C. W. GOOCH.

ADDING MACHINE.

APPLICATION FILED DEC. 6, 1916.

1,395,044.

Patented Oct. 25, 1921.

4 SHEETS—SHEET 1.

Fig. 1.

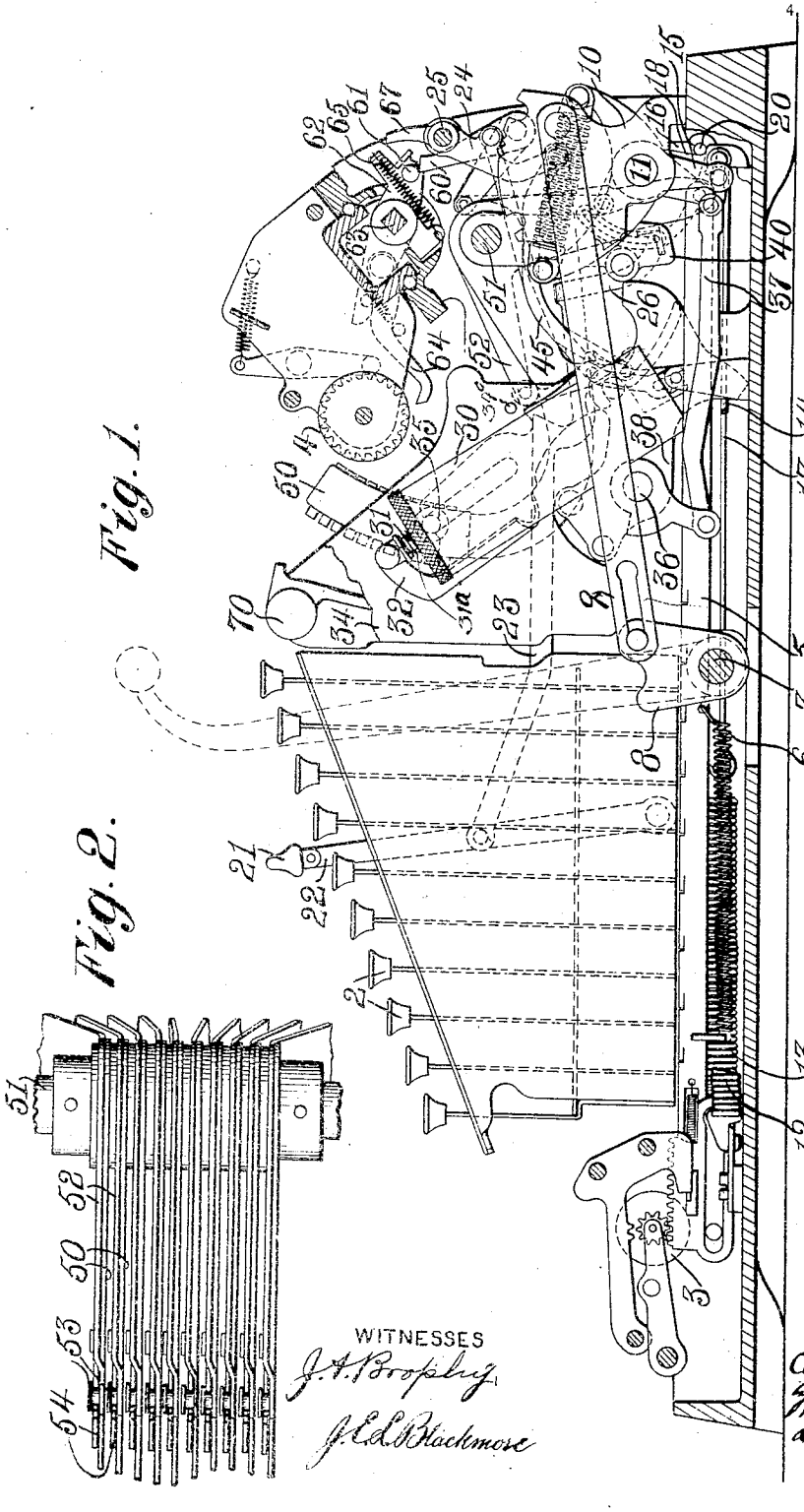


Fig. 2.

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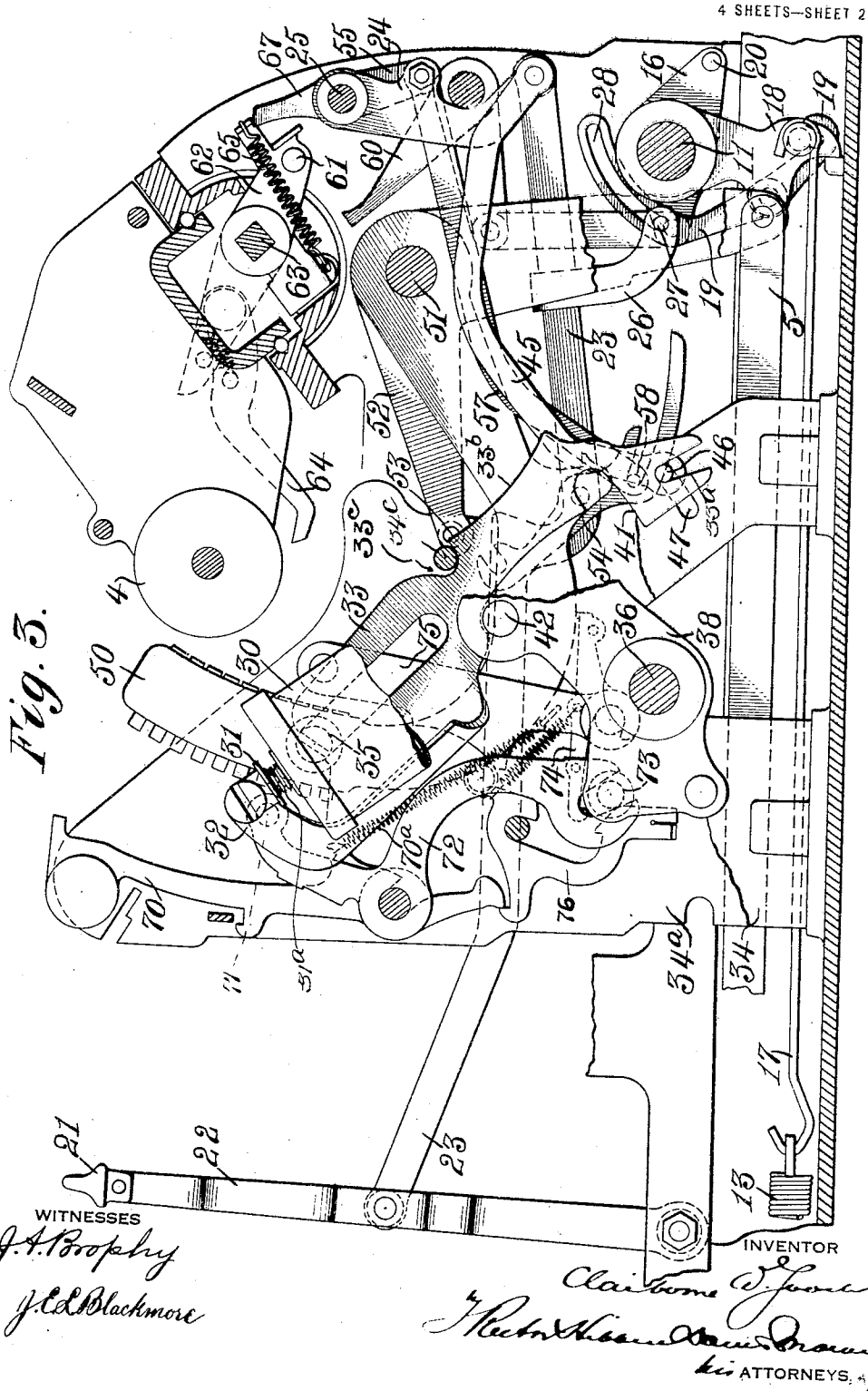


Fig. 3.

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4 SHEETS—SHEET 3.

Fig. 5.

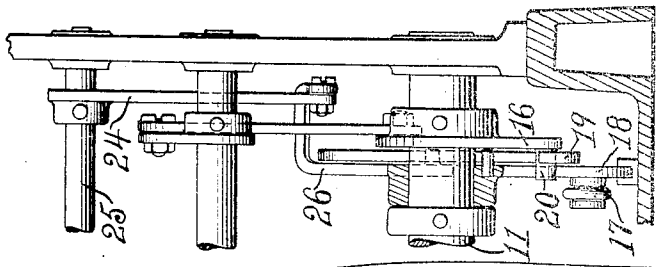
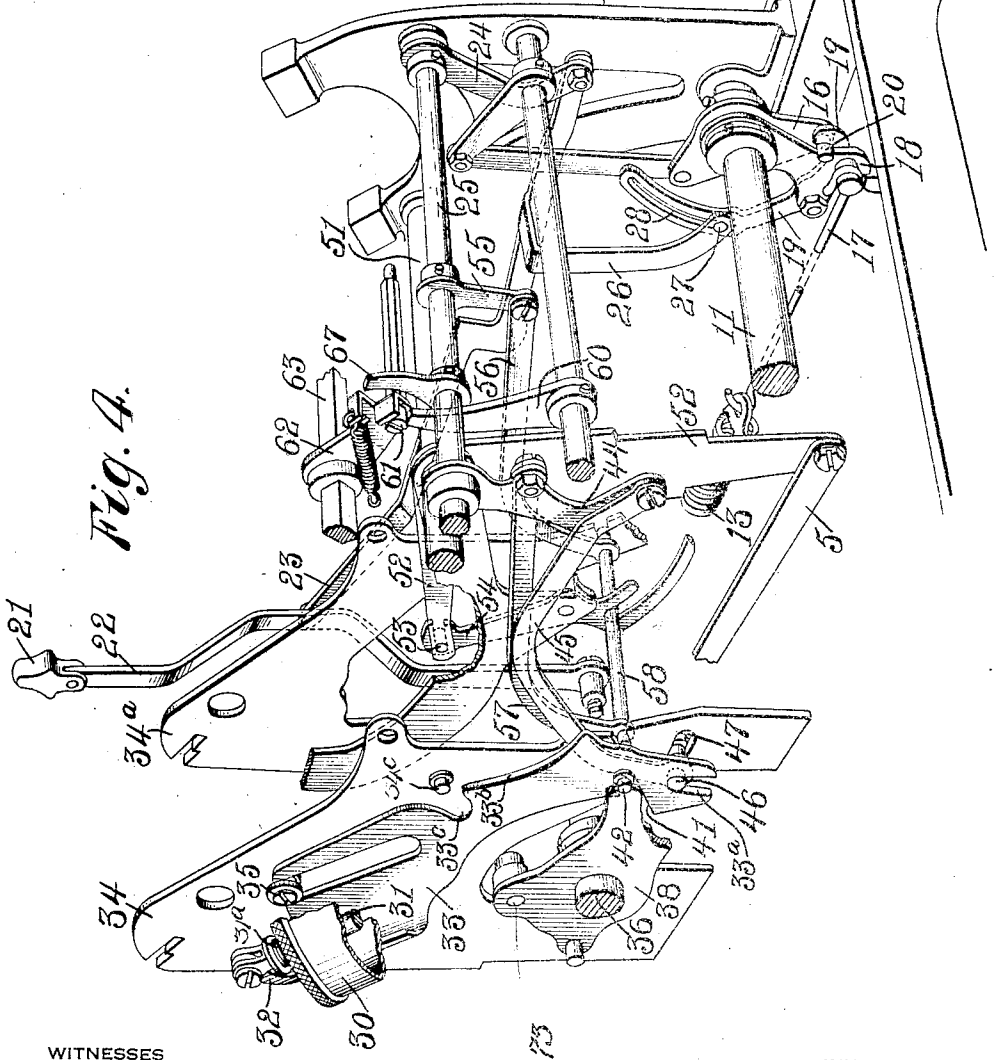


Fig. 4.



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4 SHEETS—SHEET 4.

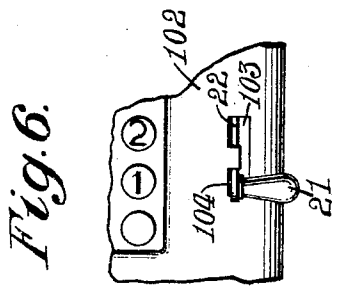


Fig. 6.

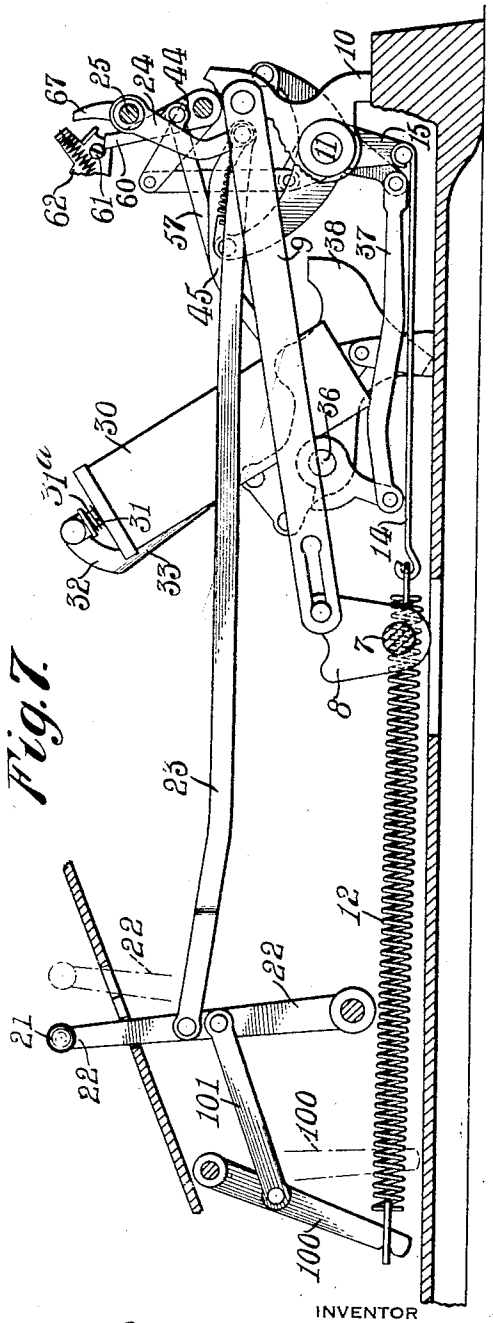


Fig. 7.

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UNITED STATES PATENT OFFICE.

CLAIBORNE W. GOOCH, OF DETROIT, MICHIGAN, ASSIGNOR TO BURROUGHS ADDING MACHINE COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

ADDING-MACHINE.

1,395,044. Specification of Letters Patent. Patented Oct. 25, 1921.

Application filed December 6, 1916. Serial No. 135,47

To all whom it may concern:

Be it known that I, CLAIBORNE W. GOOCH, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Adding-Machines, of which the following is a specification.

The present invention has to do more particularly with the use of an adding and listing machine for the purposes of multiplication or division wherein repeated operations of the machine take place, the calculations being performed by the process of repeated addition of the multiplicand, or, in the case of division, repeated addition of the complement of the divisor. Reference may be had to the prior Patent No. 1,195,575, issued August 22, 1916, upon the invention of Clyde E. W. Gardner, which patent shows an adding and listing machine of a well-known type especially equipped with means for facilitating its use in the performance of multiplication or division. I have here illustrated my invention as applied to that same type of machine though it is to be understood that the invention is not limited to such special application.

The object of my present invention is to lighten the manual work of operating the machine when used for performing calculations of the character above indicated which, as stated, call for repeated operations of the machine. It is of course desirable that such operations may be speedily effected and obviously possibilities of speed in operation are increased by reducing the amount of force required to be exerted by the user. I therefore aim to reduce, as far as practicable, the load upon the operating handle. In the machine as organized for the regular work of registering and recording, the load borne by the operating handle includes considerable spring resistance and also the resistance offered by a governor in the form of a dashpot. I provide for partially relieving the handle of the load of the power springs and also eliminating the resistance offered by the dashpot. By so reducing the load upon the operating handle to the minimum I am able to very appreciably increase the possibilities of speedy operation of the machine when used to perform such calculations as multiplication and division requiring so many strokes of the operating handle. I provide for the accomplishment of this result by simple manipulation of a single key or handle which through appropriate connections with separable couplings will operate to simultaneously disable the connections between the operating handle and the several elements above-mentioned which represent different portions of the load. By the same manipulation I provide for disconnecting the type carriers from the registering mechanism, and also for disabling the line-spacing mechanism. Manifestly neither printing nor line-spacing is desirable during the performance of multiplication or division in the manner above indicated.

In the drawings which accompany and form part of this specification, Figure 1 represents a longitudinal section of a machine of the type above referred to, with the parts appearing in normal position; Fig. 2 is a detail plan view of type-carrier elements; Fig. 3 is a view similar to the rear portion of Fig. 1, showing the effect of setting the load-reducing key; Fig. 4 is a perspective view of this same portion of the machine, somewhat skeletonized and the parts broken away and many other parts eliminated, all for the purpose of more clearly bringing out the construction and arrangement of those particular parts introduced for the carrying out of the present invention; Fig. 5 is a fragmentary sectionalized rear elevation of the right-hand portion of the machine; Fig. 6 is a fragmentary top plan view of a modification; and Fig. 7 shows the modified construction in side elevation.

In view of the disclosure afforded by the above-mentioned prior patent and the extent to which machines have been marketed under that patent, it will not be necessary to include in this specification a detailed description of the machine proper and for the same reason the accompanying drawings do not illustrate all such details but only include illustration of those parts of the machine with which the new parts are more intimately associated. The design of machine here illustrated is that including a keyboard equipment such as disclosed in the aforesaid patent whereby the setting over of the multiplicand or complement of the divisor from order to order is facilitated, but the present invention in no way depends upon the presence of that equipment, though this invention may find

its chief commercial use in machines so equipped.

As usual in the type of machine here illustrated the registering or accumulating mechanism is located at the front and the recording or printing mechanism is located at the rear and the keyboard intervenes. The numbered keys of the latter are designated by the numeral 2, the accumulating wheels are designated by the numeral 3, and the printing platen is designated by the numeral 4. The numeral 5 designates the customary slide bars or strips which carry the registering racks at their front ends and are connected at their rear ends with the type-carriers, and the numeral 6 designates the springs which operate to advance said bars or strips. The operating handle of the machine is indicated by dotted lines in Fig. 1 and the numeral 7 designates the stub shaft to which that handle is secured. A crank-piece 8 also secured to said shaft is connected by a link 9 to a full-stroke sector 10 fastened to a rock shaft 11 at the rear of the machine.

Referring first to Figs. 1 to 5 and the matter of reducing the spring resistance to the handle pull the numerals 12 and 13 designate the usual pair of power springs which are connected to the rock shaft 11 and against which the handle is pulled, said springs functioning to complete the operation of the machine when the handle is released after being drawn fully forward. The right hand spring 12 is connected as usual by a rod or wire 14 with a crank arm 15 secured to and depending from the rock shaft 11. The left-hand spring 13 is the one whose resistance is to be removed and consequently it is not so connected with said rock shaft. The latter has another depending crank arm 16 secured upon it near its left-hand end but the spring 13 is not directly connected to that crank arm. Its connecting wire or rod 17 is coupled to a crank arm 18 loosely mounted upon the shaft 11 alongside the crank arm 16, as best shown in Fig. 4. A latch 19 pivoted upon said crank arm 18 normally engages a stud 20 on said crank arm 16 as there shown so that the two crank arms will operate as one. Manifestly when the rock shaft 11 and its crank arm 16 are rotated in a counter-clockwise direction during the forward pull of the operating handle of the machine, the crank arm 18 will be carried along by reason of the stud 20 being interlocked with the latch 19, and the spring 13 will be stretched as usual. At the same time this latching arrangement provides for relieving the handle of the load of this spring whenever desired.

The manipulating means for accomplishing the reduction of load takes the form of a key or finger-piece 21 conveniently located at the left of the keyboard and carried upon the upper end of a lever 22 which is pivoted at its lower end upon a suitable frame stud and has coupled to an intermediate portion a link 23 extending back to a point above the rock shaft 11 where it is coupled to an arm 24 secured to and depending from another rock shaft 25. At a point somewhat forward of its connection with said crank arm 24 this link has an offset arm 26 of angular form, the downwardly extending portion of which has a stud 27 occupying an arc-shaped slot 28 in an extended portion of the latch 19. Under normal conditions this slot is concentric with the rock shaft 11 so that in oscillation of the latter accompanied by the crank arm 18 the latch will not be affected and the interlock between that crank arm and the crank arm 16 will be maintained. Normally the lever 22 is forward as illustrated in Figs. 1 and 4. When thrown rearward to the position illustrated in Fig. 3, said lever, through the medium of the link 23 and its angular branch 26 and stud 27, will rock the latch 19 on its pivot and disengage the same from the stud 20, as illustrated in Fig. 3. This obviously disconnects the spring 13 from the rock shaft 11 and consequently relieves the operating handle of that portion of the load represented by the power of said spring.

Referring next to the matter of further relieving the load by eliminating the resistance offered by the dashpot governor, numeral 30 designates the dashpot cylinder and 31 the piston rod which is coupled to the ear 32 of a reciprocating plate 33 located alongside one of the frame plates 34 of the printing section of the machine and slotted to embrace a stud 35 thereon. The dashpot cylinder is pivotally supported at its lower end as usual and the plate 33 besides being longitudinally movable for reciprocating the piston is also pivotally movable about the stud 35 and to such extent as to provide for uncoupling it from the operating handle. The rock shaft 11 is operatively connected with another rock shaft 36 through familiar means including a link 37 and there is secured to the rock shaft 36 a cam plate 38 which is also a familiar element of the machine, its main function being to force rearward the restoring bail 40 which returns the bars or strips 5 to normal rearward position. This cam plate is the particular element of the driving or actuating means to which the dashpot is coupled, ordinarily in a permanent manner. For the purposes of the present invention the coupling is a separable one. Thus the dashpot operating plate 33 is notched as shown at 41 to embrace a stud 42 on the said cam plate 38, as best shown in Fig. 4.

The connections for shifting the said

dashpot plate 33 to disconnect it from the cam plate 38 by the act of throwing rearward the key 21, are of the following description: It will be recalled that the link 23 which runs rearward from the key lever 22 is coupled to a crank arm 24 fastened to a rock shaft 25. The latter has fastened to it another depending crank arm 44 at a point over toward the right hand side of the machine, and there is coupled to the lower end of this crank arm an irregular-shaped link 45 which extends alongside the lower rear portion of the dashpot plate 33 and carries a stud 46 occupying a notch 33ª in the lower end of said plate. This stud 46 is guided in a slot 47 of the aforesaid frame plate 34. It will now be seen that the rocking of the shaft 25, as effected by throwing rearward the key 21, results in pulling rearward said link 45 and thereby swinging the dashpot plate 33 in a counter-clockwise directon around the stud 35. In this manner the notch 41 of said plate 33 is carried away from the stud 42 of the cam plate 38 so that when the latter rocks counter-clockwise during the forward stroke of the operating handle it has no effect upon said dashpot plate. Said stud 42 then simply rides along an under edge of the plate which under such conditions is concentric with the rock shaft 36, as illustrated in Fig. 3, where the key 21 is rearward and the operating handle has been drawn forward. It will be clear, therefore, that the load represented by the resistance of the fluid in the dashpot is removed.

Referring next to the matter of disconnecting the type-carriers from the registering mechanism, the numeral 50 designates the type-carriers which are of the familiar form and hung upon the rock-shaft 51 to which the restoring bail 40 is fastened. Said type-carriers do not have the usual depending arms coupled permanently to the slide bars or strips 5 but there is separately mounted upon said rock shaft 51 alongside the type-carriers, a series of bell-crank levers 52, the depending arms of which are coupled to said slide bars. Forwardly extending arms of said bell-cranks are separably coupled to the respective type-carriers, as best shown in Figs. 3 and 4. The bell-crank arm has a stud 53 and the associated type-carrier has a latch 54. The latter is pivoted to the type-carrier and notched at its upper end to embrace the said stud and when embracing the same, as shown in Fig. 4, the type-carrier and bell-crank obviously operate as one.

The connections for displacing all of these latches and so uncoupling the type-carriers from the several bell-cranks, as a result of the throwing rearward of the key 21, are of the following description: The aforesaid rock shaft 25 has a third crank arm 55 and a curved link 56 is coupled thereto and extends forward. A similar link 57 is coupled to the before-mentioned crank-arm 44, and these two links carry between them at their forward ends a cross rod 58 which is guided in slots of the aforesaid frame plate 34 and the companion plate 34ª. The several latches 54 have downward and rearward extensions with open slots and they embrace the said cross rod 58. These slots and the rearward extensions of the lower sides thereof are normally concentric with the rock shaft 51 so that when the type-carriers swing about the latter the latches will be unaffected by the bail cross rod 58 and the type-carriers will therefore remain coupled to the bell-crank levers 52. The considerable extension of the lower sides of the slots is for the purpose of positively keeping the latches interlocked with the studs of the bell-cranks in whatever position the type-carriers may be. The throwing rearward of the key 21 and consequent rocking of the shaft 25 results in drawing the bail cross rod 58 rearward and thereby swinging all of the latches upon their pivots and disconnecting them from the several studs 53, as illustrated in Fig. 3. Then manifestly the forward movement of slide bars or strips 5 will be accompanied merely by clockwise movement of the bell-cranks 52 while the type-carriers remain at normal. As in all machines of this type the printing hammers are not tripped unless one or more type-carriers move out of normal position. Consequently no printing action will occur at all so long as the key 21 occupies its rearward position.

Referring next to the line-spacing mechanism, this includes the familiar oscillating arm 60 which is operatively connected with the rock shaft 11 and ordinarily acts upon a stud 61 of an arm 62 through which a square-sided rock-rod 63 slides, the latter carrying at its left-hand end the line-space pawl 64. A spring 65 pulls the arm 62 forward but is normally restrained by engagement of the stud 61 with the end of the operating arm 60. When the handle is pulled that arm swings forward and downward and is followed up by the arm 62 and the line-space pawl is retracted and then when the operating handle returns to normal the said arm 60 acts upon the stud 61 and effects line-spacing.

The means for disabling the line-space mechanism as a result of throwing rearward the key 21 simply comprises a finger 67 secured to the rock shaft 25 which finger swings under the laterally turned portion of the arm 62 to which the spring 65 is attached. This is clearly illustrated in Fig. 3 and it will be obvious that when the finger has been so located the arm 62 cannot follow up the arm 60 when the latter swings forward and consequently there will be no line-space action. That much of the power

of the main springs which ordinarily serves to effect the line-spacing is then not called upon and so it is entirely practicable to reduce that power to the extent of disconnecting one of the springs in the manner before described, spring power being neither required to overcome the resistance of the fluid in the dashpot nor that of line-space elements, besides which such spring power is not called upon to retract the printing hammers in opposition to their individual springs. In the latter connection it may be well to point out that the hammers 70 are retracted in opposition to their springs 70ª by the cross-rod 71 of a bail whose side pieces 72 have depending arms slotted to embrace studs 73 upon the aforesaid cam-plate 38 and the companion cam-plate. The hammers are engaged as usual by restraining latches 76 and there are latch-tripping pawls 74 in a swinging bail 75, and type carriers at normal hold up the pawls so they miss the latches. This is the familiar arrangement in this particular type of machine, the form of the under edges of the type carriers being such that at normal and also when advanced only one step, they restrain the pawls 74 by engagement with the rear ends thereof, whereas when any type carrier is further advanced the associated pawl is permitted to swing counterclockwise to engage the associated latch 76. As before explained the setting of the key 21 disconnects the type carriers from their levers so that they do remain at normal.

At the conclusion of repeated operations of the machine with the key 21 set, that key will be thrown forward to restore the machine to normal position, and then the product or quotient may be printed by operating the machine with the total or subtotal key depressed.

In order to somewhat further safeguard the mechanism and insure smooth operation without loose play or rattle of uncoupled parts, I form the dashpot operating plate 33 with an extended arcuate edge 33ᵇ on the upper side of its lower rear portion, and just forward of this edge I form said plate with a notch 33ᶜ. I secure a stud 34ᵉ in the frame plate 34 for coöperation with said arcuate edge and said notch. Under normal conditions reciprocation of the plate 33 causes its said arcuate edge to ride along the underside of the said stud and this insures against any displacement of the plate which might otherwise cause its notch 33ª to get out of registry with the stud 46. When the plate 33 is swung upward and rearward as an incident to the pushing back of the key 21 the aforesaid notch 33ᶜ will be caused to embrace the said stud 34ᵉ, as shown in Fig. 3, and the engagement between the stud and the lower side of the notch will then prevent play of the plate which might otherwise take place as permitted by the spring 31ª which encircles the piston rod 31 of the dashpot between sliding collars thereon, as in the familiar construction.

Referring next to the modified construction illustrated by Figs. 6 and 7, this pertains more especially to the matter of reducing or limiting spring resistance to the handle pull. In this modified construction there is not the disconnection of a power spring as in the first described construction but the tension of the spring is lessened or removed altogether as an incident to the setting of a special key. In this modified construction the said special key 21 and lever 22 upon which it is mounted are located at the right instead of at the left of the keyboard and of course the link 23 is correspondingly located. It may be assumed that only the power spring 12 is employed in this construction, said spring being likewise located at the right-hand side of the machine. It is coupled as usual and as before described, permanently to the rock shaft 11 at the rear of the machine, and inasmuch as there is in this modified construction no uncoupling of any power spring the said link 23 does not have the offset arm 26 of the previously described construction nor any substitute for that. The link simply connects, as in the previously described construction, with the depending crank arm 24 of the upper rock shaft 25, which crank arm is shifted over to the right-hand portion of said rock shaft to correspond with the location of the link. The arrangement for reducing the spring resistance to handle pull comprises a lever 100 pivoted under the keyboard and to which lever the forward end of the spring 12 is coupled; and a link 101 connecting the said lever to the handle lever 22. The latter is capable of being flexed laterally and the keyboard panel 102 (which is part of the removable casing of the machine) is formed not only with a slot 103 in which the lever 22 may work back and forth, but also with notches 104 so that the said lever may be locked in its two positions of adjustment, which expedient is manifestly called for in view of the fact that the lever is connected to the power spring.

Under normal conditions the lever is forward and locked in the front notch as shown in Figs. 6 and 7, and consequently the lever 100 is held forward and the spring 12 under tension. When the handle lever is disengaged from the front notch and is thrown rearward the lever 100 will be correspondingly swung rearward and the tension of the spring 12 will manifestly be relaxed.

I claim:

1. The combination with driving means, registering mechanism and a dashpot cylinder and piston; of a piston-reciprocating

member movable into and out of connection with said driving means, and a key and connections for shifting said piston-reciprocating member.

2. The combination with registering mechanism, driving means including an oscillating member carrying a stud, and a dashpot cylinder and piston; of a reciprocable and laterally movable plate or bar coupled to the piston and notched for engagement with the stud of said driving member, and a key and connections coupled to said plate for laterally shifting the same to disconnect it from the driving member.

3. The combination with registering mechanism, and driving means therefor including a plurality of springs; of a separable coupling between one such spring and the driving means, and manipulative means for controlling the coupling.

4. The combination with registering mechanism, and driving means therefor including a plurality of springs and a rock shaft; of a pair of crank arms on the latter one fixed thereto and the other loose thereon and connected to one of said springs, a latch connecting the two arms, and manipulative means for operating the latch.

5. The combination with registering mechanism, and driving means therefor including a plurality of springs and a rock shaft; of a pair of crank arms on the latter one fixed thereto and the other loose thereon and connected to one of said springs, a latch pivoted on one of said arms and normally interlocked with the other and having a slot normally concentric with the rock shaft, and a key and connections including a link or bar having a stud engaging said slot.

6. The combination with registering mechanism and driving means; of a series of levers connected to the registering mechanism, a series of type-carriers normally latched to said levers respectively, and a key and connections for collectively unlatching said type-carriers.

7. The combination with registering mechanism and driving means; of a series of levers connected to the registering mechanism, a series of type-carrier latches pivoted upon the type-carriers respectively and normally interlocked with the said levers and being slotted concentrically with the latter, a bail engaging the latch-slots, and a key and connections for shifting the bail and disconnecting the several latches from the levers.

8. The combination with registering mechanism, driving means including a plurality of springs, and a governor imposing restraint upon the driving means; of a separable coupling between one spring and the driving means, a separable coupling between the driving means and the governor, and manipulative means common to said two couplings for simultaneously disabling both of them.

9. The combination with registering mechanism, driving means and a governor imposing restraint upon the driving means; of a separable coupling between the driving means and the governor, type-carriers separably connected with said driving means, and manipulative means common to said coupling and the type-carriers for simultaneously disabling both.

10. The combination with registering mechanism, driving means including a plurality of springs; of a separable coupling between one such spring and the driving means, type carriers separably connected with said driving means, and manipulative means common to said coupling and said type-carriers to simultaneously disable both.

11. The combination with registering mechanism, driving means including a plurality of springs, and a governor imposing restraint upon the driving means; of a separable coupling between one spring and the driving means, a separable coupling between the driving means and the governor, type-carriers separably connected with said driving means, and manipulative means common to said two couplings and said type-carriers to simultaneously disable all of these elements.

12. The combination with registering mechanism, driving means including a plurality of springs, and a governor imposing restraint upon the driving means; of a separable coupling between one spring and the driving means, a separable coupling between the driving means and the governor, type-carriers separably connected with said driving means, line-space mechanism separably connected with the driving means, and manipulative means common to said two couplings, said type-carriers and said line-space mechanism to simultaneously disable all of these elements.

13. The combination with registering mechanism, driving means including a plurality of springs and a rock shaft and an oscillating member carrying a stud, and a dashpot cylinder and piston; of a reciprocable and laterally movable plate or bar coupled to the piston and notched for engagement with the stud of said driving member, a pair of crank arms on said rock shaft one fixed thereto and the other loose thereon and connected to one of the springs of the driving means, a latch connecting the two crank arms, a series of levers connected to the registering mechanism, a series of type-carriers having latches engaging said levers, a rock shaft having a number of crank-arms, a bail coupled to certain of the latter and engaging the type-carrier latches, a link connecting another of said

arms with the dash-pot-piston-reciprocating bar, and a key lever and link coupled to a crank-arm of the last-mentioned rock-shaft, the link being engaged with the latch connecting the crank arms on the rock shaft of the driving means.

14. The combination with registering mechanism, driving means including a plurality of springs and a rock shaft and an oscillating member carrying a stud, and a dashpot cylinder and piston; of a reciprocable and laterally movable plate or bar coupled to the piston and notched for engagement with the stud of said driving member, a pair of crank arms on said rock shaft one fixed thereto and the other loose thereon and connected to one of the springs of the driving means, a latch connecting the two crank arms, a series of levers connected to the registering mechanism, a series of type-carriers having latches engaging said levers, line-space mechanism, including a spring-actuated lever coöperating with the driving means, a rock-shaft having a finger to obstruct said lever and having a number of crank-arms, a bail coupled to certain of the latter and engaging the type-carrier latches, a link connecting another of said arms with the dash-pot-piston reciprocating bar, and a key lever and link coupled to a crank-arm of the last-mentioned rock-shaft, the link being engaged with the latch connecting the crank-arms on the rock-shaft of the driving means.

15. The combination with registering mechanism, and driving means therefor including a manually operated element and an opposed driving motor element; of manipulative means for effecting partial disconnection of said elements whereby operation of the registering mechanism may be had minus resistance of the motor element.

16. The combination with registering mechanism and driving means therefor including a manually operated element and an opposed driving motor element; of manipulative means for reducing without altogether eliminating the resistance of the motor element to the manually operated element.

17. The combination with registering wheels, their actuators, type carriers, and setting and driving means common to the latter and said actuators; of latches normally connecting said means to one of the two elements common thereto, and a key common to the latches with connections for withdrawing them.

18. The combination with registering wheels, their actuators, type carriers, positioning bars common to the latter and said actuators, and driving means; of latches normally connecting said means to one of the two elements common thereto, and a key common to the latches with connections for withdrawing them.

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Witnesses:
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