absorb a large portion of the shock of the returning type bars, but the material is not depended upon by itself to prevent rebound. It has been found that a piece of insulated electric wire serves the purpose very well as the insulating material has about the right amount of cushioning effect and the wires offer a convenient means of maintaining the strip at the proper curvature

and as a means for forming loops by which the strip can be suspended. The rebound strip is suspended freely on springs 182 held by projecting arms 183 attached to the frame member 181. Guides 184 attached to the member 181 act to guide the rebound strip in its movement. The combined weight of all the type bars at rest maintains the strip at an even distance above the member 181. As each type bar drops back to normal position, the rebound strip absorbs a portion of the shock and the springs 182 yield, but they are prevented from rebounding the type bars owing to the dead weight of the remaining type bars against the strip. In other words, the material of the rebound strip cushions a portion of the shock and the strip moves, but the weight of the type bars acts to dampen the return of the rebound strip in much the same way as shock absorbers act on automobiles. The construction has been proved very effective in increasing the speed of the machine. In fact, when the rebound strip is held solidly against the member 181, the type bars rebound and collide frequently with consequent interference with the proper operation of the machine.

I claim:

1. A typewriter having a power driving means including a rotatable toothed wheel, a type bar action urged toward a normal non-printing position, driving connections for connecting said type bar action to said toothed wheel including a pawl provided with means for urging it in a direction to engage said wheel, a detent urged to a position to normally restrain said pawl, a type key having connections for moving said detent to release said pawl to enable the latter to engage said wheel to thereby cause said type bar action to be driven to printing position, and disconnecting means automatically disengaging said pawl from said wheel after said type bar has moved a predetermined distance, said disconnecting means also reversing the direction of action of said pawl urging means to cause the latter to hold the pawl in disengaged position, said disconnecting means also having provisions for again reversing the direction of action of said pawl urging means during the return of said type bar to normal to thereby urge the pawl toward said wheel, said detent being returned to normal position before the second reversal of said urging means to thereby arrest said pawl before it engages said toothed wheel.

2. A typewriter having a power driving means including a rotatable toothed wheel, a type bar action, driving connections for connecting said type bar action to said toothed wheel including a pivoted pawl normally urged by a spring in a direction to engage said wheel, a detent urged to a position to normally restrain said pawl, a type key having connections for moving said detent to release said pawl to enable the latter to engage said wheel to thereby cause said type bar to be moved to printing position, means acting automatically, as said type bar is moved to printing position, to disable the key control of said detent to free said detent for return to normal, disconnecting means automatically disengaging said pawl from said wheel after the type bar has been moved a predetermined distance, said disconnecting means also acting to reverse the direction of action of said pawl spring to enable said spring to hold said pawl in disengaged position, and means for returning said type bar to normal, said disconnecting means having portions acting automatically, as said type bar ac-

tion returns to normal, to again reverse the direction of action of said pawl spring to cause said pawl to be urged to normal position in engagement with said detent.

3. A typewriter having a type bar action, a power driving means including a rotatable toothed wheel, depressible type keys, driving connections for connecting said type bar action to said toothed wheel including a pivoted arm urged toward a normal position, a pawl on said arm, a spring urging said pawl in a direction to engage said toothed wheel, a detent urged to a position to restrain said pawl, connections operable by depression of a type key for moving said detent to release said pawl to enable it to engage said toothed wheel whereby said arm is moved with said wheel to move said type bar action to printing position, means releasing said detent for return to normal as said type bar action moves to printing position, and means actuated by movement of said arm to reverse the direction of action of said pawl spring and to disengage said pawl from said toothed wheel, said last-named means acting to again reverse the direction of action of said pawl spring as said arm returns to normal to thereby urge said pawl into engagement with said detent.

4. A typewriter having a type bar action, depressible type keys, power driving means including a rotatable toothed wheel, driving connections including a pivoted arm urged toward a normal position, a pawl pivoted on said arm, a spring connected at one end to said pawl and at its other end to a pivoted member on said arm, said spring normally urging said pawl in a direction to engage said toothed wheel, a detent urged to a position to restrain said pawl, connections operated by depression of a type key for moving said detent to release said pawl to enable it to engage said toothed wheel whereby said arm and pawl are moved with said wheel, means for releasing said detent for return to normal as said type bar action moves to printing position, means for swinging said member on its pivot after said arm has moved a predetermined distance to thereby reverse the direction of action of said pawl spring and move said pawl out of engagement with said toothed wheel, and means for swinging said pivoted member in the reverse direction as said arm returns to normal to again reverse the direction of action of said pawl spring to urge said pawl into engagement with said detent.

5. A typewriter having a plurality of front-strike type bar actions with corresponding depressible type keys, power driving means, normally disconnected driving connections between said power driving means and said type bar actions, means conditioned by depression of a type key for causing said driving connections to connect a type bar action to said power driving means by a connection that takes place independently of the rapidity of the key depression, means actuated automatically after said type bar action has started on its movement toward printing position for disabling the control of said driving connections by said type key to prevent a reconnection of said driving connections while said depressed type key remains depressed, means automatically disconnecting said driving connections with a sudden action after the type bar action has been moved a predetermined distance, means serving to hold said driving connections in disconnected position after they have been moved to such position, and

means acting to recondition said driving connections for subsequent control by said type keys as said type bar action returns to normal.

6. A typewriter having a plurality of front-strike type bar actions with corresponding depressible type keys, power driving means including a rotatable toothed wheel, normally disconnected driving connections between said type bar action and said power driving means including a pawl urged toward said toothed wheel, a detent urged to a position to normally restrain said pawl, means operated by depression of a type key for moving said detent to release said pawl to enable the latter to engage said toothed wheel independently of the speed of depression of the type key, means acting automatically after said type bar action has started toward printing position for disabling the control of said detent by said type key to enable said detent to return to normal, means acting to automatically strike said pawl to suddenly disengage it from said wheel after said type bar has moved a predetermined distance, means acting to hold said pawl in disengaged position after it has been moved thereto, and means acting to automatically recondition said pawl for engagement with said wheel and control by said type keys as said type bar action returns to normal.

7. A power operated typewriter having a type bar action, a type key arranged to be normally depressed a certain distance but being capable of being depressed farther than normal, power driving means having connections conditioned by a normal depression of said type key to cause said driving means to drive the type bar to printing position for a single impression only, and means conditioned by depressing said key farther down than normal in the direction of its normal movement for causing said power driving means to repeatedly drive said type bar to printing position.

8. A power operated typewriter having a type bar action, a key lever, a type key yieldingly mounted on said lever so that a normal depression of said key moves said lever to the limit of its movement, power driving means having connections conditioned by normal depression of said type key to cause said driving means to drive the type bar to printing position for a single impression only, and means conditioned by depressing said key so as to cause it to move relative to said key lever for causing said driving means to repeatedly drive said type bar to printing position.

9. A power operated typewriter having a type bar action, a key lever, a type key slidably mounted on said lever, a spring yieldingly holding said type key in position on said lever so that a normal depression of said key will move said lever to the limit of its movement, power driving means having connections conditioned by normal depression of said type key to cause said driving means to drive the type bar to printing position for a single impression only, and means conditioned by pressing said key down against the tension of said spring to move said key relative to said lever for causing said driving means to repeatedly drive said type bar to printing position.

10. A power operated typewriter having a type bar action, a type key mounted to be normally depressed a given distance but being depressible an abnormal distance, a ball positioned beneath said type key so as to be out of the path of said key when the latter is normally depressed but being moved when said key is depressed an ab-

normal distance, power driving means having connections conditioned by normal depression of said type key to cause said driving means to drive the type bar to printing position for a single impression only, and means conditioned by said bail when it is moved by depressing said key to its abnormal position for causing said driving means to repeatedly drive said type bar to printing position.

11. A typewriter having type bar actions, a plurality of depressible type keys, power operated driving means including a rotatable toothed wheel, driving connections for connecting said type bar actions to said power driving means including a pawl urged toward said toothed wheel, a detent normally restraining said pawl, connections operated by depression of a type key for moving said detent to release said pawl to enable it to engage said toothed wheel whereby the latter may drive a type bar action to printing position, means automatically disengaging said pawl from said toothed wheel after the type bar action has been moved a predetermined distance toward printing position, means normally returning said detent to restraining position as said type bar action moves toward printing position to thereby prevent a second actuation of said type bar action for a normal key depression, and means for moving said detent to pawl-releasing position and holding in said position to enable said pawl to reengage said ratchet wheel to repeatedly operate said type bar action.

12. A typewriter having a plurality of type bar actions urged to a normal non-printing position, type keys depressible to a normal and to an abnormal position, power driving means including a rotatable toothed wheel, driving connections for connecting said type bar actions to said power driving means, said driving connections including a pawl urged in a direction to engage said toothed wheel, a detent urged to a position to restrain said pawl, means operated by a normal depression of a type key for moving said detent to release said pawl to enable it to engage said toothed wheel whereby a type bar action is driven to printing position, means automatically releasing said detent from said type key as said type bar action moves to printing position to enable said detent to return to normal position, means automatically disconnecting said pawl from said toothed wheel after the type bar action has been moved to a predetermined position, said last named means including provisions for conditioning the pawl to reengage said wheel as the type bar action returns to normal, and means operated by an abnormal depression of said type key for holding said detent in pawl-releasing position whereby said pawl will reengage said toothed wheel to cause successive operations of the type bar action.

13. A front-strike typewriter having a plurality of front-strike type bar actions with corresponding depressible type keys, said actions being urged away from printing position, power driving means for moving said actions toward printing position, normally disconnected driving connections between said type bar actions and said power driving means including a toothed wheel and a pawl adapted to engage the same, means conditioned by depression of a type key for causing said pawl to engage said toothed wheel independently of the rapidity of the key depression, means automatically disconnecting said pawl from said toothed wheel after the moved type bar action has moved a predetermined distance toward printing position, and separate means ac-

tuated by said driving connections after said type bar has moved a predetermined distance toward printing position acting to positively condition said driving connections to prevent said pawl from re-engaging said toothed wheel until said type bar action has returned to normal and preventing any re-engagement as long as said depressed type key remains depressed.

14. A front-strike typewriter having a plurality of front-strike type bar actions with corresponding depressible type keys, said type bar actions being urged away from printing position, power driving means including a rotatable toothed wheel for driving said type bar actions to printing position, driving connections for connecting said type bar actions to said driving means, said driving connections including a pawl urged toward said toothed wheel, a detent urged to a position to restrain said pawl against engagement with said wheel, means operated by depression of a type key for moving said detent to release said pawl to enable the latter to engage said wheel independently of the character of the key depression, means automatically disengaging said pawl from said wheel after said type bar action has been moved a predetermined distance toward printing position, and means automatically releasing said detent from said type key as said type bar is moved toward printing position to enable said detent to return to pawl-holding position prior to release of said pawl to thereby prevent said pawl from re-engaging said wheel until the type bar action has returned to normal and preventing any re-engagement as long as said type key remains depressed.

15. A front-strike typewriter having a plurality of front-strike type bar actions with corresponding depressible keys, said type bar actions being urged away from printing position, power driving means including a rotatable toothed wheel for driving said actions to printing position, driving connections for connecting said power driving means to the individual type bar actions, said driving connections including a pawl urged in a direction to engage said toothed wheel and a movable lever arm for moving said type bar actions, a detent normally restraining said pawl against engagement with said wheel, means operated by depression of a type key for moving said detent to release said pawl to enable the latter to engage said toothed wheel to drive a type bar action corresponding to the depressed key to printing position, and means actuated by said lever arm as it moves said type bar action toward printing position for automatically disabling the control of said detent by said type key to enable the detent to return to pawl-holding position prior to release of said pawl and for preventing any re-engagement while said type key remains depressed.

16. A front-strike typewriter having a plurality of front-strike type bar actions with corresponding depressible type keys, power driving means including a rotatable toothed wheel, and driving connections for connecting said power driving means to the respective type actions when a type key is depressed, said driving connections including a pawl urged by a spring toward said toothed wheel, a detent having a shelf normally restraining said pawl, a key lever having an arm pivoted thereon provided with a shoulder adapted to engage said detent upon depression of a type key to move said detent to release said pawl, and means operating automatically during the movement of said type action to printing position for disengaging the

shoulder of said pivoted arm from said detent to enable the latter to return to normal.

17. A typewriter having a plurality of type bar actions with corresponding depressible type keys, power driving means including a rotatable toothed wheel, and driving connections controlled by said type keys for connecting the respective type bar actions to the driving means when a type key is depressed, said driving connections including a pawl normally urged toward said toothed wheel, a detent for restraining said pawl, connections between the type keys and said detent for releasing the same to enable the pawl to engage said toothed wheel, disabling means acting to automatically disable the control of said detent by the depressed type key as the type action moves to printing position, said disabling means acting to reenable the control of said detent as said type bar action returns to normal and before it returns to normal.

18. A power operated typewriter having a plurality of front-strike type bar actions with corresponding depressible type keys, power driving means including a rotatable toothed wheel, driving connections for connecting said power driving means to the respective type bar actions when a type key is depressed, said driving connections including a pawl which is placed in driving engagement with said toothed wheel when a type key is depressed, and means operating to hit said pawl to positively, suddenly and completely knock it out of engagement with said toothed wheel when the moved type bar action reaches a predetermined position.

19. A power operated typewriter having a plurality of front-strike type bar actions with corresponding depressible type keys, power driving means including a rotatable toothed wheel, driving connections for connecting said power driving means to the respective type bar actions when a type key is depressed, said driving connections including a pawl which is placed in driving engagement with said toothed wheel when a type key is depressed so that said pawl moves with said wheel, said driving connections providing a mounting for said pawl so that, as said pawl is moved with said toothed wheel, it moves in the arc of a circle which is concentric with the periphery of said toothed wheel, and means operating to hit said pawl to positively, suddenly and completely knock it out of engagement with said toothed wheel when the moved type bar action reaches a predetermined position.

20. A power operated typewriter having a plurality of front-strike type bar actions with corresponding depressible type keys, power driving means including a rotatable toothed wheel, driving connections for connecting said power driving means to the respective type bar actions when a type key is depressed, said driving connections including an arm pivoted on the same axis as said toothed wheel and carrying a pawl which is placed in driving engagement with said toothed wheel when a type key is depressed, and means operating to strike said pawl to positively, suddenly and completely knock it out of engagement with said toothed wheel when the moved type bar action reaches a predetermined position.

21. A typewriter having a plurality of front-strike type bar actions with corresponding type keys, power driving means including a rotatable toothed wheel, driving connections for connecting the respective type bar actions to said power driving means when a type key is depressed, said driv-

ing connections including a driving arm carrying a pawl which engages said toothed wheel upon depression of a type key, a disconnecting member pivoted on said arm, and means for turning said disconnecting member on said arm when said arm reaches a predetermined position to cause said member to strike said pawl to knock it suddenly and completely out of engagement with said wheel.

22. A power operated typewriter having a plurality of front-strike type bar actions with corresponding type keys, power driving means including a rotatable toothed wheel, driving connections for connecting said power driving means to the respective type bar actions when a type key is depressed, said driving connections including a pawl which is placed in driving engagement with said toothed wheel when a type key is depressed, means operating to hit said pawl to positively, suddenly and completely knock it out of engagement with said wheel when the moved type bar action reaches a predetermined position, and means operating automatically to hold said pawl out of engagement with said wheel after it is disconnected.

23. A power operated typewriter having a plurality of front-strike type bar actions with corresponding type keys, power driving means including a rotatable toothed wheel, driving connections for connecting said power driving means to the respective type bar actions when a type key is depressed, said driving connections including a pawl which is placed in driving engagement with said toothed wheel when a type key is depressed, said pawl being held in driving engagement with said wheel by a spring, and means acting to automatically reverse the direction of action of said spring on said pawl and to positively, suddenly and completely knock said pawl out of engagement with said wheel when the moved type bar action reaches a predetermined position.

24. A typewriter having a plurality of front-strike type bar actions with corresponding type keys, power driving means including a rotatable toothed wheel, and driving connections for connecting the respective type actions to the power driving means when a type key is depressed, said driving connections including a pivoted driving arm having a pawl pivoted thereto, a disconnecting member pivoted on said arm, a spring between said disconnecting member and said pawl normally urging said pawl toward said toothed wheel, and means acting to automatically turn said disconnecting member on its pivot when said arm reaches a predetermined position to thereby reverse the direction of action of said spring on said pawl to urge said pawl out of engagement with said wheel, said disconnecting member having a portion serving to strike said pawl to knock it suddenly and completely out of engagement with said toothed wheel.

25. A typewriter having a plurality of front-strike type bar actions with corresponding type keys, power driving means including a rotatable toothed wheel, and driving connections for connecting the respective type bar actions to said driving means when a type key is depressed, said driving connections including a driving arm pivoted on the same axis as said toothed wheel, a pawl pivoted on said arm, a disconnecting member pivoted on said arm, a spring between said disconnecting member and said pawl normally urging said pawl toward said toothed wheel, and means acting to automatically turn said discon-



necting member on its pivot when said arm reaches a predetermined position to thereby reverse the direction of action of said spring on said pawl to urge said pawl out of engagement with said toothed wheel, said disconnecting member having a portion serving to strike said pawl to knock it suddenly and completely out of engagement with said wheel, means for automatically turning said disconnecting member again as said driving arm is returned to normal to thereby again reverse the direction of action of said spring to urge said pawl toward said toothed wheel, and a detent for normally preventing engagement of said pawl with said wheel when the driving arm is returned to normal.

26. A typewriter having a plurality of front-strike type bar actions with corresponding type keys, power driving means including a rotatable toothed wheel, and driving connections for connecting the respective type actions to the power driving means when a type key is depressed, said driving connections including a pivoted driving arm for said type actions having a pawl pivoted thereto, a disconnecting member pivoted on said arm, a spring between said disconnecting member and said pawl normally urging said pawl toward said toothed wheel, a detent urged to a position to normally restrain said pawl, connections between the type keys and said detent for moving said detent to release said pawl, means acting to automatically turn said disconnecting member on its pivot when said driving arm reaches a predetermined position to thereby reverse the direction of action of said spring on said pawl and to strike said pawl and knock it suddenly and completely out of engagement with said toothed wheel, disabling means acting to automatically disable the connection between the depressed key and said detent as said driving arm is moved to thereby release said detent to enable it to return to normal, said disabling means acting to re-enable the control of said detent by said key as said driving arm returns to normal, and means acting to automatically swing said disconnecting member on its pivot as said driving arm returns to normal to again reverse the action of said pawl spring to urge said pawl into engagement with said detent.

27. A typewriter having a plurality of front-strike type bar actions urged to a normal non-printing position, depressible type keys, power driving means including a rotatable toothed wheel, and driving connections for connecting said power driving means to said type bar actions when a type key is depressed, said driving connections including a pawl urged toward said rotatable wheel, a restraining means normally holding said pawl out of engagement with said wheel,

means operated by depression of a type key for moving said restraining means to release said pawl for engagement with said wheel to thereby enable said driving connections to move a type bar to printing position, means acting automatically to disengage said pawl from said wheel after said type bar has been moved a predetermined distance, a second restraining means acting to hold said pawl out of engagement with said ratchet wheel while the type bar action is returning to normal, and means acting to release said second restraining means and place the pawl in control of said first restraining means as said type bar returns to normal.

28. A typewriter having a type bar action urged to a normal non-printing position, depressible type keys, power driving means including a rotatable toothed wheel, driving connections between the type bar action and said power driving means including a pawl adapted to engage said toothed wheel but normally held out of such engagement, means operated by depression of a type key for releasing said pawl to enable it to engage said wheel to drive the type bar action to printing position, means automatically disengaging said pawl from said wheel after the type bar has been moved a predetermined distance toward printing position to thereby release said type bar action for return to normal, and means acting to hold said pawl in engagement with said wheel while said type bar is being moved to printing position and for holding said pawl out of engagement with said wheel while said type bar action is returning to normal.

29. A typewriter having a type bar action urged to a normal non-printing position, depressible type keys, power driving means including a rotatable toothed wheel, driving connections between the type bar action and said power driving means including a pawl adapted to engage said toothed wheel but normally held out of such engagement, means operated by depression of a type key for releasing said pawl to enable it to engage said wheel to drive the type bar action to printing position, means automatically disengaging said pawl from said wheel after the type bar has been moved a predetermined distance toward printing position to thereby release said type bar action for return to normal, a spring acting to hold said pawl in engagement with said toothed wheel while said type bar action is moving to printing position, and means for changing the action of said spring on said pawl to cause it to hold said pawl out of engagement with said wheel while said type bar action is returning to normal.

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