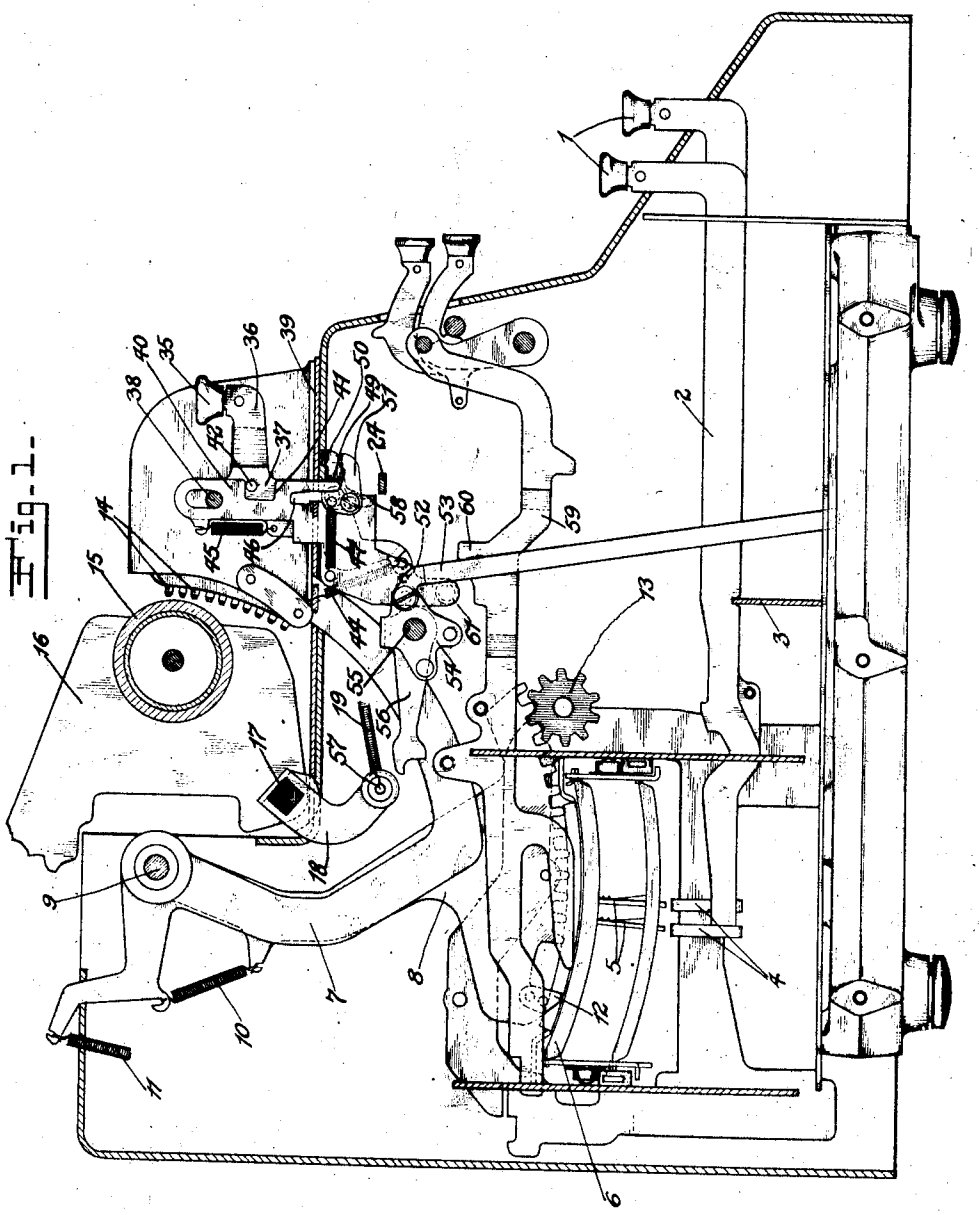
Dec. 19 1922.

1,439,175

H. LANDSIEDEL.
MULTIPLYING MACHINE.
FILED JULY 30. 1921.

4 SHEETS-SHEET 1

Fig. 1.



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4 SHEETS-SHEET 2

Fig. 2.

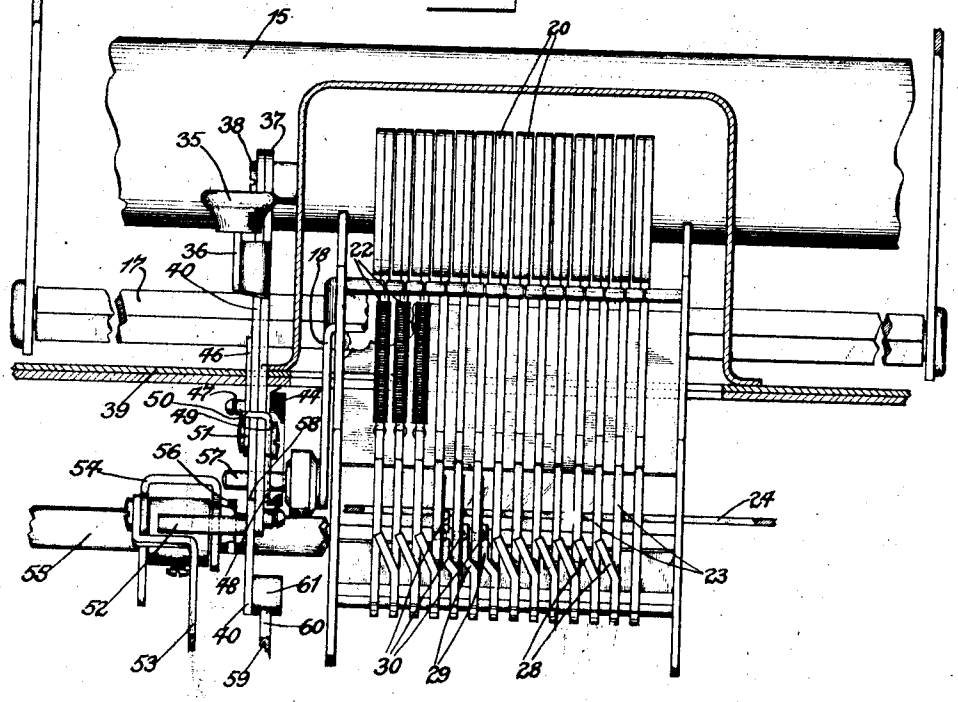
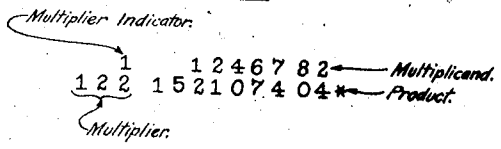


Fig. 3.



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Fig. 3.

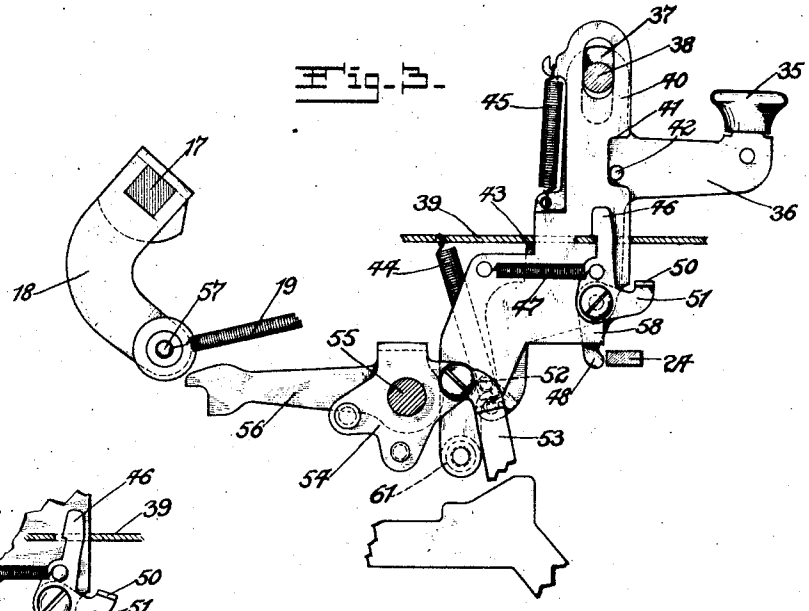


Fig. 5.

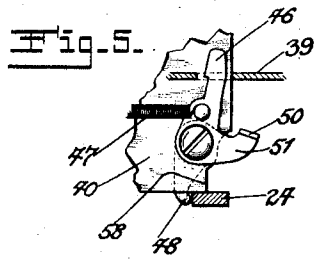
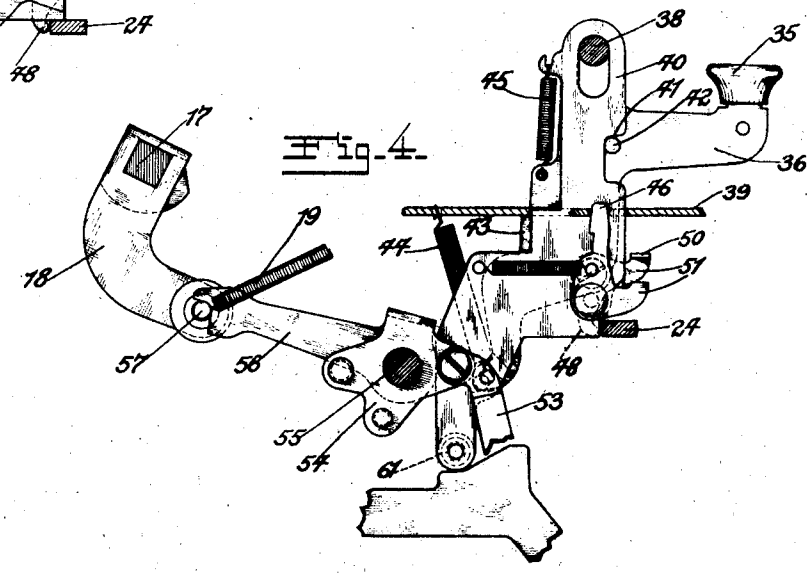


Fig. 4.



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4 SHEETS-SHEET 4

Fig. 6.

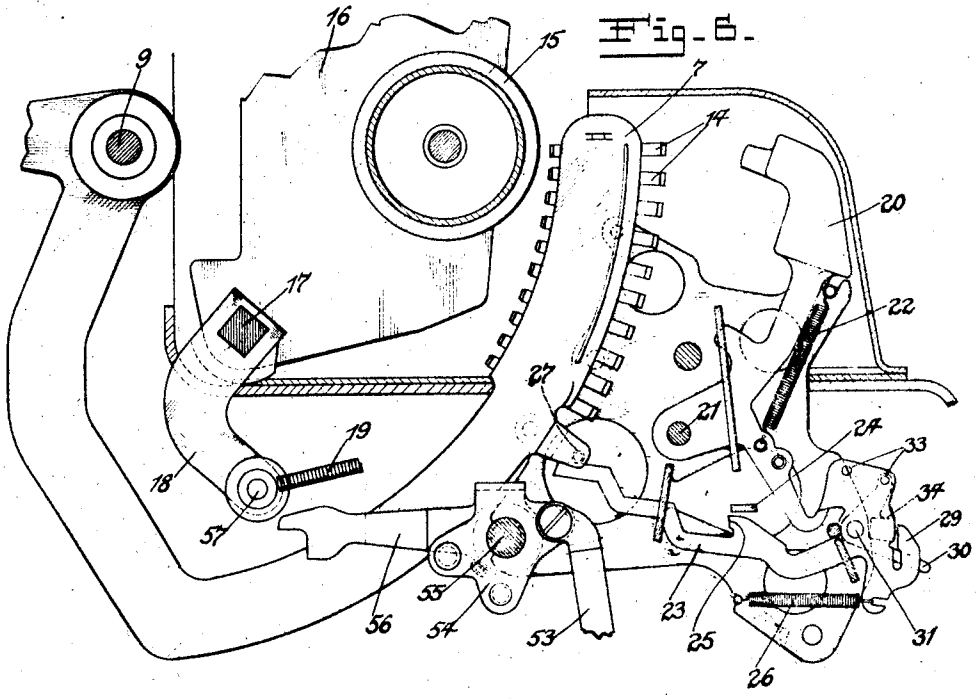


Fig. 7.

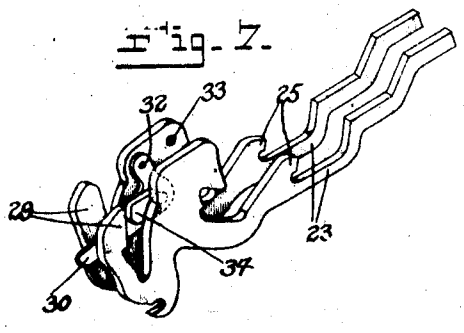
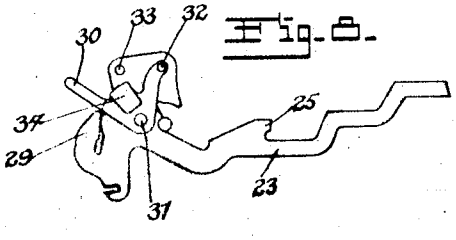


Fig. 8.



INVENTOR.
HARRY LANDSIEDEL,
BY
HIS ATTORNEYS.

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Patented Dec. 19, 1922. 1,439,175

UNITED STATES PATENT OFFICE.

HARRY LANDSIEDEL, OF NORWOOD, OHIO, ASSIGNOR TO THE DALTON ADDING MACHINE COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

MULTIPLYING MACHINE.

Application filed July 30, 1921. Serial No. 488,629.

To all whom it may concern:

Be it known that I, HARRY LANDSIEDEL, a citizen of the United States, residing at Norwood, Hamilton County, and State of Ohio, have invented a new and useful Multiplying Machine, of which the following is a specification.

This invention relates to machines for performing examples of multiplication and indicating the results thereof.

For convenience of illustration and description, my invention is shown and described as embodied in a machine of the Dalton type, but it is apparent that the invention may easily be used with advantage in other machines.

Numerous new and advantageous results are obtained by my invention. One such desirable result is the control of the paper feed mechanism of the machine to prevent unnecessary operation thereof and to control the movement of the paper so that the multiplicand may be printed on one line, and the multiplier and the product may be printed on the next line below. Another improved and better result obtained by use of my invention is a showing of proof in connection with the example of multiplication that the proper multiplier was used and that the example or work was correctly performed. Another advantage resides in the fact that the paper feed mechanism is permitted or caused to operate to move the paper so that a noticeable space is shown between different examples of multiplication. Various other advantages and desirable results are obtained by use of the invention, all of which will be apparent from the following description without specific mention thereof.

An object of the invention is to provide equipment for obtaining the results mentioned, as well as others that will hereinafter appear.

Another object of the invention is to provide means cooperatively related with a part of the usual total printing mechanism of the machine to permit operation of the paper feed mechanism when a total or product is printed.

Another object of the invention is to provide means whereby the present invention permits the usual line space or paper feed mechanism to operate when the multiplicand is printed and which prevents further operation of the paper feed or line space mechanism when the machine is operated to complete the example of multiplication.

Various other objects will hereinafter appear, reference being made to the accompanying drawings, in which

Fig. 1 is a side elevation showing the present invention embodied in a machine of the Dalton type.

Fig. 2 is a front view of the hammer section showing also the mechanism of the present invention for controlling the printing mechanism and the line spacing during multiplication.

Fig. 3 is a side elevation of the present invention detached from the machine, the multiplying key being shown depressed and other parts being shown in the positions they occupy before the machine is operated to print the multiplicand.

Fig. 4 is a similar view showing the positions of the parts after the multiplicand has been printed and while the machine is in operation to perform an example of multiplication.

Fig. 5 is a detailed view of a latch device forming a part of the mechanism which prevents operation of the printing mechanism after the multiplicand has been printed, and while the example of multiplication is being performed.

Fig. 6 is a view showing part of the printing mechanism of the machine, and also a part of the equipment for controlling the line space mechanism to prevent operation thereof after the multiplicand has been printed.

Fig. 7 is a perspective view of a pair of hammer latches contained in the printing mechanism, and the device in connection therewith for splitting the machine to prevent the printing of ciphers between simultaneously printed numbers.

Fig. 8 is a side elevation of one of the hammer latches and the coupling by which it is possible to split the machine.

Fig. 9 (Sheet 2) shows an example of multiplication performed by a machine equipped with this invention.

The well known adding machine shown includes a number of numeral keys 1 ar-

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ranged in a keyboard at the front of the machine, on the ends of the levers 2. The levers 2 are pivoted on a support 3 and have hammers or tappets 4 on their inner ends for setting up the digit pins 5 of the differential mechanism.

The differential mechanism of the machine comprises a transversely movable carriage 6 in which the digit pins 5 are mounted.

As the Dalton adding machine is well known, only so much of the structure thereof is shown as will suffice to show the connection of the invention therewith. For a more complete disclosure of the structure of the Dalton adding machine, reference is made to Hubert Hopkins Patent, Number 1,039,130, dated September 24, 1912.

The machine also includes a number of type-carriers 7 and a number of cooperative racks 8, the type-carriers and racks being pivotally supported upon a shaft 9. Springs 10 connecting the type-carriers with their respective racks operate the racks in transferring operations. Springs 11 connected with extensions of the type-carriers operate the type-carriers to their various recording positions. Shoulders 12 on the racks engage the digit pins 5 that have been set up by the operation of the numeral keys and serve to stop the racks and thereby the type-carriers in proper recording positions. The racks operate the adding pinions 13 in the usual way for the well understood purposes. Each type-carrier supports a number of printing type 14.

The paper feed mechanism includes a roll or platen 15 usually supported in a laterally movable carriage 16. Paper is passed under and to the front of the platen 15 and at the proper time the type 14 on the type-carriers that had been moved to recording positions are driven toward the platen to imprint upon the paper. It is well known that the operation of the platen effects movement of the paper in line spacing and that the mechanism for rotating the platen to move the paper in line spacing includes a shaft 17 mounted in the paper carriage and supporting an arm 18 for rocking the shaft 17. The arm 18 is slidably supported on the shaft 17 by a construction which permits the shaft to move laterally with the paper carriage while the arm 18 remains stationary, and whereby oscillation of said arm 18 will rock the shaft 17 to effect movement of the platen in line spacing operations. The arm 18 is actuated in one direction by a spring 19. If the arm 18 be prevented from moving the required extent, the line spacing mechanism will not operate and the paper will not be moved in line spacing, thus permitting the machine to be operated to perform examples of multiplication without moving the paper during certain operations.

The Dalton adding machine also includes a series of hammers 20 pivoted upon a shaft 21 and operated at the proper time by springs 22 to drive the type 14 to print. Latch members 23 are normally engaged with the hammers 20 (Fig. 6) to hold the hammers retracted and, at the proper time, in each cycle of operation when printing is to be done, the latch release bar 24 engages shoulders 25 on the hammer latches and pushes the proper latches forwardly in opposition to their springs 26, releasing the latches pushed forwardly and permitting the springs 22 to operate the corresponding hammers to drive the type to print. However, as is well known, only the hammers corresponding to the type-carriers that move forwardly to printing positions are operated in this way, due to the fact that each type-carrier has a projection 27 engaging the corresponding hammer latch 23. Hence, if the type-carriers do not move, the latches 23 cannot rise and the shoulders 25 on the latches which do not rise will not be engaged by the latch release bar 24.

As the latch members 23 cannot rise to position to be engaged by the latch release bar 24 until the corresponding type-carriers move beyond zero printing position, and as it is useful to print zeros in many examples of work, certain of the latches are constructed and cooperatively related so that latches in higher numerical orders will release latches in lower numerical orders. As shown (Fig. 2), latches in various numerical orders have laterally extended arms 28 extending in front of the respective latches in next adjacent higher numerical orders. Thus the latch in units order has an arm 28 extending in front of the latch in tens order; the latch in tens order has an arm 28 extending in front of the latch in hundreds order, and so on.

It is desirable, however, to split the machine for certain examples of work so as to prevent latches in higher numerical orders from releasing latches in lower numerical orders whenever desired. As shown (Fig. 2), a number of the latches in higher numerical orders have arms 29 which do not extend in front of adjacent latches, but each of said adjacent latches supports a pivoted coupling member comprising a plate 30, mounted on a pivot 31 and having a detent 32 for making latching engagement in holes 33 in the supporting latch member. Each plate 30 carries a block 34 which, in the lower position of the plate 30 (Fig. 7), is behind the arm 29 of the latch in the next lower order. If the plate 30 be raised to the position shown in Fig. 8, the block 34 is supported above the arm 29, permitting release movement of the latch member 23 on which said plate 30 is mounted without effecting release of the next lower latch

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member. By raising the proper split plate 30, the printing of ciphers can be prevented between different numbers concurrently printed. Thus, a number consisting of one or more digits can be printed at the left or in higher numerical orders, and another number can be simultaneously printed at the right or in lower numerical orders without printing ciphers between said two numbers. In this way a noticeable space is left between two numbers. This is a highly desirable result in various classes of work. This splitting device, however, is not new in the present invention and is here described for the purpose of showing the connection of the present invention therewith.

Having described so much of the existing machine as is useful for the purpose of showing the connection of the present invention therewith, I now proceed to a description of the invention.

The multiplying key 35 is attached to an arm 36 extending forwardly from a plate 37. The plate 37 is mounted for sliding and oscillating movements and, in the arrangement shown, is guided and limited in its movements by a pin 38 extending through a slot in the plate. The plate 37 extends for operation through a slot in the plate 39, which may be a part of the case of the machine. An independently movable plate 40 also has a slot in its upper end through which the pin 38 extends and also extends through a slot in the plate 39. The plates 37 and 40 are mounted side by side for independent movement, extent of relative movement of said plates being limited by the width of a notch 41 in one of said plates into which a pin 42 on the other plate extends. One of the duties of these two plates and the connections controlled thereby is to control the line spacing device 18 to prevent effective operation thereof when multiplication is being performed; and another duty thereof is to prevent operation of the printing mechanism during the operation of multiplication.

After the multiplicand number has been set up in the differential mechanism, the multiplying key 35 is depressed until a shoulder 43 on the plate 37 becomes latched under the plate 39. A spring 44 connected with said plate and with some stationary part actuates the plate 37 in a direction to engage said shoulder 43 under the plate 39. The plate 37 is thereby held in its depressed position. As an incident to the downward movement of the plate 37, a spring 45 connecting said plate 37 with the plate 40 is extended and placed under tension, the power of said spring being exerted to move the plate 40 downwardly. Downward movement of the plate 40 is prevented at this time by a latch 46 pivotally supported thereby and extending through a slot in the plate 39 and having latched engagement with said plate 39. A spring 47 yieldingly holds the latch 46 in engagement with the plate 39. The plate 37 supports a device for releasing the latch 46 from the plate 39 at the proper time to permit the spring 45 to move the plate 40 downwardly, as required to prevent effective operation of the line space mechanism of the machine; and also to prevent operation of the hammer latch release bar 24. As shown, said latch release device comprises a member including an arm 48 extending downwardly, and an arm 49 extending forwardly, and provided with a formed part 50 extending over a forwardly extended arm 51 in connection with the latch 46. In the normal or idle position of the multiplying mechanism, as shown in Fig. 1, the arm 48 of the latch release device is above and out of the way of the hammer latch release bar 24. When the plate 37 is lowered, the arm 48 is extended downwardly behind and adjacent to the hammer latch release bar 24.

The multiplicand having been set up in the differential mechanism and the plate 37 having been lowered, the recording mechanism of the machine is operated in the usual way to print the multiplicand upon the paper. In the operation of the machine the usual backward and forward movement of the hammer latch release bar 24 occurs. As a result of the backward movement thereof, the latch release device 49 is operated with the result that the latch 46 is released from the plate 39, permitting the spring 45 to move the plate 40 downwardly from the position shown in Fig. 3 to the position shown in Fig. 4.

The lower end of the plate 40 carries a pin 52 which extends over a shouldered portion of a link 53. The link 53 is pivoted to the forward part of an abutment device 54 that is pivotally supported upon a shaft 55. The lower end of the link 53 is guided in a slot in the machine base. When the plate 40 is lowered, the forward end of the abutment device 54 is lowered, thereby raising the rearwardly extending abutment arm 56 in front of a pin 57 in connection with the arm 18 of the line space mechanism. As a result of these operations, the plate 37 is held latched in its downward position and the plate 40 is held in its downward position by the spring 45. So long as the plate 40 is held in its downward position it will hold the rear end of the abutment 56 in position to prevent effective operation of the line space device 18.

When the plate 40 is moved downwardly, a shoulder 58 thereon is placed behind and adjacent to the hammer latch release bar 24 (Fig. 4) and prevents effective operation of said hammer latch release bar during subsequent operations of the machine until the

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example of multiplication has been completed.

After the example of multiplication has been completed, except as to the printing of the product, and when it is desired to print the product that has been introduced or represented in the adding pinions 13, the usual total control printing device 59 is operated in the usual way. For cooperation with the present invention, the device 59 is provided with an inclined shoulder 60, arranged to operate under a roll 61 supported near the lower end of the plate 40, and to raise the plate 40 in opposition to the power of the spring 45 when the part 59 is moved rearwardly. The construction is such that the plate 40 is raised until the latch 46 is engaged with the plate 39, thereby supporting the plate 40 above and out of the line of movement of the hammer latch release bar 24 and permitting the abutment 56 to drop below the line of movement of the pin 57, as shown in Fig. 3. The recording mechanism of the machine is then operated in the usual way to print the total or product contained or represented in the adding pinions 13 and, if desired, to clear the adding mechanism for new work.

The use of the invention and the result obtained thereby will be clearly understood from the following description, reference being made to Fig. 9 of the drawing. The example of work shown in Fig. 9 is the multiplication of 1246782 by 122.

To obtain the result of the multiplication of 1246782 by 122 the digit 1 is first set up in the differential mechanism, after which the differential mechanism is shifted the proper distance toward higher numerical orders, so that when the multiplicand number 1246782 is set up in the differential mechanism, the digit pin for the 1 first set up will be in position to cooperate with the type-carrier and rack in the next numerical higher order above the order of the last arm 29 (Fig. 2). The machine is split by raising the adjustment of the split device (Figs. 7 and 8), so that no ciphers will be printed immediately at the right of, or in lower numerical orders from, the digit 1 mentioned. The machine being adjusted for "repeat" operations and the multiplying key 35 having been depressed, the recording and adding mechanisms are operated in the usual way with the result that at a single operation the digit 1 and the multiplicand 1246782 are printed on the same line with a noticeable space between them. As above described, this single operation of the adding and recording mechanisms of the machine results in the plate 40 being moved downwardly by this spring 45 to place the shoulder 58 behind the hammer latch release bar 24 and to place the abutment arm 56 in front of the pin 57. The placing of the shoulder 58 behind the hammer latch release bar 24 prevents effective operation of said release bar in subsequent operations, and the placing of the abutment arm 56 in front of the pin 57 prevents effective operation of the line space mechanism in said subsequent operations. As the digit in units order of the multiplier is 2, the machine is again operated while the differential mechanism is in the first set up position. Next, after completion of multiplication by the multiplier digit in units order, the differential mechanism is shifted one order or step toward higher numerical orders and the machine is operated a number of times, conforming to the value of the digit in tens order of the multiplier, which digit in the example being explained is 2. Accordingly, in the first shifted position of the multiplicand, the machine is operated two times since the digit in the multiplier in tens order in the example being explained is 2. After the machine has been operated as many times as is necessary to multiply by the digit in tens order of the multiplier, the differential mechanism is shifted to move the multiplicand one space or step toward higher numerical orders for multiplication by the next digit of the multiplier. In the example being considered, the digit in the third or hundreds numerical order of the multiplier is 1 so that only a single operation of the machine is needed for multiplication by that digit. The machine is then operated once to complete transferring.

During all these operations, after the multiplicand and the indicating digit in line therewith have been printed, the line space mechanism and the type driving mechanism remain disabled, with the result that the paper has been moved only a single line space after the printing of the multiplicand, and with the further result that the different operations or sub-additions are not recorded.

After the machine has been operated as many times as is necessary to complete the multiplication, and as an incident to the last operation, the differential mechanism is cleared or returned to its starting position, after which the total control printing device 59 is operated in the usual way to raise the plate 40 and to permit the abutment arm 56 to drop to the position shown in Fig. 3 out of the way of the line space mechanism actuating device. This permits the machine to be operated to print the result and also to print the multiplier in line with the result and noticeably spaced therefrom toward higher numerical orders. As an incident to the printing of the result and the multiplier, the line space mechanism operates to move the paper to position for new work.

Of course, in describing the above specific example, I do not restrict myself to a use nor to a construction of the machine in

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which the multiplier must be printed, for in any desired instance the printing of the multiplier may be omitted.

When it is desired to restore the machine to condition for use for straight addition it is only necessary to disengage the shoulder 43 from the plate 39 to permit the springs 44—45 to raise the plate 37 to the position in which it is shown in Fig. 1. Such disengagement of the shoulder 43 from the plate 39 may be effected by manipulating the key 35—36 to move the lower end of the plate 37 forwardly a sufficient distance to disengage the shoulder 43 from the plate 39.

From the foregoing it is plain that my invention obtains all of its intended results and objects. The mechanism is simple and construction and reliable in operation.

I do not restrict myself to unessential features but what I claim and desire to secure by Letters Patent is:—

1. In a machine of the character described, the combination with line space mechanism, printing hammers, and a device controlling the operation of the printing hammers, of means for preventing effective operation of the line space mechanism, an element controlled by said device that controls the operation of the printing hammers to set said means in position to prevent effective operation of said line space mechanism, and a key device for positioning said element for control by said device as aforesaid.

2. In a machine of the character described, the combination with line space mechanism, printing hammers, and a device controlling the operation of the printing hammers, of means for preventing effective operation of the line space mechanism, and an element controlled by said device that controls the operation of the printing hammers to set said means in position to prevent effective operation of said line space mechanism, and also to prevent subsequent operations of said device.

3. In a machine of the character described, the combination with printing mechanism, of a device controlled in part by the printing mechanism at one operation thereof to prevent subsequent operations of the printing mechanism.

4. In a machine of the character described, the combination with line space mechanism, and printing mechanism, of a device controlled in part by the printing mechanism to permit one operation of the line space mechanism and to prevent additional operations thereof.

5. In a machine of the character described, the combination with type-carriers, line space mechanism, and hammer mechanism, of means preventing effective operation of the line space mechanism; and a device controlled in part by the hammer mechanism for positioning said means to prevent further effective operation of the line space mechanism after a single operation of said line space mechanism and said hammer mechanism.

6. In a machine of the character described, the combination with line space mechanism, and printing mechanism, of a device for controlling the operation of the line space mechanism and the printing mechanism, and means operated by part of the printing mechanism as an incident to an operation of the printing mechanism for controlling said device and for enabling said device to move to position to prevent operation of the line space mechanism.

7. In a machine of the character described, the combination with line space mechanism, and printing mechanism, of a device for controlling the operation of the line space mechanism and the printing mechanism, and means operated by part of the printing mechanism as an incident to an operation of the printing mechanism for controlling said device and for enabling said device to move to position to prevent operation of the printing mechanism.

8. In a machine of the character described, the combination with line space mechanism, and printing mechanism, of a device for controlling the operation of the line space mechanism and the printing mechanism, and means operated by part of the printing mechanism as an incident to operation of the printing mechanism for controlling said device and for enabling said device to move to position to prevent operation of both the line space mechanism and the printing mechanism.

9. In a machine of the character described, the combination with line space mechanism and printing mechanism, of an abutment movable to position to prevent effective operation of the line space mechanism, a device for moving said abutment to position to prevent effective operation of the line space mechanism, an actuator for moving said device, a latch for preventing movement of said device by said actuator, and means operated by the printing mechanism for releasing said latch and permitting said actuator to move said device.

10. In a machine of the character described, the combination with printing mechanism, of a device controlled thereby at one operation thereof to prevent additional operations thereof.

11. In a machine of the character described, the combination with printing mechanism, of a device for preventing operation of the printing mechanism, a latch for preventing movement of said device to position to prevent operation of the printing mechanism, and means operable by and as an incident to an operation of the print-

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ing mechanism for releasing said latch to permit said device to be moved to position to prevent operation of the printing mechanism.

12. In a machine of the character described, the combination with printing mechanism, of a device movable to and from position to prevent operation of the printing mechanism, an actuator for moving said device to position to prevent operation of the printing mechanism, means for energizing said actuator, and a latch preventing movement of said device by said actuator during the time that the actuator is being energized.

13. In a machine of the character described, the combination with printing mechanism, of a device movable to and from position to prevent operation of the printing mechanism, an actuator for moving said device to position to prevent operation of the printing mechanism, means for energizing said actuator, a latch preventing movement of said device by said actuator during the time that the actuator is being energized, and means for releasing said latch after the actuator has been energized.

14. In a machine of the character described, the combination with printing mechanism, of a device movable to and from position to prevent operation of the printing mechanism, an actuator for moving said device to position to prevent operation of the printing mechanism, means for energizing said actuator, a latch preventing movement of said device by said actuator during the time that the actuator is being energized, and means operated by the printing mechanism for releasing said latch after said actuator has been energized and as an incident to operation of the printing mechanism.

15. In a machine of the character described, the combination with adding mechanism and printing mechanism for printing the numbers added, of devices controlled by the printing mechanism to prevent operation of the printing mechanism after the first number added has been recorded by the printing mechanism, leaving the adding mechanism free to operate while the printing mechanism remains unoperated.

16. In a machine of the character described, the combination with adding mechanism and printing mechanism arranged to operate to print numbers added, of a device movable to position to prevent operation of the printing mechanism, an actuator for moving said device to position to prevent operation of the printing mechanism, means for energizing said actuator, a latch preventing movement of said device by said actuator during the time that the actuator is energized and until a number has been printed, and means operated by the first operation of the printing mechanism for releasing said latch after said actuator has been energized and as an incident to the operation of the printing mechanism.

17. In a machine of the character described, the combination with adding mechanism and printing mechanism for printing the numbers added, of a device movable to and from position to prevent operation of the printing mechanism, an actuator for moving said device to position to prevent operation of the printing mechanism, manual means for energizing said actuator, and a latch preventing effective movement of said device by said actuator during the time that the actuator is being energized.

18. In a machine of the character described, the combination with adding mechanism and printing mechanism for printing the numbers added, of a device movable to and from position to prevent operation of the printing mechanism, an actuator for moving said device to position to prevent operation of the printing mechanism, manual means for energizing said actuator, and a latch preventing effective movement of said device by said actuator until the printing mechanism has operated to print a number.

19. In a machine of the character described, the combination with adding mechanism, printing mechanism for printing numbers added, and line space mechanism, of a device movable to and from position to prevent operation of the line space mechanism and the printing mechanism, and means for preventing movement of said device to position to prevent operation of the line space mechanism and the printing mechanism until a number has been printed.

20. In a machine of the character described, the combination with adding mechanism, printing mechanism for printing numbers added, and line space mechanism, of a device movable to and from position to prevent operation of the line space mechanism and the printing mechanism, an actuator for moving said device to position to prevent operation of the line space mechanism and the printing mechanism, means for energizing said actuator, and a latch preventing movement of said device by said actuator until a number has been added.

HARRY LANDSIEDEL.