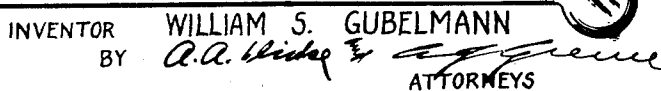


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Fig. 1



July 31, 1934.

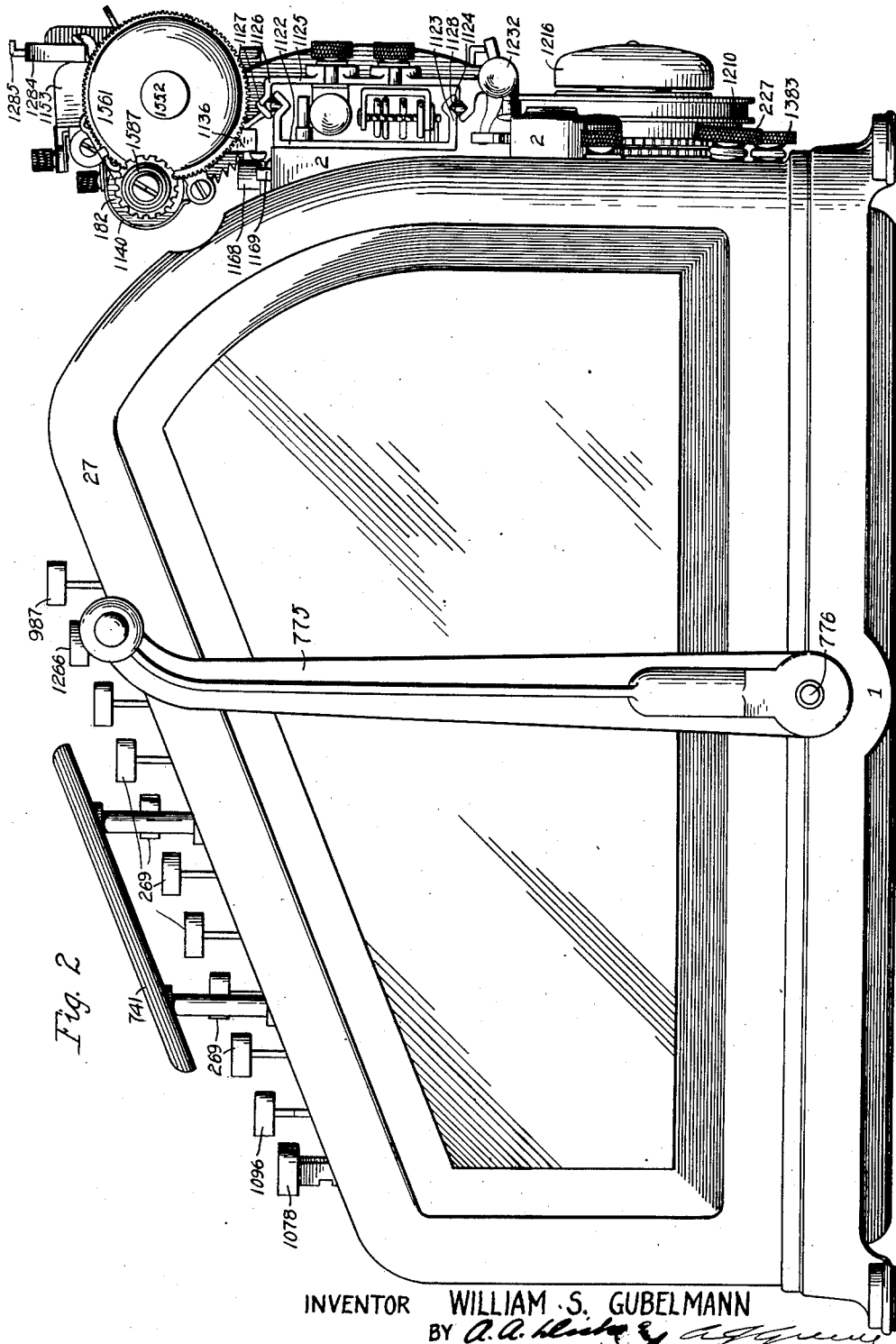
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INVENTOR

WILLIAM S. GUBELMANN

BY *A. A. Hinkley & Associates*

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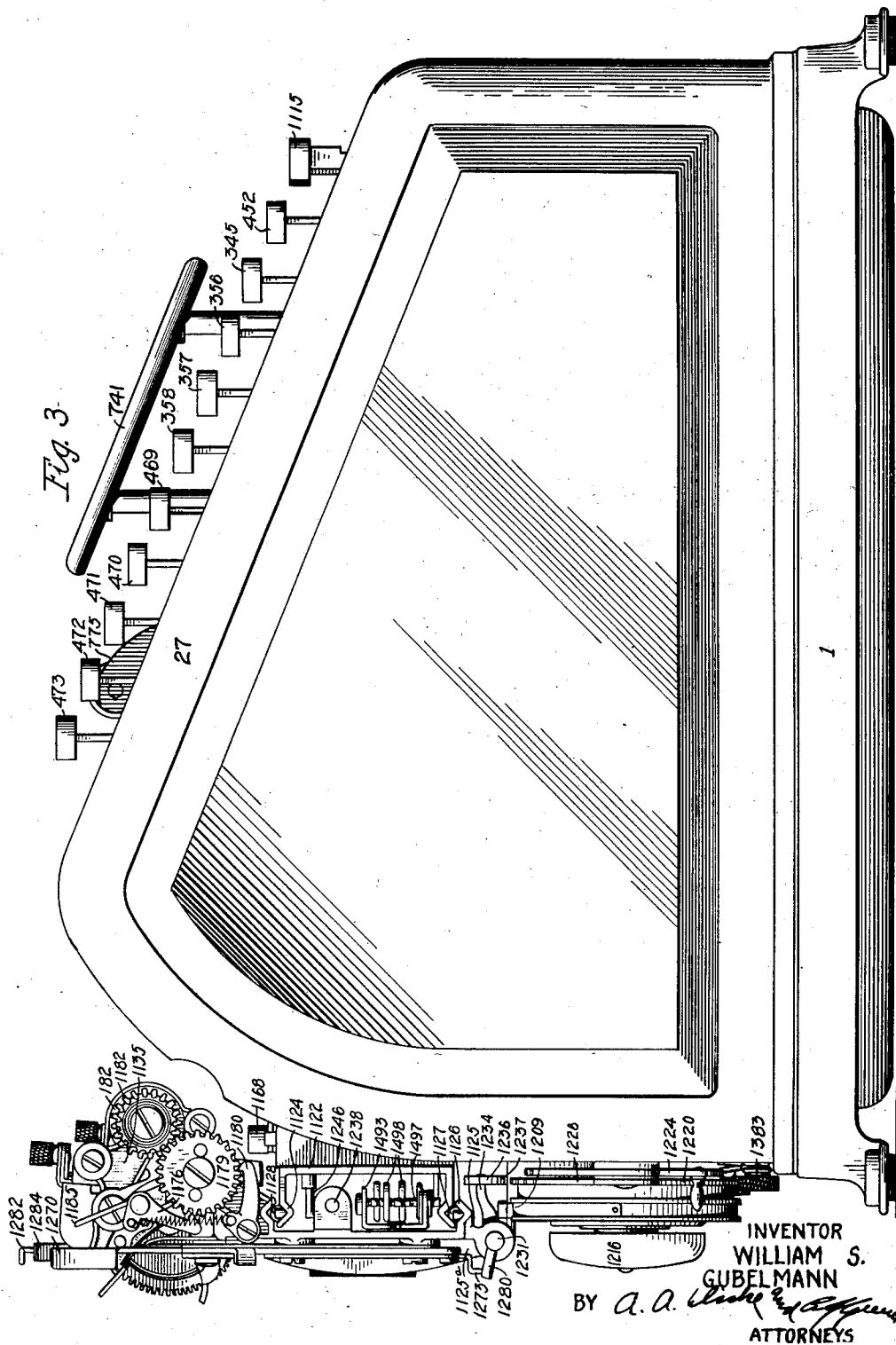
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July 31, 1934.

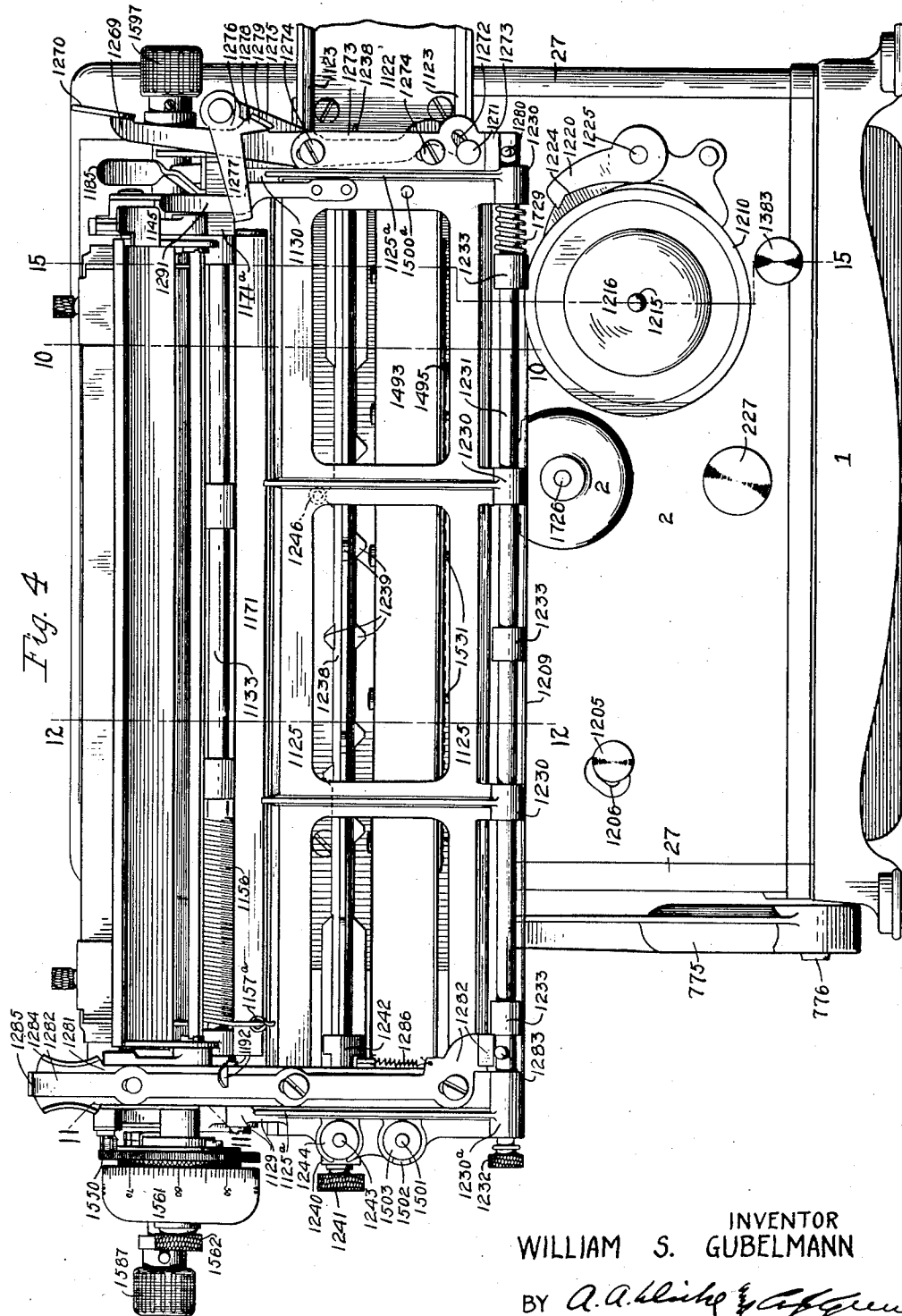
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WILLIAM S. GUBELMANN

BY *A. A. Kline & Co.*
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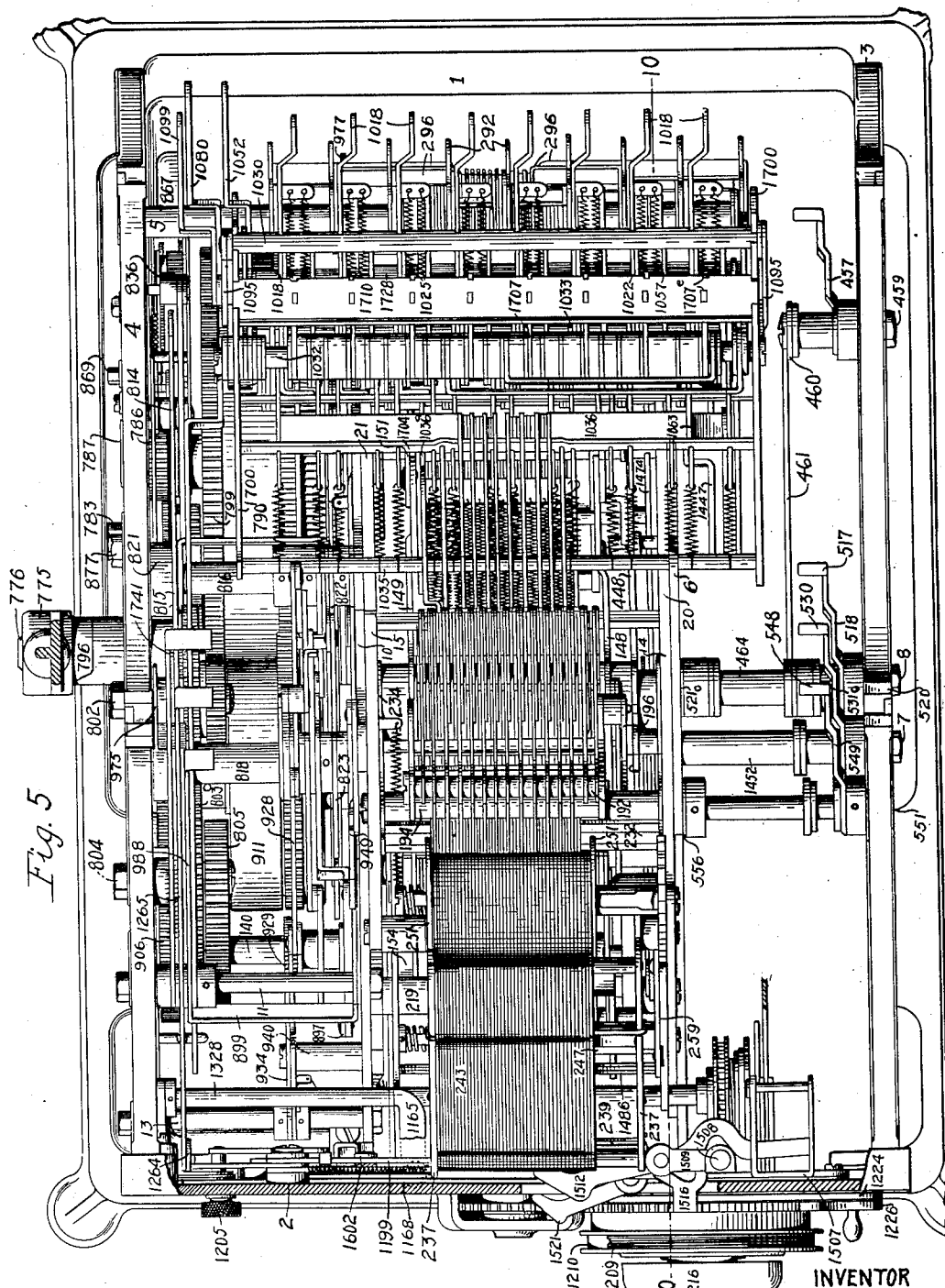


Fig. 5

INVENTOR
WILLIAM S. GUBELMANN
BY *A. A. Wiley*
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July 31, 1934.

W. S. GUBELMANN

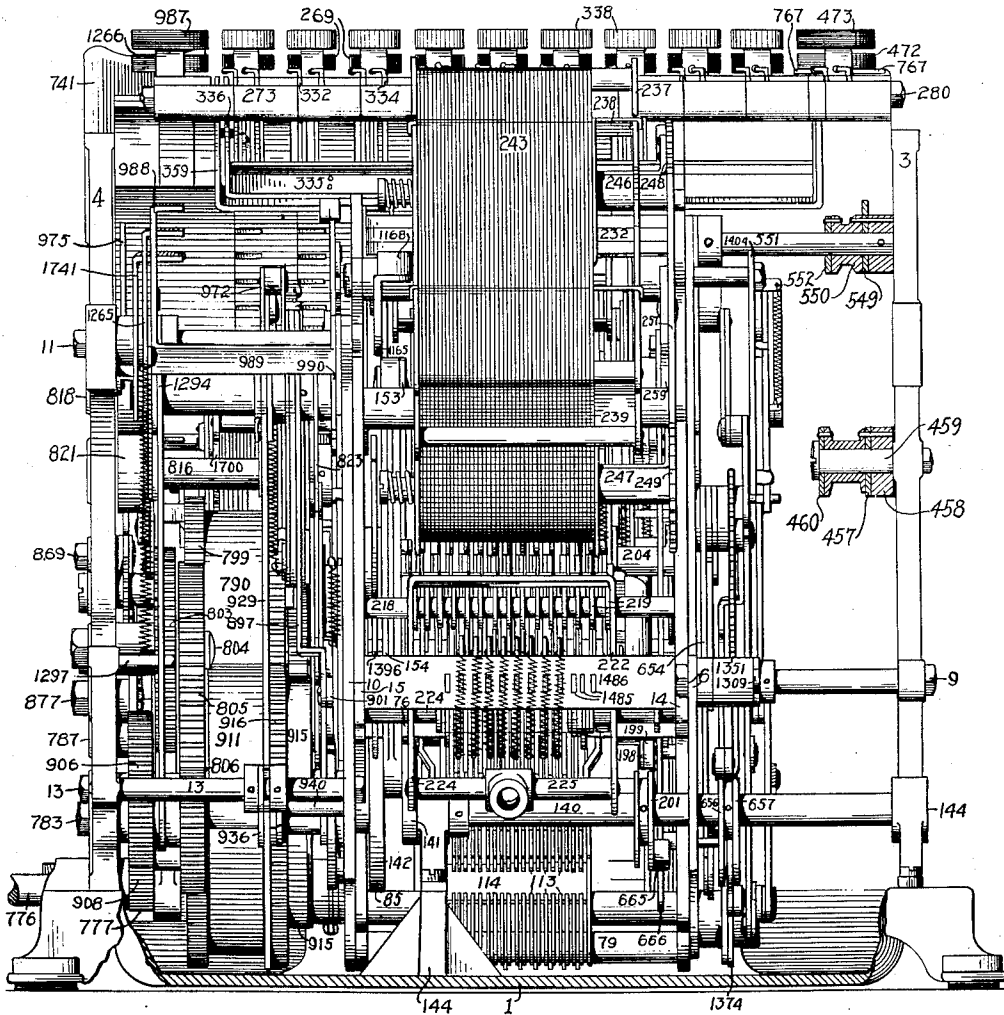
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Fig. 6



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Attorneys
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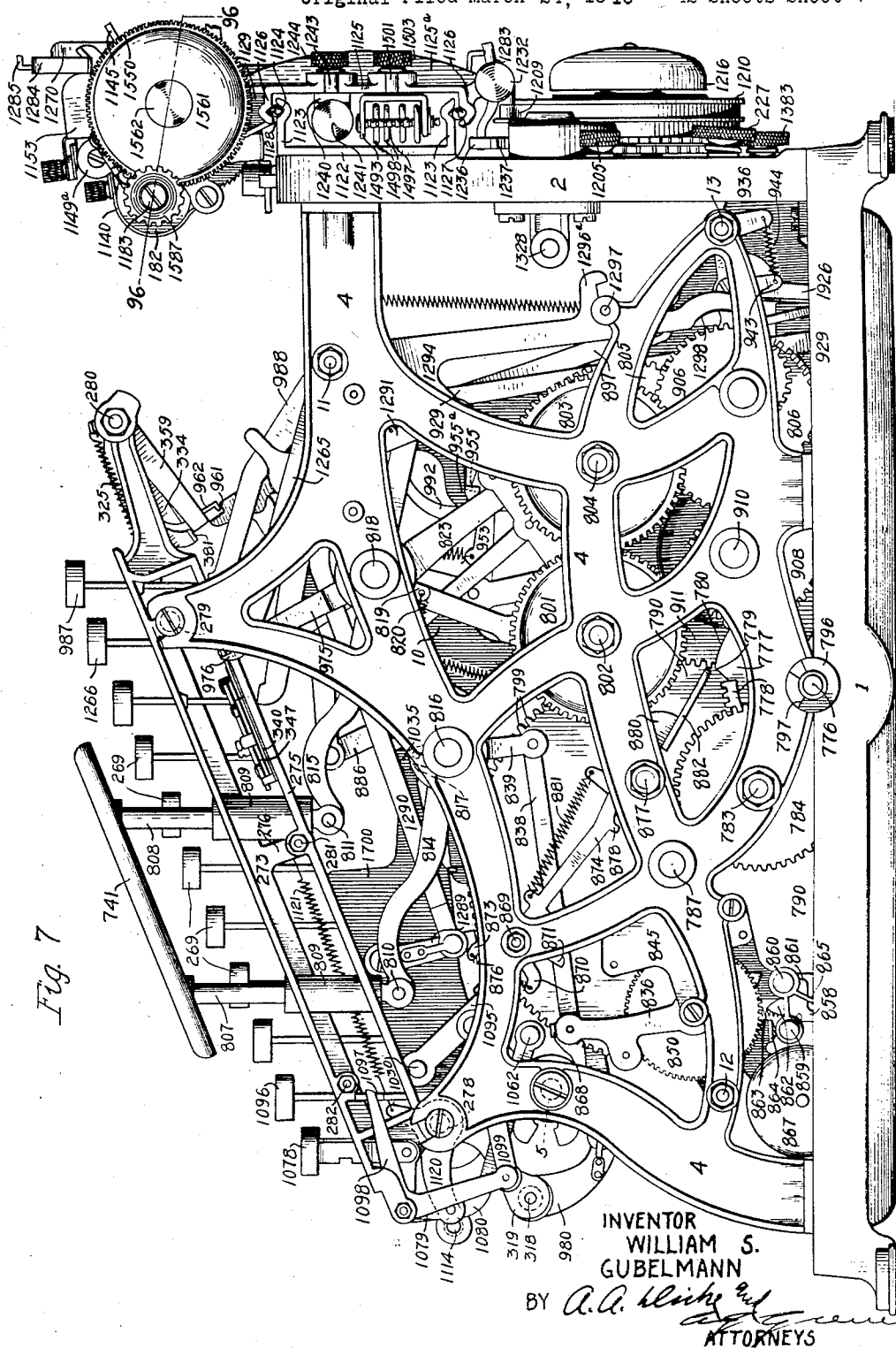
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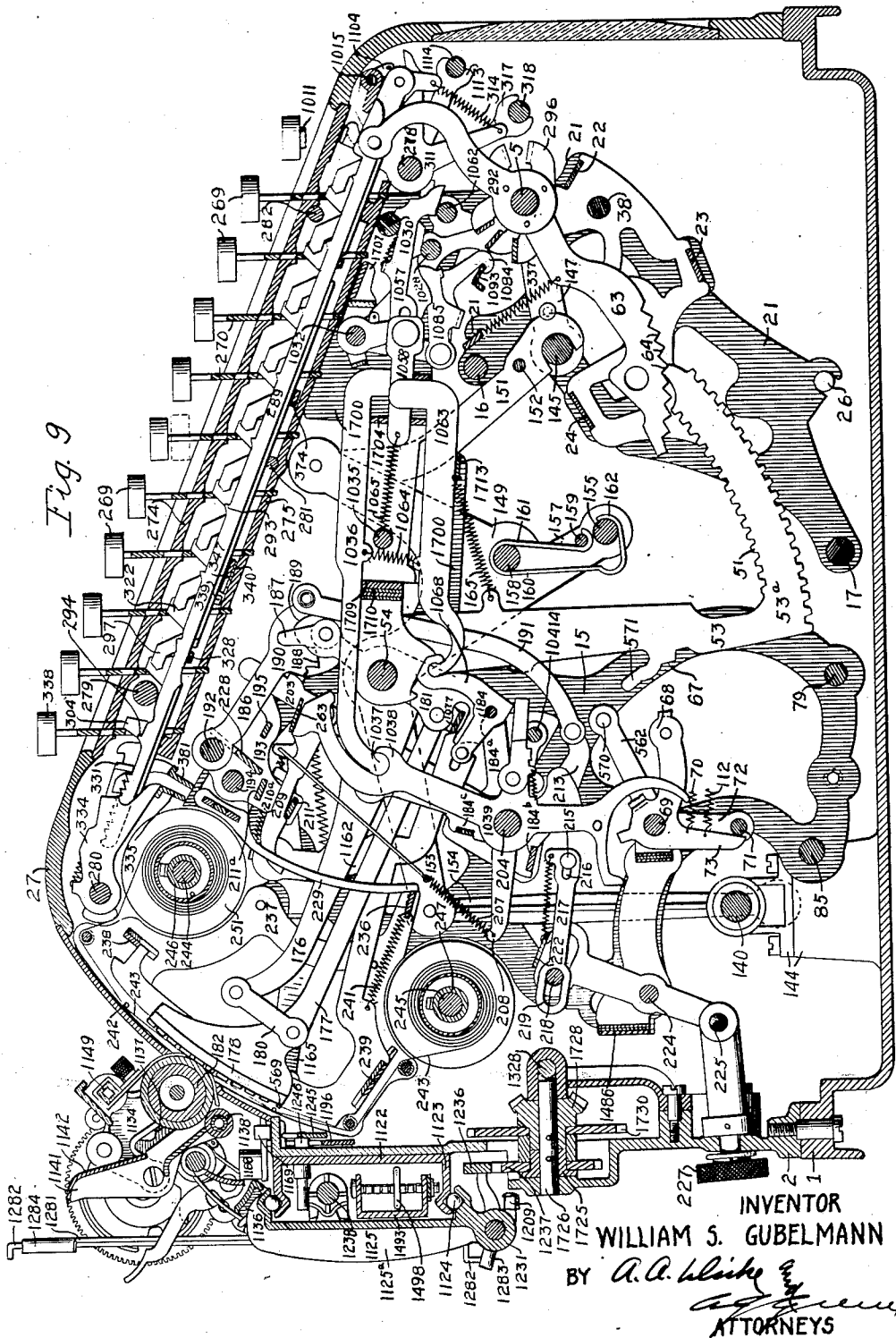
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July 31, 1934.

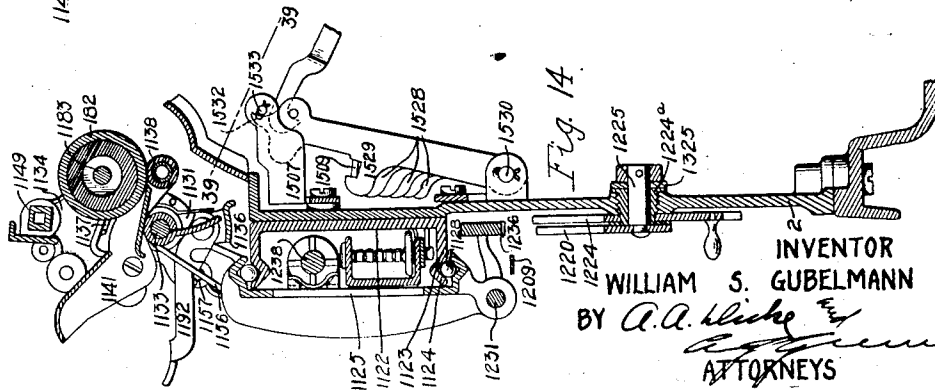
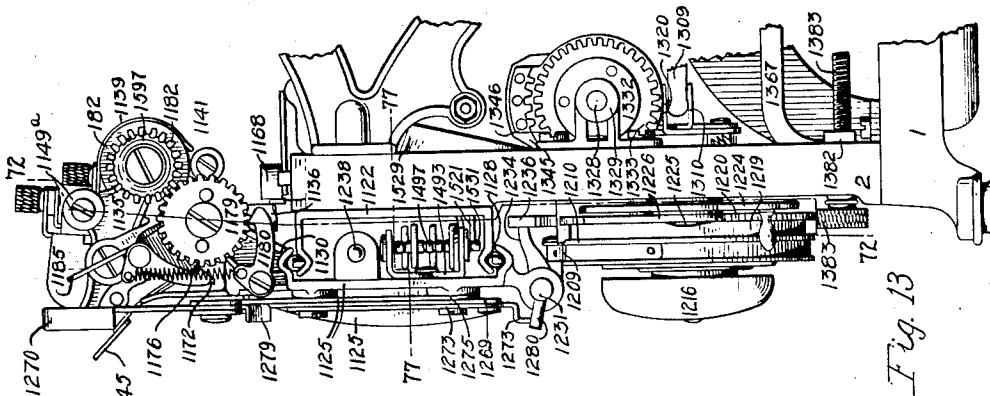
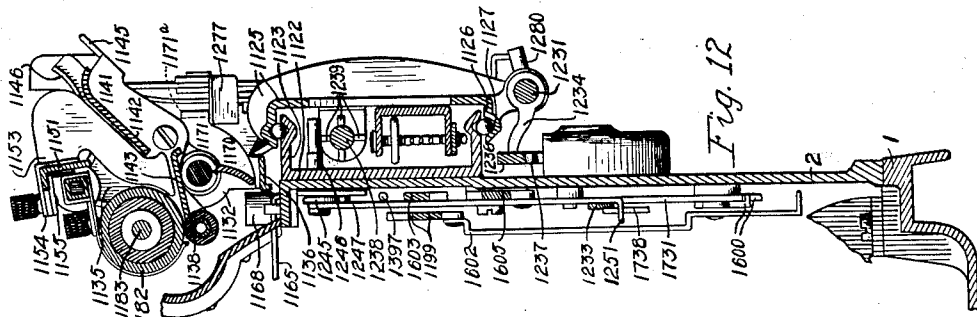
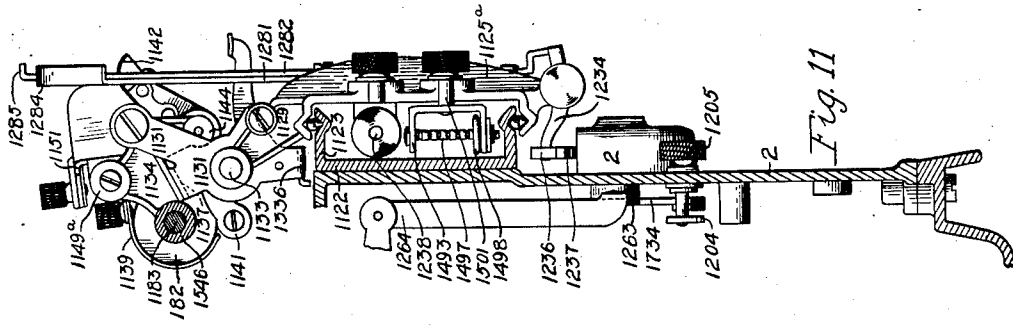
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INVENTOR

WILLIAM S. GUBELMANN

BY *A.A. Hickey*
[Signature]
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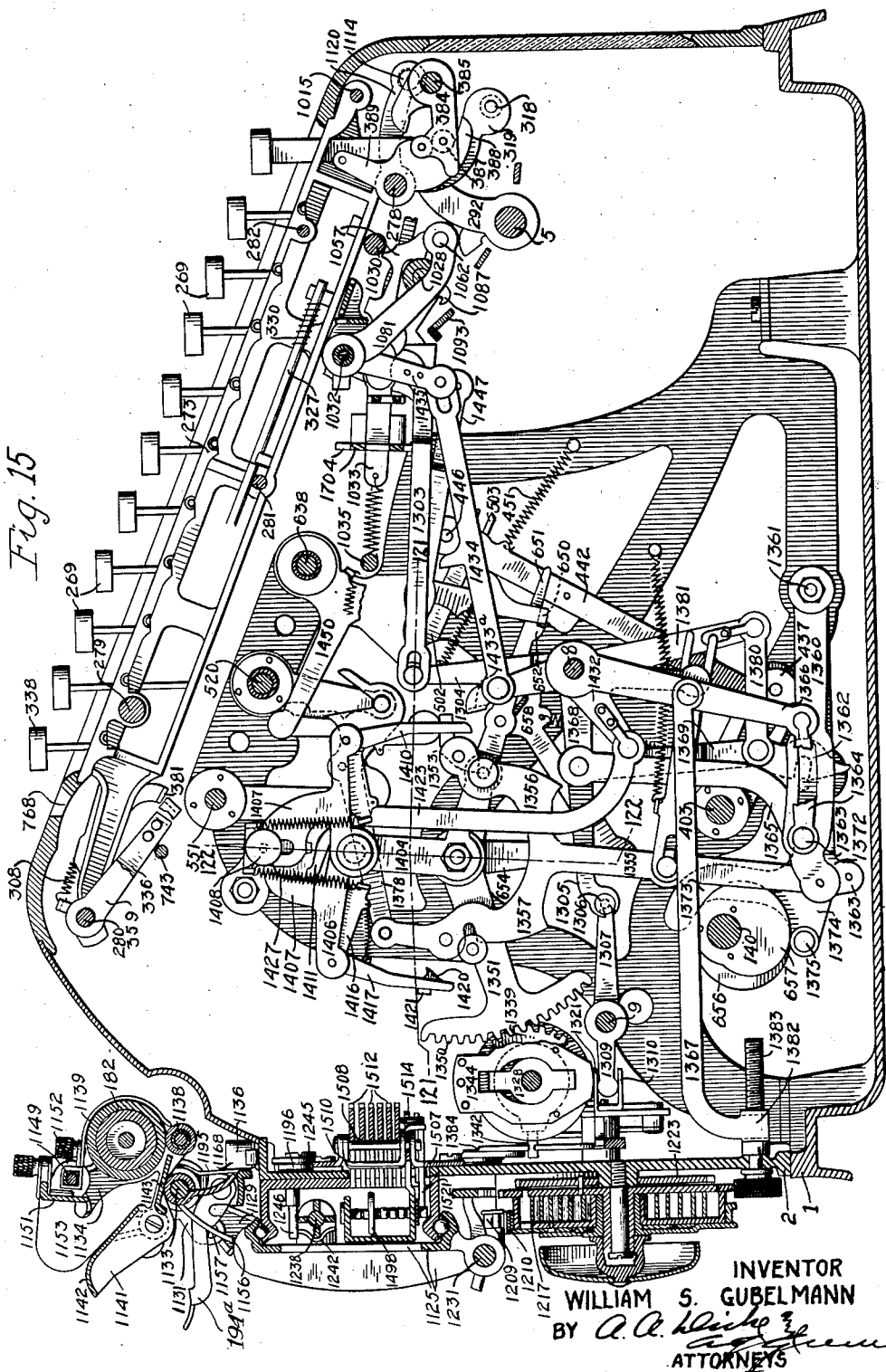
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July 31, 1934.

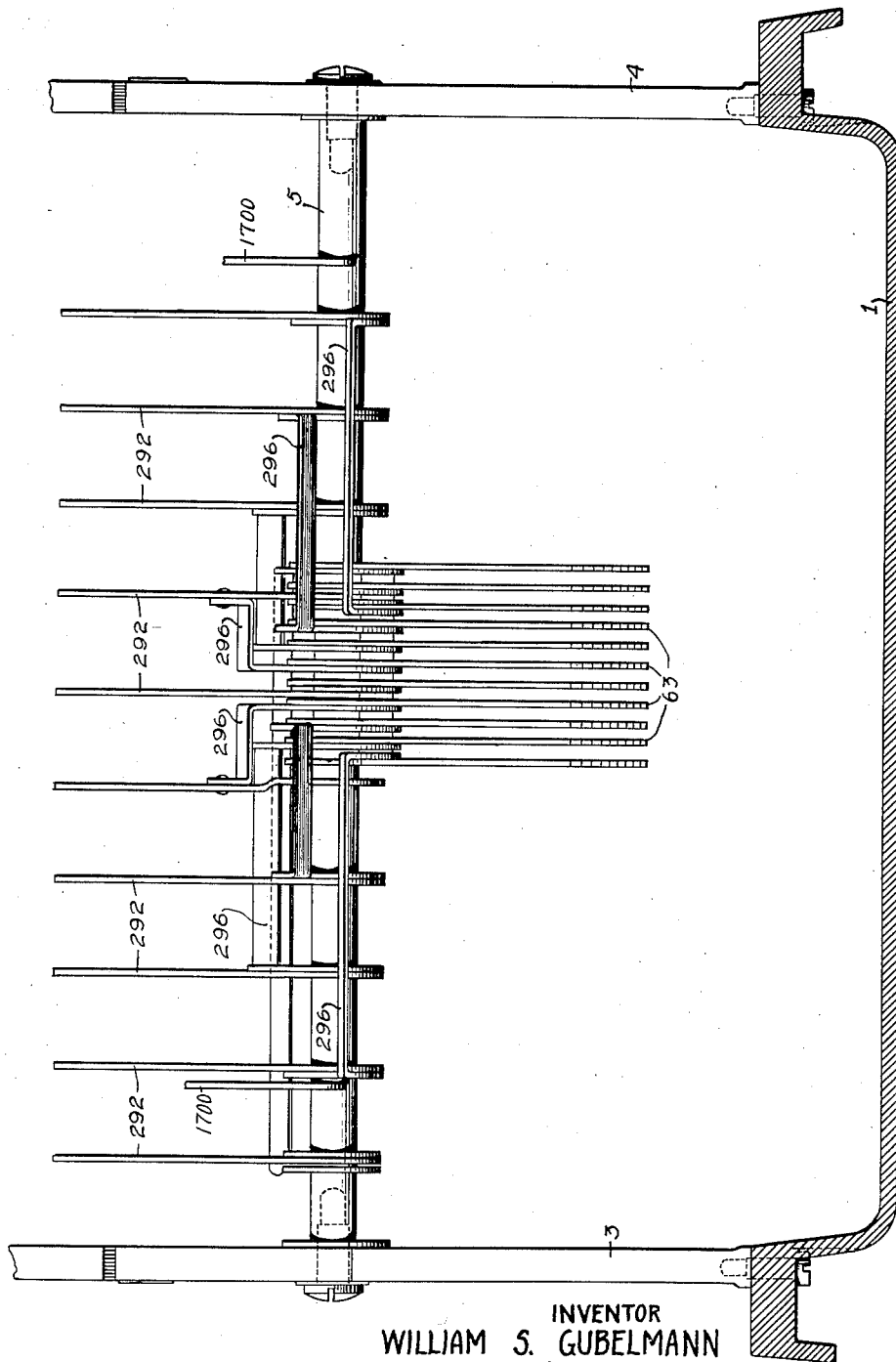
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Fig. 16



INVENTOR
WILLIAM S. GUBELMANN
BY *A. A. Hickey & Co.*
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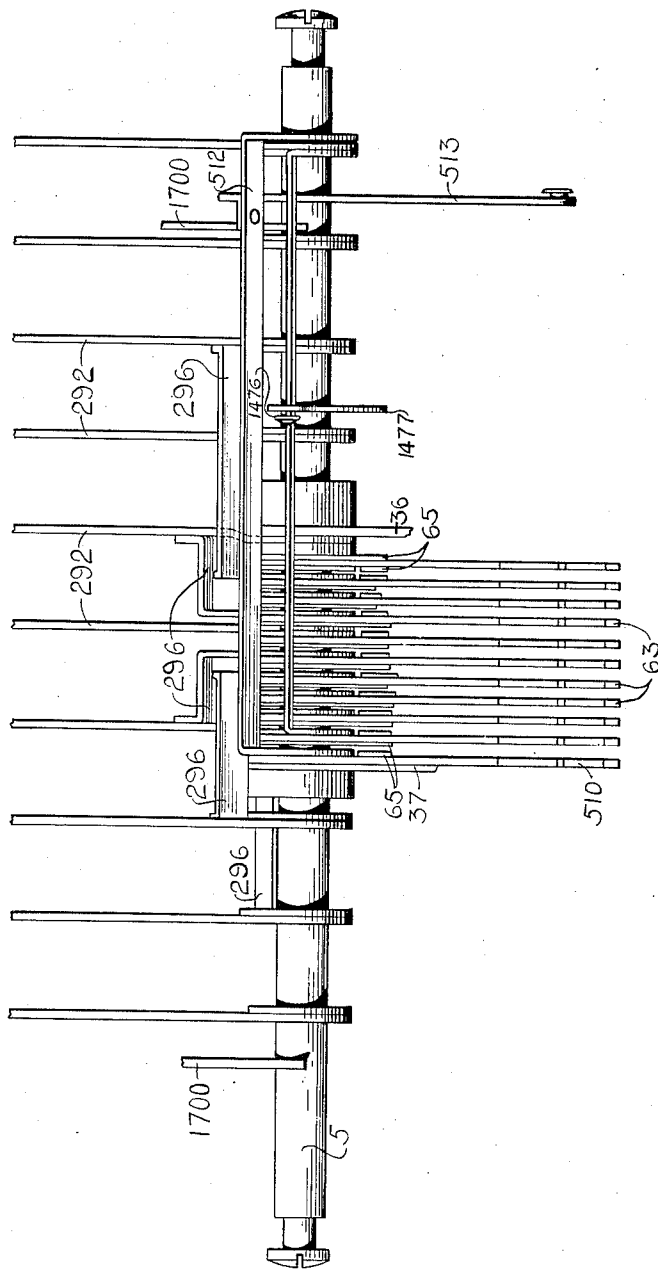
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WILLIAM S. GUBELMANN
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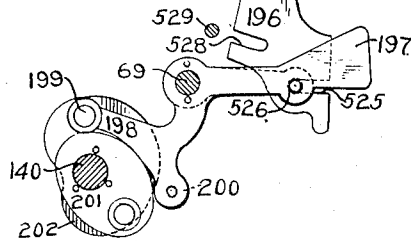
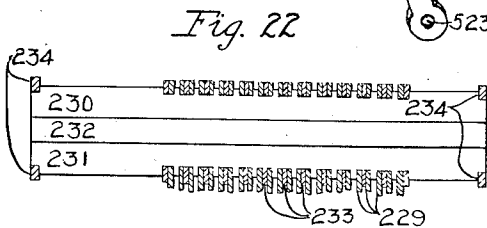
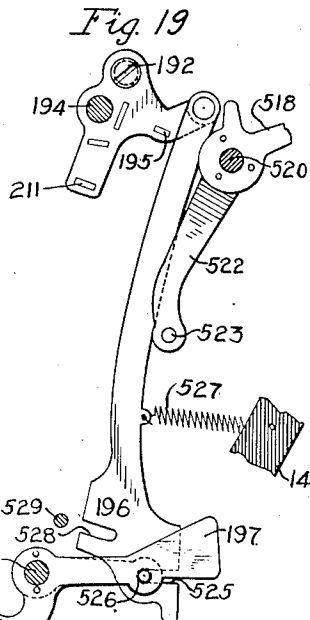
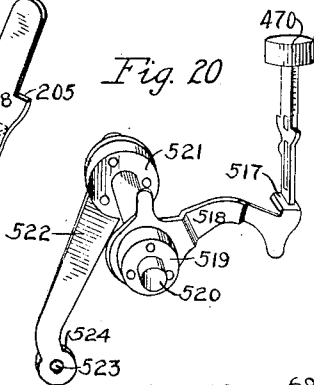
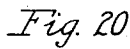
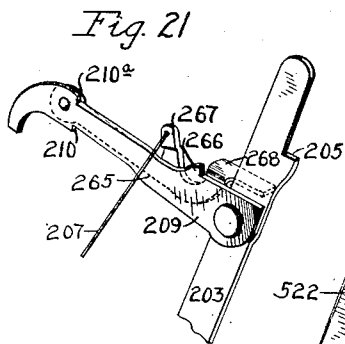
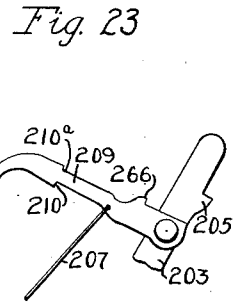
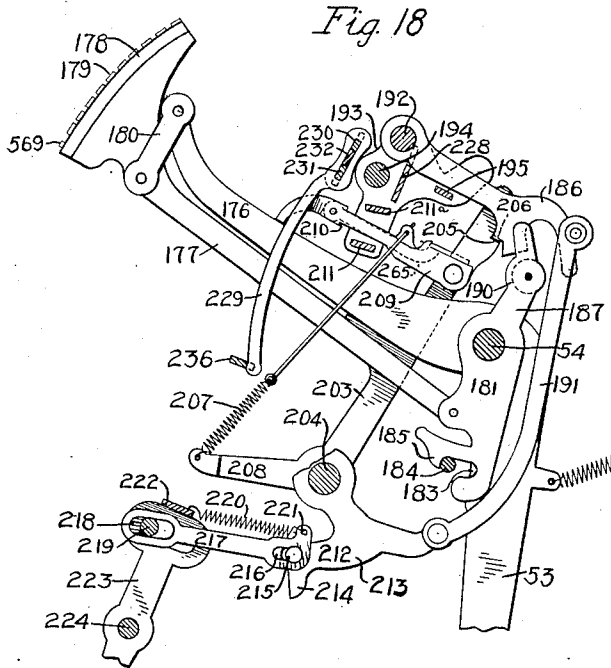
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WILLIAM S. GUBELMANN

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Fig. 24

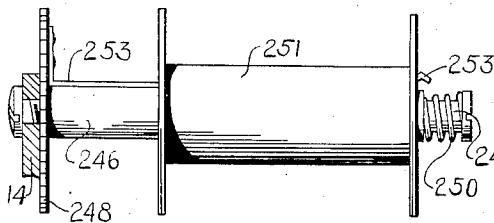


Fig. 25

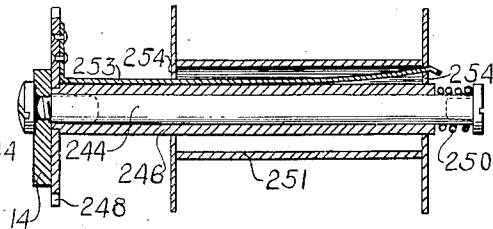


Fig. 26

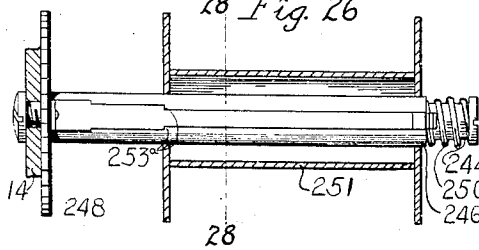


Fig. 27

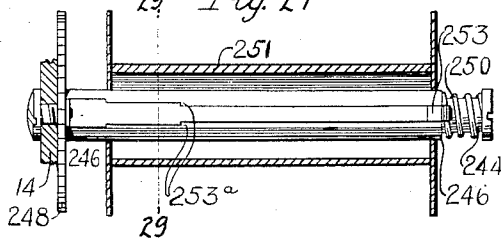


Fig. 28

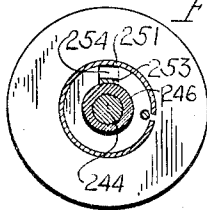
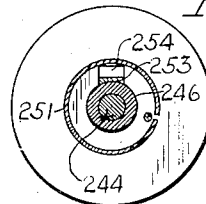


Fig. 29



INVENTOR
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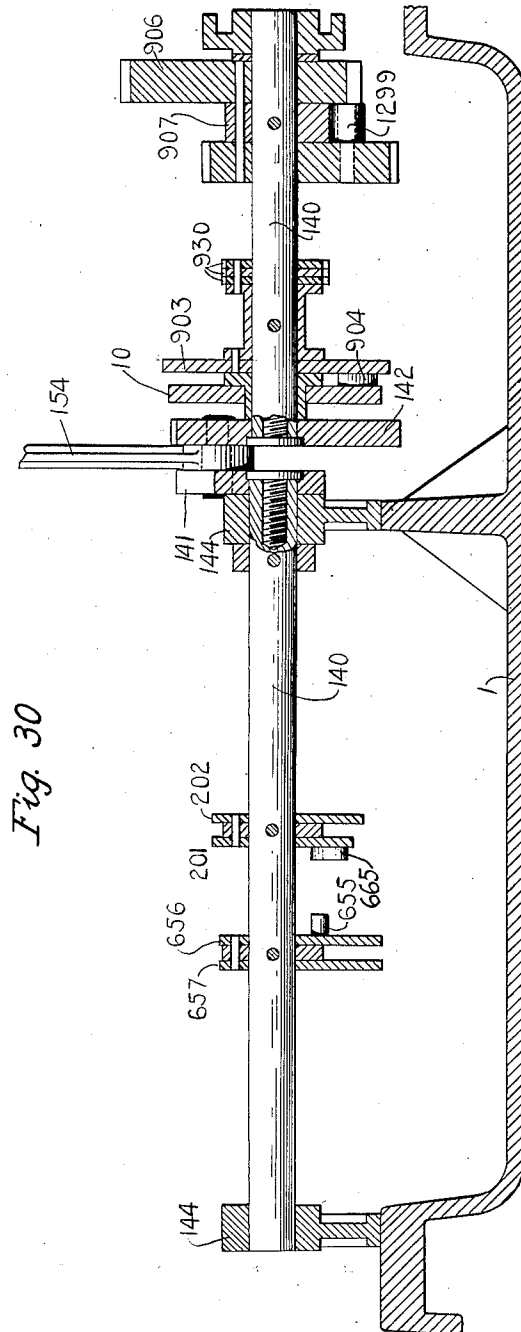


Fig. 30

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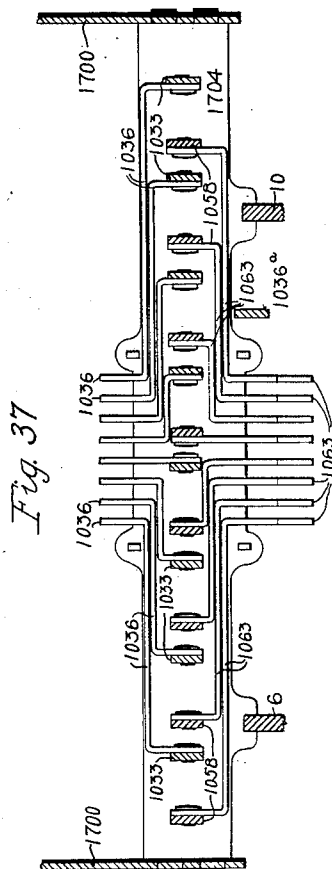
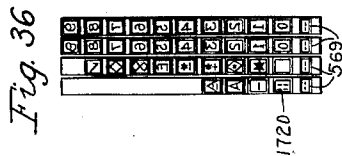
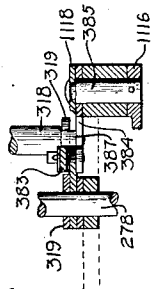
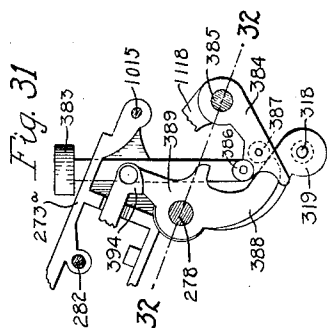
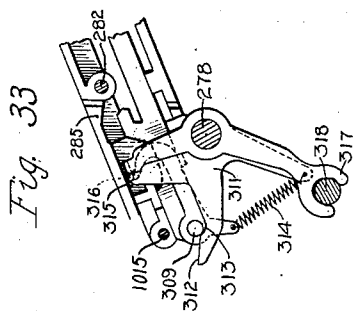
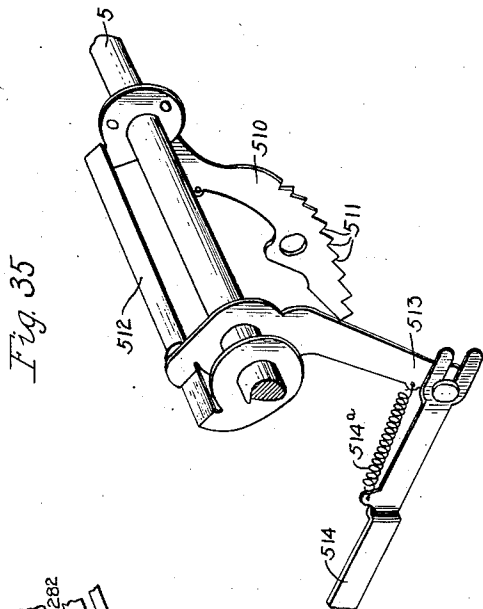


Fig. 34

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WILLIAM S. GUBELMANN
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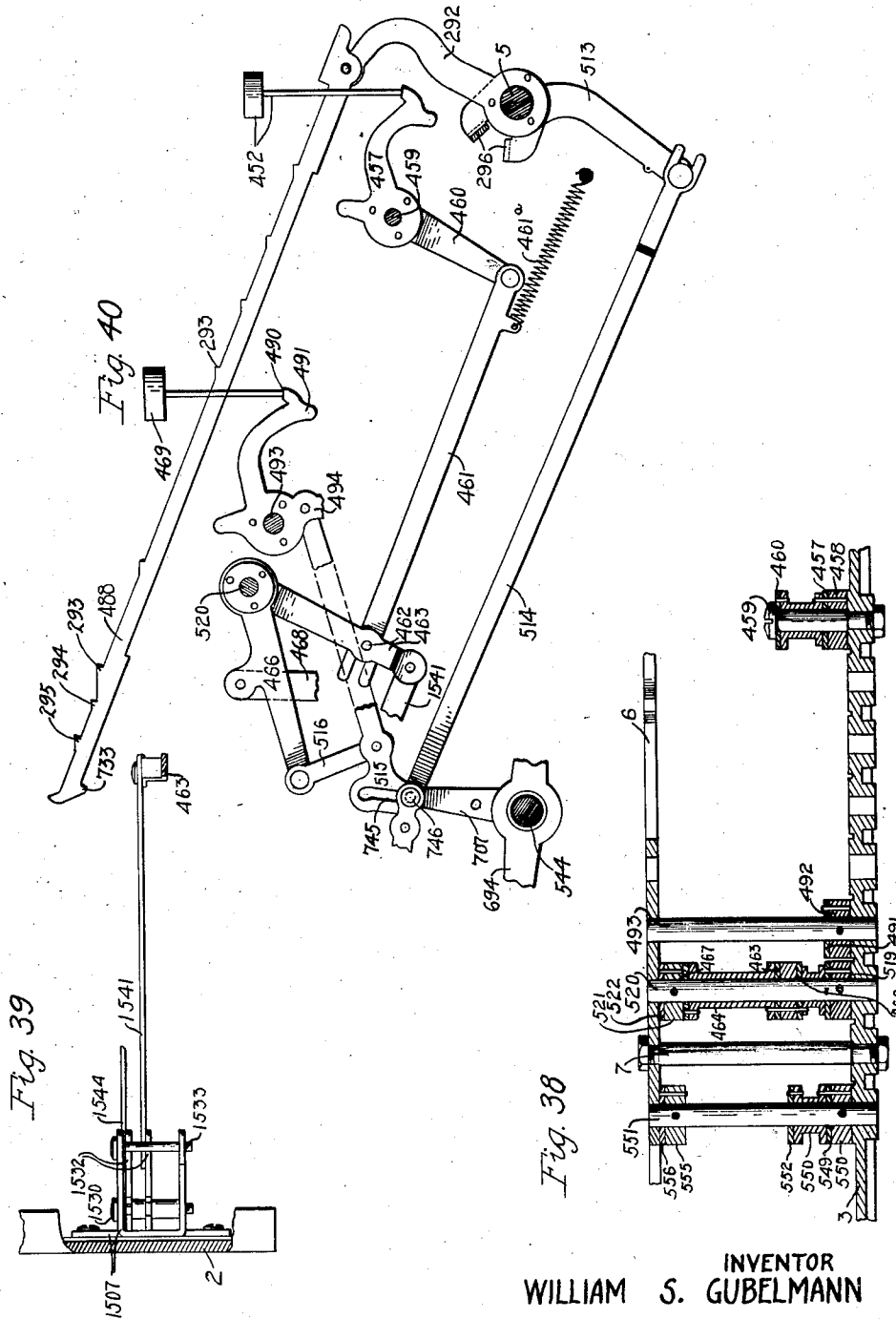
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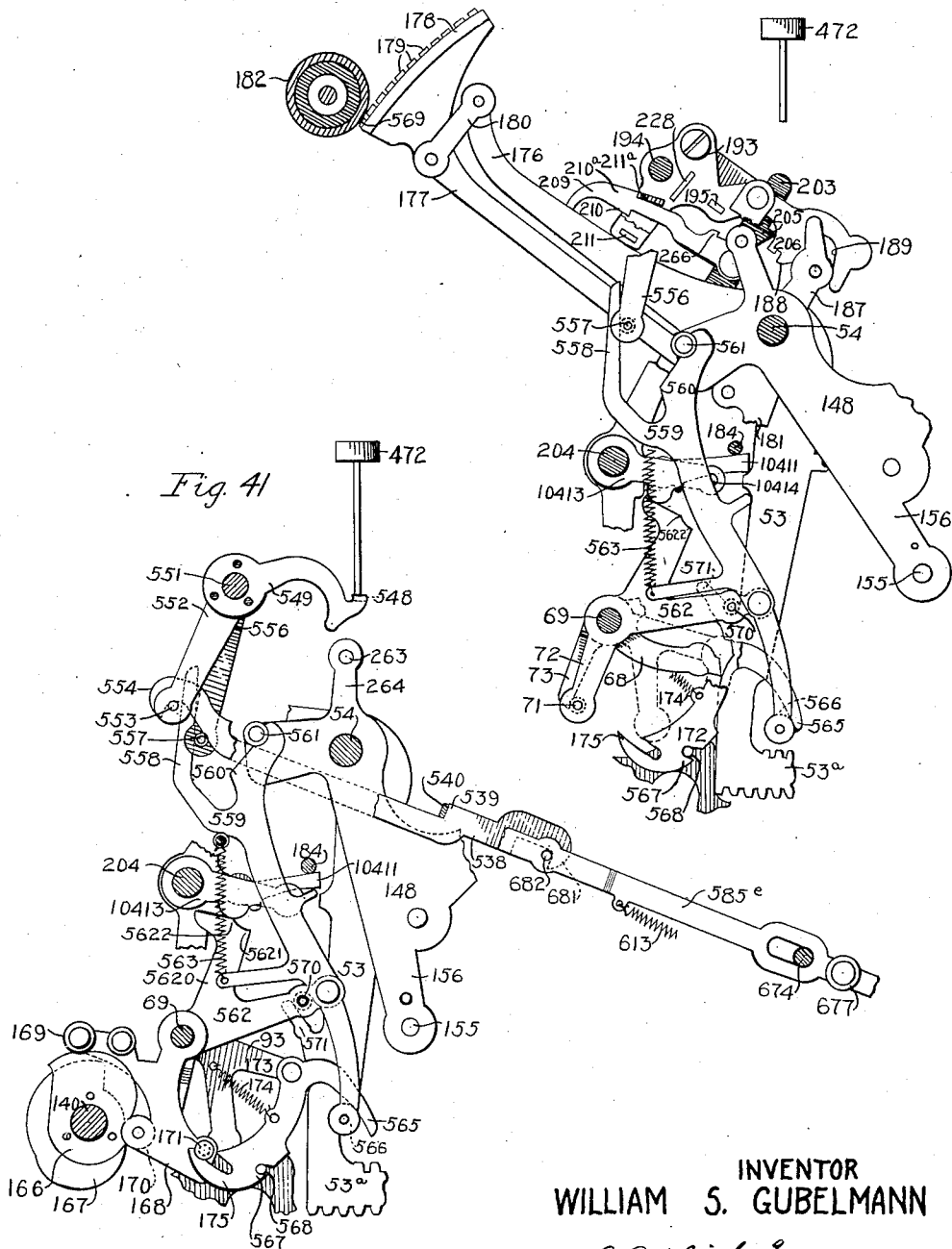
BY *A. A. Kline & Co.*
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Fig. 42'



INVENTOR
WILLIAM S. GUBELMANN

BY *A.A. Hinkle & Associates*
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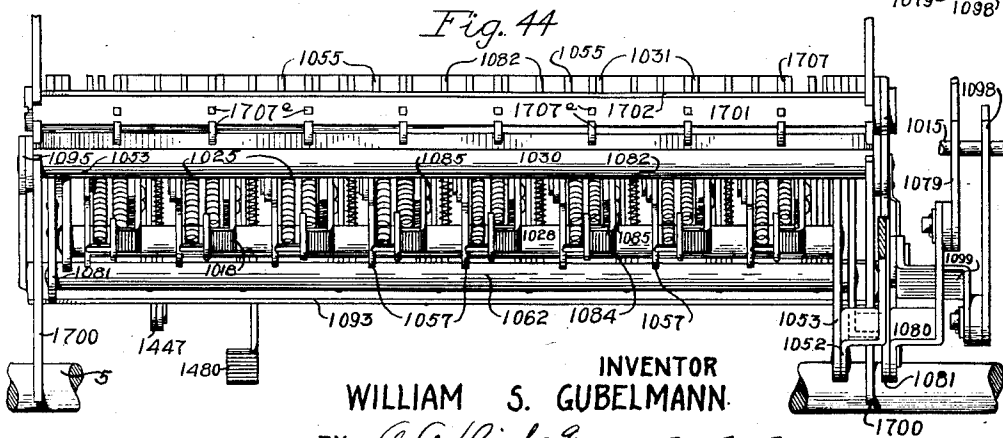
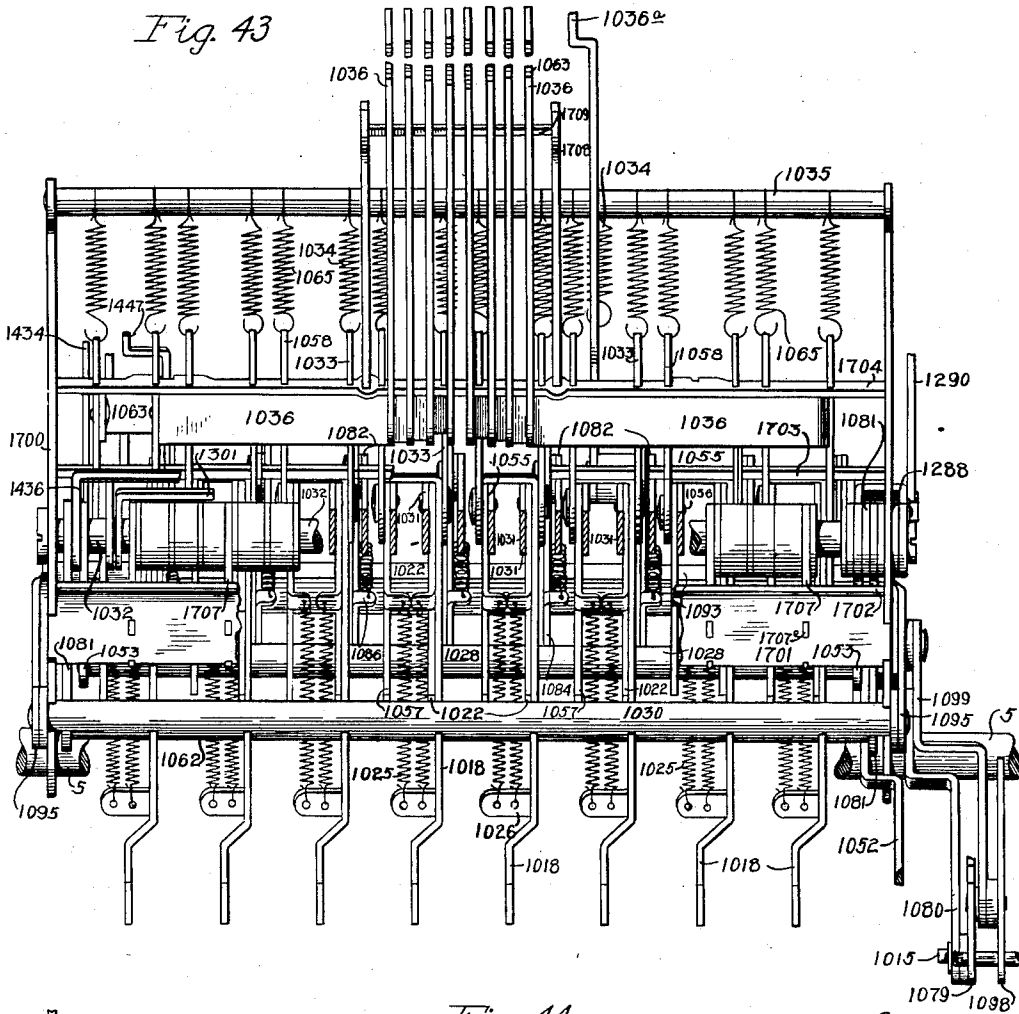
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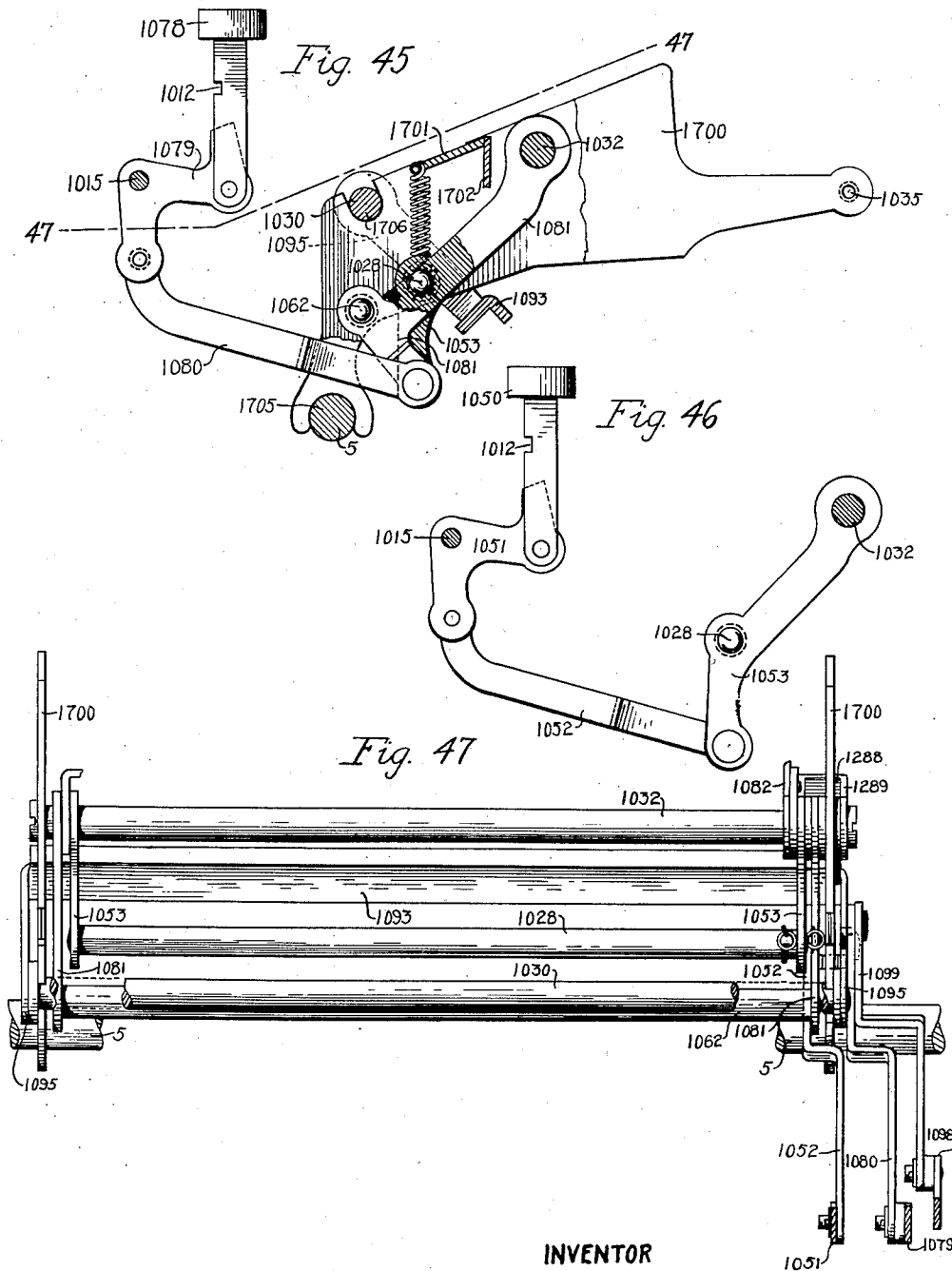
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INVENTOR
WILLIAM S. GUBELMANN
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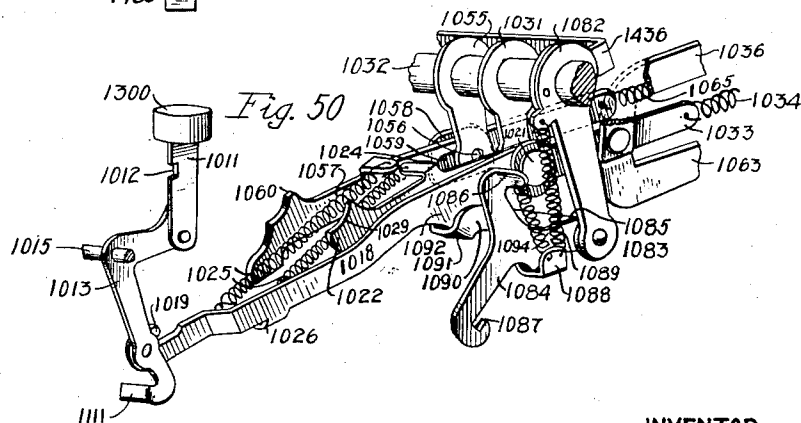
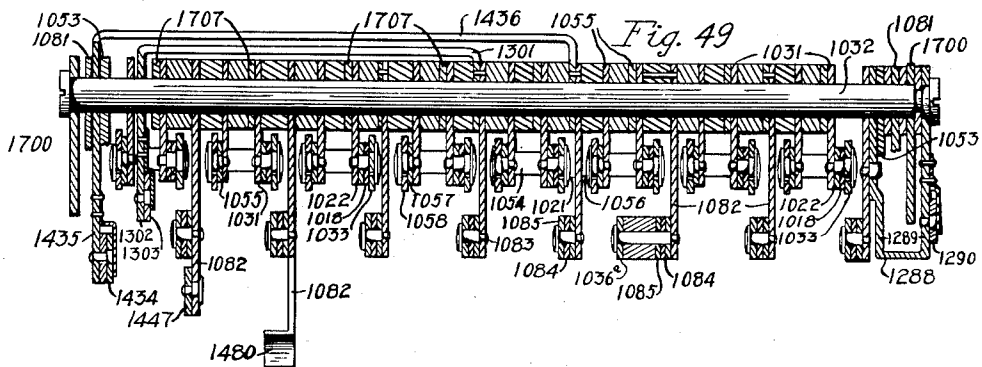
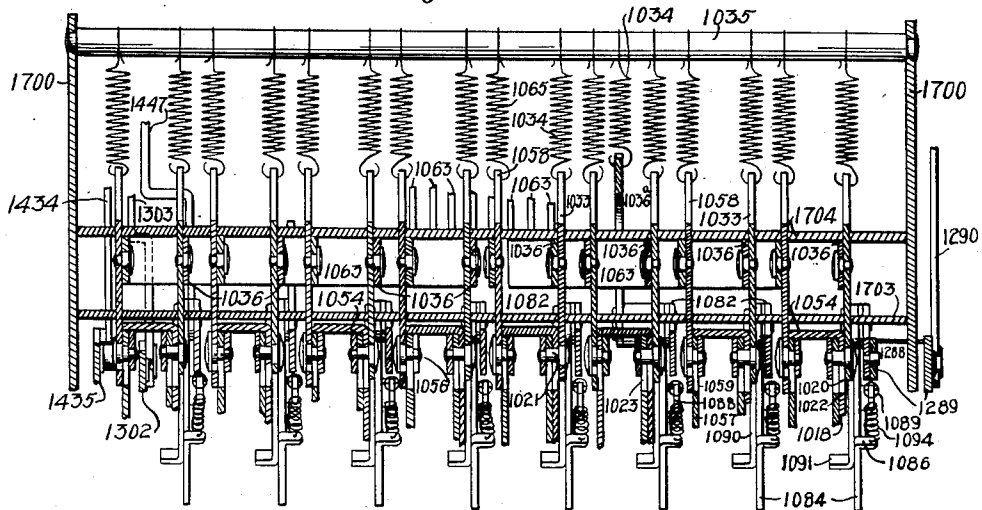
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Fig. 48



INVENTOR
WILLIAM S. GUBELMANN
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Fig. 51

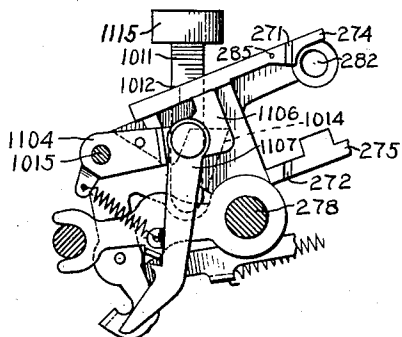


Fig. 52

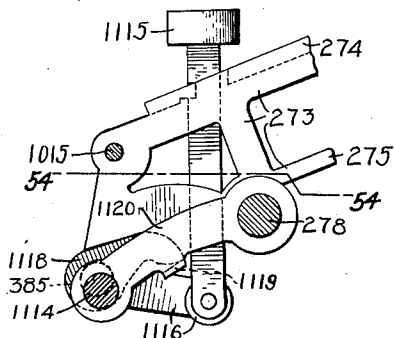


Fig. 53

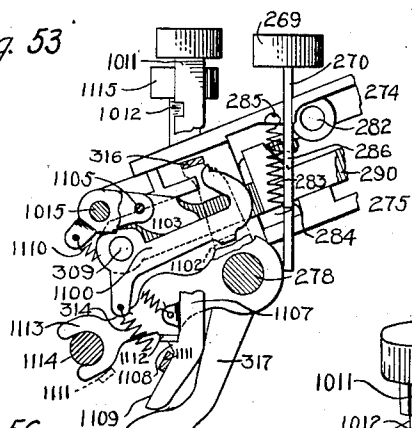


Fig. 54

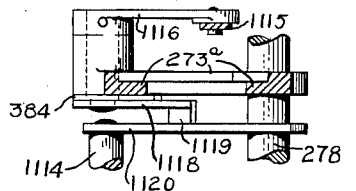


Fig. 55

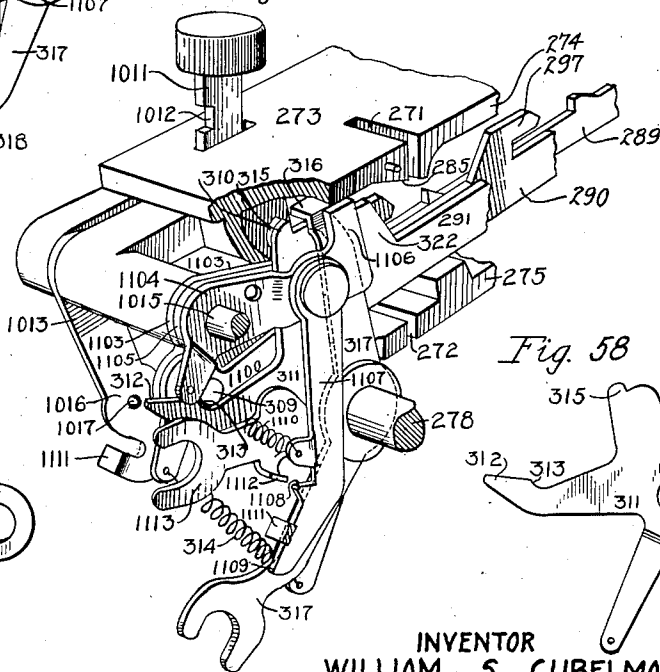


Fig. 56

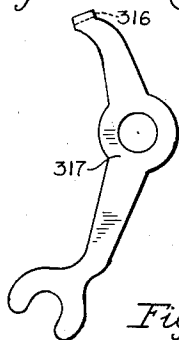


Fig. 57

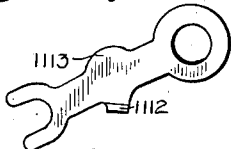
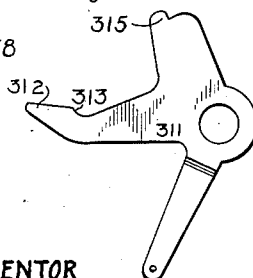


Fig. 58



INVENTOR
WILLIAM S. GUBELMANN
BY *A. A. Klink*
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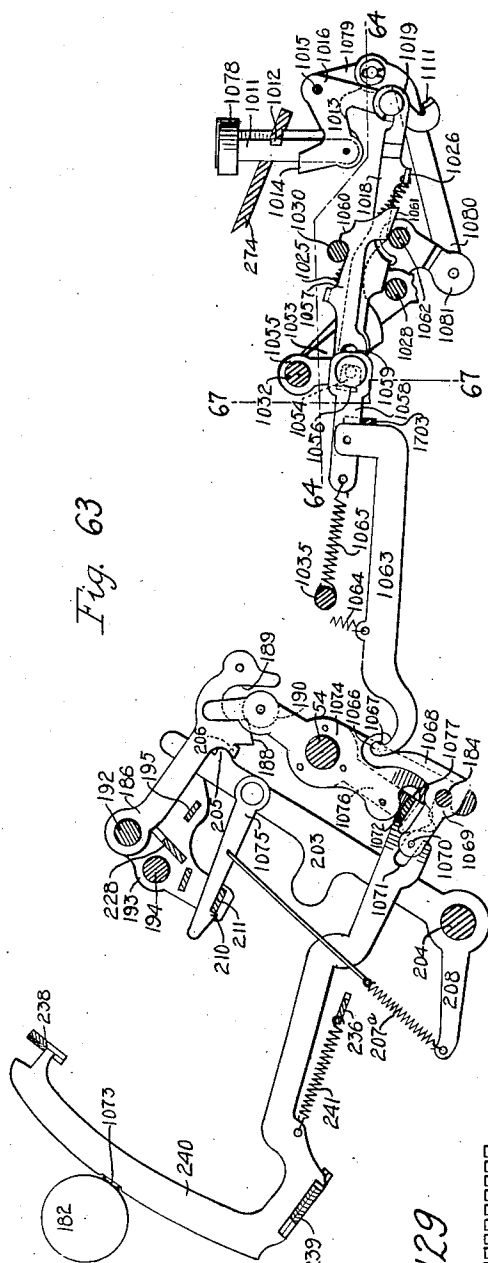


Fig. 63

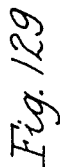


Fig. 129

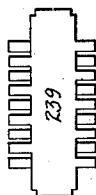


Fig. 65

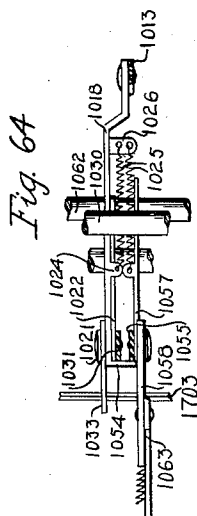
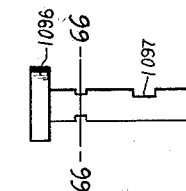


Fig. 64



Fig. 130

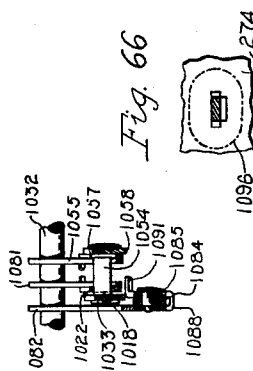


Fig. 66

INVENTOR
WILLIAM S. GUBELMANN

BY *A. A. Hinkley & A. J. Greene*
ATTORNEYS

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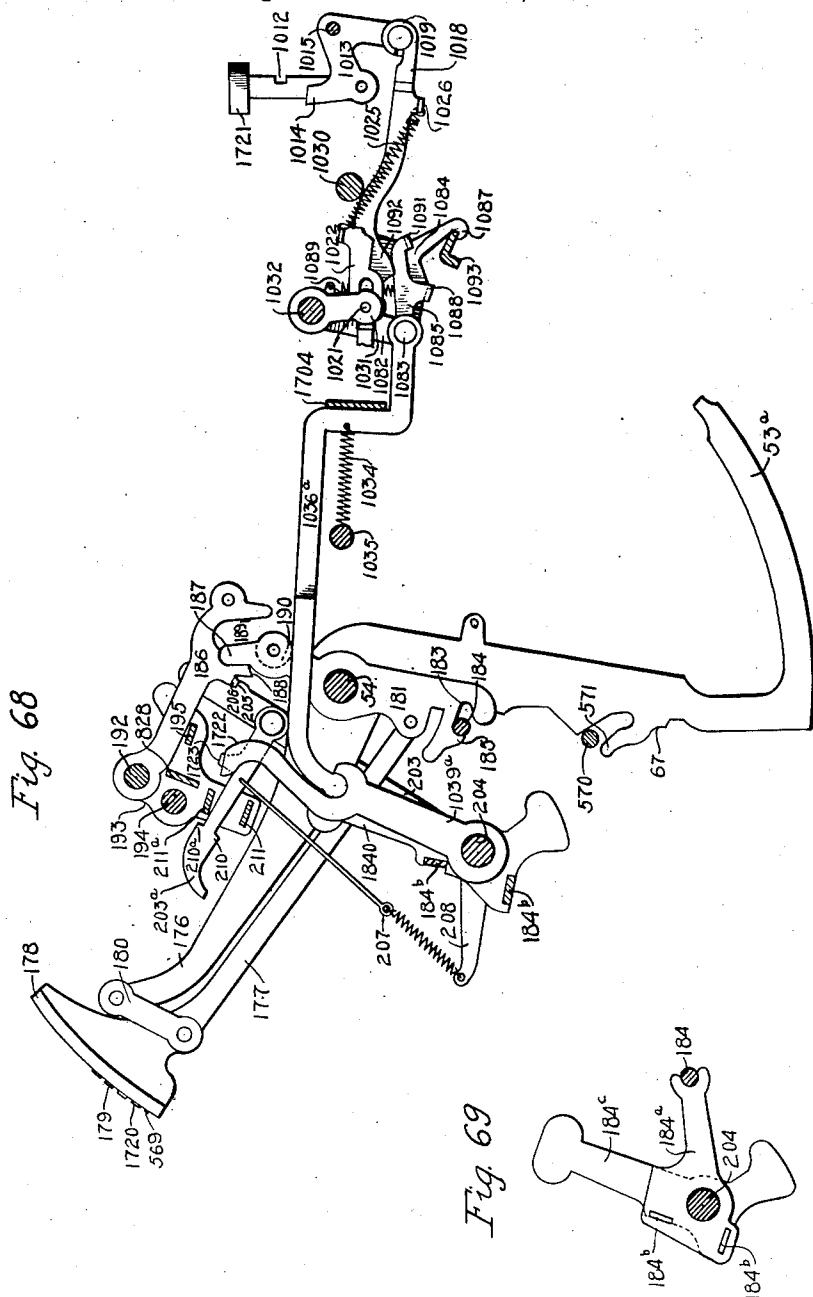
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INVENTOR
WILLIAM S. GUBELMANN

BY *A. A. Hickey & Company*
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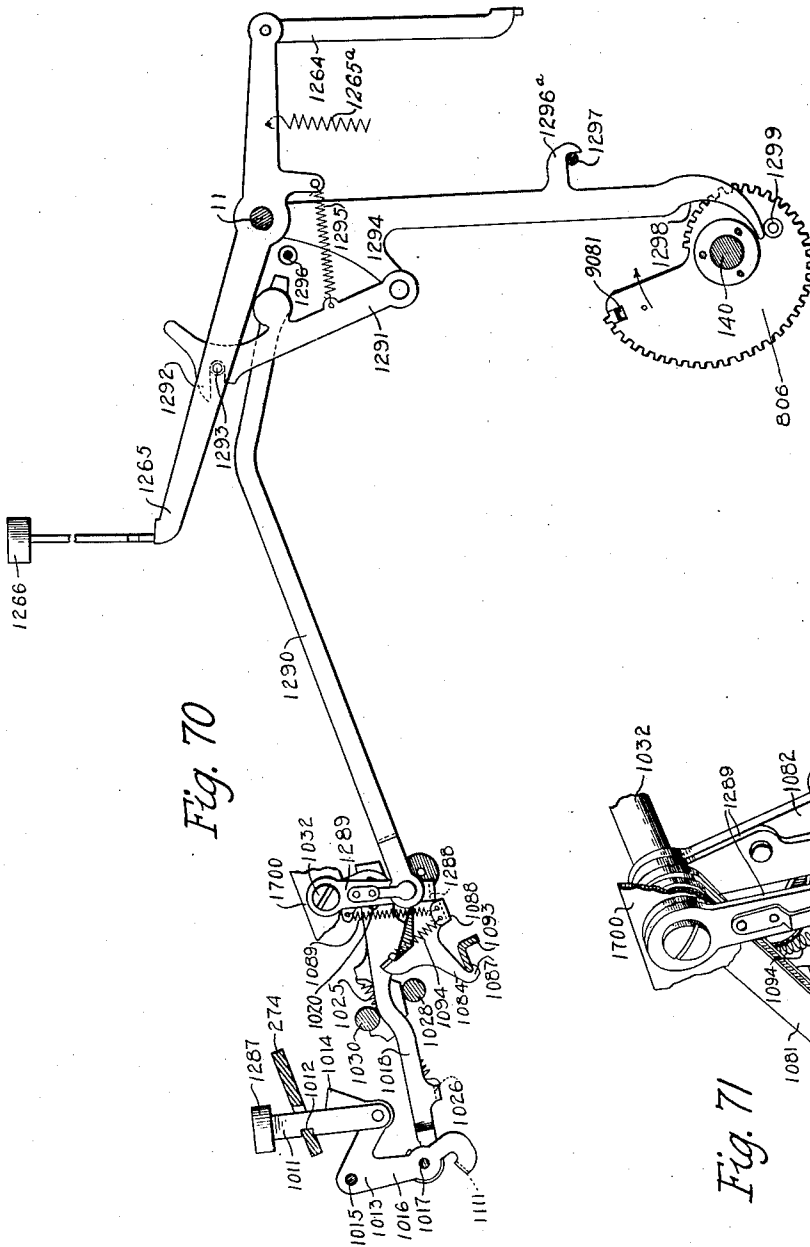


Fig. 70

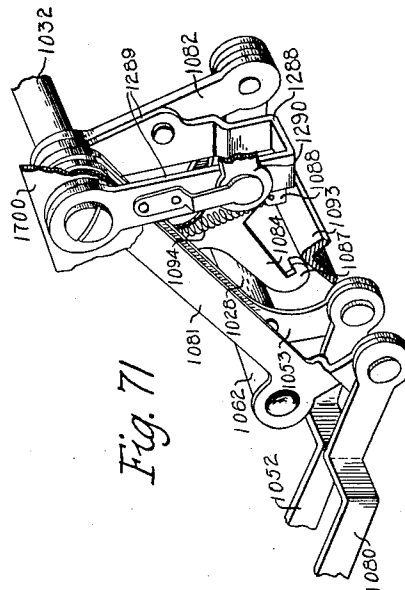


Fig. 71

WILLIAM S. GUBELMANN INVENTOR

BY *A. A. Hickey & Eugene*
ATTORNEYS

July 31, 1934.

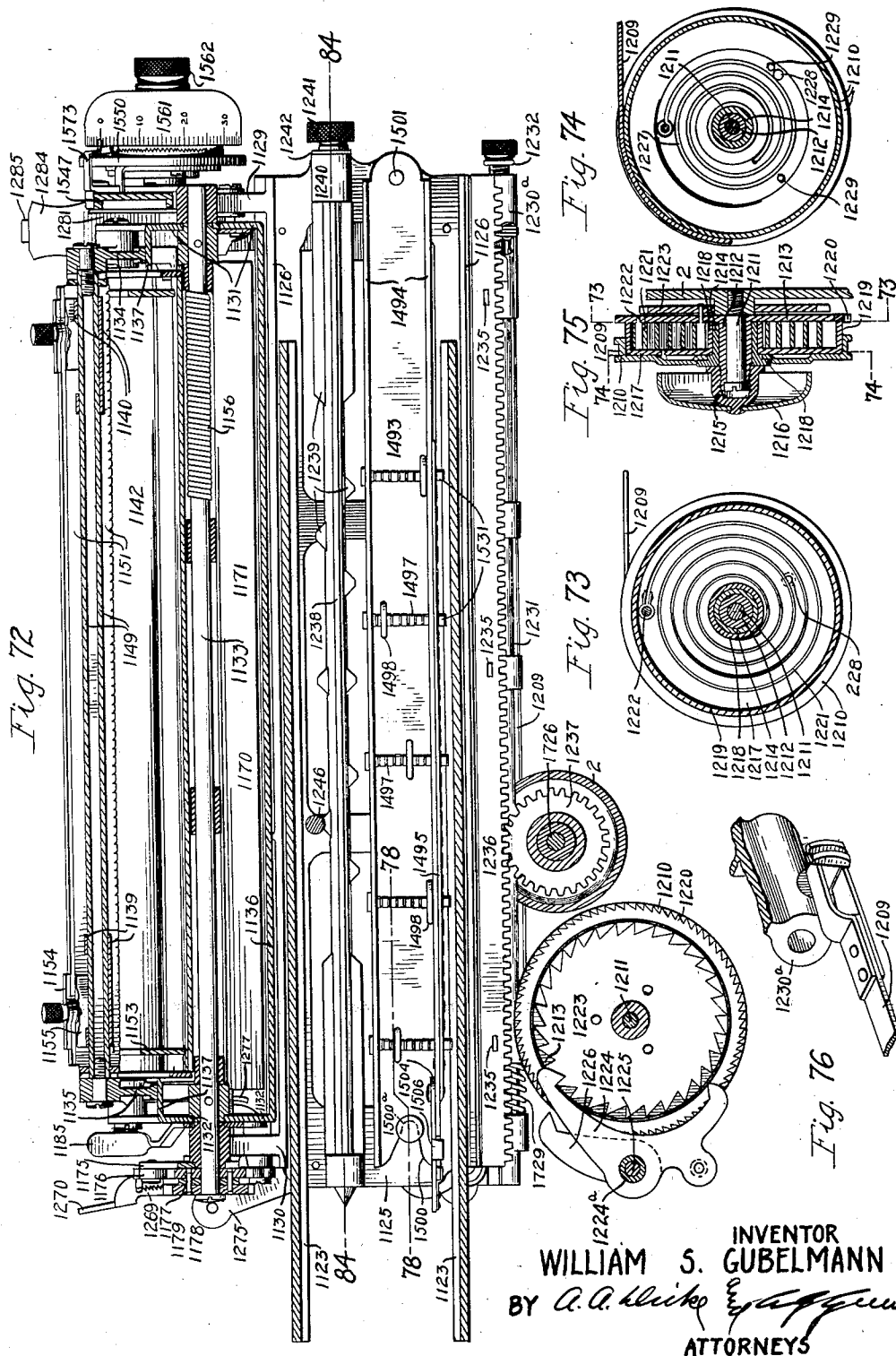
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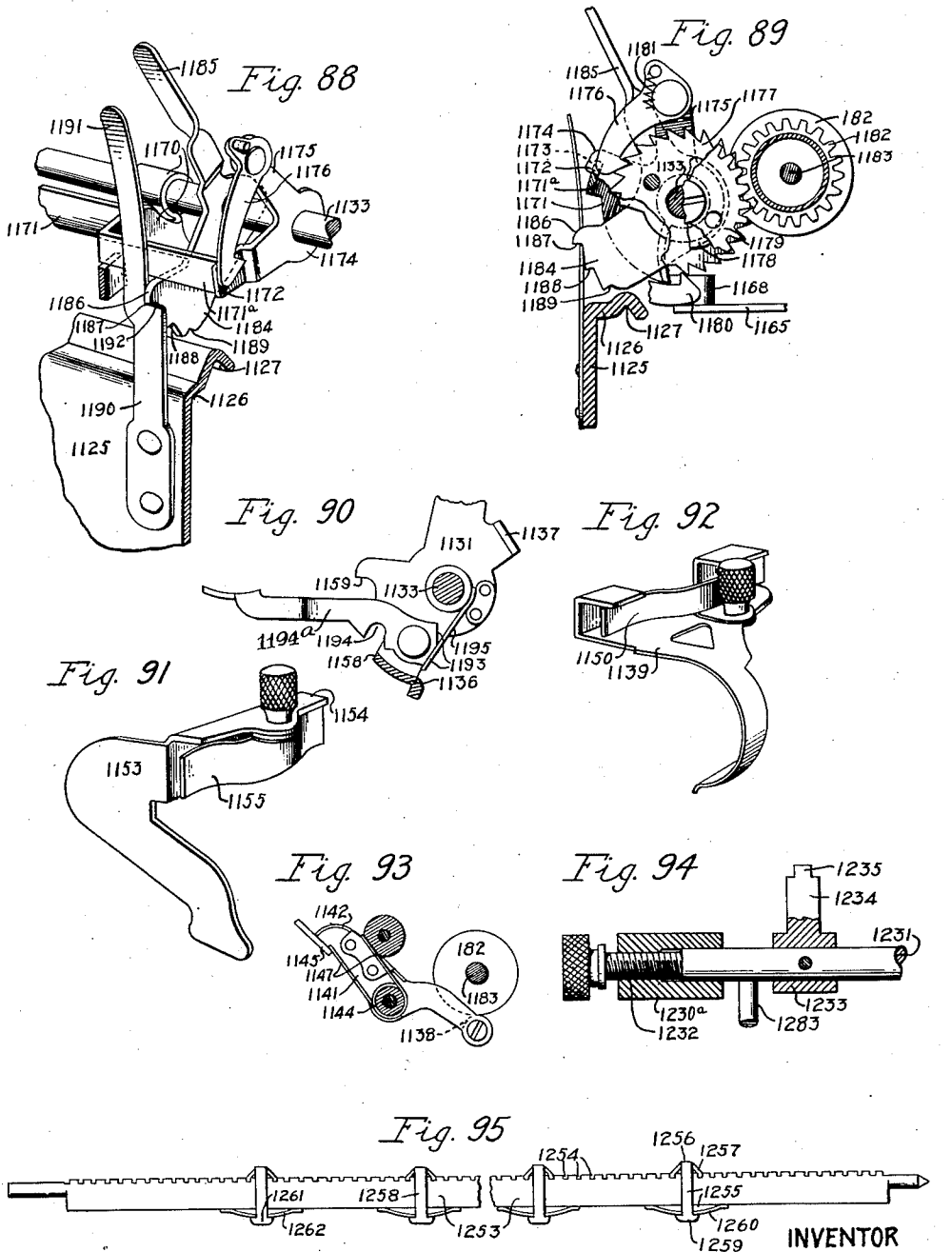
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INVENTOR
WILLIAM S. GUBELMANN

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Fig. 96

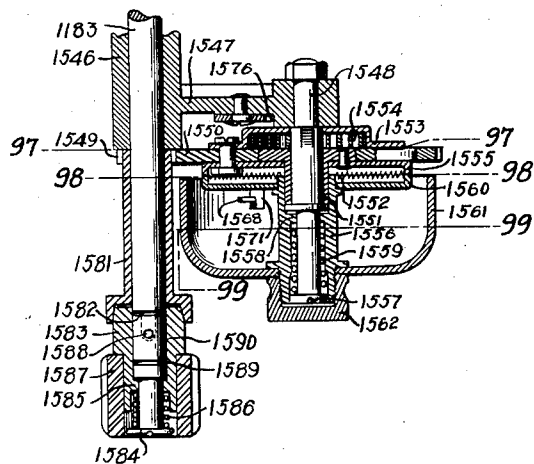


Fig. 97

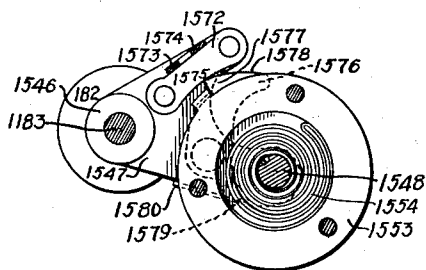


Fig. 98

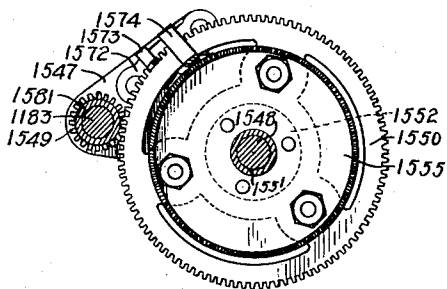


Fig. 99

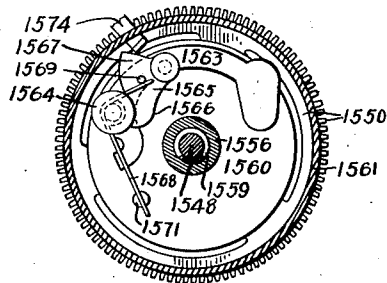
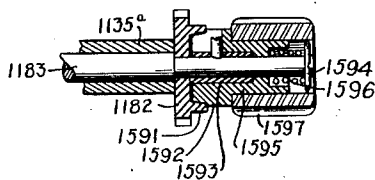


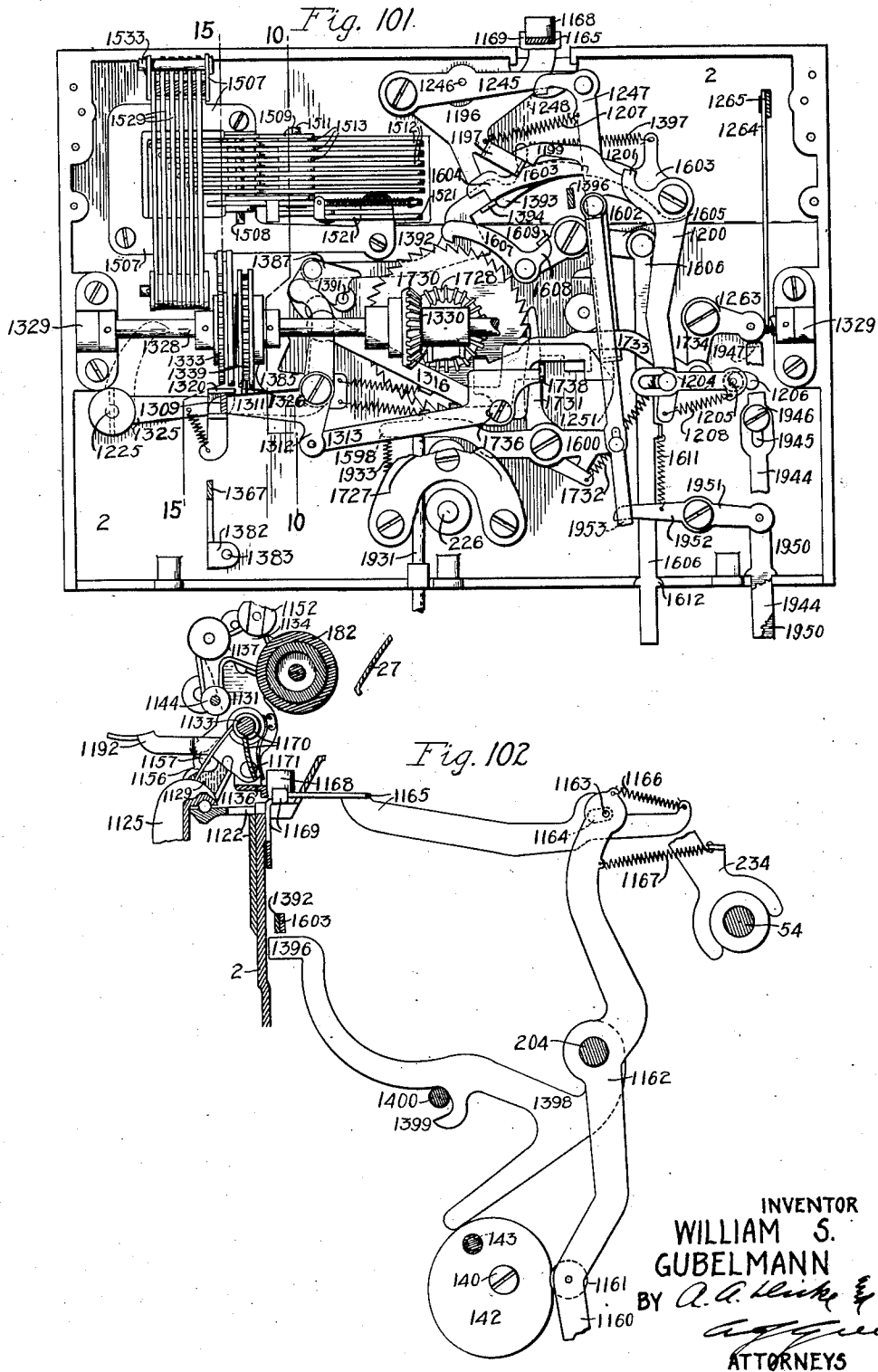
Fig. 100



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Fig. 103

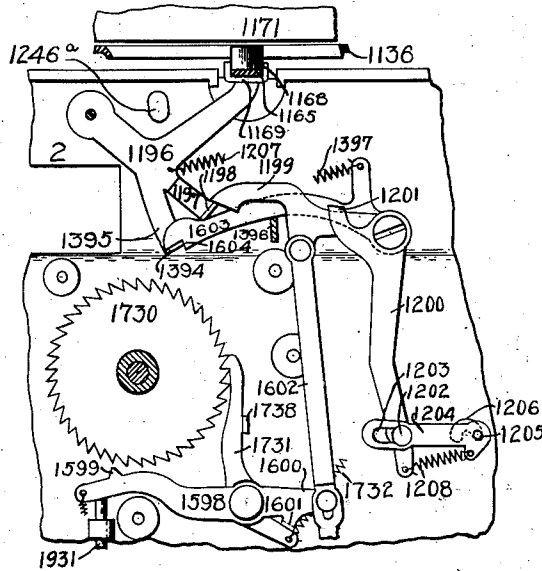


Fig. 104

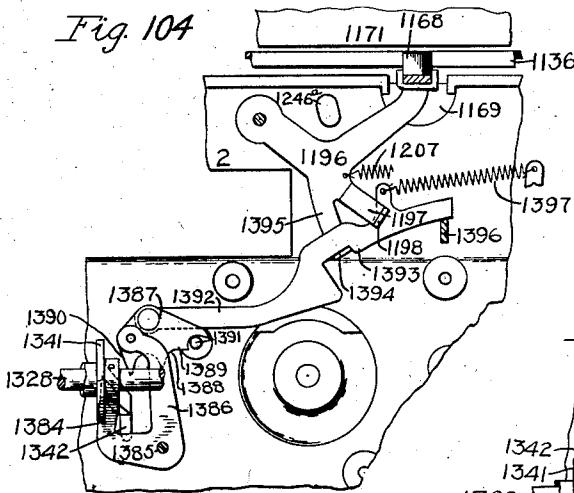
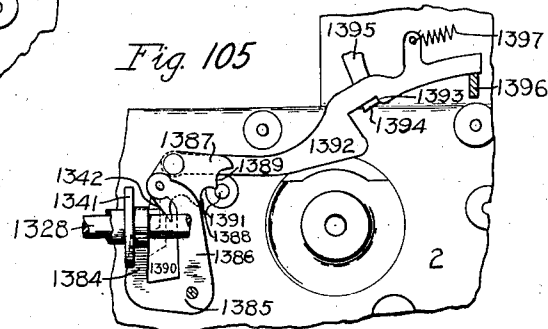


Fig. 105



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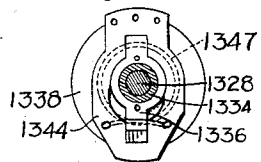
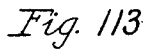
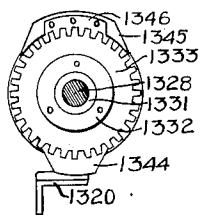
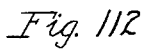
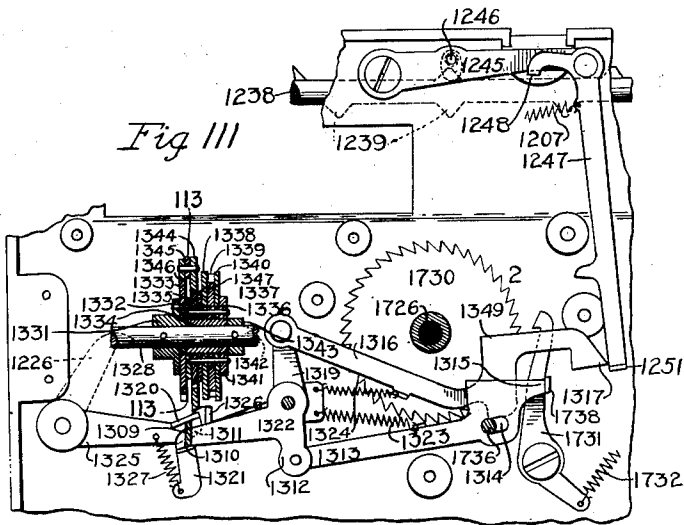
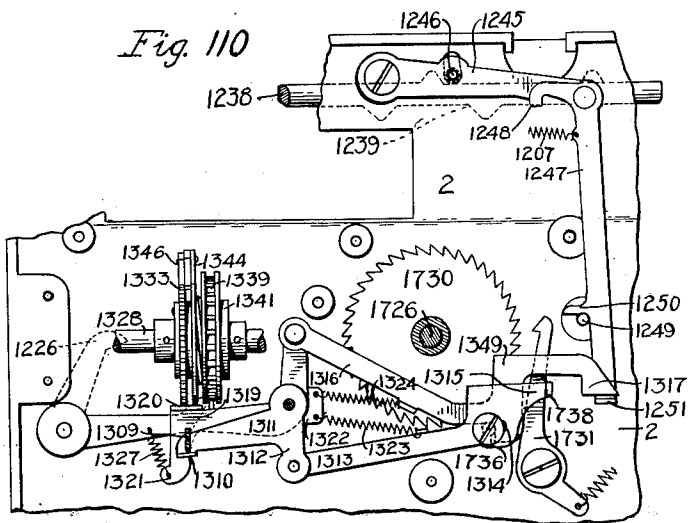
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1,968,386

PRINTING MACHINE

Original Filed March 24, 1915 42 Sheets-Sheet 37



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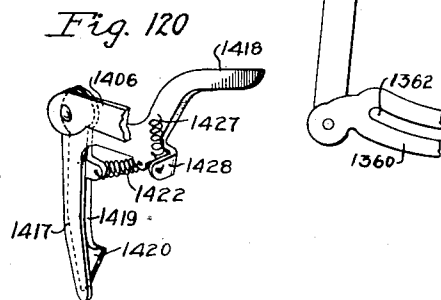
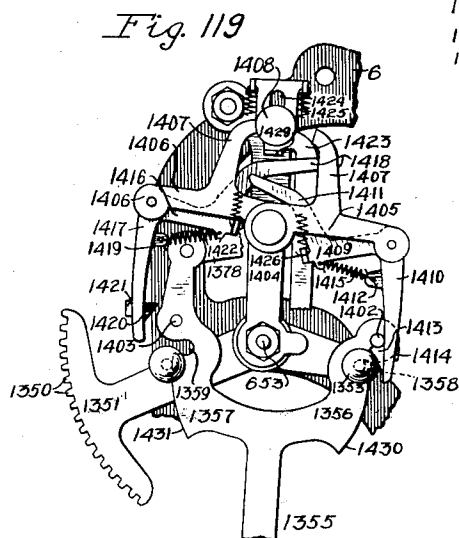
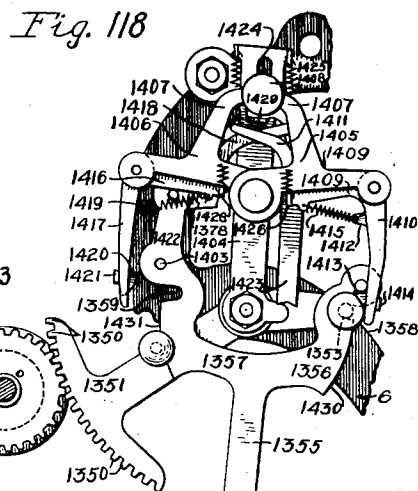
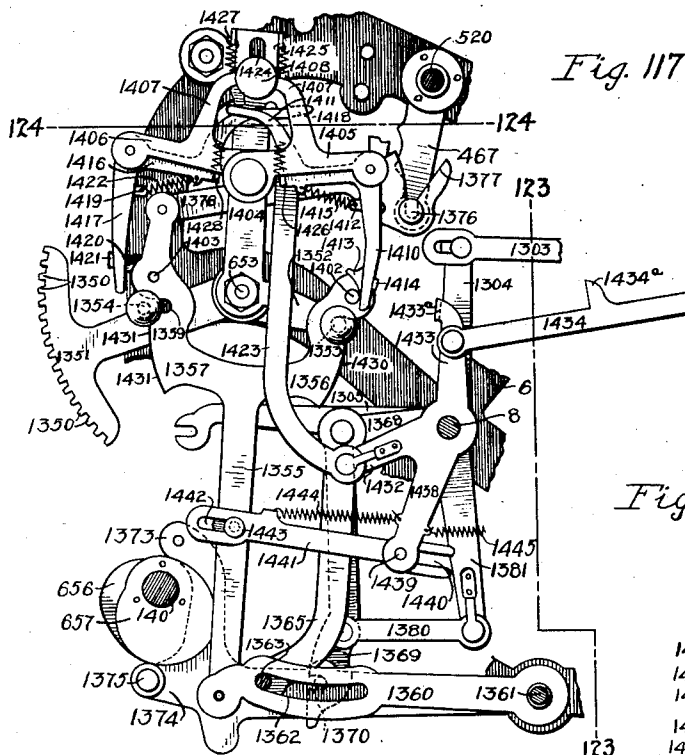
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42 Sheets-Sheet 39



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PRINTING MACHINE

Original Filed March 24, 1915 42 Sheets-Sheet 40

Fig. 121

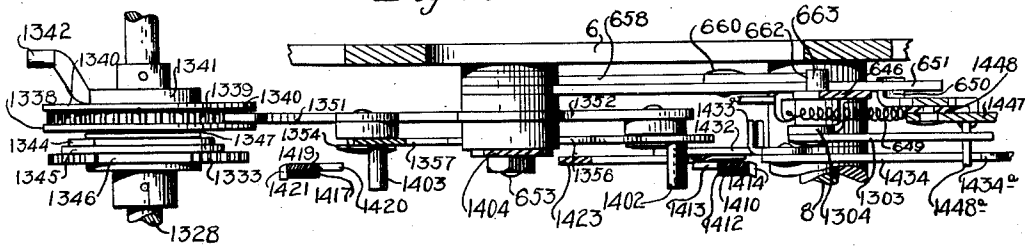


Fig. 122

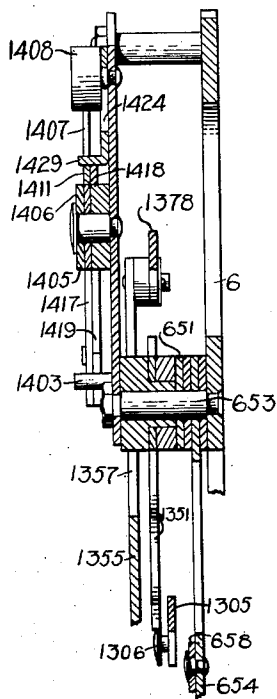


Fig. 123

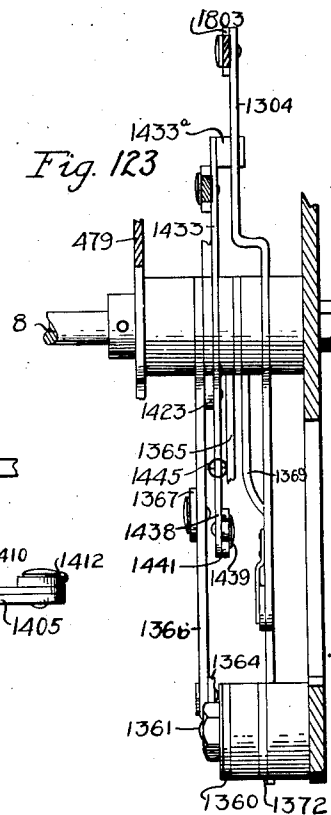


Fig. 124

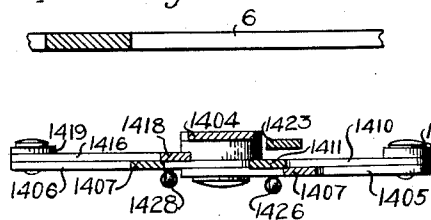
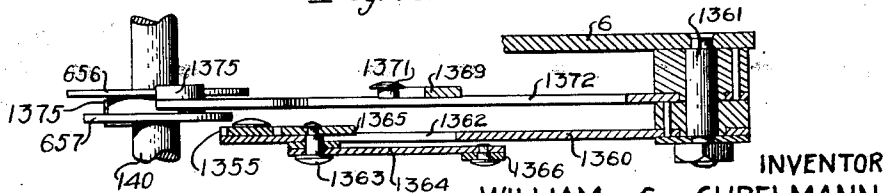


Fig. 125



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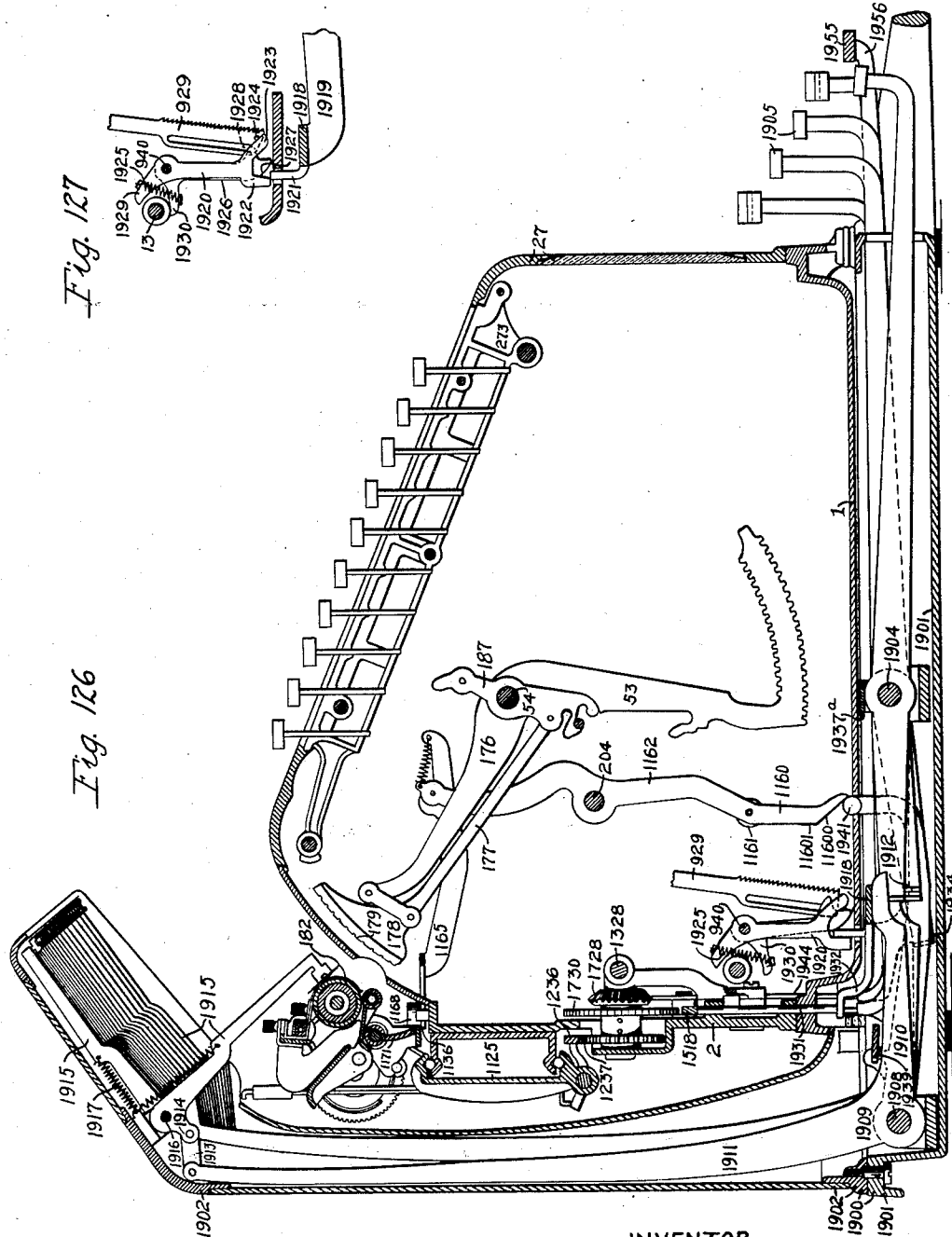
July 31, 1934.

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PRINTING MACHINE

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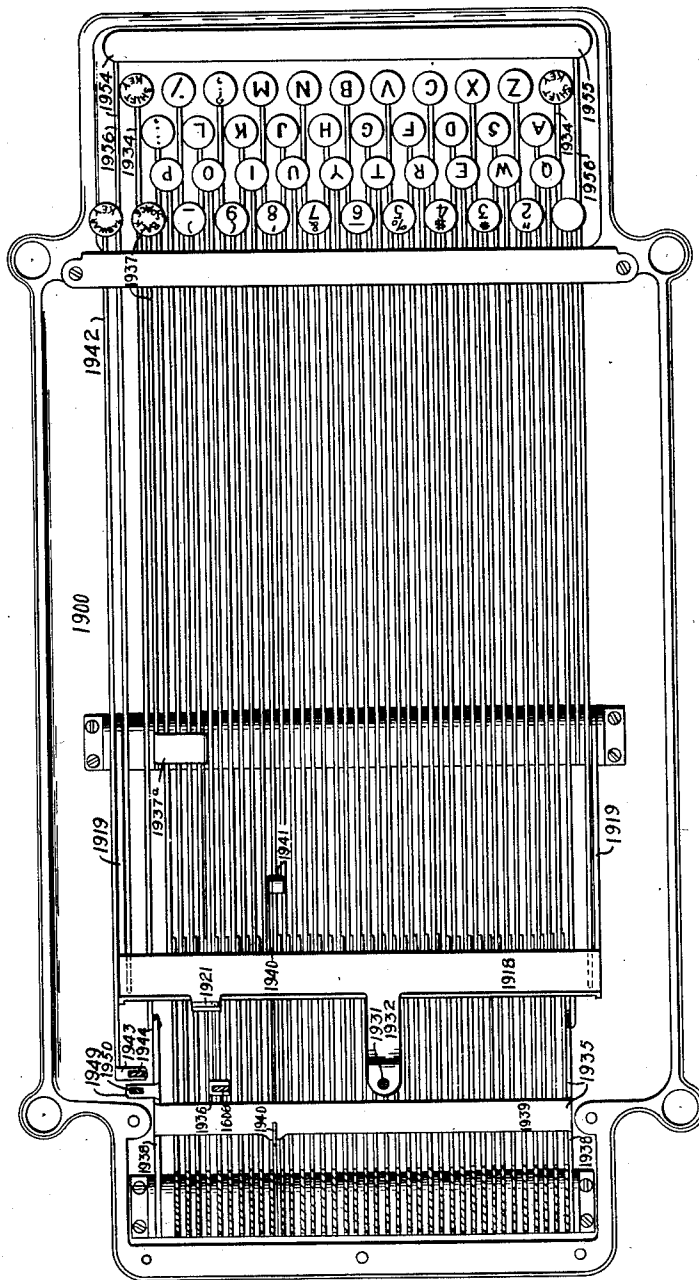


Fig. 128

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UNITED STATES PATENT OFFICE

1,968,386

PRINTING MACHINE

William S. Gubelmann, Brooklyn, N. Y.

Original application March 24, 1915, Serial No. 16,636. Divided and this application July 8, 1930, Serial No. 466,381

250 Claims. (Cl. 101—93)

This application is a division of my prior co-
pend application, Serial No. 16,636, filed March
24, 1915, now Patent No. 1,895,848, issued January
31, 1933; to which reference may be made for a
full illustration and description of mechanisms
not directly associated with the subject of this
divisional application. Said parent application
discloses comprehensive improvements in what
are commonly known as adding machines and in-
cludes that type thereof capable of not only
adding or accumulating but also of subtracting,
and in which operations may be performed on
different sets of accumulators for such purposes
as grand totalizing, bookkeeping, etc., and in
which printed lists of the operations may be
simultaneously produced, and which performs a
number of desirable functions not possible in
machines heretofore known and which performs
the usual functions of this class of machine in a
superior manner. The machine is in many re-
spects a modified and improved construction of
the machine described in my pending application
filed September 19, 1912, Serial No. 721,141, now
Patent No. 1,817,451, issued August 4, 1931 and
also of my application filed January 10, 1900,
Serial No. 1,004, now Patent No. 1,429,201, issued
September 12, 1922.

The present application relates to carriage and
printing mechanism, including means for setting
the type carriers, means for impressing the type
on a record sheet to print numerals and other
characters, means for specially controlling the
type positioning and impression mechanism for
such purposes as filling in of zeros and at will dis-
abling the zero filling, the carriage which car-
ries the impression receiving platen and the
various controls of and by the movements of the
carriage and platen.

In the accompanying drawings, the figures of
which have been selected from the drawings of
the parent application:

Fig. 1 is a top plan view of the machine, the
operating lever handle and portions of the car-
riage and track being broken away.

Fig. 2 is an elevation view of the right-hand
side of the machine.

Fig. 3 is an elevation view of the left-hand side
of the machine.

Fig. 4 is a rear elevation of the machine with a
portion of the carriage track broken away, and
showing principally the carriage mechanism.

Fig. 5 is a top plan view of the machine with
the keyboard, carriage and carriage-track re-
moved, and part of the rear frame broken away,
and certain parts not directly associated with

carriage and printing mechanism being omitted.

Fig. 6 is a rear elevation of the machine with
the carriage, cover and rear frame removed, part
of the base broken away, and certain shifting key
mechanism being omitted.

Fig. 7 is a right side elevation of the machine
with the cover removed.

Fig. 8 is a vertical longitudinal sectional view
taken directly through the central part of the
machine showing the parts in their normal posi-
tions, showing one set only of the plurality of sets
of printing and actuating devices that are con-
fined between the main frames 14 and 15, the
totalizers and parts of the transfer mechanism be-
ing omitted.

Fig. 9 is a view similar to Fig. 8, but showing
the parts in their operating positions.

Fig. 10 is a vertical longitudinal sectional view
of the machine, the carriage section being taken
along the line 10—10 of Fig. 4, the keyboard be-
ing sectioned on line 10—10 of Fig. 1, the rear
frame on line 10—10 of Fig. 101, and the remain-
ing sectional plane being taken substantially
along the line 10—10 of Fig. 5, certain of the
parts being slightly offset therefrom for clear-
ness, the carriage spring and bell being removed
and the platen shown as locked down in the
printing position, and parts of the calculating
mechanism and control being omitted.

Fig. 11 is a sectional elevation of the carriage
and back frame plate, the carriage section being
on the line 11—11 of Fig. 4.

Fig. 12 is a sectional elevation of the carriage
and back frame plate, the carriage section being
on the line 12—12 of Fig. 4.

Fig. 13 is a side elevation of the carriage and
back frame plate.

Fig. 14 is a sectional elevation of the carriage
and back frame plate on the line 10—10 of
Fig. 4.

Fig. 15 is a vertical, longitudinal sectional view
of the machine, the carriage and rear frame being
sectioned on line 15—15 of Fig. 4, the section of
the rear frame being also indicated as substan-
tially on line 15—15 of Fig. 101.

Fig. 16 is an enlarged front view showing the
dials, the yokes and arms that connect the key
stop bars with the differential stop bars, and the
main binding and supporting rod.

Fig. 17 is a rear view of the yokes, arms, dif-
ferential stop bars and their supporting rod,
shown in Fig. 16.

Fig. 18 is a fragmentary vertical longitudinal
sectional view showing the type carrier and actu-
ating device for the printing mechanism.

Fig. 19 is a fragmentary vertical sectional view showing the operating cam and connections for the printing mechanism and also a portion of the no-print mechanism.

Fig. 20 is a perspective view of the no-print key and adjuncts.

Fig. 21 is a perspective view of one of the releasing dogs and its adjuncts.

Fig. 22 is a detail view showing the manner of securing the guide members for the type carriers and releasing dogs.

Fig. 23 is a fragmentary detail view showing the units releasing dog of the printing mechanism.

Fig. 24 is a detail view of one of the ribbon shafts and the narrow ribbon spool in place thereon.

Fig. 25 is a view similar to Fig. 24, but showing the spool and other parts in section, and illustrating the manner of retaining the spool in place.

Fig. 26 is a view of the mechanism shown in Fig. 24, illustrating the spool retaining spring, viewed at a different angle.

Fig. 27 is a view, similar to Fig. 26, but showing the broad ribbon spool in lieu of the narrow one.

Fig. 28 is a sectional view taken on the line 28—28 of Fig. 26, viewed from the right.

Fig. 29 is a sectional view taken on the line 29—29 of Fig. 27, viewed from the right.

Fig. 30 is a vertical sectional detail view illustrating the main driving or operating shaft and its adjuncts.

Fig. 31 is a detail fragmentary side elevation of the keyboard frame section which carries the universal correction key, said key and its adjuncts being in their operating position.

Fig. 32 is a fragmentary sectional plan view taken on the line 32—32 of Fig. 31.

Fig. 33 is a detail fragmentary side elevation of one of the keyboard frame sections, and of the correction mechanism (which is operable by the universal correction key) in normal position.

Fig. 34 is a perspective view of one of the actuator controlling springs, illustrating its form and construction.

Fig. 35 is a perspective view of the auxiliary sign printing stop device.

Fig. 36 is an enlarged rear elevation of the sign printing segments and two adjacent number printing segments.

Fig. 37 is an enlarged sectional view, taken on the line 37—37 of Fig. 8 and viewed from the front.

Fig. 38 is a fragmentary sectional view through the center line of the shifting key levers and lever supporting studs, some parts being omitted.

Fig. 39 is a fragmentary sectional plan view on the line 39—39 of Fig. 14, and extending forwardly therefrom, some parts being omitted.

Fig. 40 is a fragmentary sectional elevation showing the control of the "auxiliary" and "subtract" type carrier stop bar.

Fig. 41 is a fragmentary, vertical, longitudinal sectional view, illustrating the horizontal rule controlling mechanism, the horizontal rule key being depressed and the main operating shaft normal.

Fig. 42 is a view somewhat similar to Fig. 41, but showing the parts in an operating position; certain parts that are shown in each figure being omitted from the other.

Fig. 43 is a fragmentary top plan view of the "functional" frames and mechanism supported thereby, enlarged.

Fig. 44 is an enlarged front elevation of the frames and mechanism shown in Fig. 43.

Fig. 45 is an enlarged fragmentary elevation of the right side of the frames and mechanism shown in Fig. 43, parts being removed.

Fig. 46 is an enlarged detail view of the split key and its connections.

Fig. 47 is a fragmentary detail plan view taken on the line 47—47 of Fig. 45 showing the relative positions of the "split", "rule", and "specific functional" frames, and their key connections.

Fig. 48 is an enlarged sectional view of the functional frame taken on the line 48—48 of Fig. 8.

Fig. 49 is an enlarged sectional view through the functional shaft taken substantially on the line 49—49 of Fig. 8.

Fig. 50 is a perspective view of the connections operated by the two column various key (1300).

Fig. 51 is an enlarged detail side elevation of the column lock mechanism, showing a "various" key depressed and the column lock mechanism not operated.

Fig. 52 is an enlarged detail side elevation, showing the column lock key depressed and connected parts moved accordingly.

Fig. 53 is an enlarged fragmentary side elevation showing the column lock key depressed, a number key depressed, and a "various" key returned to normal position after being depressed for column locking.

Fig. 54 is a sectional plan view taken on the line 54—54 of Fig. 52.

Fig. 55 is an enlarged fragmentary perspective view of the front end of a key frame section showing principally the column lock mechanism.

Figs. 56, 57 and 58 are enlarged detail side elevations of members forming part of the mechanism illustrated in Fig. 55.

Fig. 59 is a fragmentary side elevation showing one of the split or keyboard dividing mechanisms with the controlling keys therefor depressed.

Fig. 60 is a detail of one of the members of the mechanism shown in Fig. 59.

Fig. 61 is a detail sectional view on the line 61—61 of Fig. 59, viewed in the direction of the arrow and showing part of the rule mechanism on the same line.

Fig. 62 is a vertical longitudinal sectional elevation of the carriage and back plate, the carriage being shown on the line 62—62 of Fig. 1.

Fig. 63 is a side elevation showing one of the vertical rule mechanisms in operating position.

Fig. 64 is a sectional view taken on the line 64—64 of Fig. 63, viewed from above, portions being omitted.

Fig. 65 is a detail front elevation of the "specific functional" key.

Fig. 66 is a sectional view taken on the line 66—66 of Fig. 65, showing also a fragment of the keyboard frame, to illustrate the "specific functional" key lock.

Fig. 67 is a sectional view taken on the line 67—67 of Fig. 63, viewed in the direction of the arrow.

Fig. 68 is a longitudinal, vertical, sectional detail view of the special rule mechanism in its operative position.

Fig. 69 is a detail view of one of the division plates and one of the end plates of the frames which separate and guide parts of the split and printing mechanism.

Fig. 70 is a side elevation of the automatic column feed mechanism.

Fig. 71 is a fragmentary perspective view of the

column feed mechanism and adjacent connections.

Fig. 72 is a sectional elevation taken on the line 72—72 of Fig. 13, viewed from the front, illustrating the carriage and adjuncts.

Fig. 73 is a sectional view taken on the line 73—73 of Fig. 75, viewed from the front, and illustrating the carriage driving spring.

Fig. 74 is a sectional view taken on the line 74—74 of Fig. 75, viewed from the front, and illustrating the carriage driving strap take-up mechanism.

Fig. 75 is a fragmentary detail sectional view taken through the carriage driving spring mechanism.

Fig. 76 is an enlarged detail perspective of the carriage driving strap attachment.

Fig. 77 is a sectional view taken on the line 77—77 of Fig. 13, viewed from above.

Fig. 78 is a detail sectional view taken substantially on line 78—78 of Fig. 72, viewed from above, showing the carriage in its extreme right-hand position, and parts shown in Fig. 77.

Fig. 79 is a detail sectional view taken on the line 79—79 of Fig. 10 showing the carriage being returned and its effect on the tappet mechanism.

Fig. 80 is an enlarged detail sectional view showing one of the tappet shafts and a roller tappet illustrating the means for securing both.

Fig. 81 is an enlarged detail sectional view taken through one of the carriage control roller tappets on line 81—81 of Fig. 80.

Fig. 82 is an enlarged fragmentary detail perspective view of the tappet frame release mechanism.

Fig. 83 is an enlarged detail perspective view of the tappet frame.

Fig. 84 is a transverse horizontal sectional detail view taken on the line 84—84 of Fig. 72, illustrating particularly the form and arrangement of the carriage stops.

Fig. 85 is a detail perspective view of the carriage stop bar retaining spring.

Fig. 86 is a diagrammatic view of the carriage stop bar and a record sheet, showing the relative positions of the columns in single column work.

Fig. 87 is a diagrammatic view of the carriage stop bar and a record sheet, showing the relative positions of the columns in two column work.

Fig. 88 is an enlarged detail perspective view showing the controlling mechanism for the line-spacing device.

Fig. 89 is an enlarged fragmentary sectional view of the carriage, showing principally the line-spacing mechanism.

Fig. 90 is an enlarged fragmentary sectional view of the platen-swinging device, showing the lock therefor.

Fig. 91 is an enlarged perspective view of one of the paper-end guides.

Fig. 92 is an enlarged perspective view of one of the paper clips.

Fig. 93 is a sectional detail view taken transversely through the platen shaft and illustrating the spring for holding the paper presser-roller against the platen, the finger piece being shown in full.

Fig. 94 is a sectional detail view showing the micrometer adjustment for the carriage stop bar.

Fig. 95 is a fragmentary detail view of the adjustable-stop carriage stop bar.

Fig. 96 is a sectional view of the paper return mechanism taken on the line 96—96 of Fig. 7.

Fig. 97 is a vertical sectional view of the paper return mechanism taken on the line 97—97 of Fig. 96.

Fig. 98 is a vertical sectional view of the paper return mechanism taken on the line 98—98 of Fig. 96.

Fig. 99 is a vertical section of the bell of the paper return mechanism taken on the line 99—99 of Fig. 96, and showing the bell striking mechanism.

Fig. 100 is a sectional view of the left-hand end of the platen shaft, showing the variable line spacing mechanism.

Fig. 101 is a front elevation of the rear frame and the mechanism mounted thereon, with portions broken away.

Fig. 102 is a fragmentary sectional side elevation showing principally the platen-swing and paper feed mechanisms.

Fig. 103 is an elevation of a portion of the rear frame and adjuncts, showing in detail the manually operable means for rendering the automatic paper feed inoperative.

Fig. 104 is an elevation of a portion of the rear frame of the machine, viewed from the front, showing in detail the automatic means, operable by the two-column mechanism, for rendering inoperative the automatic paper feed.

Fig. 105 is an elevation of a portion of the mechanism shown in Fig. 104, showing the automatic paper feed inoperative mechanism moving back to its normal position.

Fig. 106 is an elevation of a fragment of the rear frame, viewed from the front of the machine, showing the parts in the position assumed upon depressing the column key, but before the carriage has moved.

Fig. 107 is a view somewhat similar to Fig. 106 but showing the parts in the position assumed when the carriage has moved a slight distance.

Fig. 108 is an elevation of a fragment of the rear frame of the machine, viewed from the front, showing part of the two-column mechanism, all parts being normal.

Fig. 109 is a view similar to Fig. 108, but showing the two-column mechanism rendered operative.

Fig. 110 is a front elevation of a fragment of the rear frame showing a portion of the two-column mechanism with its clutch operative.

Fig. 111 is a view similar to Fig. 110 but showing the two-column clutch in section and operative.

Fig. 112 is a left-hand elevation of the two-column clutch.

Fig. 113 is a sectional view of the two-column clutch taken on the line 113—113 of Fig. 111.

Fig. 114 is a detail left-side elevation of mechanism for rendering the two-column mechanism operative, the parts being in a position for adding on the main accumulators and printing in the main column.

Fig. 115 is a view somewhat similar to Fig. 114, showing parts in position for adding on the auxiliary accumulators and printing in the auxiliary column.

Fig. 116 is a sectional view taken on the line 116—116 of Fig. 114.

Fig. 117 is a detail left-side elevation, partly in section, of the alternator mechanism rendered operative, but not yet operated.

Fig. 118 is a view somewhat similar to Fig. 117, but showing the alternator mechanism during the operation of printing in the main column.

Fig. 119 is a view somewhat similar to that of Fig. 118, showing the alternator mechanism

during its return after causing printing in the main column.

Fig. 120 is an enlarged fragmentary detail perspective view of a portion of the alternating mechanism.

Fig. 121 is an enlarged sectional plan view taken on the line 121—121 of Fig. 15, with parts removed.

Fig. 122 is an enlarged sectional view taken on the line 122—122 of Fig. 15, looking rearward.

Fig. 123 is an enlarged sectional view taken on the line 123—123 of Fig. 117, looking rearward.

Fig. 124 is an enlarged sectional view taken on the line 124—124 of Fig. 117, with parts omitted.

Fig. 125 is an enlarged sectional view taken substantially on the line 125—125 of Fig. 114.

Fig. 126 is a vertical sectional view, illustrating the combined calculating machine and typewriting machine; the section being taken in different planes through the machine.

Fig. 127 is a detail view illustrating in normal position devices whereby the calculating machine renders the typewriting machine inoperative, and whereby the typewriting machine renders the calculating machine inoperative.

Fig. 128 is a horizontal view, partly in plan and partly in horizontal section, of the typewriter detached from the calculating machine.

Figs. 129 and 130 are detail views of two different kinds of guides used in the machine.

General description

This machine is of the class in which are arranged side by side, in successive denominational order, a series of sets of actuating, accumulating and recording devices; each set comprising an adding wheel, its cooperating printing devices, a row of nine digital setting keys which may be set for controlling without actuating said adding and printing devices, an actuator for actuating the adding and printing devices according to the setting of said keys, and cooperating devices for carrying from a set of one denomination to another of the sets; and which machine is also provided with a universal operating mechanism for causing simultaneous actuation of said adding and printing devices by their respective actuators.

Each row of keys is provided with a stop bar 289 (Figs. 8, 9 and 55) upon which is formed a series of stops 293, one for each key, each of said stops being arranged at a different distance from its respective key, according to the value of said key. Each stop bar 289 is associated with a differential stop bar 63 to which it is connected by an arm 292 and a yoke 296 (Fig. 17); the differential stop bar, arm and yoke, all being mounted on the shaft 5. An accumulating wheel and an actuating rock lever 53 having a rearwardly extending arm 176 to which is hung an oscillating printing segment 177, are provided for each row of keys. Carrying devices for the accumulator wheel, and actuating devices for the printing segment, are also provided for each row of keys 269.

The universal operating mechanism comprises an operating key 741 (Figs. 1 and 7) or operating lever 775, either or both of which are connected to a main spring, or power storing device, which spring is partly wound by each operation of said key of said lever and which is connected with, for driving, a main operating shaft 140, which latter is provided with a crank 143 (Figs. 8 and 9) to which one end of a connecting rod

154 is pivoted, the other end of the latter being pivoted to a rearwardly extending arm 153 of an operating frame, which frame comprises the two side plates 148, 149, connected by cross rods 155, 158, and which is pivotally mounted on shaft 54. The operating frame includes also a supplemental frame, comprising two side arms 146, 147, connected by a cross rod 145, and said supplemental frame is pivoted on shaft 5 and is operatively connected to the main operating frame by the links 150, 151.

When items are to be added and listed on the machine, the keys representing the digits of the first item are depressed and temporarily remain in this depressed or set position, forming abutments for the respective stops on said stop bars 289. The depression of the keys releases the stop bar 289 from the pawl 331 in each row in which a key has been depressed. The stop bars 289 are, however, still detained in their normal position by the detent pawls 333 of a universal detaining mechanism, until the operating lever 775 or key 741 is thereafter actuated, which causes the universal detaining mechanism to disengage its pawl 333 from the stop bars 289, allowing those stop bars which have also been previously released by the keys, to be moved forward by the action of the springs 337 until the differential stop bars 63 are arrested by rod 145 of the supplemental operating frame. Immediately thereafter, the main operating shaft 140 makes a complete revolution under power supplied by the power spring. This causes the operating frames 146, 147 and 148, 149 to move, and the stop bars 289 and the differential stop bars 63 to be moved by the action of their springs 337 until each stop bar 289 is arrested by a depressed key 269 of its row engaging with its stop on said stop bar 289 whereby each differential stop bar 63 is positioned to present in the path of the correlated actuator a stop 64 corresponding to the key depressed in its respective row.

The movement of the operating frame also permits the actuators 53 to move until each is arrested by said stop 64 of its correlated differential stop bar 63, and simultaneously the actuators position the type segments 177, 178 to present to the printing line type representing the digits of the item set up on the keys.

After said operating frame has moved a distance sufficient to permit the greatest required forward movement of the actuators 53, viz. nine steps, said frame has an additional half step forward and a half step return movement during which time the printing segments are swung to engage the platen 182, printing the number represented by the keys depressed, and on the nine-step return movement of the operating frame the actuators are moved back to their normal position, turning with them their respective accumulator wheels an amount represented by their respective keys depressed. The operating frame continues to move thereafter one-and-one-half steps in the same or rearward direction, causing cross bar 145 of the supplemental operating frame to restore the differential stop bars 63 and the stop bars 289 to their normal position.

Although I have spoken of "forward movement", in the foregoing, as indicating the movement toward the front of the machine, or the part next to the operator, it is to be understood that, for the sake of convenience and comparative brevity in describing the invention, I may hereinafter speak of forward and rearward movement of certain parts with relation to the initial

and return movements of those parts, without relation to the front and rear of the machine.

The machine of said parent application is designed to be constructed of nine independent main sections, each of which is composed of a number of sub-sections, which permits of parceling the assembling, so that each assembler will handle only a few different kinds of parts, sub-sections or sections. The nine main sections comprise generally the following mechanisms:—

- I. Key mechanism;
 - II. Key controlled mechanism for controlling various functions of the machine;
 - III. Accumulator mechanisms;
 - IV. Driving mechanism;
 - V. The carrying and actuating mechanism for the accumulators and also printing and other mechanism;
 - VI. Mechanism controlled by the row of shifting keys situated at the extreme left of the keyboard, devices for controlling the two-column and alternating movements of the carriage, and mechanism for controlling the printing of a clear sign with the first number printed and accumulated on a set of registers after said set has been cleared;
 - VII. The base of the machine in which is mounted the main operating shaft and to which are secured the main frames of the machine;
 - VIII. The rear frame upon which is mounted the carriage and most of the controlling mechanism therefor, and also the mechanism by which the carriage may be made to control various functions of the machine;
 - IX. The carriage mechanism.
- These sections have individual frames to which they are assembled, forming independent units. This construction, as well as the key, accumulating and power mechanisms, is fully described in the parent application.

Actuating gear segments

Guide plates associated with the accumulator frame form a comb-like guide for a plurality of actuating members or gear segments 53^a, each of which extends into one of the spaces between two adjacent guide plates and is provided on its upper and lower edges with gear racks 51 and 52 (Figs. 8 and 9).

Each of these gear segments projects forwardly from the lower end of a rock arm 53 which turns at its upper end about a horizontal transverse rod or arbor 54 in the central part of the machine.

Differential stop bars and operating frame movements

The distance which it is possible for the actuating gear segments 51 and 52 to move forwardly is controlled by a plurality of differential stop bars 63 (Figs. 8 and 9) which are arranged to swing vertically in front of the correlated gear segments and are pivoted at their upper ends on the horizontal transverse rod 5. Each of these differential bars is provided on its lower front side with a series of ten stop shoulders 64 which are arranged in successive steps and run from 0 to 9, inclusive, the shoulder corresponding to 0 or zero position being arranged at the free end of the respective stop bars, and the remaining shoulders corresponding to 1 to 9, inclusive, being arranged progressively toward the pivot of the stop bar.

When the machine is normal, the actuating gear segments are in their retracted position,

the stop bars are in their lowest position and present their zero shoulders to the front ends of the gear segments for locking them against forward movement, and both sets of accumulator wheels are disengaged from the gear segments, as shown in Fig. 8. For the purpose of setting up any particular number in the machine, each stop bar 63 corresponding to a figure of the number is moved and set to release the companion gear rack from the zero stop and present the proper stop shoulder 64 to the same for arresting the gear rack when it has moved forwardly the required distance. The number of pairs of such gear racks and stop bars may be varied in different machines, depending on the intended capacity of each machine.

After the stop bars have been thus set, the several liberated gear segments move forwardly until each engages at its front end with the desired shoulder 64 of the correlated stop bar 63 in its path, as shown in Fig. 9.

The several differential stop bars 63 are separated from each other and held in their proper relationship by guide plates 65 (Figs. 8, 9 and 16). These guide plates are secured to each other and spaced apart at proper distances by the spacing tie plates 22, 23 and 24, secured to the two outer or side guide plates, and have slots embracing the other guide plates so that the shoulders at the opposite sides of the slots engage with shoulders formed on the guide plates for securing the latter in properly spaced position.

Main operating frame mechanism

(Figs. 8, 9, 10 and 30) represents a horizontal main driving shaft which is arranged transversely in the lower rear part of the machine and which makes one complete rotation counter-clockwise (Fig. 8) for each operation of the machine. This shaft is preferably constructed in two sections, as shown in Fig. 30, which are provided at their opposing inner ends with disks 141 and 142 which are connected by a crank pin or wrist 143. For convenience of description, the distance which the crank moves vertically will be divided into eleven spaces or steps upward and eleven steps downward. The crank pin is secured to one of the disks and projects into a radially elongated opening in the other.

The left-hand portion of the main shaft 140 is mounted on supports 144 (Fig. 30) secured to the base of the machine. The right-hand portion of the main shaft is mounted in bearings on the frames 4 and 10 of the driving section.

145 (Figs. 8, 9 and 10) represents a universal stop return rod or bar arranged transversely above the differential stop arms or levers 63 and hung at opposite ends by means of rock arms 146 and 147 from the pivot rod 5. 148 and 149 represent a pair of forwardly extending rock arms pivoted on the rock shaft 54 and each connected by links 150 and 151 with said universal return rod 145. The links 150 and 151 are connected to each other at their forward ends by a rod 152. Extending rearwardly from one of the rock arms 149 is an actuating rock arm 153, which latter is connected by a connecting rod or link 154 with the crank pin 143, as shown in Figs. 8 and 9.

155 represents a universal segment return bar or rod which is arranged transversely in front of the segment arms 53 and which is connected by depending rock arms 156 and 157, respectively, with the upper rock arms 148 and 149. A tie rod 158 is also secured at its opposite ends to the depending rock arms 156 and 157. Just above

the universal return bar 155 and connected at its ends to the rock arms 156 and 157 is a tie rod 159. The rods or bars 158 and 155 and 159 together with the arms 156 and 157, and link 151 may, for convenience of description, be regarded as the operating frame.

160 (Figs. 8, 9 and 34) represents flat springs formed so as to be mounted on rods 155, 158 and 159 in the following manner: the end 161 of each spring is passed from below up in rear of rod 159; the spring then rising in front of rod 158 and curving rearwardly over and down in rear of said rod 158 until about on a level with the top of rod 155 where it has a rearward bend followed by an evenly curved portion for engaging with one of the actuating rack arms 53; the spring now curves forwardly and up, in front of rod 155, to its end 162. The springs 160 are held under constant tension by rod 155, and ends 162 at times move forward from rod 155 when sufficient resistance is exerted by actuating arms 53. The curved ends 161 by their contact with rod 159 prevent displacement of the springs.

In the position of the parts shown in Fig. 8 the machine is at rest, at which time the crank 143 has moved downwardly on the rear side of the main shaft one-and-one-half spaces or steps from the uppermost part of the stroke of the crank, the universal stop return bar 145 is raised one-and-one-half spaces above its lowermost position above the differential stop arms 63 and the segment return bar 155 is also moved one-and-one-half spaces forwardly from its rearmost position. Upon depressing a key controlling one of the differential stop arms 63 and then operating the machine, said stop arms 63 will be raised to release the segment or actuator 53^a and permit the latter to move forwardly for engaging the shoulder 64 on the stop arm corresponding to the key depressed. The forward movement of the segment 53^a is produced by gravity due to the weight of the parts connected with the segment arm on the opposite side of its pivot, but if desired this movement of the segment may be aided or effected solely by a spring 165.

As the crank pin 143 moves nine-and-one-half spaces from the normal position (as shown in Fig. 8) to its lowest position (shown in Fig. 9) the universal stop return bar 145 is raised to its highest position in advance of the stop arms, and the segment return bar 155 moves forwardly into its foremost position in advance of the segment arms. While the crank pin is moving past the dead center at the lower end of the stroke, one or the other of said accumulator or subtracting wheels is moved into mesh with the respective rack of the segment 53^a and remains in mesh during the entire subsequent backward movement of the segment, for effecting the rotation of the respective wheel. As the crank pin 143 moves eleven spaces from its lowest to its highest position, the operating frame is moved a full stroke backwardly which causes its segment return bar 155 to move the springs 160 against the segment arms 53 and move the segments backwardly into their rearmost position and the stop return bar 145 to engage the differential stop bars 63 and depress the same into their lowermost position. When the backward movement of a segment arm 53 is arrested by its movable back stop arm 68, the springs 160 bearing against the same will also be arrested, in which event the segment return bar 155 will complete the last portion of its backward movement independently of the spring 160 and strain the latter so that its end 162 will be

removed from the bar 155. The extent of this idle backward movement of the segment return bar is one-and-one-half steps; but, if the said back stop 68 has been withdrawn, for the purpose of permitting the respective segment arm to move backwardly an additional step, for carrying purposes, then the respective spring 160 will follow the movement of the segment return bar and force the segment arm backwardly one step or until the segment arm 53 is arrested by engaging the depressed arm 68; and the universal segment return bar 155 will move only the last half step of its return or backward movement independent of the segment arm 53. After the crank pin reaches its highest position it continues the movement one-and-one-half steps or spaces downwardly to its normal position and is there arrested, as shown in Fig. 8. During the last half step of the upward movement of the crank pin and the first half step of the subsequent downward stroke of the crank pin it moves across its upper dead center and during this time the particular accumulator or subtracting gear wheel is disengaged from the gear segment. When the crank pin 143 reaches one-and-one-half steps below and in rear of its highest position the segment return bar 155 has again moved forwardly into engagement with the ends 162 of the springs 160, and the stop return bar 145 is again raised one-and-one-half steps above the differential stop bars 63, as shown in Fig. 8.

By actuating the operating frame from the crank pin 143 in the manner described a quick forward and backward movement of the gear segments is produced, but due to the passage of the crank through its "dead center" position, their velocity is gradually reduced as they approach either limit of their movement. This enables the machine to be operated very rapidly without producing a jar or undue wear or noise.

Wherever in this description or accompanying claims is mentioned an "operation of the operating frame", an "operation of the machine", a "complete operation", or an "operation of the operating mechanism, means or device", this is intended to mean the movement of the parts of the machine under the influence of or power imparted through and by the operating lever 775 or the operating key 741 (hereinafter described) during which movement the operating frame 148 makes only one complete cycle consisting of the twenty-two measures or steps, viz: the eleven steps upward and eleven steps downward (hereinbefore described).

Printing mechanism

176 represents a plurality of vertically swinging printing arms which are arranged substantially horizontally in the rear of the shaft 54 which forms the fulcrum thereof, and each of which is connected at its front end with the upper end of an arm 53 carrying the actuating gear segments 51 and 52, as shown in Figs. 8 and 9. Each printing arm and the corresponding gear segment and arm are preferably formed integrally, as shown. Lengthwise below each printing arm 176 is arranged a type bar 177 which is provided at its rear end with an upwardly projecting type head 178 which carries a segmental row of type 179. The type bar 177 is suspended near its rear end from the rear end of the printing arm by a pair of depending links 180 arranged on opposite sides of the arm and bar. The front end of each type bar is movably supported by means of the lower arms 181

of a pair of upright printing levers which are arranged on opposite sides of the corresponding printing arm and type bar (as shown in Figs. 8, 9, 18 and 68) and pivoted on the rod or shaft

54. As an accumulator gear segments moves forward into one position or another, according to whichever of its setting keys have been depressed, the type head descends and presents that one of its type to the printing position corresponding to the depressed setting key. After the type head comes to rest with the desired type at the printing position, the type bar and head are moved backwardly with a quick stroke for producing an impression of the respective type on the recording sheet supported on a paper platen 182 in rear of the type and then are quickly returned to their forward position to prevent smutting or blurring of the recording sheet. In order to limit the backward stroke of the type and prevent injury to the parts, if operated when the platen is not in the printing position, a stop device is provided consisting of a front stop 183 arranged on the arm 181 and adapted to engage a stationary transverse stop bar 184, shown in Figs. 8, 9, 10, 18 and 68. The return or forward movement of the type head and bar are limited by rear stop lugs or shoulders 185 arranged on the printing arm 181 and adapted to engage with the rear side of the stop bar 184. Each type head and bar is yieldingly held in the foremost position by gravity.

The mechanism for producing a quick backward and forward stroke of the type head is constructed as follows:

186 (Figs. 8, 9, 18, 42 and 68) represents a plurality of cam arms or actuators, one of which is arranged lengthwise above each printing arm and each of which is confined at its front end between the extremities of the upper arms 187 of the printing levers. Each cam arm 186 is provided at its front end with a forwardly throwing rear cam 188 and a rearwardly throwing front cam 189 which are adapted to engage successively with a roller abutment 190 mounted between the upper arms 187 of the printing levers, and each cam arm 186 when free is drawn downwardly by a link 191.

The rear ends of the cam arms 186 are pivoted to a transverse pivot rod 192 which is secured at opposite ends to pairs of vertically rocking heads 193. The latter are pivoted below the pivot rod 192 on the stationary supporting rod 194 which is mounted on the frames 14 and 15. Below the cam arms 186 and in front of the supporting rod the heads 193 are connected by a return bar 195.

196 (Figs. 10 and 19) represents a vertical link which connects the front end of one of the rocking heads with the adjacent forwardly projecting rock arm of a rock lever whose rearwardly extending arm 198 carries a pair of rollers 199 and 200, one on each side, said rollers cooperating with printing cams 201 and 202, respectively. The printing cams 201 and 202 are mounted on the main driving shaft 140, to which they are secured and with which they revolve. The printing cams are so shaped and positioned as to cause the proper rocking of the heads 193 through the engagement of their peripheries with the rollers 199 and 200.

203 represents a plurality of upright printing trip latches which are arranged in a transverse row and pivoted at their lower ends on a stationary transverse rod 204, while their upper ends are provided with upwardly facing shoulders 205

(Fig. 59) each of which is yieldingly held in engagement with a shoulder or lug 206 on the front part of one of the printing cam arms by spring 207 which connects with arm 208 projecting rearwardly from the pivoted end of the respective latch, as shown in Figs. 8, 9, 18 and 63.

209 represents a plurality of releasing dogs or connectors, one arranged lengthwise above each printing arm and resting thereon with its downwardly turned rear end while its front end is pivoted to the upper end of the respective printing latch or trip 203. Each of the releasing dogs is drawn downwardly by the respective spring 207 and is provided near its rear end on its under side with a forwardly facing shoulder 210 which is adapted to engage with a transverse releasing bar 211 which connects the rocking heads 193 below the supporting rod 194. These rocking heads and the connecting bars 211 and 211^a constitute a universal actuator for all of the trips 203, through the medium of the connectors 209; while the top surface of each arm 176 constitutes a guide way for the correlated connector 209.

Preparatory to operating the machine, the several printing arms 176 are in their uppermost position, the type heads 178 and bars 177 are moved forward, and the cam arms 186 are held in an elevated position by the printing latches 203 and the releasing dogs 209 are disengaged from the releasing bar 211, as shown in Fig. 8. Upon moving the operating frame forwardly after the desired setting keys have been depressed, each actuating or accumulating gear segment advances in accordance with the setting of its stop device, and the type head descends and brings the corresponding type to the printing position. As the printing arm 176 descends its companion releasing dog 209 is lowered with its shoulder 210 into the path of the releasing bar 211. While the operating frame is effecting its forward movement the rocking heads 193 connected therewith are turned forwardly, causing the cam arms 186 to move forwardly and the releasing bar 211 to move rearwardly, owing to the connection of these parts with the heads 193 on opposite sides of the supporting rod 194. Each printing latch 203 is held in engagement with the cam arm 186 until the operating frame effects the last part of its forward movement, at which time the under shoulder 210 of the dog 209 engages with the rearwardly moving releasing bar 211. Dog 209 and latch 203 thereupon move rearwardly, while cam arm 186 continues its forward movement. The latch 203 is thus freed from the cam arm, thereby permitting the latter to be drawn suddenly downward by the spring 220 through the medium of connections 217, 213 and 191. During the first part of this downward movement of the cam arm, its rear cam 188 engages the roller 190 of the printing lever 187 and forces the type bar 177 and head 178 rearwardly, thereby producing an impression of the type at the printing position on the record sheet, as shown in Fig. 9. Immediately after the rear cam 188 of the cam arm 186 clears the roller 190 the front cam 189 thereof engages this roller, causing the printing lever to be turned in the opposite direction and the type head to be moved forwardly away from the record sheet and held in this position. During the backward or return movement of the operating frame the rod 192 continues to move backwardly, and with it the cam arm 186; and the cam face 189 of said arm rides on the roller 190 and is thereby gradually raised, but the position of the type bar is not disturbed during the

latter part of this movement. The return bar 195 raises each cam arm 186 sufficiently high to permit its respective printing latch 203 to swing forwardly and engage its shoulder under that of the cam lever for holding the same up preparatory to effecting the next operation. When no numeral key in a particular decimal order is depressed, and the related gear segment and associated parts do not move forward and the respective releasing dog 209 will be held in its normally elevated position by the printing arm 176. Thus the shoulder 210 is clear of the releasing bar 211, and the movement of said bar will not affect the latch 203, said latch remaining engaged with the cam arm 186 and preventing operation of the associated printing device.

The mechanism whereby the link 191 exerts force on the cam arm 186 is constructed as follows:

212 represents downwardly facing T-shaped rock levers pivoted on the shaft 204 and having their forwardly extending arms 213 pivoted to the lower ends of links 191, as seen in Figs. 8 and 9, and particularly in Fig. 18. The rearwardly extending arms 214 of the levers 212 carry pins 215 which cooperate with slots 216 in the forward ends of the respective links 217. 218 represents rear slots in links 217 through which extends a universal supporting bar 219. Springs 220 (Fig. 18) connect upwardly extending ears 221 on the forward ends of links 217 with a tension bar 222, which is mounted on a pair of rock levers 223 pivoted on shaft 224. These rock levers have their lower arms connected by a rod 225. A tensioning screw 226 (Fig. 8) is mounted in the rear frame 2 and carries a knob 227. The forward end of screw 226 cooperates with one of the lower arms of levers 223 so that by turning the knob 227 the tension of spring 220 may be made greater or less.

When a shoulder 205 is withdrawn from under the lug 206 of its respective cam arm 186, the cooperating spring 220 pulls its link 217 rearwardly, thereby rocking its lever 212 and drawing down the link 191 which in turn pulls down the cam arm 186, thereby causing printing to be done. Spring 220 draws link 217 rearwardly until said link is stopped by bar 219. This is at approximately the instant that printing occurs. Thereafter, the rock lever 212 and related driving devices of the printing mechanism are not further actuated, and the momentum of said driving devices counteracts the momentum of the type-carrying member 177, the pin and slot 215 and 216 providing for the extra movement of the driving mechanism after spring 220 becomes inoperative.

A comb-like plate 228 is secured to and extends transversely between the side plates 193. Between the teeth of this plate the arms 186 are placed so that the plate acts as a guide for said arms.

The releasing dogs 209 have their rear portions extending between guide plates 229 (Figs. 18 and 22) which are secured together by upper and lower comb-like plates 230 and 231 and a plain central plate or bar 232. The comb-like plates engage two of the guide plates 229 in each of their recesses and are locked in their holding position by the insertion of the plain central plate between them. The two guide plates 229 in each recess are separated by washers 233. The ends of the three plates 230, 231 and 232 are secured to end plates 234 which are mounted on the pivot rod 194 and which have

downwardly extending forked arms 235 (Fig. 10) with their forks straddling the rod 54. The lower ends of plates 229 are retained in slots or recesses in the front edge of a bar 236.

The type heads 178 are guided in frame work constructed as follows:

237 (Figs. 8, 9, 10 and 63) represent a pair of end plates one of which is situated on each side of the type heads 178. 238 (Fig. 130) represents a pair of upper comb plates, and 239 (Fig. 129) represents a pair of lower comb plates both pairs of comb plates are secured by riveting or other desired means to end plates 237. The slotted bar 236 is also secured between end plates 237. The plates of each pair of plates 238 and 239 are counterparts of each other, and each plate has its teeth so placed that when one plate of the pair is reversed and placed upon its counterpart companion plate, which is not reversed, the teeth of one of the pair register with the centers of the spaces of the other and thus provide very narrow slots between the neighboring teeth. In these slots are guided movable division plates 240 which separate the several printing heads 178 and guide them. These division plates serve also another purpose which will be described later. The division plates are held in their normal position by springs 241 connecting them with the bar 236. Wires or rods 242, fitted in slots in plates 237, form guides for the printing ribbon which passes over them.

184^a (Figs. 8 and 9) represents a pair of end plates mounted on shaft 204 and having their bifurcated front ends straddling the rod 184. These plates are secured to each other by transverse plates or bars 184^b, which bars have notches formed in their edges. Division or guide plates 184^c are secured to the bars 184^b by engagement with said notches and by the shaft 204 which passes through them. The guide plates 184^c guide the printing members 212 and certain members of the "split" mechanism, as will be later described.

Whenever in this specification or in the claims is mentioned the "printing position", this means the position occupied by the type immediately preceding the movement of the type into contact with the platen or record sheet on the latter.

Automatic ribbon feed reverse

Means for automatically feeding the ribbon forward step by step and reversing its step by step movement when necessary, are constructed as follows:

243 (Figs. 8 and 9) represents the inking ribbon of the printing mechanism, which is arranged between the platen and the type of the several printing segments.

On the upper and lower parts of the rear portion of the left hand intermediate frame 14 are mounted upper and lower transverse spindles or rods 244 and 245. Upon these spindles are mounted upper and lower sleeves or hollow shafts 246 and 247. On corresponding ends, the sleeves are provided with ratchet wheels 248 and 249, the teeth of one wheel facing opposite to those of the other. The sleeves are constantly pressed to the left by compression springs 250 seated against screw heads (see Figs. 24 to 29, inclusive). Mounted on the upper and lower sleeves are upper and lower ribbon spools 251 and 252 which are held on the sleeves and caused to turn therewith by springs 253, secured to the ratchet wheels and adapted to engage with recesses 254 in the ends of the spools.

The springs 253 are designed to accommodate and hold in place two sizes of ribbon spools, and it may be seen that they could be designed to position other and more sizes by extending the following principles. Each spool-carrier consists of an element comprising a sleeve, a ratchet wheel and a spring 253 all rigidly secured together; and these elements are retarded in their rotation on the spindles by the compression springs 250, so as to prevent slackness of the ribbon. Each spring 253 is formed with a bend or boss at its free end over which the spools may be forced but which prevents accidental displacement of the spool from the spool-carrier. Each spring 253 is provided with a pair of opposite shoulders 253^a for limiting the inward movement of a small sized spool while allowing a large sized spool to be passed over said shoulders; the inner aperture 254^a of the larger or longer spools being made sufficiently large for this purpose. By this construction, either of several widths of ribbon may be employed. To the upper and lower spools, the upper and lower ends of the ribbon are secured, while the intermediate part of the ribbon passes over the guide rods 242. The right-hand intermediate frame 15 is cut away opposite the spools so as to permit of their being easily removed and inserted.

Between the ratchet wheels is arranged a pawl member or ratchet bar 255 (Fig. 10) having its ends constructed to form pawls 256 and 257 provided medially with a V-shaped cam slot 258. 259 represents a carrier or rock lever pivoted to the frame 14 and provided on its rear arm with a pivot or pin 260 which engages with said V-shaped cam 258. The ratchet bar is yieldingly held with either one end or the other of its V-shaped slot in engagement with the pin 260 by means of a spring 261 connecting the median line of the ratchet bar with the rock lever. The front end of the rock lever 259 is provided with a cam slot 262 which engages a pin 263 carried by an upper arm 264 of the left side 148 of the main operating frame.

When the ratchet bar engages one end of its cam slot with the pin of the rock lever, spring 261 is on one side of the center and draws the pawl on the corresponding side of the rock lever into engagement with its ratchet wheel whereby the respective spool is turned intermittently or each time the machine is operated, and the ribbon is progressively wound over the same. When the ribbon is fully unwound from the other spool, the rotation of the spool upon which the ribbon is being wound is arrested by the resistance of the ribbon. The last-mentioned spool thus acts as a stationary abutment which prevents the pawl engaged with its ratchet wheel from being moved forward by the rock arm. When this occurs the tension of the spring 261 is overcome and the pressure of the rock lever causes its pin 260 to pass from one end of the V-shaped cam over the cam lug to the other end thereof, thereby shifting the pivotal point of connection between the ratchet bar 255 and the spring 260 to the opposite side of the rock lever 259. When this occurs the previously active pawl end of the ratchet bar is disengaged from its ratchet wheel and the previously inactive pawl end of the ratchet bar is engaged with its ratchet wheel, thereby causing the movement of the ribbon to be reversed and to be wound up on the empty spool and unwound from the full spool. This operation is

repeated whenever the ribbon is fully unwound from either spool.

Automatic zero printing

The means for automatically printing one or more zeros to the right of any number printed, where no key has been depressed for a lower order, are as follows:

Each of the printing releasing dogs 209, except those of the units and sign mechanisms (to be described), has pivoted to its right side and near its rear end a latch 265, and also has, near its front end, an upwardly projecting shoulder 266 (Figs. 18, 21 and 23). Each latch 265 has near its center an upwardly projecting finger 267, at its front end a bent-over lip 268 which extends over the top of the releasing dog 209 of the next lower order, in front of the shoulder 266. The spring 207 connects with the lip 268 and tends to hold the latch and its next lower releasing dog down. When a releasing dog 209 of a higher order is moved rearward for causing printing in that order, it carries with it its latch 265, and the lip 268 on the latter engages the shoulder 266 of the next lower releasing dog, and so down to the dog at the extreme right or lowest order, causing these lower dogs to be pulled rearwardly also. By this means any releasing dog which is not drawn rearwardly by reason of none of its corresponding number keys being depressed is automatically drawn rearwardly by the dog of the next higher order when a key of a higher order is depressed and thus the respective printing device is caused to print and, as it has not been moved out of its normal or zero position, zero is printed.

Key mechanism

The keyboard and key mechanisms are fully described in the parent application, as well as in the divisional application, Serial No. 461,312, filed June 16, 1930, hence, they will be mentioned but briefly. The shank of each numeral key 269 comprises two slots, the lower slots of each longitudinal row of keys forming a channel through which extend three bars, a stop bar 289, a locking bar 290, and a release bar 291. A stop lever 63 is associated with each stop bar 289, being connected therewith through arms 292 (Figs. 16 and 17) and yokes 296, pivoted on shaft 5. Each stop bar is provided with upwardly projecting stop lugs located at distances from the several key shanks which are proportional to the value of the different keys. When a key is depressed and the associated stop bar released for forward movement, it will move until the stop lug engages the shank of the depressed key.

Each stop bar 289 is held in home position by two pawl members 331 and 333 (Figs. 8 and 9). Each pawl or "zero stop" 331 is controlled by its release bar 291, which bar is moved forwardly on the depression of any number key of the associated row and in so moving lifts its pawl 331. Pawls 333 are lifted upon the depression of the machine operating key 741, and when they are so lifted the stop bars associated with any rows in which a key has been depressed will move forward until stopped by the depressed numeral key.

The locking bars 290 serve to lock depressed keys in depressed position until they are actuated to release the keys by the operation of another key in the same row, the associated column release key, or the universal correction key; or by the operation of the machine.

After the desired keys have been set and the machine is operated by depressing its operating

lever or operating key, and during the first part of the forward or downward movement of the operating lever or key, which latter will hereinafter be more fully described, the universal releasing bar 335 is raised by the operating mechanism. Bar 335 in turn raises all the detent pawls 333 which release all the stop bars 289, allowing such of them and their respective stop levers 63 as have also been released by their respective release pawl 331 in any column where a key has been depressed to move forward by the action of a spring 337 (Fig. 8) until the said stop bar is arrested by the stop 293 corresponding to the key depressed, and the stop 64 on the stop lever 63 corresponding to the key depressed is moved into the path of the finger on the front end of the gear segment 53^a for arresting the latter after it has moved a number of spaces or teeth as represented by the depressed key. The operating mechanism is constructed to release at the beginning of its movement, the stop bars 289, then the latter and the stop levers 63 are moved by the springs 337, Fig. 8, in advance of the gear segments until arrested by the bar 145, after which the operating frame, of which the bars 158 and 145 are a part, is moved and allows the gear segments to move and the stop levers to continue their movement in advance of the gear segments until arrested by the keys depressed, after which they arrest the forward movement of their respective actuating gear segments in a position corresponding to the keys depressed, and the gear segments actuate their respective accumulator gears, as has been described.

The universal correction key

Situated at the foot of the column of number keys of the highest order is the universal correction key 383, (Figs. 1, 31 and 32). This key operates to return all the depressed number keys, but does not return the total keys if they are depressed. The means by which the universal correction key returns all the depressed number keys is as follows:

384 represents a rock arm pivoted loosely on a short shaft 385 mounted in a bearing formed in the front end of the left-hand section 273 of the keyboard frame, said shaft extending in front of a filler section 273^a. Rock arm 384 extends rearwardly in the machine from its pivot. 386 is an upward projection, near the rear of the arm 384, to which the lower end of the universal correction key 383 is pivotally connected. Arm 384 carries a roller 387 projecting laterally above one of the arms 319 of the universal restoring bar 318.

When the universal correction key is depressed it pushes arm 384 downwardly, causing the roller 387 to press down the arm 319 of the universal restoring bar 318, thereby causing the latter to restore all the depressed number keys to their unlocked position, by restoring their lock bars to normal position.

Identifying shifting keys

345, 356, 357, 358, 452, 469, 470, 471, 472 and 473 represent the keys of a column of identifying shifting keys, as shown in Figs. 1 and 3.

The identifying shifting keys are constructed similar to the number keys, and arranged in a longitudinal row parallel with and to the left of the number keys, for the purpose of facilitating their manipulation with the left hand while the right hand is engaged in setting the number keys or manipulating the operating key or lever, also for the purpose of facilitating the man-

ufacture of the machine, these keys being in close proximity to the mechanism to which they are connected.

The majority of the identifying shifting keys are constructed to automatically print a sign or word to the right of, and adjacent to, the number printed whenever the mechanism is under the control of one of these keys, to identify the key used and the nature of the operation, and for other purposes which will be treated in connection with the respective keys.

This row of keys has its differential stop bar arranged to the right and its releasing bar to the left of the central locking bar, and is preferably so constructed that the latter does not release to restore the depressed key until the operation of the machine is completed or nearly completed.

Identifying shifting keys stop bar

488 (Fig. 40) represents the stop bar for the identifying shifting keys. This stop bar is provided with stop teeth or lugs 293 like those of the number key stop bars 289 but less in number, there being provided one for each of the following identifying shifting keys only, viz: 345, 356, 357, 358 and 471. The main detent tooth 294 acts as a stop lug to cooperate with key 473. Only one auxiliary detent tooth 295 is provided, whose only function is to hold the stop bar against movement until the machine operates, more of these teeth being unnecessary as the machine does not release the keys of this row until near the end of the operation. A lower tooth or lug 733 is provided near the rear end of bar 488, the purpose of which is to cause printing of certain clear signs.

The bar 488 is connected with a yoke 296, as are the number key stop bars, this respective yoke connecting with the differential stop lever 63 next to the extreme right. The cooperating rock arm 53 carries no actuator racks, as it is used only to position, for printing, suitable sign type of its respective type head 178 when one of said identifying shift keys is used. In other respect this mechanism operates substantially as do similar parts of the number printing mechanism.

Each of said identifying shifting keys has on its upper surface an identifying mark to designate the purpose for which said key is to be used.

The locking and release bars for the row of identifying shifting keys, as well as the mechanisms controlled and operated by them, are fully described in the parent application. The present description will be limited to certain of these keys which effect the movement of an "auxiliary" character type carrying bar.

Auxiliary key

The auxiliary key 452 (Figs. 1, 3 and 40) is guided in slots in the top and bottom of the total key section of the keyboard frame.

The lower end of the shank of the auxiliary key rests upon the forward end of a rock arm 457 (Figs. 5, 38 and 40) which is secured to one end of a sleeve 458, mounted loosely on a stud 459 secured in the frame 3. To the other end of the sleeve 458 is fastened a downwardly extending rock arm 460 to which is pivoted a forked link 461 which extends rearwardly in the machine, the forked end of said link straddling a pin 462 projecting from the side of a downwardly extending rock arm 463. Arm 463 is fixed to a

sleeve 464 loosely mounted on the no-print shaft 520 journaled in the frames 3 and 6. In addition to the arm 463 the sleeve 464 has fixed to it two arms 466 and 467; the arm 467 being connected to the alternator, as described in the parent application, the arm 466 extending rearwardly and its rear end connecting with actuating means for the auxiliary sign mechanism. Near the middle of the arm 466 a link 468 is pivotally secured thereon for the purpose of controlling the totalizer engaging devices in the manner described in the parent application.

The link 461 and the auxiliary key are held in normal position by a spring 461^a (Fig. 40).

The subtracting key

469 (Figs. 1, 3 and 40) represents the subtracting key. The mechanism actuated by the depression of this key causes items to be subtracted from either the main or auxiliary accumulators, and with the parts moved by the auxiliary key controls the auxiliary sign printing mechanism.

The shank 270 of the subtracting key 469 is positioned in the keyboard so that its lower end is directly above and rests upon a flat upwardly facing shoulder 490 of a curved rock lever 491 secured on a collar 492 which is fast on a shaft 493 mounted in bearings in the frames 3 and 6 (Fig. 40). A downwardly extending arm 494 of lever 491 carries a link or lever 515 connected to the auxiliary sign printing mechanism.

The auxiliary sign mechanism

There are two sign printing mechanisms for printing designating signs (which may be either words, abbreviations or arbitrary symbols) to the right of numbers as printed. The first may be termed the "main sign printing mechanism", and operates to print signs when any shifting key of the set, comprising the total keys 345, 356, 357 and 358, the no-add key 471 and the special key 473, is depressed; also to print a sign with the first number printed and added on an accumulator after said accumulator has been cleared or all the accumulators have been cleared. This mechanism is related to, and has been described with, the stop bar of the identifying shifting keys.

The second sign printing mechanism is what may be termed the "auxiliary sign mechanism" and operates to print signs when either or both the auxiliary key and subtracting key are operative; said auxiliary and subtracting keys constituting a set of shifting keys separate from the above mentioned set. The mechanism for this auxiliary sign printing is as follows:—

510 (Fig. 35) is a differential stop bar of the auxiliary sign mechanism, situated in the right hand portion of the adding section to the right of the stop bar of the main sign mechanism. It has stops 511 similar to the number key differential stop bars, but the arm 53^a which it stops, and the arm 53^a which cooperates in the main sign printing, carry no gear teeth but act only as positioners for the sign printing type. The auxiliary stop bar 510 is rigidly connected by a yoke 512 with a downwardly extending arm 513, connected by a link 514 to a pivot rod 746 (Fig. 40) supported by a pair of rock arms 707 which are rigidly secured to each other and pivoted on a stud 544. The arm 513 is provided with a pivot or stud at its lower end, which is slidably engaged with a slot in the front end of the bar or link 514. A spring 514^a connects the link 514 and arm 513 so that the members 513, 512 and 510 are moved by said spring in accordance with

the movement of link 514, the object of this loose connection being to allow free movement of the rod 514 and its adjuncts, while the members 510, 512 and 513 are prevented by the cross bar 145 of the operating frame from being moved to their fully set position while the machine is in its normal or inoperative position. The spring 514^a is used in preference to a spring 337 on the differential stop bar for the reason that the latter might tend to buckle the link 514.

An auxiliary sign cam lever 515, provided at one end with a slot cam 745 which embraces the pivot rod 746, is pivoted at its opposite end to the arm 494 of the subtracting key rock lever and is connected near its cam end by a link 516 to the rear end of arm 466 of the auxiliary key mechanism. The slot cam 745 is constructed with a dwell at each end and positioned with relation to the pivot of lever 515 so as to move the pivot 746 two steps as the last mentioned pivot rides from one to the other of said dwells. Thus when the auxiliary key is depressed its arm 466 raises cam lever 515 which causes rod 746 to move link 514 and arm 513 two steps rearwardly, which permits lever 513, yoke 512 and differential stop lever 510 to move for positioning the proper stop 511 in the path of the auxiliary sign printing arm when the operating mechanism is thereafter actuated.

The auxiliary sign cam lever 515 is pivoted to the arm 494 of the subtracting key rock lever, so that when the subtracting key is depressed the lever 515 is bodily displaced and moves the link 514 one step to properly position the stop 511 corresponding to the subtracting sign on the auxiliary sign printing head.

Upon the concomitant setting of the auxiliary and subtracting keys, lever 515 is both bodily displaced and rocked about its pivot, thus imparting a greater amount of throw to the link 514 than is imparted by either key alone, viz. three steps, and the type bar controlling stop is positioned accordingly.

The differential stop lever 510 has, therefore, only four positions, though it may be made to have more should there be use for more. The normal or first position is the one which is assumed when adding is done on the main accumulators, and no sign is printed for this operation, though a sign could be printed if desired; the second is the position assumed when subtraction is performed on the main accumulating mechanism; the third is the position assumed when the auxiliary key alone is set; and the fourth is the position assumed when subtraction is performed on the auxiliary accumulating mechanism. Signs are printed when the stop lever is in either of the last three positions. More positions may be attained if found necessary or desirable. The differential stop lever 510 is returned by the universal return bar 145, while its controlling mechanism may remain set for subsequent operations.

No-print key

Sometimes it is desired to add a list of numbers without printing the same, and to permit of doing this a no-print key 470 is provided and operatively connected with the printing mechanism. The no-print key 470 (Figs. 1 and 20) is arranged in the row of identifying shifting keys. The lower end of the shank of this key bears upon a flat upwardly facing shoulder 517 on a curved rock arm 518 mounted on and fast to a

sleeve 519 secured to the shaft 520 (Figs. 19 and 38) which may be termed the "no-print" shaft. This shaft has its bearings in the frames 3 and 6 and has a collar 521 fixed on its inner end adjacent to frame 6. Riveted to the collar 521 is a depending rock arm 522 which is provided near its lower end with an elongated transverse pin 523 carrying a roller 524, said pin and roller extending through an opening in frame 6 and being in position in front of link 196 (Figs. 10 and 19). Link 196 has previously been mentioned as connecting one of the printing rock heads 193 with the rock arm 197 for causing printing (see "Printing mechanism"). The connection between link 196 and arm 197 is by means of a hook 525 on the former engaging with a pin 526 on the latter. A spring 527 from link 196 to frame 14 normally holds the hook 525 in engagement with pin 526. 528 is a rear hook on the lower portion of link 196, and 529 is a stationary pin (on frame 14) adapted to be engaged thereby when link 196 is swung rearwardly.

When the no-print key 470 is depressed its shank rocks arm 518 which moves sleeve 519 and with it the no-print shaft 520 which in turn rocks sleeve 521. This rocks arm 522 rearwardly, carrying pin 523 so that its roller 524 operates on link 196, pushing it rearward until the hook 528 of the latter is in locking engagement with pin 529, and hook 525 is disengaged from pin 526, whereby printing of numbers is prevented as long as the no-print key 470 remains depressed; though the accumulation of numbers is not interfered with. When the key 470 is released the spring 527 returns the link 196 to normal position thereby returning the other elements of the no-print mechanism to their normal positions.

No-add key

Means are provided whereby the accumulators are made inoperative while the printing device remains operative whereby a number may be printed without affecting any of the accumulators. The mechanism for this purpose is constructed as follows:—

471 (Figs. 1 and 3) represents a no-add key situated in the column of identifying shifting keys. The lower end of the shank of this key engages with a flat upwardly facing shoulder 530 on a curved rock arm 531 mounted on and secured to a sleeve which is loose on the tie rod 7 between frames 3 and 6 (Fig. 38). The further connection for disabling engagement of the accumulators with the actuating segments are fully described in the parent application.

Horizontal rule key

Means are provided for automatically printing a horizontal line, as for instance, between the bottom of a column and its total.

472, (Figs. 1, 3, 41, and 42) represents a horizontal rule key located in the column of identifying shifting keys. The lower end of the shank of this key engages with a flat upwardly facing shoulder 548 (Figs. 5 and 41) on a curved rock arm 549 fast on the sleeve 550 secured to one end of a shaft 551 having its bearing in frames 3 and 6. To sleeve 550 is secured a depending rock arm 552 from the lower portion of which projects a pin or shoulder 553. This pin 553 supports the hooked rear end of link 538, the hook 554 of which engages with said pin 553. On the opposite end of shaft 551 from that on which sleeve 550 is mounted, is secured a second sleeve

555 having fast thereon a depending rock arm 556 carrying an elongated laterally projecting pin or shoulder 557 which passes through an opening in frame 6 and contacts with a track or edge of an upper arm 558 of what may be termed the horizontal rule lever 559. 560 represents a forwardly extending cam arm of lever 559, the cam face of which is adapted to contact with a roller 561 on the side of arm 148 of the main operating frame. The horizontal rule lever 559 is pivoted on one of a pair of upper forwardly extending arms 562 of the rock arms 72 which support the universal stop bar 71 of the carrying back stop arms 68. A universal bar 570 is carried between arms 562 and cooperates with lugs or arms 571 on the rock arms 53 of the main and auxiliary sign printing mechanism (Fig. 68). Each of these arms differs from the arms associated with the accumulator wheels in having no gear teeth, also in being formed with a stop lug opposite to the cam surface of its lug 571, and having its adjacent surface substantially parallel with and extending beyond said cam surface, so as to normally rest against the stop bar 570. A spring 563 exerts a constant upward and forward tension on lever 559, while the stop or bar 184 contacts with a stop lug on the lever 559 to limit the upward and forward movements of the latter. 565 represents a tail or cam arm on latch 172 extending forwardly and downwardly over a roller or pusher member 566 on the lower part of lever 559. 567 is a front hook on latch 172, and 568 is a stop pin cooperating therewith. 569 (Figs. 8 and 9) represents the horizontal ruling type, one of which is provided on each number printing type head and all of which are positioned on their respective type heads one step below the normally operatively positioned or zero type. It is therefore necessary to swing the type heads up one step higher for horizontal ruling which is accomplished by pulling the actuating gear segments rearwardly.

When the horizontal rule key 472 is depressed, its shank presses down on shoulder 548, rocking arm 549 which turns sleeve 550. Sleeve 550 being secured to shaft 551, rocks this shaft, thereby rocking the sleeve 555 and arms 552 and 556. Arm 552 in rocking engages its pin 553 with hook 554, pulling link 538 rearwardly, whereby the neutralizing mechanism is operated and the accumulator frame is not rocked during the ensuing operation of the machine, which keeps the accumulator wheels of both registers out of engagement with their actuators. Arm 556, during its rocking movement, engages its pin 557 with the arm 558, rocking the lever 559 against the tension of its spring 563. This causes cam face 560 to slide under roller 561 and as cam 560 is inclined the lever 559 is forced downwardly. The rocking movement of lever 559 causes roller 566 to engage and lift cam arm 565, thereby swinging latch 172 so that the hook 567 engages with stationary pin 568, and the carrying mechanism disengages from the carrying rock lever 168. The downward movement of lever 559 rocks arm 562 which in turn rocks the arms 72 whereby the universal stop bar 71 is swung rearwardly, carrying down all the back stop arms 68 from their normally operative positions. The universal rule bar 570 is also brought down slightly by the downward movement of arms 562 and engages with all the lugs or arms 571, riding along their respective cam surfaces, while the arms 68 are simultaneously moved out of the respective paths of the stop lugs 67, by means already described.

During the ensuing operation of the machine, the roller 561 (on the operating frame) presses down on cam face 560, forcing lever 559 down until bar 570 is fully depressed. This draws all the actuating levers 53 back, so that the rule types 569 of the type-heads are brought to the printing position. The roller 566 follows the inner curve of the cam arm 565 under the combined influence of rollers 561 and arm 562.

Each of the releasing dogs 209 has on its upper edge a forwardly facing shoulder 210^a (Fig. 111) similar to its shoulder 210, which shoulders are adapted to engage with an auxiliary releasing bar 211^a similar in construction to bar 211, and rocked at each operation of the machine by the heads 193 to which it is secured.

As the arms 176 move up for positioning the ruling type, they lift the ends of the dogs 209 until the shoulders 210^a stand in the path of the auxiliary releasing bar 211^a, and as the operation of the machine proceeds the bar 211^a is moved rearward, carrying with it dogs 209, and causes the printing to be done with the ruling types.

When the horizontal rule key 472 is released, the springs mentioned in connection with the various parts operated by said key return the respective parts to their normal position.

Special key

473 (Figs. 1, 3 and 6) represents a special key situated in the row of identifying shifting keys. One purpose of this key is to position the main sign mechanism for printing a special sign with any desired item. For this purpose, a special type is provided, and if desired a modified stop bar may be used to suit the requirements of any particular business.

Assuming that in a particular business or business system it is desirable to indicate a balance by a printed sign; a special type can be provided for printing the desired sign in lieu of the sub-total sign, by holding down the special key 473 while the sub-total key is depressed. For this purpose the stop tooth or lug 293 cooperating with the special key is placed on the stop bar to normally rest nearer its key than the lug cooperating with the sub-total key, so that upon depressing both the sub-total and special key and operating the machine, the special sign for "balance" is printed in lieu of the sub-total sign, with the number representing the sub-total. The special key is not locked down upon depressing it but is intended to be held down by the operator.

The driving mechanism

The driving mechanism of this machine is constructed to be operated manually, although if it is desired it may be operated by power.

The mechanism comprising this hand operated driving device is constructed as follows:—

The machine is provided with an operating key 741 (Figs. 1, 2, 3, 6, and 7) and an operating lever 775. In ordinary operations of the machine the operation of the key furnishes sufficient power; but in doing heavy work the operating lever should be used from time to time to store up a surplus amount of power, said operating lever being particularly constructed for this purpose.

The operating lever 775 is removably secured on the outer end of a transverse shaft 776 which may be termed the "operating lever shaft", and is mounted in the frames 4 and 10 (Figs. 3 and 4). The shaft 776 has attached to it a segmental body 777 comprising a portion carrying gear teeth 778, a stop shoulder 779, and a guide portion 780,

The gear teeth 778 of this segmental body mesh with the teeth of a small gear wheel the rotation of which transmits power to a spring motor comprising a gear 790 on shaft 787. The movement of handle 775 also releases the main operating shaft 140 for rotation by the spring motor, all as more fully described in the parent application.

The operating key

Situated at the right hand side of the keyboard and extending above the same is a large key 741, (Figs. 1, 2, 3, 6, and 7), which performs functions similar to those of the operating lever, and may be termed the "operating key". This key comprises two stems or shanks, one 807 toward the front of the machine and the other 808 toward the back, which pass through two guideways 809 (Fig. 3) secured in the keyboard frame. At their lower ends the stems 807 and 808 carry lateral pins 810 and 811, respectively, which work in slots in front and rear rock arms 814 and 815. The front rock arm 814 is mounted on a shaft 816 and has an upwardly projecting ear 817, and the rear rock arm 815 is mounted on a shaft 818 and has a downwardly projecting ear 819. A spring 820 connects the ears 817 and 819 and tends to hold the operating key in its elevated position. Hubs 821 (Fig. 6) are provided for arms 814 and 815, said hubs being secured to said arms and also to their respective shafts 816 and 818 so that said shafts are turned by the depression of the operating key.

Means are provided comprising an arm 823 (Fig. 7) associated with shaft 818 and a similar arm associated with shaft 816, by which the excess of power applied to operating key 741 is stored in the power spring. Means are also provided whereby upon depression of the key 741 the main shaft 140 is released for rotation by the power spring, all as more fully described in the parent application.

The various and functional keys

Situated in a transverse row at the front part of the keyboard of the machine is a series of keys which may be termed the "various" keys. One of these keys is situated forward from and between each pair of adjacent rows of number setting keys; that is, one is placed between the units and tens columns, a second between the tens and hundreds columns, etc.; there being in all one less "various" key than there are rows of number setting keys. There are also four "functional" keys, three of which are situated in the row with the "various" keys, while the fourth is placed at the extreme right of the keyboard and in the transverse row with the number "one" keys of the several columns of number setting keys. The "various" keys have certain functions in common and each has in addition some one special function. The common functions of these keys are vertical ruling, splitting and column locking. The performance of each of these functions is in part controlled by one of the "functional" keys, three of these keys being assigned respectively to the functions of column locking, vertical rule, and splitting. Any one, two, or all three of the common functions may be performed at the same time. The fourth "functional" key operates in conjunction with any of the "various" keys to control the performance of its individual or "specific" function. The common functions of the various keys will first be considered.

Splitting or dividing the keyboard

It is often desirable to split or divide the keyboard and printing mechanism, so that two or more sets of numbers simultaneously set up on different parts of the keyboard may be separately printed. In the absence of a more expressive term, the word "divide" is hereinafter employed to define a point at which the machine is split. For the purpose of splitting the machine, means are provided as follows:

1st. Means are provided for preventing automatic zero printing across the divide when the splitting mechanism is operative.

2nd. Means are provided for rendering part of the total printing mechanism inoperative when the adding mechanism has been split.

The mechanism for splitting or dividing the machine into independent parts is constructed as follows, see Figs. 7, 8, 9, 51, 53, 55, 59, 60, 61, 63, 64, and 66.

Each of the "various" keys has its stem 1011 (Figs. 5, 8, 9 and 63) guided in a slot in the upper plate 274 of its particular section 273 of the keyboard frame. The mechanisms associated with the several "various" keys are similar, hence only one will be described. In the forward edge of each stem or shank 1011 is a notch or depression 1012 which is adapted to engage the top plate 274 of the keyboard frame when the key is depressed and pushed forward, thereby locking the key in its depressed position. The lower end of shank 1011 is pivoted to a rock lever 1013 having an upwardly projecting finger 1014 which normally rests against the under side of the plate 274, preventing the elevation of the shank 1011 above its proper normal position. The lever 1013 is pivoted on a pin 1015 which passes through a front arm on the plate 274 of the keyboard frame. This plate has a slot extending from front to rear into which the lever 1013 projects and in which it is secured by the pin 1015. Lever 1013 has a downwardly extending arm 1016 which carries about midway of its length a lateral pin 1017. Pin 1017 is engaged by a hook 1019 on a rearwardly extending link 1018, which has near its rear end a slot 1020 through which passes a pin 1021 which binds link 1018 to several other parts about to be described. 1022 represents a pawl having a slot 1023 near its rear end through which passes the pin 1021. This pawl is arranged next to link 1018 and extends forwardly parallel thereto. 1024 is an ear on the upper edge of pawl 1022 to which is attached one end of a spring 1025 the other end of which is attached to an ear 1026 on link 1018. The pawl 1022 has a lower face 1027, which rests on a horizontal transverse rod 1028, and a stop 1029 on the forward part of its upper edge, which stop normally occupies a position below and to the rear of a horizontal transverse rod 1030. Next to pawl 1022 is a short upwardly extending link 1031 which is hung loosely at its upper end on a transverse rod 1032 and supports with its lower end the pin 1021. Arranged next to the link 1018, on the side opposite to pawl 1022 is a rearwardly extending link 1033 which is also pivoted on pin 1021, said pin having its head on the opposite side of this link. The link 1033 has attached to its rear end a spring 1034, the other end of which spring is attached to a transverse rod 1035; said spring tending constantly to pull the pin 1021 and its adjuncts into their normal positions. Near the center of the link 1033 is pivoted the forward end of a split bar 1036, the different bars 1036 being

offset varying amounts near their forward ends to accommodate the set of bars to the wide spaces between the "various" keys and the narrow spaces between the elements of the accumulating and printing mechanisms. The rear end of the split bar has a downwardly facing convex head or hinge element 1037, which fits into an upwardly facing socket or hinge bearing 1038 on an upright rock lever 1039 pivoted near its center on the shaft 204. The rock lever 1039 has upwardly, forwardly and downwardly extending arms 1040, 1041 and 1042, respectively. The upper arm 1040 has the socket 1038 on its front edge and extends above said socket, its upper end forming a cam head 1043 which normally stands in rear of one of the lips 268 which have been fully described under the heading "Automatic zero printing".

The forwardly extending arm 1041 of lever 1039 ends in a laterally bent lip 10410. A rock arm 10411 is pivoted on the arm 1041 in rear of lip 10410 and extends forwardly over said lip against which it is pressed by a spring 10412. The arm 10411 extends forwardly in back of the next higher gear rack arm 53 and normally stands with its front end just above a stop 1044 on the rear edge of said arm 53.

The lower arm 1042 has front and rear fingers 1045 and 1046. The rear finger 1046 has a cam face at its rear end which rests against a front cam face of a coupling dog of the "no-print-part-of-total" mechanism, which will hereinafter be fully described. The arm 1042, at the base of fingers 1045 and 1046, carries a pin 1048 which projects laterally to the left above a hook 1049 connected with the detector, to be described hereinafter.

The operation of the splitting devices above described is as follows:—

The "various" key at the desired divide is depressed, and that functional key 1050 which controls the split is thereafter depressed. When any "various" key 1011 is depressed it rocks lever 1013, which pulls forward link 1018, which in turn draws pawl 1022 forward by means of spring 1025. In moving forward, link 1018 also carries with it pin 1021, thus drawing forward link 1033 and split bar 1036. The head 1037 of the bar 1036, working in the socket 1038 of rock lever 1039, rocks the latter with the following results: The upper arm 1040 disconnects the automatic zero printing mechanism at the proper place, and finger 1046 splits the "no-print-part-of-total" mechanism.

The depression of the "split" key 1050 forces the bar 1028 up in a manner to be presently described, so that stop 1029 is locked in front of rod 1030, whereby pawl 1022, link 1033, split bar 1036, and the parts operated thereby, are retained in their set position, though the "various" key by which these parts were set may be released.

The loose arm 10411 is provided to allow horizontal ruling to be done while the machine is split. For this purpose mechanism is provided which is operable by the horizontal ruling key for removing to a position where they cannot interfere with the ruling movements of the carrier members 53 any arms 10411 which may at that time be in an operative position in rear of their respective stops 1044. This mechanism, best illustrated in Figs. 41, 42 and 59, is constructed as follows:

10413 represents a pair of rock arms mounted loosely on the shaft 204 and extending forwardly therefrom and carrying between them at their

front ends a rod 10414 which extends under all of the rock arms 10411. The horizontal rule rock lever 562 (Fig. 41) has an upwardly projecting portion 5620 having on its upper end a depression 5621 and an abrupt cam portion 5622 adapted to contact with a lug on the under edge of one of the arms 10413. This lug normally rests on the depression 5621 of the element 5620; but when the horizontal rule key 472 is depressed, the cam 5622 is swung so as to lift up on the said lug until the rod 10414 is raised high enough to raise any of the arms which may be at that time in an operated position out of operative relation with the respective carriers 53. After the ruling operation is completed, those of the arms 10411 which have been raised by the rod 10414 will be returned to their pre-ruling position by their respective springs 10412.

The split key

The mechanism whereby the bar 1028 is forced up by the depression of the "split" key is constructed as follows:—

The split key 1050 (Figs. 1, 45, 46, 47, and 59) is similar to the "various" keys in construction, has the locking notch 1012, and is provided with a cooperating rock lever 1051 mounted similarly to rock levers 1013. 1052 represents a link pivotally attached to the rock lever 1051 and to one of the side arms 1053 of the "split frame". This "split frame" consists of two arms 1053 loosely mounted on the transverse rod 1032 and supporting between them the rod 1028.

When the key 1050 is depressed it rocks lever 1051 which draws link 1052 forward, swinging the split frame up so that rod 1028 raises all the pawls 1022. Those pawls 1022 which are forward are locked from moving back to normal and those which are in normal position are locked from moving forward. The rod 1032 is secured in the side plates 1700 of the functional frame, more fully described in the parent application.

The vertical ruling mechanism

Means are provided whereby a line of vertical ruling may be printed between any two adjacent rows of figures at the same time that said figures are printed. That is, vertical ruling may be done between the units and tens, between the tens and hundreds, and between any other two rows, or several lines of ruling may be done simultaneously. As before mentioned, the vertical ruling is done by means of the "various" keys. The mechanism for this purpose, as shown in Figs. 7, 8, 9, 15, 63, and 67, is constructed as follows:—

Like the split mechanism, the vertical rule mechanism comprises a plurality of similar units, one of which will be described. Each link 1018 of the split mechanism has a finger 1054 at its rear end, which finger extends to the left from its link 1018 in back of a link 1055 similar to link 1031 of the split mechanism. The link 1055 is supported by rod 1032 and supports a pin 1056 similar to pin 1021. Next to link 1055 (on pin 1056) is a vertical rule pawl arm 1057, and next to arm 1057 is a rearwardly extending link 1058 similar to link 1033 of the split mechanism. The pin 1056 is constructed so as to hold the members 1055, 1057, and 1058 movably together. Pawl arm 1057 is provided with a slot 1059 through which pin 1056 passes, a stop shoulder 1060 and a lower face 1061, which face rests on a horizontal transverse universal bar or rod 1062. A spring 1025 holds pawl arm 1057 forward. 1063 represents a vertical rule bar which is secured to link 1058

and extends rearwardly therefrom; 1064 represents a spring connecting the rule bar to its corresponding split bar 1036; and 1065 is a spring from link 1058 to rod 1035 to hold said link in its rearmost position. The link 1058 has a slot through which pin 1056 passes. This slot is provided to compensate for the difference in movement required to set the split mechanism and that required to set the vertical ruling mechanism, the latter being less than the former, see Figs. 50 and 63. The vertical rule bar 1063 has at its rear end an upwardly facing convex head 1066 which fits into a downwardly facing socket or bearing 1067 in a rock lever 1068 mounted loosely on stop bar 184. The lever 1068 has a rear arm 1069 which carries a stud 1070 projecting laterally into a slot 1071 in the rear arm of the adjacent ruling type carrier or division plate 240 of the printing mechanism. 1072 represents a shoulder on the upper edge of rule type carrier 240, above slot 1071; and 1073 represents a vertical ruling type on the rear edge of plate or rule type carrier 240 opposite the printing line. Each rule type 1073 consists of a plurality of minute bosses arranged in a row along the rear edge of the ruling type carrier 240, the length of the row being approximately equal to the height of one of the number type, the bosses being so spaced apart that when several impressions are made by the type in immediate succession and in a vertical line, the distance between two adjacent impressions is equal to the distance between adjacent bosses of each rule type. Although the drawings show the rule type formed integrally with the rule type carrier, an attached rule type is within the scope of this invention. 1074 represents two upright printing levers similar in construction to those of the number printing mechanism. These two levers are arranged one on each side of the number printing levers and are actuated by cam arms 186, trip latches 203 and rollers 190, similar to those for the regular or number printing mechanism. The releasing dogs 1075 are unlike dogs 209 however, being constantly hooked over bar 211 so that the levers 1074 are operated during every operation of the machine. 1076 represents side arms of a vertical rule printing frame, said frame consisting of two such arms, pivoted on rod 54 and riveted to their respective printing levers 1074 and the cross bar 1077, which bar is secured between the arms 1076. Said bar 1077 is normally positioned above and just in front of shoulder 1072.

Because the levers 1074 are operated every time the machine operates, cross bar 1077 is driven rearwardly every time the machine operates; and because the shoulder 1072 is normally lowered out of the path of bar 1077, this rearward movement is usually idle. When, however, one of the "various" keys and the rule functional key are depressed, vertical ruling is done as follows: The "various" key depressed pulls forward its link 1018 of the split mechanism, causing finger 1054 to draw forward the upright link 1055 of the related rule mechanism. This allows pawl arm 1057 to move forward until stop 1060 stands in front of rod 1030. At the same time link 1058 is moved forward, carrying with it rule bar 1063, the arcuate head 1066 working in socket 1067 of lever 1068 rocks the latter, raising the stud 1070 and therewith the rear arm of division plate 240 until shoulder 1072 stands in rear of cross bar or universal rule actuator 1077. When bar 1077 is thereafter moved rearward it strikes shoulder 1072, driving plate 240 to the rear so that type 1073 is driven to make an impression on the platen. The de-

pression of the vertical rule key 1078, one of the four "functional" keys heretofore mentioned, raises bar 1062, lifting pawl arms 1057 until they are locked by bar 1030 coming either in front or in back of shoulder 1060.

Referring now to Figs. 8, 9 and 10, it will be seen that the rod or shaft 184 is a pivot for the member 1068 of the vertical rule mechanism; a stop for the members 181 of the printing mechanism, a stop for arm 1041 of the split mechanism, a stop for horizontal rule lever 559; and, as it supports the end plates 184^a it serves to help support the division plates 184^c.

Although only a single splitting and a single vertical ruling mechanism has been described, there is one such mechanism for each "various" key and operable thereby, these mechanisms for each "various" key being counterparts of the similar mechanisms for every other "various" key. To provide for vertical ruling without performing the other functions of the "various" key depressed, a bar 1062 acts to latch the pawls 1057 forward in a manner similar to that in which the "split" pawls are latched by bar 1028.

The vertical rule key

The means by which the universal bar or rod 1062 is raised is constructed as follows:

1078, Figs. 1 and 45, represents the vertical rule key, which is similar to the "various" keys; 1079 is the rock lever for key 1078, mounted as are the rock levers of the "various" keys; and 1080 is a rearwardly extending link connecting rock lever 1079 to one of the side arms 1081 of the vertical rule frame. This frame consists of the two side arms 1081 pivoted on bar 1032 and supporting between them the universal bar or rod 1062.

When key 1078 is depressed, it rocks lever 1079, which draws link 1080 forward, moving the vertical rule frame up until the rod 1062 has raised all the pawl arms 1057 into a locked position.

If any of the "various" keys is purposely or accidentally depressed while the machine is operating, the machine will rule and split at a position corresponding to the key depressed, the vertical ruling indicating the divide where carrying has been prevented.

The common functional mechanism

As heretofore stated, each of the "various" keys is adapted to partially control the performance of an individual function, in addition to the functions of splitting, vertical rule and column locking, which are common to all of the "various" keys. Certain identical mechanisms are associated with the several "various" keys for controlling the performance of their individual functions, and such mechanisms will now be described, reference being made to Figs. 7, 8, 9, 15, 43, 44, 48, 49 and 67.

1082 represents a plurality of depending links, one for each "various" key, pivoted on rod 1032. Each link 1082 carries at its lower end a pin 1083 which secures it loosely to a pawl 1084 and a pawl supporting arm 1085, both of which extend forwardly from pin 1083. Each pawl 1084 has an upper extension provided with a lateral finger 1086, and a lower extension provided with a rearwardly facing hook 1087. Each supporting arm 1085 is situated to the left of its respective pawl 1084 and has a lower finger 1088 which is bent to the right under pawl 1084 and up on the right side thereof. This bent up por-

tion of finger 1088 is connected to an ear on the front edge of link 1082 by a spring 1089 which normally holds arm 1085 and its pawl 1084 in their elevated position. The arm 1085 has also a forwardly and upwardly extending finger 1090 having a bent over ear 1091, which ear rests against a cam face 1092 on the under edge of link 1018, which cam face normally acts as a stop to limit the upward movement of arm 1085 under the tension of spring 1089. The hook 1087 normally rests above and in front of a locking bar 1093 which is adapted to be swung forward to engage with hook 1087 when pawl 1084 is in its lower position.

1094 represents a spring extending from the bent up side of finger 1088 to finger 1086, which spring holds pawl 1084 and arm 1085 in contact with each other so that they move as one piece. When any one of the "various" keys is depressed, its cooperating link 1018 is pulled forwardly (as previously described). The forward movement of link 1018 causes cam face 1092 to move forward against ear 1091, forcing down finger 1090. This moves arm 1085 down, drawing pawl 1084 with it by means of spring 1094, until hook 1087 stands directly in front of locking bar 1093.

When the specific functional key is now depressed, it moves bar 1093 into engagement with hook 1087, drawing pawl 1084, arm 1085 and link 1082 forward, and the specific function of the particular "various" key depressed is thereby rendered operative, as explained hereinafter.

The mechanism whereby the locking bar 1093 is moved forward is constructed as follows:—

The locking bar 1093 is supported by rock arms 1095 pivoted on rod 1030. The bar 1093 and arms 1095 are preferably formed of a single piece of metal bent into the desired shape.

1096 (Figs. 1, 65 and 66) represents the specific functional key. This key is provided with a pair of notches adapted to engage with the keyboard frame when depressed and moved forwardly, so as to hold said key in a depressed position. Instead of being pivoted to its rock lever, an opening 1097 is cut in the side of the key 1096, which opening receives one arm of the rock lever 1098. 1099 represents a link connecting the lower arm of lever 1098 with one of the rock arms 1095.

When the key 1096 is depressed it turns lever 1098 about its pivot, pulling link 1099 with it which draws arm 1095 forward, carrying with it the locking bar 1093.

Each of the links 1082 is connected; either directly by a link or indirectly by a yoke, an arm and a link; to the mechanism for the performance of the particular function controlled by its related "various" key. Certain of these particular functions and their mechanisms will be fully described hereinafter.

The special rule mechanism

Means are provided for printing special characters or rule line elements which combine to form a special rule line, to supplement the vertical rule lines already mentioned; the purpose of this special rule being to divide the record sheet into column spaces, while the "vertical rule" is to subdivide the column spaces.

The mechanism whereby this special rule line is printed is as follows:—

Mounted on the auxiliary sign type head at a point normally opposite the printing point is a special rule type 1720, (Fig. 36) which may be

adapted to print either an extra heavy rule line, or two narrowly spaced lines, or any desirable character, so as to differentiate from the vertical rule.

5 1721 (Figs. 1 and 68) represents that one of the "various" keys which controls the special ruling, and which has its "common functional mechanism" connected to a bar 1036^a, which bar is similar to the split bars 1036. 1039^a represents
10 an arm operable by the bar 1036^a, said arm being pivoted on the bar or shaft 204 and connected with the bar 1036^a by a head and socket similar to those used for connecting the members 1036 and 1039. The arm 1039^a is provided near its upper
15 end with a cam face 1722 which is adapted to co-operate with a finger 1723 formed on the dog 209^a of the auxiliary sign printing mechanism for lifting said dog. The spring 207 of the auxiliary sign printing mechanism, as well as the
20 springs 207 of the units number printing mechanism and the main sign printing mechanism, is directly connected to the releasing dog, there being no automatic zero printing latch mounted on any of these three releasing dogs.

25 The operation of this mechanism is as follows: The "various" key 1721 is first depressed, setting its "common functional mechanism" ready for operation; after which the specific functional key 1096 is depressed, operating the set mechanism to draw bar 1036^a forward, carrying arm
30 1039^a with it, whereby the cam 1722 forces up the finger 1723 until the dog 209^a stands with its upper shoulder 210^a in the path of the bar 211^a, so that the special rule will be operated to print
35 at every operation of the machine, except such operations as control the auxiliary sign printing mechanism for printing identifying signs.

The column lock

40 Means are provided for locking any one or more of the columns so that any number key which is set in the selected column or columns will remain in its set or operative position during successive operations, thereby repeating the printing of the
45 number set in such column or columns, while the keys of the other columns remain under the control of the ordinary locking and releasing mechanism and are released during each operation. To accomplish this, the operator depresses the
50 "various" key at the foot of and to the right of the column which it is desired to lock, or in the case of the units column depresses the split key 1050 (which controls this function in the units column) and, while said key is depressed, locks
55 down the "column lock" key 1115 (Figs. 1 and 51), afterwards releasing the "various" key. The selected column will then repeat at each operation of the machine until the column lock key is released. The release of the column lock
60 key renders the machine again normal. The mechanism for this purpose is illustrated in Figs. 1, 8, 9, 15, and 51 to 55 inclusive and is constructed as follows:—

Pivoted at 309 on each numeral key locking
65 bar 290 is a lever 1100, which projects rearwardly and upwardly, terminating in a shoulder 310, adapted to be engaged by the overturned end 316 of a lever 317 (Fig. 56). Lever 317 is pivoted on
70 rod 278 and has a forked lower end adapted to engage a bar 318, which bar is moved upwardly and forwardly near the middle of each operation of the machine by mechanism fully described in the parent application. Obviously when this
75 movement of bar 318 occurs and any shoulder 310 is in the path of the part 316 its locking bar will

be retracted, and the keys of the associated row restored to normal position. A spring 314 connects the lower arm of each lever 1100 with an arm of its tension finger 311, said spring constantly tending to raise lug 310. 1102 is a stop
80 finger on lever 1100 which by engaging the underside of lock bar 290 limits the upward movement of lug 310. Pivoted on the pin 1015 are two rock arms 1103 and 1104 spaced apart by a washer
85 1105. The elements 1103, 1104 and 1105 are secured together by a rivet and move as one piece. The arm 1103, which is to the left of its companion arm 1104, is in the same plane with lever
90 1100, and has a lower front face which is positioned over the rear arm of said lever 1100 between the lug 310 and the pivot pin 309. The arm 1104 has an upwardly facing shoulder 1106 which engages normally with the under side of the top
95 plate 274 of the keyboard frame to limit the upward movement of arms 1103 and 1104. 1107 represents a depending latch mounted on the side of arm 1104, said latch 1107 having a hook 1108
and a cam face 1109 on its front edge. A spring 1110 on latch 1107 has its other end attached to an ear on arm 1104 and tends to hold latch 1107
100 forward and arms 1103 and 1104 upward. The cam face 1109 cooperates with a finger 1111 on the rock lever 1013 of the "various" key to its right, or in the case of the units column with a similar finger on the rock lever of the split key,
105 so that when one of the "various" keys or the split key is depressed it allows latch 1107 to move forward, enabling the hook 1108 of latch 1107 to engage a bent over finger 1112 on a rock arm 1113. The rock arms 1113 of the several columns are
110 pivoted on rod 278, which rod supports the front of the keyboard sections, and these arms extend forwardly from said rod, their front forked ends straddling the universal column lock bar or rod 1114.

When one of the "various" keys is depressed,
115 it swings finger 1111 forward allowing the latch 1107 to its left to move forward and engage its hook 1108 on finger 1112. The column lock key is now depressed, which swings the column lock
120 bar 1114 down, as will be described hereinafter. The column lock bar 1114 rocks arms 1113, causing such fingers 1112 as are engaged by hooks 1108 to pull down the respective latches 1107
125 which carry with them the respective arms 1103 and 1104. Each arm 1103 so moved, strikes its lever 1100, rocking it so that the lug 310 is depressed out of the path of the restoring finger 316, which finger passes idly over lug 310 at each subsequent operation of the machine, and the locking
130 bar of the selected column is not restored to normal, so that the same key is held depressed during any desired number of successive operations of the machine.

After the column lock key is depressed, the
135 "various" key or keys which have been depressed are released and move their fingers 1111 from the position shown in dotted lines in Fig. 53 to the position shown in full line in the same figure. The relative positions of the centers of the several
140 moving parts are so arranged that the finger 1111 when returned to normal rests against the front face 1109 of the latch 1107 without moving the latch far enough rearward to disengage hook 1108 from finger 1112. When the column lock
145 key is thereafter released, the latch 1107 is moved up by its spring 1110, and the face 1109 (being inclined) forces latch 1107 back to its normal position.

The mechanism whereby the column lock bar is depressed is constructed as follows:—

1115 (Fig. 51) represents the column lock functional key which is situated at the left of the keyboard in front of the column of identifying shifting keys. The key 1115 has a lock similar to those of the "various" keys and the lower end of its shank is pivoted to the rear end of a rock arm 1116, the front end of which rock arm has a hub which is mounted on and pinned to the end of the short rock shaft 385. Said rock shaft is received in bearings in a boss formed on the front end of the filler section 273^a of the keyboard frame, said filler section being situated between the section carrying the row of number keys of the highest order and the section carrying the identifying shifting keys. An arm of this filler section projects forwardly of the other sections of the keyboard and carries the boss above referred to at its forward end. Shaft 385, at the other end from that to which arm 1116 is secured and adjacent to the point where the universal correction arm 384 is mounted, has secured to it a rearwardly extending arm 1118 the rear end of which normally rests over a finger 1119 carried by one of a pair of side arms 1120. These arms 1120 are pivoted on the rod 278, which supports the front part of the keyboard frame sections, and support between them the column lock bar 1114, which bar receives the forked ends of rock arms 1113 as above described. 1121, Fig. 8, represents a spring which is secured to the right hand arm 1120 and serves to support arms 1120 and rod 1114.

When the column lock key 1115 is depressed it rocks arm 1116 and shaft 385, moving arm 1118 down upon finger 1119 of side arm 1120, thereby depressing the column lock bar 1114. As the column lock bar moves down it rocks all the rock arms 1113, but operates to lock only those columns whose latches 1107 have been allowed to move forward by the depression of their related "various" keys.

The paper carriage

The carriage and its adjuncts are illustrated in Figs. 1, 4, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, and 72 to 102 inclusive.

The mechanism for supporting and feeding the paper or sheet which receives the record is constructed as follows:—

1122 represents the carriage track comprising a channel bar secured by screws or in any desired manner to the rear frame 2 of the machine, the flanges 1123 of said channel bar projecting rearwardly from said frame 2 in parallel horizontal planes. The channel bar 1122 might be cast with and form part of the rear frame 2, but for purposes of manufacture it is preferably formed of a separate piece. The upper flange 1123 has a ball race or groove 1124 (Figs. 3, 7 and 11) formed in its upper surface near its rear edge, and the lower flange has a similar ball race 1124 formed in its lower surface near its rear edge, the upper and lower races 1124 lying in the same vertical plane and parallel to each other. The ends of the carriage track 1122 project beyond the sides of rear frame 2.

On this track is mounted a transversely movable carriage 1125, on which carriage the transverse sheet supporting platen or roller 182 is mounted in such a manner as to be capable of moving with the carriage and also movable forward and backward, or at right angles to the direction of movement of the carriage, into and

out of the printing relation to the type carrying heads or segments 178. The carriage is preferably formed of a single piece of metal having a channel formed horizontally therein. The flanges 1126, forming the sides of this channel, extend forwardly from the main body of the carriage in parallel horizontal planes and have grooves or ball races 1127 (Figs. 2 and 11) formed in their inner surfaces, which grooves are positioned in the same vertical plane as the grooves 1124 of the carriage track.

The carriage 1125 is formed with stiffening ribs 1125^a extending vertically and at right angles to the flanges 1126, the end ribs 1125^a being projected upward and forward, forming arms 1129 and 1130 which terminate respectively in a journal seat or bearing (see Figs. 4 and 72). Balls 1128 cooperate with the registering grooves 1124 and 1127 of the track and carriage, forming bearings for the latter in its movements.

The means for operatively connecting the platen with the carriage comprises the pair of supporting arms 1129 and 1130 of the carriage; a pair of intermediate upright rock arms or frame ends 1131 and 1132 (Figs. 11 and 62) secured on the right and left end portions respectively of a transverse rod 1133 which has its bearings in supporting arms 1129 and 1130; and two platen supporting rock arms 1134 and 1135 pivoted at their rear ends on the upper ends of the intermediate rock arms 1131 and 1132 and pivotally supporting the platen shaft 1183 at their front ends. The rock arms 1131 and 1132 are secured together at their lower ends by a bar 1136. These three elements, 1131, 1132 and 1136, constitute a "platen swinging frame" or yoke, which is preferably stamped from a single piece of sheet metal and secured to the shaft 1133 as above mentioned. Each of said arms 1131 and 1132 has a bent over finger 1137 (Figs. 11 and 72) which supports its adjacent platen supporting arm or frame end 1134, 1135.

The record sheet is held against the platen by means of a roller 1138 (Figs. 8 and 93) and spring clips or paper guides 1139 and 1140 (Figs. 1, 8, and 92), all three of which press the sheet against the platen. The roller 1138 acts as a presser roller to assist the platen in feeding the record sheet, and is supported pivotally by the front ends of a pair of arms 1141 which also support upper and lower paper directing or guiding plates or tables 1142 and 1143 (Fig. 15). One of the arms 1141 is pivoted on a boss 1144 (Fig. 11) of the platen supporting arm 1134, and the other of said arms is pivoted on a similar boss 1144 (Fig. 62) of the arm 1135. 1145 represents a finger piece on the left hand arm 1141, and 1146 (Fig. 12) a finger piece on a boss of the arm 1135. 1147 (Fig. 93) is a spring which is coiled around the boss 1144 on the rock arm 1135 and has one end pressing against the finger piece 1145 and the other end seated against the boss which carries the finger piece 1146. The purpose of this spring is to hold the roller 1138 yieldingly against the platen 182 or the record sheet carried thereby.

The spring clips 1139 and 1140 (Fig. 92) are constructed similarly to each other but reversed, so that one cooperates with the right and the other with the left end of the platen. Each of these clips, beginning at its lower or free end, curves upwardly around a portion of the face of the platen, extends rearwardly, and is bent upwardly and forwardly about three sides of a square bar 1149 (Fig. 12.) The bar 1149 is

non-rotatably secured in recesses or seats formed in bosses 1149^a (Fig. 62) on arms 1134 and 1135. Secured to each of the clips 1139 and 1140 is a tension spring 1150 (Fig. 92) which presses against the fourth or front side of bar 1149, holding the clip in frictional and slidable engagement with the bar 1149 and pressing down the lower portion or finger of the clip on the platen. The head of the rivet securing the spring 1150 and the clip together is extended outwardly to form a handle or finger piece by means of which the clip may be shifted from one position to another on the bar 1149 and platen 182.

When it is desired to place a sheet in position for printing, the sheet is passed down along the front face of table or guide plate 1142 onto the table 1143 which directs it between the platen and the presser roller 1138. Upon now turning the platen, the paper is fed up between the platen and clips 1139 and 1140 which hold the paper down on the platen. The sheet passes under bar 1149 and out of the machine again over the upper table 1142.

The paper cutter

1151 (Figs. 10, 11 and 15) represents a paper cutter bar which is provided with a longitudinal flange along one edge and with a series of teeth along its opposite edge and with bent up ends, forming ears or flanges 1152 having therein apertures of a shape conforming to the cross section of bar 1149. This bar has been described as "square", but it may have any other non-cylindrical shape. The paper cutter is thereby non-rotatably secured in rear of the platen, with its serrated cutting edge over the paper leaving the machine. The record sheet may be cut off at the desired line by first causing said line to coincide with the cutting edge of the paper cutter and then raising the paper with sufficient pressure against the serrated edge. This paper cutter is preferably formed by stamping it from sheet metal and bending the longitudinal and end flanges substantially at right angles to the body of the cutter and to each other.

The paper guide

Means are provided for guiding the lateral edges of the record sheet as it enters the machine.

1153 (Figs. 12 and 91) represents a paper edge guide carrying an angular bearing or lip 1154 which fits against the rear and upper sides of the angular paper cutter or bar 1151 and projects forwardly beyond said bar. 1155 represents a tension spring riveted to the forward projection of lip 1154, extending under and in front of said paper cutter or bar 1151 and pressing against the same, thus holding lip 1154 forward and down against bar 1151. The rivet which secures lip 1154 to spring 1155 projects upwardly, forming a finger piece by which guide 1153 may be moved along said bar or paper cutter to different positions thereon.

Ordinarily two guides are used, and the record sheet is fed into the machine between and with its edge bearing against the guides 1153, which causes the sheet to enter straight and guides it after it enters.

The platen swing

Means are provided for moving the platen forwardly and downwardly upon the carriage from the normal position, shown in Fig. 10, to the printing or impression receiving position, as shown in Fig. 11.

The platen is held in its normal or elevated position by a spring 1156 (Figs. 4 and 102) coiled about rod 1133. One end of spring 1156 is secured to rod 1133 while the other end runs down on the carriage frame. A pin 1157 on the carriage arm 1129 acts as a stop for front and rear shoulders 1158 and 1159 (Fig. 90) on platen swing frame arm 1131, thus limiting the swing of the platen in both forward and rearward directions.

1161 (Fig. 102) represents a roller mounted on the lower arm of an upright rock lever 1162. The roller 1161 bears against the cam disk 142 which is mounted on the main operating shaft 140, as described under "Main operating frame mechanism". The lever 1162 is pivoted on the transverse rod 204 near the frame 10 and carries on its upper end a lateral pin 1163; said pin works in a slot 1164 in the forward portion of a rearwardly extending link or pusher 1165. A spring 1166 is attached at opposite ends to ears on lever 1162 and link 1165 and thereby holds said lever and link so that the pin 1163 normally rests in the front portion of slot 1164. 1167 represents a spring connecting the upper arm of lever 1162 with an ear on one of the end plates 234, described under "Printing mechanism", said spring constantly exerting tension on said lever 1162 to press roller 1161 against its cam 142. The rear portion of link 1165 is bent over and on the upper surface of this bent over part and at the rear end thereof is mounted an upright roller 1168 which normally stands just in front of bar 1136 of the platen swinging frame. The bent over portion of link 1165 is supported by a rest 1169 in which it slides, said rest being movable so as to raise and lower the rear end of link 1165 and its roller 1168, for a purpose hereafter to be described.

When the machine is operated, the shaft 140 turns the cam disk 142. The periphery of said cam disk is of such configuration as to move the roller 1161 back and forth as the shaft 140 revolves. When cam 142 moves roller 1161 forward the lever 1162 is rocked thereby and moves link 1165 rearward, forcing roller 1168 against bar 1136 and swinging the platen down to the printing position (Fig. 9) against the tension of spring 1156. As the disk 142 again comes to its normal position the lever 1162, link 1165 and roller 1161 are returned to normal position by the spring 1167; allowing spring 1156 to return the platen to its normal position (Fig. 8), in which position the printing on the record sheet is visible to the operator.

The loose connection between pin 1163 and slot 1164 is provided to compensate for any lack of uniformity in the thickness of the record sheets used.

The paper feed

The mechanism whereby the paper is fed forward is best shown in Figs. 4, 12, 72, 88, 89, and 102, and is constructed as follows:—

1170 represents a plate or bar provided with spaced lateral fingers which are curved around the rod 1133 and form bearings for supporting said plate, which latter comprises a depending element or bar 1171 which stands in the path of roller 1168 of the platen swing mechanism when said roller is in its elevated position. The left end of the bar 1171 is provided with an extension 1171^a which is curved rearwardly and upwardly and then to the left, and carries at its end a tenon 1172 (Fig. 89). The tenon 1172 extends into and exactly fits a slot 1173 formed

in the lower arm 1174 of an L-shaped rock lever mounted loosely on shaft or pivot rod 1133, thus rigidly connecting members 1170 and 1174. The upper arm 1175 of this rock lever has pivoted thereto a pawl 1176. Pawl 1176 engages with the teeth of a ratchet wheel 1177 which is riveted to a spacing washer 1178 and gear wheel 1179. The ratchet, washer and gear wheel are mounted on shaft 1133 so as to turn together freely thereon. The ratchet wheel is also engaged by a pawl 1180 (Figs. 13 and 89) which is pivoted to the side of the carriage arm 1130. The pawls 1176 and 1180 are held in engagement with the ratchet wheel by a spring 1181 connecting said pawls. 1182 represents a gear wheel mounted on and frictionally secured to the platen shaft 1183.

In ordinary line spacing operations, the roller 1168 when forced rearward strikes first against bar 1136 for swinging the platen. Should bar 1171 of the line space mechanism be far enough rearward to escape contact with roller 1168, as is the case when several items are to be printed in a horizontal line, the gear wheel 1182 would roll about gear wheel 1179, the resistance of pawls 1176 and 1180 being sufficient to prevent rotation of the latter gear wheel. As the platen then moves up from its printing position the gear wheel 1182 rolls back about gear wheel 1179. However, if bar 1171 is in its normal position, as in ordinary line spacing, the gear wheel 1182 rolls about gear wheel 1179 until roller 1168 engages and begins to move bar 1171. As this bar is moved it raises its extension 1171^a, which rocks lever 1174-1175. The arm 1175 carries with it the pawl 1176 which turns the ratchet wheel 1177 and thereby turns gear wheel 1179, so that gear wheel 1182 does not roll about wheel 1179 during the remainder of the movement to the printing position. The foregoing movement brings a new and lower portion of the record sheet to the printing line. During its entire return movement to normal position, the wheel 1182 rolls about the wheel 1179, rotating the platen a greater distance than it was rotated in the downward movement to the printing position.

Means are provided for feeding the paper a greater or less amount, or temporarily disabling the paper feed, according to the character of the work being done.

When several items are to be printed in a horizontal line, it is desirable to make the paper feed mechanism inoperative while the platen swing mechanism remains operative; in ordinary work it is desirable to have the paper fed a line space at each operation; and in certain work it is desirable to have the paper fed two line spaces at each operation. The mechanism for accomplishing these ends is constructed as follows:—

1184, (Fig. 88) represents a paper feed adjusting lever mounted loosely on shaft 1133 and having a finger piece 1185. The rear part of lever 1184 has a flat upper surface 1186 which rests under the extension 1171^a adjacent to the tenon 1172. 1184 has also upper, intermediate, and lower downwardly facing rear stops or shoulders 1187, 1188, and 1189 respectively. 1190 represents a spring arm secured to the carriage 1125 and pressing constantly against the rear of lever 1184. The spring arm has a finger piece 1191 and a stop shoulder 1192 which shoulder cooperates with one or another of the stops 1187, 1188 and 1189.

When the stop 1187 is in engagement with shoulder 1192, the flat upper surface 1186 is in

its lowest position and the plate 1170 is positioned so that the bar 1171 is in its foremost position. In this position the roller 1168 will swing the bar 1171 a relatively great distance and the paper is fed its greatest amount, which in this machine is designed to be two line spaces. By shifting the finger piece 1185 forward, the intermediate stop 1188 is brought into cooperative relation with shoulder 1192, and the bar 1171 is swung rearward until it is operable by roller 1168 during only the last part of the rearward stroke of the latter; and thus the paper is fed a less amount or (in this case) a single line space. By shifting the finger piece 1185 still further forward, the stop 1189 is brought into engagement with shoulder 1192, and bar 1171 is carried so far rearward that it is out of reach of roller 1168, and the paper feed mechanism is inoperative. When single or double line spacing is again desired the shoulder 1192 is forced rearwardly by pressing on its finger piece 1191, and the lever 1184 is adjusted by means of the finger piece 1185 to bring stop 1188 or stop 1189 above the shoulder 1192.

As has been already described, the platen supporting arms 1134 and 1135 rest on fingers 1137 of the upright rock arms 1131 and 1132. This arrangement of the above mentioned parts positions the platen gear wheel 1182 to properly mesh with its driving gear 1179. By raising the platen and engaging the gear 1182 from the gear 1179 the platen may be turned any integral number of line spaces and again lowered to re-engage said gears.

Platen swing lock

Means are provided for locking the platen down in the printing position during a succession of operations, when it is not desired to have the platen swing at each printing operation. As shown in Fig. 90, this mechanism is constructed as follows:

1194^a represents a locking lever mounted pivotally on the intermediate rock arm 1131 of the platen swing mechanism (previously described). The forward end of this locking lever is provided with upper and lower faces 1193 arranged at an angle with each other, and the rear end is formed into a finger piece. 1194 represents a notch formed in the lower edge of the lever 1194^a and adapted to engage with pin 1157 on carriage arm 1129, described in connection with the platen swing. 1195 represents a spring secured to the rock arm 1131 and bearing normally against the upper face 1193.

When it is desired to lock the platen down in the printing position the platen is moved down to the printing position by hand, and the finger piece on lever 1194^a is pressed down; this engages the notch 1194 with the pin 1157, and changes the position of the faces 1193, so that the spring 1195 bears against the lower one of the faces 1193 and holds the lever 1194^a in engagement with pin 1157. When it is desired to release the carriage from the lock, the finger piece is lifted up and the platen swings back to its normal position by means of its spring 1156. As the lever is thus raised the spring 1195 again contacts with the upper face 1193, and the lever 1194^a is thereby held from engaging with the pin 1157.

Paper feed operative and inoperative

Means are provided, as shown in Figs. 101 and 103, for raising and lowering the platen swing-

ing link or pusher 1165, so as to render the paper feed operative and inoperative at will.

As previously stated, the platen swinging link 1165, Fig. 102, is supported at its rear end by a rest 1169. This rest or movable support is the upper arm of a rock lever 1196 pivoted to the inner side of the rear frame of the machine. 1197 represents a second arm of the lever 1196, said second arm being bent forward and then laterally of the machine and terminating in a forwardly extending finger 1198. The finger 1198 stands under the free end of a rock arm 1199 pivoted to the rear frame. A finger 1201 of a depending rock arm 1200 having the same pivot as arm 1199, rests on the upper edge of arm 1199. Near its lower end, arm 1200 carries a pin or stud 1202 which projects through a slot 1203 in one end of a link 1204. Link 1204 carries at its opposite end a pin 1205 which projects through an inverted V-shaped slot 1206 in the rear frame. The portion of pin 1205 which extends out from the rear of the frame forms a finger piece for moving said pin from one leg to the other of the slot 1206. 1207 is a spring on lever 1196 for holding arms 1196 and 1197 in their elevated positions. 1208 represents a spring from the lower end of arm 1200 to an ear on link 1204 below the pin 1205, said spring holding pin 1202 in the right end of slot 1203 and holding pin 1205 down into either of the legs of slot 1206. Arm 1199, being in contact with finger 1198, acts as a stop for lever 1196 when the latter moves up under power of spring 1207, and the arm 1199 is stopped by finger 1201. For the present, arms 1199 and 1200 may be considered as one piece, and the link 1204 may be considered as pivoted on pin 1202.

When the pin 1205 is in the left leg of slot 1206 the arm 1199 acts only as a stop for the upward movement of lever 1196, and the link 1165 is held in its elevated position, so that the pusher or its roller 1168 may swing the platen and also feed the paper. By moving pin 1205 over into the right hand leg of slot 1206 the link 1204 rocks arm 1200, which forces arm 1199 down, carrying with it finger 1198 and rocking the lever 1196, so that the rest 1169 is moved down; whereby link 1165 assumes its lower position, so that roller 1168 when moved engages the platen swing frame bar 1136 only, passing under the paper feed bar 1171, and the paper feed is rendered inoperative.

The carriage feed

The carriage is moved forward or leftward by a propelling device which may be of any suitable or approved construction; that shown in the drawings (Figs. 2, 3, 4, 8, 9, 72, 73, 74 and 76) consisting of a driving band or strap 1209 connected at one end with the carriage and at its opposite end with a drum 1210 which is mounted as follows:

A pivot, screw or stud 1211 extends rearwardly from the rear frame 2 and has rotatably mounted thereon a hub 1212 which is screw threaded at one end and formed integrally with a flange or disk 1213 at its other end. A sleeve 1214 is seated on the hub 1212 and held in fixed position thereby by means of a cap or nut 1215 which is engaged with the screw threaded end of the hub 1212, so that the members 1212, 1213, 1214, 1215, and a bell 1216 rotate as one piece on the pivot 1211. The bell 1216 is secured to the nut 1215 in any desirable way, and any proper and preferred mechanism may be employed for ringing the bell

when the carriage reaches the limit of its movement.

Rotatably mounted upon the sleeve 1212 and within the flange of the drum 1210 is the spring casing or drum 1217, this casing being formed with inner and outer flanges 1218 and 1219 respectively, the outer flange being formed with ratchet teeth 1220. 1221 represents the main or carriage driving spring which is coiled inside the casing 1217 with its inner end secured to the inner flange 1218 and its outer end fast on a pin 1222 secured to the flange or disk 1213. Secured to the front side of disk 1213 and spaced apart therefrom by a washer is a ratchet wheel 1223 provided with a double pawl 1224. The pawl 1224 is mounted loosely on a hollow stud or journal 1224^a supported by the rear frame 2 and having a shaft or axle 1225 journaled therein, Figs. 4, 14, and 72. The ratchet wheel 1223 is held stationary except when the tension of spring 1221 is increased or decreased. Secured to the shaft 1225 is a pawl 1226 which is normally inoperative but is adapted to be thrown into engagement with the ratchet teeth 1220 for removing the carriage from the driving influence of the spring 1221, as will be fully explained under the "Two column mechanism".

The drum 1210 forms a spring casing for a comparatively light take up spring 1227, the outer end of which is fastened to a pin projecting from rear side of the main spring casing 1217 and the inner end being secured to the drum 1210. A stop 1228 on casing 1217 cooperates with a pair of stops 1229 on the drum 1210, for driving said drum by the power of said main spring 1221 and permitting the drum 1210 a limited amount of movement independent of the main spring when the latter is rendered ineffective by the engagement of pawl 1226 with the ratchet teeth. This limited amount of movement is allowed the drum 1210 for the purpose of taking up slack in the band 1209 which occurs in two column work, as will be fully explained hereinafter.

1230 and 1230^a (Figs. 4 and 94) represent a plurality of sleeves secured to the lower rear part of the carriage 1125 and supporting a rod 1231. The rod 1231 is adjustable longitudinally by means of a screw 1232 fitted in the right hand end sleeve 1230^a and abutting the end of rod 1231. The outer end of the screw 1232 is formed into a finger piece or knob for turning said screw, to force it against or withdraw it from said rod. 1233 represents a plurality of sleeves mounted on and secured to the rod 1231, each of said sleeves carrying an arm 1234 which extends forwardly, ending in a tenon 1235, the several tenons 1235 supporting a rack bar 1236 (Figs. 13, 62, and 72). The teeth of rack bar 1236 project downwardly and engage with the teeth of a gear wheel 1237 (Figs. 8 and 9) secured on a bushing 1725 said bushing being fast on a short shaft 1726 having its bearings in the rear frame and a bracket 1727 secured to the rear frame. Mounted on the short shaft 1726 and abutting against the bushing 1725 with a rear extension of its hub is a beveled gear wheel 1728. 1729 (Fig. 4) represents a spring coiled about the rod 1231 between one of the sleeves 1230 and its adjacent sleeve 1233 and having one end fastened to each of said sleeves, thus forcing the rod 1231 against its adjusting screw 1232 and turning it so as to cause the rack bar 1236 to engage with its gear wheel 1237. 1730 (Figs. 101, and 106 to 111 inclusive) represents a ratchet wheel mounted on the above

mentioned extension of the hub of gear wheel 1728 and secured thereto. 1731 represents a pawl for ratchet 1730, said pawl being pivoted to the rear frame; and 1732 is a spring for holding said pawl in engagement with ratchet 1730. When the pawl 1731 is in engagement with ratchet 1730 it holds the carriage from moving under the power of its spring by means of the above described train of mechanism between said carriage and said ratchet 1730.

1733 represents a dog pivoted to a lower arm 1734 of a rock lever pivoted on the rear frame and normally resting with a lower face 1735 (Figs. 106 and 107) of its free end on a stop pin 1736 secured to the rear frame, as shown in Fig. 108. In its normal position a shoulder 1737 of dog 1733 is to the left of a forwardly projecting finger 1738 on the pawl 1731. The spring 1732 of pawl 1731 is connected to the dog 1733, for holding said dog down. 1739 represents a shoulder on the lower side of the free end of dog 1733, for engaging with pin 1736 when said dog is moved to the right.

When the arm 1734 is rocked, by means to be presently described, the dog 1733 is drawn to the right, whereby shoulder 1737 forces finger 1738 to the right until pawl 1731 is disengaged from its ratchet and the face 1735 moves from over pin 1736 so that the dog 1733 is forced down with its shoulder 1739 in engagement with pin 1736, locking the pawl 1731 in its inoperative position. The carriage is now free to move under the propelling power of its spring.

Step by step movement of the carriage

1238 (Figs. 4, 72, 84, 85, 86, 87, 106 and 107) represents a stop rod or bar having four radial plates or wings each of which carries projections or stop lugs 1239 the series of stop lugs on each wing being spaced apart a different distance from those of any other series. Each machine is provided with several interchangeable stop bars any one of which may be employed in lieu of the one illustrated, each stop bar having its stop lugs spaced in accordance with the work to be accomplished, whereby a variety of column spacings may be made. There will also be provided a bar having adjustable lugs so that any desired spacing may be obtained by using this or one of the other stop bars. The adjustable stops and their bar will be described hereinafter.

A journal is formed on each end portion of the stop bar 1238, the left hand journal terminating in a substantially pointed end and the right hand journal being provided with an extension or stem on which is secured a knob or finger piece 1241. The journals are each rotatably mounted in a bearing member, the left hand one of which is fixedly secured to the carriage, while the right hand bearing 1240 is detachably secured to said carriage by any desirable means, such as the following:

Extending radially to the axis of the journal in the bearing 1240 is a screw 1243 formed rigidly with said bearing and provided with a nut or finger piece. The bearing 1240 is permanently held in engagement with the stop bar by means of a finger piece 1241. 1242 represents a spring arm formed with a lateral flange at one end and provided at its other end with a notched detent, said detent being formed by bending the spring longitudinally in such a manner as to cause the end portion to be substantially V-shaped in cross section. The spring 1242 is provided with an

aperture through which the screw 1243 extends in such relation that the flange of the spring arm fits snugly against the outer end of the bearing 1240, where it may be secured if desired, so that the V-shaped detent engages with one or another of the plates or wings 1238, as shown in Fig. 84, so as to hold the stop bar in one or another of its operative positions. By turning the finger piece 1241, the stop bar may be turned so as to cause the wing plate which is engaged by the V-shaped detent to move against one side plate thereof and thereby press the spring arm outward, allowing another of the wings to move into engagement with the detent in lieu of the one priorly engaged.

The carriage is provided at its right hand end with a notch and a communicating countersink; said notch being of size to have the shank of the screw 1243 snugly fitted therein, and the countersink being of a size to receive a boss formed on a thumb nut 1244 fitted on the screw 1243. When it is desired to remove a stop bar for substituting another it is only necessary to unscrew the thumb nut 1244 sufficiently to free it from the countersink, whereupon the screw 1243 may be moved laterally out of the notch, carrying with it the bearing 1240, the stop bar and spring arm.

Pivoted to the rear frame of the machine is a horizontal rock arm 1245 (Figs. 101, 106, 107, 110, and 111) which carries a pin 1246 projecting through a slot 1246^a in the rear frame and riding on the stop bar 1238. The rock arm 1245 supports at its free end a depending link 1247. 1248 is a finger on link 1247, which finger extends parallel with arm 1245 and is bent under said arm. The spring 1207 (previously described) is attached by one end to link 1247 so as to constantly tend to pull said link toward the left of the machine. 1249 represents a stop pin normally stopping link 1247 in its leftward movement, and 1250 is a finger on link 1247 overlying pin 1249. 1251 represents a finger on the end of link 1247, which finger is bent forward under dog 1733, said finger normally resting in a recess in the lower surface of dog 1733, adjacent a downwardly projecting lug 1252 formed on the under side of said dog.

When the dog 1733 is moved to the right (Fig. 106), releasing the carriage by withdrawing pawl 1731 from the ratchet 1730, and the carriage moves, said carriage carries the stop bar 1238 to the left and the pin 1246 rides down from the top of one of the stop lugs 1239, allowing link 1247 to drop until its finger 1251 is below lug 1252 of dog 1733. The spring 1207 now acts to pull link 1247 to the left until it contacts with the stop pin 1249 (Fig. 107), at which time finger 1251 stands under lug 1252. As the pin 1246 rides up onto the next lug 1239 of the carriage stop bar, said pin causes arm 1245 to raise link 1247, so that finger 1251 lifts dog 1733 until the shoulder 1739 of said dog is out of engagement with its pin 1736. The finger 1738 of the pawl 1731 is now below the shoulder 1737 of dog 1733, and spring 1732 forces said pawl into engagement with the ratchet 1730. At the time when the pawl 1731 is moved, or as soon thereafter as the rock arm 1734 is free, the dog 1733 moves to the left, under the power of spring 1732, and the surface 1735 again rests on pin 1736. In this manner the carriage travels step by step, as the dog 1733 is successively moved to the right by means hereinafter described, for printing items in successive columns as illustrated in Fig. 86.

Adjustable-stop carriage stop bar

As previously mentioned, a carriage stop bar having adjustable stops is provided with each machine. Such a bar, shown as 1253 (Fig. 95) is provided upon its upper surface with a plurality of letter spaced depressions 1254. 1255 is an adjustable stop tooth or lug for said bar 1253, said stop tooth comprising a member having a flat top 1256 and oppositely sloping fingers 1257 which engage in two of the depressions 1254. Each tooth 1255 also comprises front and rear fingers 1258 which embrace the front and rear sides of bar 1253, extending below said bar 1253 and having shoulders or heads 1259. 1260 represents a spring having two notches 1261, which engage with the fingers 1258, with their sides resting on heads 1259, and two curved up spring fingers 1262 which press again the under side of bar 1253.

In this construction the spring 1260 holds the tooth 1255 down with its fingers 1257 in engagement with the depressions 1254 in bar 1253. To adjust the stop to a different position on bar 1253 the operator presses up on the headed lower ends of the stop, thereby disengaging fingers 1257 from depressions 1254; then slides the stop along the bar to the desired position and releases it, so that fingers 1257 again engage with the depressions 1254.

The column key

Means are provided for moving the arm 1734 so as to release the carriage and allow it to move a step. The mechanism for this purpose, as shown in Figs. 7, 11, 70, 101, 106, 107, 108 and 109, is constructed as follows:—

The arm 1734 is the lower arm of a bell crank lever having a lateral arm 1263 which is connected at its free end to a vertical link 1264 supported at its upper end by the rear arm of a key lever 1265 pivoted loosely on the tie rod 11 and extending forwardly therefrom. The front end of lever 1265 is bent over under the lower end of the shank of the column key 1266, said column key being situated just forward from the repeat key (previously described).

When the column key 1266 is depressed, the shank thereof presses down on the front end of lever 1265 causing the rear end of said lever to raise link 1264, which pulls up on the free end of arm 1263, swinging arm 1734 and causing the carriage to be released for moving a step or column space as previously described.

Carriage return levers

Means are provided for moving the carriage against the tension of its driving spring. The mechanism for this purpose is shown in Figs. 4, 11, 13 and 72 and constructed as follows:—

Situated at the left hand side of the carriage and secured thereto is a vertical rock lever 1269 having a finger piece 1270 formed on its upper end and carrying a rearwardly projecting pin 1271 on its lower end. The pin 1271 projects through a diagonal slot 1272 formed in a bar 1273, slidably secured to the carriage frame by upper and lower headed pins or screws 1274 which pass through vertical slots in bar 1273. The upper screw 1274 passes through the upper vertical slot in bar 1273 and through lever 1269, forming the pivot of the latter, and also passes through a plate 1275 and into the framework of the carriage. The lower screw passes through the lower vertical slot in bar 1273, past but not through lever 1269 (the lever curving about the screw so

as to avoid it), through plate 1275 and into the carriage frame. Said screw is provided with a shoulder seated against said plate 1275. By this means plate 1275 is immovably secured to the carriage frame, bar 1273 may slide on said screws until stopped by the ends of the vertical slots, and lever 1269 may swing until its pin 1271 reaches either end of diagonal slot 1272. To the upper left portion of plate 1275 is pivoted an arm 1276 which extends to the right and carries two fingers, one of which, 1277, is formed by bending over the free end, and normally is positioned under the extension 1171^a (Fig. 88) of paper feed plate 1170 (already described under "The paper feed"). The other finger 1278 is formed on the under side of said arm 1276 and rests against a rearwardly extending finger 1279 of the lever 1269. The slide 1273 has its lower end offset (Fig. 13) to rest against a pin 1280 on the left hand end of rod 1231. The pin 1280 presses up against the lower end of slide bar 1273, holding it normally in its elevated position, with screws 1274 in the lower ends of the vertical slots, and the pin 1271 in the lower end of slot 1272; whereby the lever 1269 is held in its normal position, with the finger piece 1270 held to the left.

When it is desired to return the carriage to normal the operator presses against finger piece 1270, whereby lever 1269 is forced to swing about its pivot, carrying pin 1271 into the upper end of diagonal slot 1272. This forces slide 1273 down on pin 1280, rocking rod 1231, thus releasing the carriage rack from its gear and allowing the carriage to be moved to the right. At the same time, the finger 1279 presses against finger 1278 of arm 1276, lifting the free end of said arm 1276 so that finger 1277 operates the plate 1170 to feed the paper according to the position of adjusting lever 1184. In this manner the carriage is returned and the paper fed.

A mechanism for moving the carriage without feeding the paper is provided on the right hand end of the carriage. This mechanism consists of a plate or bar 1281, a slide 1282 (both mounted on the carriage) and a pin 1283 on the right hand end of rod 1231. The bar 1281 is formed into a finger piece 1284 at its upper end. The slide 1282 has three vertical slots, through each of the lower two of which passes a screw, these screws being secured to the carriage. The upper one of the slots 1282 has a guide pin extending therethrough and riveted to bar 1281. The lower end of slide 1282 is offset to engage pin 1283, and the upper end is bent over to form a finger piece 1285. The pin 1283 presses up against the lower end of slide 1282, raising it to its elevated position, and a spring 1286 extending from bar 1282 to bar 1281 holds said slide in its upper position when the rod 1231 is rocked by bar 1273, above described.

When it is desired to move the carriage in either direction without feeding the paper, the operator grasps the finger piece 1284 on bar 1281 and with one finger presses down on finger piece 1285 of slide 1282. The slide 1282 pushes pin 1283 down, turning rod 1231, whereby the carriage rack is released from its gear. The carriage may now be moved in either direction by finger piece 1284.

Automatic column feed

Means are provided whereby the carriage may be fed laterally at each operation of the machine.

When it is required to print several items in a horizontal row, it is desirable to have the carriage automatically move a column space at each operation of the machine. As shown in Figs. 1, 7, 150

11, and 70; the mechanism for accomplishing this result is constructed as follows:—

1287 represents one of the "various" keys, the particular or individual function of which is automatic column feeding. By means previously described under "The common functional mechanism", this key is operatively connected with its respective depending link 1082. The link 1082 is connected by a yoke 1288 with a link 1289 similar to link 1082 and situated in the power or right hand section of the machine. Pivoted to link 1289 is a bar 1290 extending rearwardly therefrom and pivotally connected at its rear end to a latch 1291. Latch 1291 stands substantially vertical in the machine, and carries a hook 1292 the mouth of which stands normally in rear of a pin 1293 projecting from the side of lever 1265 of the column key mechanism. Latch 1291 is pivoted at its lower end to the front arm of a rock lever 1294 and is so arranged that the upper face of its hook 1292 will act as a cam on pin 1293 to draw lever 1294 forward when said hook is drawn into contact with said pin. 1265^a represents a spring from the column key lever to pin 1297 for holding said lever normal. 1295 represents a spring connecting latch 1291 with the rear arm of lever 1265, said spring tending to hold lever 1265 in its elevated position and latch 1291 in its rearmost position. 1296 represents a stop pin secured on and projecting laterally from frame 4 of the machine, said pin being positioned to limit the rearward movement of the link 1290. The lever 1294 has a rear finger 1296^a which curves about a pin 1297, also secured to frame 4, said pin and finger cooperating to limit the movements of said lever 1294. The lever 1294 is pivoted on the tie rod 11 from which it depends. The lower end of lever 1294 is curved, forming a cam face 1298. 1299 represents a pin secured to the side of the scroll gear wheel 806 and carrying a roller. The spring 1295 in acting on latch 1291 forces lever 1294 into its rearmost position.

When it is desired to have the automatic column feed operative, the "various" key 1287 is depressed, following which the specific function key 1096 is depressed and locked down. By this means, as has already been described, the respective link 1082 is operated to swing yoke 1288 forward, carrying with it the lower end of link 1289. Link 1289 pulls bar 1290 forward, causing latch 1291 to move forward until its hook 1292 engages pin 1293, and lever 1294 is moved into its forward position as determined by finger 1296^a and pin 1297. In its forward position the cam face 1298 stands in the path of the roller on pin 1299 of scroll gear 806. When the machine is thereafter operated, and near the completion of the operation of the machine, pin 1299 strikes cam face 1298, moving it rearwardly. This causes lever 1294 to pull latch 1291 down, which latch by means of hook 1292 and pin 1293 pulls down the front end of lever 1265 of the column key mechanism. Lever 1265 (as has been previously described) will thereby allow the carriage to move a column space or step. The carriage is released for movement at approximately the time when the identifying shift keys are released.

The two column mechanism

It is often desirable to print successive items in different columns, as for instance the debits and credits of an account. This requires the provision of mechanism as follows:

1st. Means are provided for rendering the pa-

per carriage escapement inoperative and the two column mechanism operative, and vice versa; also for bringing the paper carriage to rest with an inter column line of the paper (the space between adjacent columns) opposite to the printing type; see Fig. 87.

2nd. Means are provided for shifting the carriage two column spaces, by depressing the column key when the two column mechanism is operative.

3rd. Means are provided for printing all amounts accumulated on the main accumulators in one column and printing all amounts accumulated on the auxiliary accumulators in a second column.

4th. Means are provided for adjusting the amount of movement of the carriage in either direction from its inter-column position.

5th. Means are provided for feeding the paper, or line spacing, when the items are being printed successively in either column, also when one item is printed in the right hand and the next in the left hand column, and for rendering the paper feed ineffective between two printing operations the first of which occurs in the left hand column and the next in the right hand column.

Each of the above means will be taken up separately and in the order given.

1st. 1300 (Fig. 1) represents that one of the "various" keys having as its specific function the control of the two column mechanism. As previously described, this key is operatively related to its respective depending link 1082, this particular link 1082 having a yoke 1301 (Fig. 114) extending into the total or left hand section of the machine, where said yoke connects with a depending link 1302 similar to link 1082. A bar 1303 is pivotally connected to the lower end of link 1302 and extends rearwardly therefrom, connecting at its rear end with the upper arm 1304 of a rock lever mounted on tie rod 8. 1305 represents a rear arm of the same rock lever, and has its rear end forked to straddle a pin 1306 on the front end of a rock arm 1307. The rock arm 1307 is secured to a sleeve 1308 mounted loosely on the tie rod 9. 1309 represents a rock arm secured to the opposite end of sleeve 1308 and extending rearwardly therefrom, its rear end extending over a finger 1310 of a rock lever 1311 pivoted to the rear frame of the machine. The lever 1311 (Figs. 110 and 111) has a depending arm 1312 to which is pivoted one end of a sliding bar 1313, the other end portion of said bar having a slot 1314 through which extends the pin 1736, which pin has been described as furnishing a support and stop for the carriage feed pawl controlling dog 1733. 1315 represents a finger formed on the end of the bar 1313, said finger always standing in a position to strike finger 1738 of the carriage feed pawl 1731.

The mechanism thus far described operates in the following manner. When the two column key 1300 is depressed it operates, in a manner previously described, to move link 1082. Link 1082 swings yoke 1301 forward, said yoke carrying with it the lower end of link 1302. This draws bar 1303 forward, which rocks arm 1304, the latter communicating its movement to arm 1305, which lifts pin 1306, thereby rocking arm 1307 and (through sleeve 1308) depressing the rear end of arm 1309. Arm 1309 presses down on finger 1310, rocking lever 1311, so that arm 1312 forces the sliding bar 1313 to the right. Finger 1315 pushes against finger 1738 of the pawl 1731, forcing said pawl out of engagement with its

ratchet, whereby the carriage is disengaged from its escapement mechanism.

1316 (Figs. 108 to 111 inclusive) represents a bar lying in a plane parallel with the rear frame and having a downwardly facing lug 1317 at its right hand end. 1318 is a stop shoulder on the under side of said bar 1316, said shoulder normally engaging with pin 1736. The bar 1316 is pivoted at its left end to the upper arm of a rock lever 1319, the latter being pivoted on the same pin as rock lever 1311. Lever 1319 has a lateral arm which carries finger 1320, said finger projecting over the rear end of arm 1309. This lateral arm has a downwardly extending ear 1321. 1322 represents a plate pivoted on the same pin as rock levers 1319 and 1311, said plate carrying two springs 1323 and 1324, attached at their opposite ends to bars 1313 and 1316 respectively and tending constantly to draw these bars and their connected parts to the left. 1325 represents a rock arm secured on the same pin or axle as the normally inoperative pawl 1226 of the carriage driving spring mechanism; and 1326 represents a finger on arm 1325, said finger resting on the lateral or left arm of lever 1319. 1327 represents a spring connecting the arm 1325 with ear 1321 for holding the arm 1325 down. The finger 1320 normally holds a clutch described hereinafter up in an inoperative position.

When the carriage is released (by moving the pawl 1731, by means of finger 1315, as has been described), said carriage moves under the power of its spring, the link 1247 is lowered (by stop rod 1238, pin 1246 and arm 1245), and finger 1251 moves under lug 1317. As the next stop 1239 raises pin 1246, the link 1247 is drawn up, raising bar 1316 until shoulder 1318 is disengaged from pin 1736. Spring 1324 now draws bar 1316 to the left, rocking the lever 1319, allowing arm 1325 to move down; and pawl 1226 now engages the ratchet 1220, stopping the carriage and rendering the carriage spring ineffective. At the same time finger 1320 (by moving down) allows the two column clutch to be thrown in. This clutch will now be described.

1328 (Figs. 101 and 110 to 113 inclusive) represents the two column shaft which extends horizontally across the rear frame and is journaled in bearings in brackets 1329 screwed to said frame. The shaft 1328 carries a beveled gear 1330 which is secured to it and meshes with beveled gear 1728 described under "Carriage feed". 1331 represents a hub secured on shaft 1328 and having a flange 1332 formed thereon, to which flange is secured a gear wheel 1333, so that said gear wheel turns with shaft 1328. 1334 represents a sleeve or hub mounted loosely on shaft 1328 next to hub 1331. 1335 represents a washer mounted on sleeve or hub 1334 next to gear 1333; and 1336 represents a plate having a rounded body portion and two extensions arranged diametrically opposite each other, said plate being mounted on sleeve 1334 between washer 1335 and a collar or flange 1337, the latter formed integrally with sleeve 1334. 1338 represents a washer mounted on sleeve 1334 next to the other side of flange 1337. 1339 is a gear wheel mounted on sleeve 1334 between washer 1338 and a similar washer 1340. 1341 represents a perforate plate or body mounted on sleeve 1334 and carrying a tappet 1342 (Figs. 111, 114, 115 and 118) extending radially from the shaft 1328. The parts 1335, 1336, 1337, 1338, 1339, 1340 and 1341 are riveted together so as to form substantially one body. A collar 1343 is secured on the shaft

1328 and serves to hold sleeve 1334 and the parts mounted thereon in operative relationship with hub 1331 and its gear wheel 1333.

The clutch for connecting sleeve 1334 and parts supported thereby with gear 1333 is constructed of three rigidly connected parts,—a supporting plate 1344, a spacer 1345, and a segmental clutch section 1346, the latter having gear teeth on its arcuate lower edge. The supporting plate 1344 has an elongated opening comprising a curved central portion and two extensions, said opening being so constructed as to fit about the plate 1336 in such a way as to be movable only in the lengthwise direction of plate 1336. Washer 1335 and flange 1337 confine plate 1344 between them so as to prevent said plate from moving lengthwise of shaft 1328. Spacer 1345 is positioned between plate 1344 and clutch section 1346, and both members 1345 and 1346 are secured to the upper part of plate 1344. The clutch section 1346 overhangs the gear 1333 with which its teeth are adapted to mesh. The plate 1344 is held normally in its elevated or inoperative position by finger 1320 (previously described). A spring 1347 is bent about the edge of flange 1337 and has its ends connected to plate 1344, exerting a constant and downward pressure on said plate. The end portions of this spring 1347 extend tangentially from its circular middle portion, and its extreme ends are each bent at right angles to the tangential portion, to be received in apertures or spring seats in the plate 1344. This spring 1347 constantly bears upward on the lower edge of disk 1337 and downward on plate 1344 so as to yieldingly hold the plate in its lowermost position.

When the finger 1320 moves down as has been described, the plate 1344 is moved down by gravity assisted by the spring 1347 bringing the teeth of the clutch member 1346 into mesh with the teeth of gear 1333, whereby the two column mechanism is rendered operative and the carriage is brought under the control of said two column mechanism. When the two column shaft 1328 is now turned in one direction, beveled gear wheel 1330 and its connections (1728, 1726, 1237 and 1236), to the carriage bring the carriage into position for the printing to be done in one column; while turning the shaft in the opposite direction moves the carriage in the opposite direction and brings it to position for printing to be done in another column. The normal position of the carriage is such that the type are opposite the space between the two columns.

As previously described, the carriage stop bar 1238 is provided with several series of stops 1239 to be used for various kinds of work. One series of stops (Fig. 87) is designed for two column work and is turned to its operative position by the operator, preparatory to performing such work. The stops of the two column mechanism are positioned two column spaces apart, and the carriage is stopped as previously described by one of said stops, each time it is moved by its spring. Means have been described for the movement of the carriage upon making the two column device operative, which means bring the carriage into the inter column relation described.

2nd. Movement of the carriage from one intercolumn position to another intercolumn position is effected by use of the column key 1266. Devices are provided whereby the actuation of the column key, when the "two column" mechanism is set, disengages the two column clutch 1346 and the carriage spring ratchet stop pawl 1226, permitting the carriage to move under the power of

its spring 1221 until stopped under control of a stop bar lug 1239 as in ordinary column space operation. These devices may be as follows: The dog 1733 of the carriage feed mechanism has a finger 1348 (Figs. 106 to 109 inclusive) bent over from its upper edge at its free end. This finger lies to the left of and in the path of a shoulder 1349 (Figs. 108 to 111 inclusive) on bar 1316. When the two column mechanism is made operative, the bar 1316 is moved to the left as previously described, in which position, the shoulder 1349 stands against finger 1348. When the column key is depressed, dog 1733 moves to the right, its finger 1348 moving bar 1316 also to the right, rocking the lever 1319, whereby the two column clutch member 1344, is raised, and pawl 1226 is disengaged from its ratchet so that the carriage driving spring is again rendered effective. The carriage now moves as in column spacing, lowering the finger 1251 until it stands under both lugs 1252 and 1317, and then as the next lug of the carriage stop bar becomes effective, the finger 1251 is raised, lifting the dog 1733 and bar 1316 until they are disengaged from pin 1736. As lug 1252 is nearer to the pivot of dog 1733 than finger 1348, the latter is raised a greater distance and clears shoulder 1349, whereby bar 1316 is allowed again to move to the left by spring 1324, allowing reengagement of the two column clutch with wheel 1333, and rendering the carriage spring ineffective. As the two column carriage stop bar lugs are positioned two column spaces apart, the carriage is moved two columns at each depression of the column key.

The single column stop lugs could be used for two column work, but the columns would be positioned differently on the record sheet and the column key would have to be operated twice each time it is desired to print in new columns, in order to move the carriage the proper distance, in which case, the first half column would be left blank; so that, it is better to use the appropriate series of stops for the work to be accomplished in order to secure uniformity of appearance of the columns on the record sheet.

3rd. The means for segregating items in two columns corresponding respectively to the two accumulators may be as follows: The gear wheel 1339, which is thrown into operative relation with the carriage by the two column clutch, meshes with a gear segment 1350 (Figs. 15 and 114 to 120 inclusive) which is formed on the rear end of an arm 1351 of a rock lever or reversing member pivoted on pivot rod 653 and having a front arm 1352. The arm 1352 carries a pin or stud 1353 which may be called the "main" pin or engaging element, and the arm 1351 carries a pin or stud 1354 which may be termed the "auxiliary" pin or engaging element. 1355 represents a vertical bar or "alternator" member having front and rear upper arms 1356 and 1357 respectively. The arm 1356 has a hook 1358 formed in its front edge, said hook being adapted to engage main pin 1353; and the arm 1357 has a hook 1359 formed in its rear edge, said hook being adapted to engage with the auxiliary pin 1354. The hook 1358 is normally hooked on pin 1353, as shown in Figs. 15 and 114. The lower end of bar 1355 is pivoted to the rear end of a lifting bar 1360, the bar 1360 being pivoted on a short shaft or stud 1361 secured to the inner total frame 6. The bar 1360 has a slot 1362 near its rear end through which passes the middle portion of a pin 1363 (Fig. 15), said pin being connected by one end to a horizontal link 1364, and by its other end to the low-

er end of a vertical link 1365. The link 1364 is pivoted at its front end to the lower end of a depending rock arm 1366, pivoted on the tie rod 8 and connected to a stroke adjusting arm 1367 which will be described under the 4th means of this series. Link 1365 is pivoted to the rear end of a rock arm 1368 also mounted on tie rod 8. 1369 represents a connecting link pivoted to the rear end of arm 1368 opposite link 1365, extending downwardly from its pivot and having a hook 1370 formed in its rear edge near its lower end. The hook 1370 is adapted to engage with a pin 1371 secured to the side of a cam operated lever 1372, pivoted at its front end on stud 1361 and having upper and lower rear arms 1373 and 1374 respectively, each of which arms carries a roller 1375, which rollers ride upon the peripheries of complementary cam disks 656 and 657 on the main operating shaft 140.

When the hook 1370 is thrown into engagement with pin 1371 and the machine thereafter operated, the cam disks 656 and 657 (referred to under the heading "Minus transfer") cooperate with rollers 1375 to raise the rear end of cam lever 1372 and its pin 1371. This lifts connecting arm 1369, which rocks arm 1368, thereby raising link 1365, pin 1363, and lifting bar 1360. Bar 1360 lifts bar 1355, which normally raises the main pin 1353, rocking the gear segment 1350 down, thereby turning gear wheel 1339 which (through its connections, already described) moves the carriage so that printing will be done in the left hand column.

When the auxiliary key is depressed the rock arm 467 has its lower end moved rearwardly. (This has been fully described under the heading "The auxiliary key".) This rock arm 467 carries a pin 1376. 1377 represents a hook adapted to engage with pin 1376, said hook being formed in the upper edge of a link 1378 pivoted at its rear end to the arm 1357 of the alternator bar 1355. When the arm 467 is moved by the auxiliary key, it (by means of pin 1376 and hook 1377) moves link 1378 rearwardly, thereby swinging bar 1355 so that hook 1358 is disengaged from the "main" pin 1353 and hook 1359 is engaged with "auxiliary" pin 1354. The pin 1354 being on the opposite side of the pivot rod 653 from pin 1353, its engagement with hook 1359 will cause the gear segment 1350 to move in the opposite direction upon operating the machine, whereby the carriage is moved in the opposite direction, so that printing will be done in the right hand column. The weight of the parts of the auxiliary key mechanism which are connected with arm 467 is sufficient to return them to normal when the auxiliary key is released, so that the hook 1358 may be again drawn into engagement with the main pin 1353 by a spring 1444 (fully described hereinafter).

The connecting link 1369 is moved by a link 1380 to engage hook 1370 with pin 1371, said link 1380 connecting the link 1369 with a depending arm 1381 of the two column lever having the arms 1304 and 1305 previously mentioned. When the two column mechanism is made operative, the lower end of arm 1381 moves rearwardly, pushing link 1380 which link causes arm 1369 to engage hook 1370 with pin 1371.

4th. The means for varying the position of pin 1363 in slot 1362 and thus varying the spacing of a pair of columns is as follows: The adjusting arm 1367 extends to the rear frame where it is formed into an interiorly screw threaded body 1382 (Fig. 13). The threads of the body or nut 1382 engage

with the threads of a rod 1383 rotatably secured against longitudinal movement in the rear frame. On the outside of the frame, rod 1383 is provided with a finger piece, rotation of which causes nut 1382 to move either forward or backward, thereby moving arm 1367, which (through arm 1366 and link 1364) moves the pin 1363 to different positions in slot 1362. When the pin 1363 is in a part of the slot toward the pivot 1361 operation of the machine imparts to the bar 1360 a greater swing than when said pin is further removed from the pivot 1361. Therefore the amount of stroke or longitudinal movement of the carriage may be adjusted by adjusting the screw 1383, whereby the widths of the columns and the inter-column spaces may be varied. For example, the columns of each pair may be spaced apart a relatively short distance while the pairs of columns are spaced apart a greater distance.

In the operation of performing two column printing, the position of the inter-column line shifts as the columns are broadened or narrowed, so that in taking the totals of long lists of small numbers (in narrowly spaced columns) the printed totals may overlap, and to avoid such overlapping the totals must be printed on different horizontal planes; but the special vertical rule line may be printed at the right of either column and its total so as to correlate each total with its column exclusively of the other column.

5th. The mechanism for effecting the control of line spacing appropriate to the different phases of two column work may be as follows: The pin or tappet 1342 (Figs. 104 and 105) already described) normally stands over an inclined cam face on one arm 1384 of a rock elbow lever 1385 pivoted on the same pin which is the pivot of arm 1311 and lever 1319. 1386 represents the other arm of lever 1385, said arm 1386 having its free end pivoted to a plate 1387. Plate 1387 has two shoulders 1388 and 1389 and a cam face 1390, the shoulder 1388 normally resting against a pin 1391 on the rear frame, and cam face 1390 being normally out of the path of pin 1342 of the two column mechanism. 1392 represents a link pivoted to plate 1387 above arm 1386, and extending to the right therefrom parallel with the rear frame. Link 1392 has a hook 1393 normally resting over a finger 1394 of an arm 1395 carried by lever 1196 of the paper feed mechanism. Link 1392 has its free end formed into a long nose the under surface of which is curved and extends over the rear end of an arm 1396.

When the two column mechanism is made operative, the carriage is moved to its inter-column position and the paper is fed at each operation in the manner already described so long as the items are successively printed in the left hand or main column; the pin 1342 moves up and back each time and does not strike the inclined face of arm 1384. However, when it is desired to print an item in the auxiliary or right hand column, the carriage is moved accordingly and tappet 1342 swings down on the cam face of arm 1384, rocking the lever 1385, which forces plate 1387 to the left, drawing with it link 1392. This rotates plate 1387 until its shoulder 1389 rests against pin 1391, and cam face 1390 is shifted over pin 1342, above the normal position of the latter. As link 1392 is drawn to the left its hook 1393 draws finger 1394 leftward, which rocks lever 1196 down, so as to lower the pusher bar and thereby render the paper feed inoperative. As the operation of the machine progresses, at approximately the time when the printing is

done, the arm 1396 is raised by mechanism to be presently described and raises the nose of link 1392 until finger 1394 is released, said finger 1394 moving to the right under the nose of arm 1392 and rendering the paper feed again operative for subsequent operations. When it is thereafter desired to print items in the main column, the pin 1342 (in moving up) strikes cam face 1390, disengaging shoulder 1389 from and engaging shoulder 1388 with pin 1391, and returning the lever 1385 and link 1392 to their normal positions; so that the mechanism is set to again render the paper feed inoperative when the carriage is again moved to print an item in the auxiliary column. A spring 1397, attached to the nose of arm 1392, moves said link back to its normal position.

The arm 1396 is the upper arm of a rock lever 1398 (Fig. 102) mounted loosely on the rod 204. 1399 represents a stop finger formed on the lower edge of arm 1396 and curved about a pin 1400 projecting from the frame 15, said pin limiting the movement of said arm 1396. The lever 1398 has a lower arm 1401 which projects downwardly and extends over the cam disk 142 on the driving shaft. The arm 1401 is normally out of contact with disk 142, but as the machine operates and comes to the printing position, a high portion of disk 142 strikes the free end of arm 1401, rocking the lever 1398 so as to raise the arm 1396.

In two column work, the carriage in swinging back and forth causes a considerable amount of slack to occur in the carriage feed band, as the carriage feed spring is rendered inoperative at that time. This slack is taken up by the auxiliary spring box described under "The carriage feed"

The alternator

Means are provided for causing the carriage to automatically present the columns of a pair alternately to the printing position so that successive settings of numbers on the keyboard will be printed alternately in the columns of a pair and accumulated alternately on their respective main and auxiliary accumulators. An organization of this kind is useful in tabulating gross and net weights or price and discount, etc.

The means whereby this is accomplished are constructed as follows:

The bar 1355 which has been described with the two-column mechanism will hereinafter be referred to as the "alternator" or "alternator bar". The arm 1356 of this bar carries a pin 1402 (Figs. 15, 117, 118 and 119) above its hook 1358, and arm 1357 carries a corresponding pin 1403. 1404 represents a supporting bar mounted at its lower end on pivot rod 653 and at its upper end secured to the frame 6. About midway of the length of bar 1404, front and rear rock arms 1405 and 1406 are pivoted to said bar. Each rock arm has an upper finger 1407 which normally rests with its upper end against a cylindrical lug or head 1408 secured to bar 1404 near its upper end. Pivoted to the arm 1405 at its free end is a rock lever 1409 having a depending arm 1410 and an arm 1411 curving upwardly and rearwardly. A hook latch 1412 is also pivoted to arm 1405 at the same point as lever 1409, extends downwardly parallel to arm 1410 and has a hook 1413 adapted to cooperate with pin 1402 and a finger 1414 which extends over in front of arm 1410. A spring 1415 connects latch 1412 to lever 1409 tending to hold finger 1414 in constant contact with arm 1410. The arm 1406 has pivoted to its

free end a similar mechanism, but reversed owing to arms 1406 and 1405 being on opposite sides of supporting bar 1404. This mechanism, particularly illustrated in the perspective view, Fig. 8 120, comprises a rock lever 1416, having arms 1417 and 1418; and a hook latch 1419, having hook 1420 and finger 1421; and spring 1422. 1423 represents a vertical link having a slot 1424 in its upper end. The pin, securing the cylindrical lug 1408 to supporting bar 1404, passes through 10 the slot 1424, slidably confining said link between said lug 1408 and said supporting bar 1404. 1425 (Fig. 119) represents a spring connecting a finger 1426, formed on lever 1409 and bent under arm 15 1405, to an ear formed on one side of the upper end of link 1423, said spring tending constantly to hold arm 1405 with the upper end of its finger 1407 against lug 1408. A spring 1427 similarly connects a finger 1428, formed on lever 1416 and projecting under arm 1406, to an ear on link 1423 20 opposite the ear for spring 1425. 1429 represents a finger projecting from link 1423 just below slot 1424 and extending over arms 1411 and 1418. Normally the bar 1423 is in its lowermost position, with the finger 1429 holding arms 1411 and 25 1418 depressed, so that hooks 1413 and 1420 are out of the paths of pins 1402 and 1403.

The alternator bar 1355 has two track faces 1430 and 1431 situated below hooks 1358 and 30 1359, respectively. The pin 1353 rides on face 1430 when pin 1354 and hook 1359 are operative, and pin 1354 rides on face 1431 when pin 1353 and hook 1358 are operative. The link 1423 is connected at its lower end to an arm 1432 of a 35 rock lever which may be termed the "alternator lever". The alternator lever is pivoted on tie rod 8 and has an upper arm 1433 connected by a bar 1434 to a depending link 1435 which latter is connected by a yoke 1436 to one of the depending 40 links 1082 pivoted on rod 1032 and operatively connected to that one of the "various" keys which has as its individual function the control of the alternator. 1437 (Fig. 1) represents this particular "various" key. 1438 (Fig. 117) represents a 45 third or depending arm of the alternator lever, which arm carries a pin 1439. 1440 represents a fork of a link 1441, said fork straddling pin 1439. Link 1441 extends rearwardly from pin 1439 and has a slot 1442 near its rear end which 50 works on a pin 1443 secured to the alternator bar 1355. A spring 1444 is attached at one end to link 1441 and at the other end to arm 1438, and tends to hold link 1441 forward against pin 1439 and normally holds alternator bar 1355 with its 55 hook 1358 in engagement with pin 1353.

Automatic shifting between two columns being a part of the "alternating" operation, means are provided for connecting the alternator bar to its reciprocating mechanism. For this purpose, a 60 finger 1433* (Fig. 15) projects laterally from the arm 1433 of the alternator lever in rear of the arm 1304 of the two-column mechanism; so that the two-column mechanism is free to move independent of the alternator mechanism, but 65 when the alternator mechanism is rendered operative, the finger 1433* will be caused to set the two-column mechanism.

When alternating work is to be done, the alternator key is depressed and thereafter the specific function key 1096 is locked down. This renders the two-column mechanism (already described) operative, and also the respective link 1082 of the alternator key mechanism is moved, swinging its yoke 1436 and link 1435. Link 1435, 75 by means of bar 1434, rocks the alternator lever

so that arm 1438 moves link 1441 rearwardly until pin 1443 stands in the front end of slot 1442, and the alternator bar 1355 is free to swing between pins 1353 and 1354. At the same time, arm 1432 raises link 1423, which lifts finger 1429 and strains springs 1425 and 1427, causing levers 1409 and 1416 to be rocked until hook 1413 stands over pin 1402, and hook 1420 stands in a position to be over pin 1403 when the alternator bar is moved to engage hook 1359 with pin 1354. Attention is particularly directed to Figs. 15, 117 and 118, in the first of which the alternator mechanism is shown in its inoperative position; in the second, said mechanism has been rendered operative but the machine has not yet operated; and, in the third, said mechanism has been operated.

After the alternator mechanism has been set, as above described, and the machine is operated, the alternator bar 1355 moves up, hook 1358 operating pin 1353 to cause the carriage to move for printing in the main or left hand column, and the item is accumulated on the main accumulator. As the alternator bar moves up, pin 1354 rides on cam face 1431 keeping hook 1358 engaged with pin 1353; and pin 1402 forces hook latch 1412 out until pin 1402 is raised above hook 1413, at which time spring 1415 draws latch 1412 back again, positioning hook 1413 under pin 1402. As the alternator bar now moves down it draws down the hook 1413, rocking arm 1405 down so that its finger 1407 moves away from lug 1408. Spring 1425 is thereby strained, pressing arm 1410 against pin 1402 and tending to move the alternator bar rearward. The face 1431 pressing against pin 1354 prevents the alternator bar from being thus moved until hook 1359 comes opposite pin 1354, at which time the alternator bar is quickly thrust rearward engaging hook 1359 with pin 1354. When the alternator bar is thus thrown rearward, the arm 1357, by means of its connection 1378 to the auxiliary mechanism, sets said auxiliary mechanism for accumulating the next item on the auxiliary accumulator.

When the machine is next operated, the alternator bar moves up, hook 1359 operating pin 1354 to cause the carriage to move for printing in the auxiliary or right-hand column, and the item is accumulated on the auxiliary accumulator. As the alternator bar moves up, pin 1353 rides on the face 1430, keeping hook 1359 engaged with pin 1354; and pin 1403 forces hook arm 1419 out until pin 1403 rises above hook 1420, at which time spring 1422 draws latch 1419 back again, positioning hook 1420 under pin 1403. Pin 1402 has in the meantime moved gradually away from hook 1413, freeing said hook, which allows spring 1425 to return 1405 until its finger 1407 contacts with lug or head 1408. As the alternator bar now moves down it draws down hook 1420, rocking arm 1406 so that its finger 1407 moves away from lug 1408. Spring 1427 is thereby strained, pressing arm 1417 against pin 1403 and tending to move the alternator bar forward. The face 1430, pressing against pin 1353, prevents the alternator bar from being thus thrown forward until hook 1358 comes opposite pin 1353, at which time the alternator bar is quickly thrust forward, engaging hook 1358 with pin 1353. When the alternator bar is thus thrown forward, the arm 145 1357 releases the auxiliary mechanism which it has held set.

When the alternator mechanism is rendered inoperative, a spring 1445, connected to arm 1438, aids in returning the mechanism in general, and 150

particularly draws link 1441, so as to move the alternator bar to normal, in case said bar should at this time have its hook 1359 engaging pin 1354.

Check numbers

It is at times desirable to print items alternately in two columns and at the same time preserve an accumulation of only those items printed in one column. This is particularly useful for banks, where it is desired to print check numbers in one column and check amounts in a second, and to preserve an accumulation of the check amounts, but not of the check numbers.

This is accomplished by the use of a "various" key 1446, having connections to a link 1447 (Fig. 121) pivoted to a lever 1448 having a laterally extending finger 1448^a adapted to engage the lug 1434^a on the link 1434. Through this and other connections the key 1446 effects the same control of the carriage movement as the "alternator" key 1437, all as more fully described in the parent application.

Carriage control of various functions

Means are provided whereby the carriage may control various functions of the machine, said means being best illustrated in Figs. 2, 3, 4, 7 to 15, inclusive, 72, 77 to 83, inclusive, and 101.

1493 represents a channel-shaped frame, which is removably secured to the carriage between the flanges 1126; 1494 represents the flanges of frame 1493; and 1495 represents a keeper plate secured to the under side of the lower flange 1494. The flanges 1494 have a plurality of holes 1496 formed in them, the holes in the upper flange registering with corresponding holes in the lower flange. The keeper plate 1495 has holes 1496^a corresponding with holes 1496 and is pressed down about each of the holes 1496^a so as to form a circular depression, space or recess 1496^b between the lower flange 1494 and the portion of the keeper plate surrounding each hole 1496^a, as shown in Fig. 80. In each depression 1496^b is placed a circular or ring spring 1496^c the ends of which normally meet. The inside diameter of the ring 1496^c is normally less than the diameter of the hole 1496^a, and the outside diameter of said ring is greater than that of said hole and less than that of the recess or depression 1496^b, which recess is just deep enough to allow the ring spring to expand and contract freely.

1497 represents a plurality of short vertical shafts which are positioned in certain of the holes 1496—1496^a according to the carriage stop bar being used, the shafts 1497 being positioned to correspond with stopping points of the carriage. The lower ends of the shafts 1497 are beveled or tapered and the upper ends are headed. 1497^a represents an annular groove formed in the shafts 1497 so positioned that when the head of the shaft reaches the top flange 1494 the groove 1497^a will be in position to be engaged by the respective ring spring 1496^c. In positioning the shaft the tapered end spreads the spring 1496^c, and after the spring contracts into the groove the shaft is held firmly by said spring until it is desired to remove the shaft, which may be accomplished by pressing upon the lower end of the shaft, to release the shaft from the grip of the spring 1496^c, and then grasping the head of the shaft and drawing it up.

1498 represents tappets or rollers which may be removably secured to the shafts 1497. Each roller 1498 has a circular opening or hole 1498^a through it, for the passage of the shaft 1497. An

annular groove 1498^b is formed in each roller, opening into the hole 1498^a. In the groove 1498^b is seated a circular or ring spring 1498^c the ends of which normally meet. The inside diameter of this ring is normally less than the diameter of the hole 1498^a, and the outside diameter of the ring is greater than that of said hole and less than that of the recess or groove 1498^b, which groove is of such dimensions as to allow the spring 1498^c to expand and contract but to prevent independent movement of said spring axially of the roller after said spring is seated.

Although the rollers 1498 may be formed in one piece and have the springs 1498^c secured therein in any suitable way, the rollers herewith illustrated are formed of two disks each formed with a circular depression around its central aperture, and these disks are secured together by rivets or other desirable means, with their circular recesses facing inward and registering so as to constitute a housing for the ring spring 1498^c.

1497^b represents seven annular grooves formed on each shaft 1497 above the groove 1497^a and in spaced relation to each other. When the shaft 1497 is forced through the opening 1498^a its beveled end forces the ring spring 1498^c open, and as the grooves 1497^b and 1498^b come to register the spring contracts and holds the roller in position on the shaft. The roller may be moved from one to another of the grooves 1497^b by pressing in the desired direction. The lowest groove 1497^b positions the roller inoperatively and the other six grooves position it to perform various kinds of work, as will be presently explained. If desirable, more than a single roller may be positioned on each shaft at any time.

The frame 1493 is detachable, having one of its ends formed into a fork 1500 which engages with a pin 1500^a on the carriage. The opposite end of frame 1493 carries a pin 1501 which, when the frame is being positioned, enters a slot 1502 in the end of the carriage. A knurled nut 1503 screws down on pin 1501, securing frame 1493 in place. 1504 represents a lever pivoted on the inner or top side of the lower flange 1494 near the left end thereof. The lever 1504 is provided with a spring clip 1505 which holds said lever in either an operative or inoperative position. 1506 represents a downwardly projecting finger on lever 1504 which, in the operative position of said lever, projects beyond the edge of the lower flange 1494, and in the inoperative position of said lever said finger enters a notch formed in the edge of said lower flange. 1507 represents a support or frame fastened to the inner side of the rear main frame 2 of the machine. The support 1507 has projecting portions which extend forwardly in the machine and serve to secure and support various working parts of the machine in place. A pin 1508 passing through two of these projecting portions secures a swinging frame to said support 1507. This swinging frame comprises two horizontal links 1509 and a connecting bar 1510, the pin 1508 passing through one end of each of the links 1509 and forming the pivot thereof, while the bar 1510 holds said links rigidly to each other so that the links and connecting bar swing as one piece. The links and bar are preferably stamped out in a single piece and bent to the desired form. Another pin, 1511, passes through the free ends of links 1509, and on this pin, between said links, is mounted a plurality of tappet-levers 1512 spaced apart by washers 1513. The pin 1511 also passes through a cam slot formed in a plate 1514 which

is slidably secured to the main support 1507 by pin 1508 and a short pin 1515 fixed to another projecting portion of support 1507. The plate 1514 has a rear shoulder 1516 formed on its rear edge and a bent-down front finger 1517. Below the plate 1514 is a latch 1518 pivoted on pin 1515 and having a hook 1519 which, when plate 1514 is in one position, rests against the rear side of finger 1517; and when plate 1514 is in its other position, the finger 1519 hooks over the edge of said finger 1517. 1520 represents a finger formed on the front edge of latch 1518 near its pivot. 1521 represents a pawl pivoted to a rear projection of latch 1518 and lying below latch 1518. The pawl 1521 has a rear hook 1522 and a forwardly extending upturned arm 1523, which latter rests against finger 1520 of the latch 1518. A spring 1524 connects arm 1523 with a finger 1525 projecting from the forward edge of the right-hand end of plate 1514. This spring tends to hold plate 1514 to the left, arm 1523 against finger 1520 and latch 1518 forward. Each of the tappet levers 1512 has a nose 1526 formed on its rear right-hand end and a finger 1527 formed on its left-hand end, said finger engaging with a hook 1528 on one of a series of rock arms 1529. There is one rock arm 1529 for each finger 1527. All of the rock arms 1529 are pivoted on a horizontal pin 1530 from which they extend upwardly, said pin passing through two projecting portions of support 1507, which projections confine the rock arms 1529 against lateral displacement. The rock arms 1529 are spaced apart by washers, and each of said arms is connected at its upper end to a link, each of the links being connected to a mechanism controlling one of the functions of the machine. 1531 represents the lower ends of shafts 1497 projecting below the lower flange 1494.

The hooks 1528, tappets 1526, finger 1516, and the hook 1522, at times work in an opening cut in the rear frame of the machine, as shown in Fig. 77.

The operation of the above-described mechanism is as follows:

When it is desired to have the carriage control various functions of the machine, the rollers 1498 are properly positioned on the shafts 1497 to cooperate with the respective tappet-lever 1512 which controls the desired function, there being as many operative positions for the roller 1498 as there are levers 1512. The machine, as designed, has six such levers, which control the following functions: total, plus-transfer, no-add, auxiliary, subtracting, and any other one function of the machine desired. After the rollers 1498 have been set, the lever 1504 is positioned with its finger 1506 out of engagement with the depression in the flange 1494. This places finger 1506 in position to strike shoulder 1516 of plate 1514 whenever the carriage is moved to the right to begin a new line. The plate 1514 is normally in its inoperative position (shown in Fig. 77) with pin 1511 resting in the front part of the cam slot in said plate 1514, and said plate moved to the left. The noses 1526 are drawn forward out of the path of the rollers 1498, and hook 1519 rests against finger 1517. The carriage is now drawn to the right to begin the first line in which movement finger 1506, of lever 1504, strikes shoulder 1516 and forces plate 1514 to the right. This causes the pin 1511 to ride out into the rear part of its cam slot in plate 1514 and thereby swings all the tappet-levers 1512 so that their noses 1526 will be encountered by any rollers set to cooperate with them. At the same time the finger 1517

moves to the right, so that hook 1519 moves forward over the edge of finger 1517 and locks plate 1514 in its right-hand position, and pawl 1521 moves its hook 1522 rearward into a position to be struck by the ends 1531 of shafts 1497. When one of the rollers 1498 engages the nose 1526 with which it is set to cooperate, said nose causes its lever 1512 to swing about pin 1511, and the finger 1527 pulls its respective rock arm 1529 rearward, thereby pulling the link which controls the desired function of the machine. The carriage progresses from column to column, the operation in each column being under the control of the tappet-rollers and cooperating mechanism according to the setting of said rollers. As the carriage moves to its various positions, the shaft ends 1531 ride over the pawl and present themselves in front of the pawl hook 1522. Upon thereafter returning the carriage to its right-hand position one of said ends 1531 will strike hook 1522, swinging latch 1518, as shown in Fig. 79, to release finger 1517 from hook 1519, and thereby allow plate 1514 to move to its left-hand position, retracting tappet-levers 1512 to their inoperative position.

As designed and shown in the drawings, there are six of the rock arms 1529, a number sufficient for the purposes of this machine. Each of these arms is connected to mechanism for performing a particular function, but each could be connected to other mechanism for a different function if desired.

As shown in Fig. 39, the arm 1529 on the extreme right-hand is provided with a link 1544 which may operatively connect this particular arm 1529 with any desired mechanism of the machine. This connection is shown and described as typical of the connections of the several arms 1529 with the different mechanisms controlled thereby, all of which are fully described in the parent application.

It is usually desirable to render the automatic column feed mechanism operative when the carriage control mechanism is rendered operative, in which case the carriage automatically moves from column to column at substantially the time when the identifying shifting keys are released.

Each of the rock arms 1529 has formed on its upper end a lug 1532 which normally rests against a pin 1533 carried by projections from the support 1507. The pin 1533 acts as a stop to limit the forward movement of the rock arms 1529 and also as a lock to prevent the hooks of the links 1539 to 1543, inclusive, from becoming disengaged from their respective pins on their correlated arms 1529.

Carriage adjuncts

Several useful and novel time-saving attachments have been arranged to operate in conjunction with the carriage. These carriage adjuncts are; paper return mechanism, which notifies the operator when a predetermined point is reached; stop mechanism to stop the return movement of the platen when the first line is reached; and an adjustable line spacer, particularly useful for interlineation.

Platen return

One end of the platen shaft 1183 is supported, as previously described, by arm 1134. This arm may be either formed as an integral part of sleeve 1546 (Fig. 1) which forms a bearing for axle or shaft 1183, or rigidly secured to said sleeve. The sleeve 1546 also carries an arm 1547

which has secured thereto a short pivot shaft or stud 1548 (Figs. 96 to 99), said stud supporting most of the platen-return mechanism. 1549 represents a gear wheel or pinion mounted on the platen shaft and normally turning therewith. The gear 1549 meshes with a comparatively large gear wheel 1550, which will be called the "platen-indicator gear wheel", and is mounted to turn about stud 1548 as a pivot. 1551 represents a bushing or sleeve mounted loosely on stud 1548 and having a flange 1552 formed on one end, upon which flange the gear 1550 is securely mounted. 1553 represents a spring case mounted loosely on stud 1548 and secured to gear wheel 1550. 1554 represents a friction spring secured at one end to stud 1548 and bearing frictionally against the inside of spring case 1553 with its other end. 1555 represents a dished or flanged plate, disk or crown gear, mounted on sleeve 1551 and secured to both flange 1552 and gear 1550; so that members 1550, 1551, 1553 and 1555 turn as one piece on stud 1548 and constitute a unitary gear member or device. The disk 1555 has laterally extending clutch teeth formed on the edge of its outer face or flange. 1556 represents a sleeve confined on stud 1548 by a screw head 1557, and bearing at one end on said screw head and at the opposite end on sleeve 1551. An internal flange 1558 of sleeve 1556 encircles the stud 1548. A spring 1559, coiled about stud 1548 inside sleeve 1556 and bearing at its ends against screw head 1557 and flange 1558, tends constantly to force sleeve 1556 toward flange 1552. 1560 represents a dished or flanged plate, disk or crown gear, secured on sleeve 1556 adjacent to disk 1555 and having clutch teeth formed on its flange which teeth normally engage the teeth on disk 1555. Secured to the sleeve 1556 near its outer end is a bell 1561; and secured over this end of sleeve 1556 is a knob, nut or thumb-piece 1562. By pulling out on knob 1562, the clutch teeth of disks 1555 and 1560 are disengaged, and the bell, sleeve 1556 and disk 1560 may be turned without moving or immediately affecting other parts of the mechanism above described. A peripheral flange on stud 1548 holds sleeve 1551 against movement along its axis.

The bell is provided on its outer surface with a numeraled scale which registers with a pointer (to be described), and is also provided with a bell-tapper or hammer which strikes said bell when the above mechanism brings a certain number or point on said scale to register with the cooperating pointer. This bell-tapping mechanism is constructed as follows:

1563 represents a bell-hammer, pivoted on a pin 1564 secured to disk 1560 and projecting laterally therefrom. 1565 represents a trip pawl pivoted to the arm or stem of the hammer and having a finger 1566 which rests against pin 1564, and a nose 1567 projecting beyond the edge of disk 1560. A spring 1568 is coiled around pin 1564 and has one end contacting with a pin 1569 projecting from pawl 1565; while a part near its other end contacts with a finger or stop lug 1570 projecting from the stem of hammer 1563, and with a pin 1571 secured on the disk 1560. This spring tends constantly to hold the pawl and hammer in their neutral position. 1572 represents a plate secured to the arm 1547. This plate carries two fingers 1573 and 1574, the finger 1573 being the index or pointer bent over across gear wheel 1550 and registering with the scale on the bell. The finger 1574 bends laterally and

extends across the plate 1572 so that its end is in the path of the nose 1567 of the pawl 1565.

Assuming that it is desired to know when ten lines have been printed, the operator pulls out knob 1562 and then turns the bell until the number ten on the bell scale registers with the pointer 1573. The machine is now operated and as the platen turns the gear wheel 1549 drives the indicator gear wheel 1550, which in turn rotates the bell mechanism, causing the scale and pointer to indicate successively 9, 8, 7, etc. As the bell brings the zero point near the index or pointer, the finger 1574 encounters the nose 1567 of pawl 1565, driving said pawl and its hammer 1563 inward and straining spring 1568. When the zero point is approximately reached, the finger 1574 passes the pawl 1565, allowing it to move back under the power of spring 1568, carrying with it hammer 1563. The momentum of this return movement drives the head of hammer 1563 against the bell, indicating to the operator that the desired point has been reached, or that the desired number of line spaces on the record sheet have been employed. When the platen is thereafter returned to its starting position, the pawl 1565 trips idly past the finger 1574.

In returning the platen, it is desirable to have the platen stopped when the first line is reached. For this purpose, a finger 1575 is formed on and projects laterally from the edge of the spring box 1553. 1576 represents a pawl pivoted to a boss on arm 1547, said pawl being provided with a hook or stop shoulder 1577, a curved face 1578 and a bent over finger 1579. A spring 1580 tends to hold finger 1579 in contact with the under side of arm 1547 and to hold the hook 1577 and curved face 1578 in the path of finger 1575. When the bell is rotated a complete revolution by the continued operation of the machine the finger 1575 rides up on the curved face 1578, swinging the pawl on its pivot; but when the platen is returned before the bell has made a complete revolution, as the platen reaches the first line, finger 1575 engages hook 1577 and the platen is stopped.

The gear 1549 is formed on or rigidly secured to one end of a sleeve 1581 mounted loosely on the platen shaft 1183 and confined against the sleeve 1546 by a spring ring 1582 seated in a groove in the platen shaft. The outer end of sleeve 1581 is enlarged, and the enlargement has a tapered socket into which fits the tapered end of a sleeve 1583, said sleeve being confined on the platen shaft by a screw 1584 fitted into the end of the platen shaft. This end of the platen shaft is decreased in diameter, and an internal flange 1585 of sleeve 1583 fits loosely about this decreased portion of said shaft, acting as a guide for sleeve 1583. A spring 1586, confined between the head of screw 1584 and flange 1585, tends to hold the beveled end of sleeve 1583 in engagement with the beveled socket in sleeve 1581, said bevel members forming a frictional clutch. 1587 represents a knob or finger-piece secured to the outer end of sleeve 1583 by means of which said sleeve may be drawn out of engagement with sleeve 1581; and 1588 represents a pin projecting radially from shaft 1183 into a longitudinal slot in sleeve 1583, whereby said lever is rotated by said shaft but is free to be moved a certain distance axially thereupon. There is an annular groove 1589 in the shaft 1183 and a cooperating annular groove 1590 inside sleeve 1583. A ring-spring lies in one of these grooves and when sleeve 1583 is drawn out said spring operates in both said grooves, which register with each other at this time, to lock sleeve

1583 in its disengaged position and render the platen return mechanism inoperative.

The operation of the entire platen return mechanism is as follows:

- 5 After a sheet of paper has been entered in the machine and adjusted, the finger piece 1587 is drawn out, disengaging sleeve 1583 from sleeve 1581. Sleeve 1581 now turns under the power of spring 1554 until finger 1575 of the spring case strikes the hook 1577 of pawl 1576. Upon release of finger piece 1587 sleeves 1583 and 1581 are again brought into frictional engagement. Knob 1562 of the bell mechanism is pulled out, and the scale set with the index 1573 pointing to the number of lines it is desired to pass or print before returning the platen. The machine is then operated for printing, and when the desired line has reached the printing position the bell rings. The platen is now returned by turning finger piece 1587 until finger 1575 again comes into contact with hook 1577, at which time the platen has been returned to the first line.

- 20 The friction spring 1554 is constructed to wind sufficiently to turn the bell mechanism about one-and-one-half revolutions before the friction of its end against the spring box is overcome. If the platen is rotated more than one-and-one-half revolutions no detriment will result because of the frictional engagement of the spring 1554, which spring combines with its adjuncts to form a friction clutch between the bell and its pivot 1548.

- 35 In returning the platen, the operator lifts up on the finger-pieces on the ends of the platen shaft, thereby disengaging the gear 1182 from the driving gear 1179, and then turns the platen back to the desired position. As the gear to the line indicating bell is mounted on a stud or pivot extending from the platen supporting arm, platen indicator wheel 1550 remains in mesh with its cooperating platen gear wheel 1549 at all times.

Adjustable line spacer

- 45 For the purpose of interlining, or for any reason making a smaller turn of the platen than a line space desirable, the following mechanism is provided:

- 50 The platen-feed gear 1182 (Fig. 100) has a coupling flange 1591 secured to its outer side, said flange being concentric with the platen shaft and having a tapered bore into which fits the tapered end of a slidable sleeve 1592 having its bearing on another sleeve 1593 which latter is rigidly secured to the platen shaft 1183. The screw which secures sleeve 1593 to the platen shaft extends radially into a slot formed in sleeve 1592, so that the latter sleeve must always rotate with said platen shaft but is capable of longitudinal movement thereon. The amount of independent movement permitted to sleeve 1592 is limited by the head of a screw 1594. An internal flange 1595 of sleeve 1592 acts as a guide for sleeve 1592 on the platen shaft. Sleeve 1593 confines gear 1182 in its proper position on the platen shaft, said shaft being reduced for receiving the gear 1182 and the adjustable line spacing mechanism, said gear 1182 abutting against a sleeve or bearing 1135* formed on the front end of supporting arm 1135. 1596 represents a spring confined between flange 1595 and the head of screw 1594, said spring tending constantly to force sleeve 1592 into engagement with coupling flange 1591, the tapered parts of which members form a friction clutch, so that the platen shaft may be turned

by gear 1182. A finger-piece or knob 1597 is secured to the outer end of sleeve 1592.

By pulling out on knob 1597 and then turning it the platen may be turned to any desired position without moving gear 1182.

Typewriting mechanism

When it is necessary or desirable, in the operations of accounting or bookkeeping, to write the names of persons, articles of merchandise, months, places, weights, measures or other words and sentences, this is accomplished by a typewriter mechanism similar to that illustrated in my Patent No. 1,817,451, heretofore mentioned. Such typewriting mechanism may be readily and easily attached to the calculating machine herein described, and so connected with the latter that a combined calculating and typewriting machine or a complete and unitary accounting and bookkeeping machine results. One form of such mechanism is as follows:

The typewriter frame 1900 (see Figs. 126 and 128) consists of a hollow and substantially horizontal base casting 1901 on the rear end of which is secured a supporting standard 1902. On this base casting is seated the base of the previously described calculating machine or mechanism, and these two mechanisms may be secured in their definite working relation by any proper and desirable means, with the standard 1902 in rear of the carriage 1122 and curving forwardly over the platen 182. Suitable openings are provided through the base 1 for permitting the proper connections to be made between the working parts of the mechanisms carried by the bases or frames 1 and 1900 respectively.

The typewriter keyboard may be of any preferred construction and arrangement, being preferably provided with numerals, punctuations, signs or symbols, a space-bar, shift keys for the upper and lower case types, and tabulator and back-space keys. The construction and connections of these elements will be hereinafter described in detail.

A shaft 1904 is mounted within the hollow base 1901 and forms a pivotal support for the levers of the keys of said keyboard.

A shaft 1908 is supported in the rear end of the base 1901 and forms a pivotal support of a plurality of elbow levers 1909 which have forwardly extending arms 1910 and upwardly extending arms 1911. The arms 1910 each extend over a lateral finger 1912 on the rear end of its respective key lever, while the upper ends of these elbow levers are each pivotally connected by a link 1913 to an arm 1914 of a type bar 1915, the front end of which latter carries typewriter types; there being an upper and a lower case type for each type bar, a type bar for each key 1905, and as many links 1913 as there are type bars. The type bars 1915 are pivotally supported on pivots 1916 which are arranged in a curve within the concavity of the upper end of the standard 1902, and suitable means are provided for spacing the type bars apart and guiding them. The relation of the platen 182 and the type bars 1915 is such that when the platen is in its raised position, out of printing relation with the number types 145, it may be printed upon by the typewriter types on the type bars 1915, as follows:

When any of the typewriter keys 1905 is depressed its lever raises the free end of the respective arm 1910 and thereby swings rearwardly the free end of the arm 1911 and, through the medium of its link 1913, swings the type bar down-

ward against the platen or against the record sheet carried thereby. Displaced type bars are returned to their normal position by their respective springs 1917, and in turn restore the levers 1909 and the levers of the keys 1905 to normal, assisted by the rebound of the types and by spring 1933. Any suitable inking device for the typewriter types may be employed.

Universal connecting frame

For the purpose of establishing a convenient and effective means whereby any and all of the keys 1905 control certain mechanisms of the calculating machine, and whereby these typewriter keys are affected by the calculating and number-printing mechanism, a universal bar 1918 extends laterally over the front ends of the arms 1910 and is supported by the latter and held against horizontal movement by two rock arms 1919 to which its ends are secured. These rock arms have their front ends connected to the shaft 1904 which constitutes the pivot about which they swing up and down with the universal bar when the typewriter keys are operated and raise the front ends of arms 1910. The universal bar 1918 and the rock arms 1919 constitute the universal frame.

Operation of calculating machine renders typewriting machine inoperative

For the purpose of preventing accidental or erroneous operating of the typewriting mechanism, while operations of accumulating or of number-printing are being performed, mechanism is provided for automatically locking and preventing depression of the typewriter keys, as follows:

A forked blocking arm 1920 is pivotally mounted on and depends from the stud or pin 940 (see Figs. 12, 126, 127 and 128) and its crotch normally stands over a finger 1921 which projects upward from the universal frame 1918-1919. The arm 1920 is formed with a rear fork or stop 1922 and a front fork or cam finger 1923, which latter stands at an incline. A pin 1924 is carried by the depending ratchet bar 929 and normally stands against the cam finger 1923 and holds the latter in its normal position; but when the accumulating mechanism or its number-printing mechanism is operated, the pin 1924 releases the cam finger 1923 and a spring 1925 swings the arm 1920 forward, so that its stop 1922 stands over the finger 1921 and prevents it from being raised; thereby preventing the universal bar 1918, the front ends of the arms 1910 and the rear ends of the typewriter key levers from being raised; so that the typewriter mechanism is rendered inoperative by the operation of the accumulating mechanism or by the number-printing mechanism thereof. When the bar 929 again descends to its normal position, its pin 1924 impinges upon the cam finger 1923 and releases the universal frame by moving the stop or blocking finger 1922 out of the path of the finger 1921.

Operation of typewriting machine renders calculating machine inoperative

For the purpose of preventing accidental or erroneous operating of the calculating and number-printing mechanism, while any typewriting key is depressed, mechanism is provided as follows:

Pivotally mounted on the same pin 940 with the arm 1920 (Figs. 126 and 127) is a depending stop arm or catch 1926 which is provided with a

cam face 1927 and a shoulder 1928, the latter being normally held in its rearmost position by the spring 1925. When, however, a typewriter key is depressed, the lever of this key acts on the universal bar 1918 and thereby raises the fingers 1921 against the cam face 1927 and forces the shoulder 1928 over the pin 1924, thereby preventing the bar 929 from rising when an attempt is made to operate the calculating mechanism or to operate the printing mechanism thereof; said bar 929 (Fig. 12) being connected, through the medium of the members 928, 926, 925 and 886, with the arm 887, which latter carries the roller 892 that actuates the cam arms 894, 946 and 966. By thus blocking the roller 892 against movement, these cam arms are not operated upon by said roller when either the operating key or operating lever is depressed, and the motor does not operate the calculating mechanism nor the printing mechanism thereof. When the depressed typewriter key is released, the finger 1921 descends and allows the spring 1925 to swing the arm 1926 backward to move its shoulder 1928 from over the pin 1924, so that now the bar 929 will be raised when either the operating key 741 or operating lever 775 is depressed. The tie rod 13 serves as a stop and a positioner for the arms 1920 and 1926 whose stop fingers 1929 and 1930, respectively, abut against said rod 13.

Combined calculator escapement and typewriter escapement

1598 (Figs. 101 and 103) represents a pawl lever pivoted on the same pin as pawl 1731 of the calculator escapement and carrying a detent tooth 1599 which is normally out of engagement with the teeth of ratchet wheel 1730, but may at times be moved into engagement therewith. 1600 represents the right-hand arm of lever 1598, said arm having a bent-over finger 1601 which rests on the tail or lower arm of pawl 1731. A plunger 1931 is slidably seated in bearings on the rear frame 2 and stands under the left-hand end of the lever 1598 and over a rearwardly extending arm or lifter 1932, which latter is carried by the universal bar 1918. A spring 1933 has one end connected to the frame 2 and its other end connected to the left hand end of the lever 1598, so as to draw the latter downward against the plunger 1931.

The left-hand end of lever 1598 is raised by means of the plunger 1931 at each depression of the typewriter key 1903 to engage the tooth 1599 with a tooth of ratchet wheel 1730, and in rising it causes the finger 1601 to depress the tail of pawl 1731, disengaging said pawl from ratchet wheel 1730 and allowing said ratchet wheel to turn until stopped by tooth 1599, thereby allowing the carriage 1125 to move part of a letter space. When the depressed typewriter key is released plunger 1931 descends, lever 1598 is restored to normal position by its spring 1933, and the pawl 1731 is moved by its spring 1732 to again engage with the ratchet wheel 1730, which moves slightly, thereby moving the carriage 1125 the remaining part of a letter space. By repeating the operation with this key or with different typewriter keys, a step-by-step movement of the carriage is effected through the medium of the key-and-carriage-connecting elements 1918, 1932, 1931, 1598, 1731, 1730, 1726, 1237 and 1236, said carriage being drawn by its spring 1221 and strap 1209.

Typewriter renders paper feed inoperative

The first depressed typewriter key at the be- 150

ginning of each typewriting operation renders the automatic paper feed mechanism inoperative. The mechanism for this purpose is constructed as follows:

- 6 A link 1602 (Fig. 103) depending from rock arm 1199 has a slot in its lower end, in which works a pin projecting from arm 1600 so that when arm 1600 swings down, it pulls link 1602 with it; but when link 1602 is moved down, by rock arm 1199, arm 1600 will not be operated. A latch 1603 is pivoted to the rear frame on the same pin as rock arm 1199, said latch being provided at its free end with a shoulder 1604. Spring 1397 (mentioned with the "Two column mechanism") is attached to an ear on the upper edge of latch 1603 and tends constantly to force the left-hand or free end of said latch down. Normally the free end of latch 1603, near shoulder 1604, rests on finger 1394 of lever 1196 of the platen feed mechanism. This mechanism operates as follows:

- Depression of any typewriter key rocks the lever 1598, and the arm 1600 of said lever carries down link 1602 and arm 1199, which arm engages and depresses finger 1198 on lever 1196 of the platen feed mechanism, lowering roller 1168 so that it passes under the bar 1171 and thus disables the paper feed mechanism. Lever 1196 is latched in depressed position by the engagement with finger 1394 of shoulder 1604 on latch 1603, which is moved to effective position by spring 1397. The paper feed mechanism now remains inoperative until the calculator mechanism is again operated and during the first part of the operation of this mechanism, in order that the first number accumulated may be printed on the same line as the typewriting. Near the end of the first calculating operation after a typewriting operation the arm 1396 raises latch 1603, thereby releasing the arm 1196 which is thereupon raised by its spring 1207, and the platen feed mechanism is again operative. Latch 1603 also operates when the two-column mechanism is operative, but does not interfere with that mechanism, because the two column mechanism and latch 1603 are controlled by the same arm 1396.

Back space mechanism

- For the purpose of moving the carriage backward against the tension of its spring one or more letter or numeral spaces the calculator carries mechanism that is operable by devices carried by the typewriter mechanism, as follows:

- As illustrated in Figs. 101 and 128, a transversely extending back-space lever 1605 is pivoted to the rear frame 2, near the escapement wheel 1730. The right-hand arm of this lever is pivotally connected to a depending link 1606 which extends downward into the path of an ear or shoulder 1936 on the rear end of a back-space key or lever 1937 of the typewriter. Said back-space key comprises front and rear arms connected by a yoke 1937*. A pawl 1607 is pivotally connected to the left-hand arm of the lever 1605. The pawl 1607 has an arm 1608 which extends toward the right and rests under a forwardly projecting shoulder 1609 formed on the left-hand arm of the lever 1605. The pawl 1607 extends leftward from its pivot and has a hooked end that extends over the escapement wheel 1730, and is movable into engagement with the teeth of this wheel, though normally not in engagement therewith. Back-spacing is effected as follows:

- When the back-space key 1937 is depressed,

its ear 1936 pushes the link or push bar 1606 upward and rocks the lever 1605 so as to move the hook of the pawl 1607 into engagement with the ratchet wheel 1730. The continued upward movement of the push-bar 1606 causes the pawl 1607 to rotate the ratchet wheel one tooth or letter space, and far enough to allow the pawl 1731 to engage with the ratchet wheel tooth above the tooth with which it was engaged before the depression of the back-space key. By repeatedly depressing and releasing the back-space key, the carriage, through the medium of the back-space connecting elements 1936, 1606, 1605, 1607, 1730, 1726, 1237 and 1236, is back spaced step-by-step, a letter space at each step. The back space key or lever 1937 is held in its normal position and the pawl 1607 in its inoperative position by the link or lifter bar 1606, which bar is held in its lowermost position by a spring 1611 and is limited in its downward movement by a shoulder 1612 abutting against the rear flange of the base casting 1.

Upper and lower case shifting mechanism

For the purpose of shifting the platen from its normal position forwardly from position for printing with the set of lower case types to position for printing with the set of upper case types, or vice versa, the lever 1162 (Figs. 102 and 126) is provided with a depending extension or cam arm 1160, having its lower end inclined to form a cam 11600 having a dwell 11601 at its upper end. A pair of shift keys 1934 (Fig. 128) are pivotally mounted on the shaft 1904 and each is formed with a laterally projecting ear or shoulder on its rear end. An H-shaped shift-frame 1935 is formed with two arms 1938 pivoted on the rod 1908 and a cross bar or yoke 1939 which connects these arms. A shift arm 1940 mounted on the shaft 1908 and secured to the yoke 1939 comprises an upwardly extending part carrying a roller 1941, which roller stands under the cam face 11600.

When either of the shift keys 1934 is depressed the shoulder on its rear end raises the shift frame 1935, thereby raising the front end of the shift arm and causing its roller 1941 to roll on the cam face 11600 so as to swing the cam arm 1160 forward, rocking the lever 1162, actuating the pusher 1165—1168, and thereby swinging the carriage forward into the proper position for the types of the normally ineffective set to be impressed on the record sheet. The dwell 11601 of the cam 11600, being concentric with the pivot rod or shaft 1908, insures uniform positioning of the platen when so shifted.

For the purpose of preventing the paper feed mechanism from being operated when the platen is swung forward by the devices above described, the shift frame 1935 is formed with or carries a horizontal shoulder or lifter 1949 which stands under a pusher or lifter bar 1950. This pusher has its upper end pivoted to a rock lever 1951 (Fig. 10) comprising an arm 1952 which extends over a finger or shoulder 1953 formed on the lower end of the link 1602.

When either shift key 1934 is operated, the shift frame is thereby raised and the shoulder or lifter 1949 is thereby caused to raise the pusher 1950. This pusher rocks the lever 1951, pressing its arm 1952 down on the shoulder 1953 to lower link 1602 and arm 1199, which arm engages and depresses lever 1196, carrying the members 1165 and 1168 below the paper feed bar 1171 but not below the platen swing bar 1136.

Letter spacing device renders calculating machine inoperative

In order that the typewriter machine may, without typewriting, cause the carriage 1125 to move step-by-step, a space key 1954, comprising a space bar 1955 and space levers 1956, is provided. The shaft 1904 constitutes the pivotal support to which the space levers 1956 are connected. The rear ends of these levers extend under the universal bar 1918 and are thereby held in their normal position, said universal bar being normally held depressed by the spring-pressed plunger or pusher 1931. If desired, an additional spring may be suitably connected for holding the space key in normal position.

When the space key is depressed, the rear ends of its levers lift the universal bar, thereby lifting the stop or finger 1921 against the cam face 1927 so as to lock down the bar 929 by means of the pin 1924 and shoulder 1928, as more fully described under the previous heading "Operation of typewriting machine renders calculating machine inoperative".

Typewriter space key rendered inoperative by calculating machine

From the foregoing paragraph, in connection with the description under the heading of "Operation of calculating machine renders typewriting machine inoperative", it will be understood how the stop 1922 is swung over the finger 1921 and thereby prevents the universal bar from being raised, or the space key from being depressed, while the calculating machine is operating.

Tabulator key and connections

Under the heading of "The column key", mechanism has been described whereby the carriage 1125 is allowed to be shifted a column (or a plurality of numeral or letter spaces), stopped in a definite position and afterwards allowed to shift one or more additional columns. This is a form of tabulating which is effected by means of the column key 1266 and its connections. The typewriter mechanism is also provided with a column key or tabulator key 1942 operatively connected with the column key mechanism, having its lever mounted on the shaft 1904 which forms its pivot, and having its rear end formed with a horizontal shoulder 1943. A pusher or lifter bar 1944 (Fig. 101) is provided with a slot 1945 through which extends a screw 1946 secured to a boss on the rear frame 2. The upper end of this pusher is formed with a horizontal ear or shoulder 1947 which stands under the right-hand end of the arm 1263, while its lower end stands over the shoulder 1943. A spring 1942^a (Fig. 128) is provided for holding the tabulator key 1942 in its normal position.

When the tabulator key 1942 is depressed, its shoulder 1943 raises the pusher or bar 1944, thereby rocking the lever arms 1263 and 1734 (the same as they are rocked by the column key), thereby causing the dog 1733 to disengage the pawl 1731 from the ratchet wheel 1730 and thus allowing the carriage to shift until its next stop or cam lug 1239 raises the pin 1246 and stops the carriage in the manner heretofore described. It will be seen, therefore, that the tabulating mechanisms including parts 1263, 1734, 1731, 1730, 1247, 1246 and 1239, is common to both the column key 1266 and the

tabulator key 1942, and is controllable by either one of these keys.

When the tabulator key is depressed, it also affects the column key, by causing the link 1264 to rock the lever 1265 and allow the column key 1266 (Fig. 70) to descend by gravity, and if desirable, gravity may be assisted by any suitable means, so that by depressing the tabulator key 1942 the column key 1266 is caused to lock the keyboard, in the manner described in the parent application. When, however, the key 1266 is depressed, the tabulator key 1942 is not thereby affected.

To avoid calculator printing on typewritten matter

In order that the typewriting may not be obscured by the number printing, it is necessary that the typewriter types do their printing at a point to one side of that at which the calculator-printing types are impressed, so that when the typewriting is discontinued at any point in a line, and the calculator-printing device is then caused to print, the calculator-printing device prints in a clear space to the right of the typewritten matter.

In the present machine, the typewriter types are arranged to print at the left of the calculator-printing types. The relative printing position of the calculator-printing mechanism and the typewriter-printing mechanism is such that the typewriter types strike the platen (assuming the platen to remain at rest) in the same letter space in which the calculator-printing type of the highest denomination strikes.

However, since the carriage does not remain at rest, but is shifted by the typewriter escapement immediately after each impression is made by the typewriter types, a clear space on the record sheet is always provided for the numerals to be recorded after typewriting, but it is well within the scope of this invention to cause, if desired, the typewriter printing to occur at a distance of one or more letter spaces to the left of the printing done by the highest calculator-printing type.

The present application being directed to printing mechanisms, full descriptions and illustrations of many parts of the complete machine have been omitted, and reference is made to the parent Patent No. 1,895,848, heretofore mentioned, for a complete disclosure. Furthermore, the specific mechanisms which have been described and illustrated are to be understood merely as representative embodiments of inventions which may take many other forms, all falling within the scope of the appended claims.

What is claimed is:

1. The combination of a plurality of carriers, a plurality of typebars each connected to one of said carriers and having a head supporting a row of type, a plurality of rock levers each having one of its arms connected with one of said typebars, a plurality of movable cams each engaging with the other arm of one of said levers and operating to move the typebar relative to the respective carrier, a plurality of links each connected to one of said cams for moving said cam, a plurality of rock levers each connected to one of said links for causing said link to move said cam, and a plurality of springs each connected to one of the last said rock levers for rocking said lever.

2. The combination of a plurality of carriers, a plurality of type bars each connected to one of said carriers and having a head supporting a row

of type, a plurality of rock levers each having one of its arms connected with one on the said type bars, a plurality of movable cams each engaging with the other arm of one of said levers
 5 and operating to move the type bar relative to the respective carrier, a plurality of links each connected to one of said cams for moving said cam, a plurality of rock levers each connected to one of said links for causing said link to move
 10 said cam, a plurality of springs each connected to one of the last said rock levers for rocking said lever, and a universal tensioning device comprising a bar to which all of said springs are attached and means for moving said bar to exert a greater
 15 tension on said springs.

3. The combination of a plurality of pivotally mounted carrier arms, means for swinging said carrier arms on their pivots, a type carrying member carried by each carrier arm and adapted
 20 to move longitudinally thereof, a spring associated with each of said type carrying members for moving its type carrying member longitudinally of its carrier arm for effecting printing, and universal means for regulating the tension of said
 25 springs.

4. The combination of a pivotally mounted carrier arm, means for swinging said carrier arm on its pivot, a type carrying member carried by said carrier arm and adapted to move longitudinally
 30 thereof, a spring for actuating said type carrying member to move longitudinally of said carrier arm for effecting printing, and means for adjusting the tension of said spring.

5. The combination of a pivotally mounted carrier arm, a type carrying member carried by said carrier arm, means for moving said carrier arm about its pivot to select a type on said type carrying member, an impression receiving platen,
 35 means for moving said type carrying member relative to said carrier arm for taking an impression on said platen from the type selected by the movement of said carrier arm, said impression means comprising a driving spring and connections whereby the action of said driving spring is
 40 limited to moving a selected type into proximity but not into contact with said platen.

6. In a printing mechanism, a universal actuator comprising a pair of end plates each provided with an axle seat, a flat bar having its end portions
 45 united with the respective end plates, and a comblike plate having its end portions united with said end plates and having one of its major surfaces in a plane at an angle to that of the first said bar.

7. In combination, a pair of vertically rocking heads, a plurality of arms movably connected thereto and extending therebetween, a comblike plate serving as a guide for said arms and
 50 having its end portions united respectively with said heads for connecting and bracing said heads, a plurality of movable members extending between said heads, and an actuator bar for said movable members, said actuator bar being rigidly united with said heads and having one of its
 55 major surfaces lying in a plane at an angle to that of the said comblike plate.

8. A key controlled printing mechanism comprising a type carrying device, a spring for moving said type carrying device to position the type, and mechanism for driving said type carrying
 70 device to print, said mechanism including a releasing member contacting with said type carrying device and a spring holding said releasing member in contact with said type carrying device
 75 and acting through said releasing member to

move said type carrying device to position type thereby supplementing the first said spring.

9. A key controlled printing mechanism comprising a type carrying device, an actuator therefor, a detent for the actuator, a controlling member for the detent, and a single spring for effecting
 80 movement of said detent and said controlling member relative to each other and to said type carrying device.

10. A key controlled printing mechanism comprising a type carrying device, a movable member correlated therewith, a second movable member carried by the first said movable member and
 85 said type carrying device, and a single spring connected with and controlling both the first said movable member and the second said movable member.

11. A key controlled printing mechanism comprising a type carrying device, a movable member correlated therewith, a second movable member connected to the first said movable member, a
 90 third movable member carried by the second said movable member, and a single spring connected with and controlling all of the said movable members.

12. A key controlled printing mechanism comprising a type carrying device, a movable member correlated therewith, a second movable member for controlling the first said movable member, a pivotally mounted member carried by the second
 105 said member, a second pivotally mounted member carried by the first said pivotally mounted member, and a spring connected to the said second movable member and to the said second pivotally mounted member for effecting the control of a plurality of said members.

13. A key controlled printing mechanism comprising a plurality of type carrying devices; actuating mechanism therefor; controlling mechanism for said actuating mechanism comprising a
 115 plurality of movable devices in contact respectively with the type carrying devices and a plurality of coupling members each mounted for movement relative to its associated movable device; and a plurality of springs, each correlated
 120 with one of said movable devices and one of said coupling members, for effecting relative movement of the movable member and coupling member.

14. In a printing mechanism, a plurality of sets of number type each including a zero type, a plurality of sets of printing devices for carrying and impressing the type for printing, a plurality of tripping devices for the respective
 125 printing devices, a movable trip, a connector for each said trip, a universal actuator for all of the trip connectors, a plurality of coupling members pivotally mounted on the respective connectors and each coupling of one connector being arranged to become engaged with the adjacent
 130 connector so that all of the connectors may be operated for actuating the trips when only one of the connectors is directly engaged with the universal actuator.

15. In a printing machine, the combination of a plurality of printing bars, a plurality of actuators one for actuating each of said bars, a plurality of latches one for each actuator for holding said actuators in an inoperative position, a plurality of normally inoperative releasing dogs
 140 one for each latch for withdrawing said latch and permitting the correlated actuator to actuate its respective printing bar, means for rendering said dogs individually inoperative, universal means for operating said dogs, and a connection from one
 150

of said dogs to a second of said dogs whereby the first of these dogs when operated operates said second dog to also withdraw its respective latch.

16. A type carrier and positioner comprising a lever provided with an axle seat, an element for connecting with the types, a cam surface, and a stop lug having one side substantially parallel with and extending beyond said cam surface.

17. In combination, a type carrier comprising a lever formed with an axle seat and an element for connecting with the types and a cam surface and a stop lug substantially parallel with and extending beyond said cam surface, a stop member normally in contact with said stop lug for detaining said carrier in one position and cooperative with said cam surface for moving said carrier into another position.

18. In a printing machine, in combination, a frame, a platen, a set of type, a type driving device, an actuator for said type driving device, a latch normally holding said type driving device and said actuator in type driving condition, an operating mechanism, a latch releasing device mounted in said frame, normally effective connections from said operating mechanism to said latch releasing device, and means for disabling said connections.

19. In a printing machine, in combination, a frame, a plurality of sets of type, a type driving device for each set of type, an actuator for each type driving device, a latch for each type driving device normally holding its associated device in type driving condition, an operating mechanism, a universal latch releasing device mounted in said frame, normally effective connections from said operating mechanism to said universal latch releasing device, and means for disabling said connections.

20. In a printing machine, the combination of a plurality of printing devices, a universal actuator therefor, an operating shaft, a cam mounted on said operating shaft, a member mounted for constant engagement with said cam, a link connected to said actuator, means for holding said link in engagement with said member, and means for disengaging said link from said member.

21. In a printing machine, the combination of a plurality of printing devices, a universal actuator therefor, an operating shaft, a cam mounted on said operating shaft, a member mounted for constant engagement with said cam, a link connected to said actuator, means for holding said link in engagement with said member, means for disengaging said link from said member, and means for holding said link against movement when disengaged from said member.

22. In a printing machine, the combination of a plurality of carriers; a series of number types arranged on each of said carriers; a ruling type arranged on each of said carriers; a lug, operatively related to each of said carriers, for limiting movement of said carriers in one direction; means for positioning the carriers and their types for printing numbers; and a universal bar, adapted to engage with all of said lugs, for simultaneously positioning all of said carriers and their types, for printing with said ruling type.

23. In a printing machine, the combination of a plurality of carriers; a series of number types carried by each of said carriers; a ruling type carried by each of said carriers; means for moving said carriers forward for positioning said number types; means for moving said carriers rearward for positioning said ruling types; a plurality of movable backstops, one for each of

said carriers, for arresting the said carriers in their respective normal positions; means comprising a universal stop bar for holding the backstops in their normal positions; and means for moving said universal stop bar so as to shift the position of all of said backstops when said carriers move to position said ruling types.

24. In a printing machine, the combination of a plurality of carriers, a frame for holding all of said carriers in their normal position, number type carried by each carrier, a ruling type carried by each carrier, means for moving said carriers forward for positioning said number type, a plurality of lugs each operatively connected to one of said carriers, a universal bar for engaging all of said lugs and moving all of said carriers backward from their normal position and thereby positioning said ruling type, and means operated by said frame for operating said universal bar.

25. In a printing machine in combination with a lever consisting of a flat bar having an inclined cam surface and a track at one end portion and a pusher member at its other end portion and a stop lug between its ends, a movable member pivotally connected to said lever and forming its fulcrum, a member operable to be moved along said track in such manner as to swing the lever on its pivot, a member relatively movable along said cam in such manner as to move the lever longitudinally with its pivot, a member operable by said pusher member, and a stop for contacting with said stop lug and limiting movement of said lever.

26. In a printing machine in combination with a lever consisting of a flat bar having an inclined cam surface and a track at one end portion and a pusher member at its other end portion and a stop lug between its ends, a movable member pivotally connected to said lever and forming its fulcrum, a member operable to be moved along said track in such manner as to swing the lever on its pivot, a member relatively movable along said cam in such manner as to move the lever longitudinally with its pivot, a member operable by said pusher member, a stop for contacting with said stop lug and limiting movement of said lever, and a spring for moving said lever into contact with said stop.

27. In a printing machine, a carrier consisting of a flat metal lever formed with an axle seat in its medial portion and a pivot seat at one end and a gear segment at its other end and a cam lug between said axle seat and said gear segment, for the purpose specified.

28. In a printing machine, the combination of an actuating segment, a carrier therefor comprising a lever adapted for carrying types and formed with a stop lug and with a cam surface, and a member movable on said cam surface for positioning certain of said types.

29. In a printing machine, the combination of a type carrying member, a carrier therefor comprising a lever formed with a gear segment and with a cam surface and a stop lug, and a device cooperative with said cam surface for positioning said type carrying member.

30. In a printing machine, the combination of a type carrying member, a carrier therefor comprising a lever formed with a gear segment and with a cam surface and a stop lug, and a device comprising an element normally in the path of said stop lug and an element for co-operating with said cam surface and thereby positioning said type carrying member, said de-

vice being operable for moving the first said element out of the path of said stop lug simultaneously with its cooperation with said cam surface.

5 31. In a printing machine, the combination of a plurality of number printing devices; connecting means for operatively connecting each number printing device with its next adjacent number printing device; a plurality of normally
10 inoperative rule printing devices, one interposed between each number printing device and its next adjacent number printing device; and means for rendering said connecting means inoperative and for rendering said rule printing
15 devices operative.

32. In a printing machine, the combination of a number printing device, a second number printing device, means operatively connecting said number printing devices to each other, a
20 normally inoperative rule printing device between said number printing devices, a key, and means operable by said key for simultaneously moving the first said means to its inoperative position and said rule printing device to its
25 operative position.

33. In a printing machine, in combination, a record sheet supporting platen, a plurality of number printing devices adapted to be moved toward said platen to print on a record sheet
30 thereon, and a plurality of ruling devices interposed between adjacent number printing devices and movable toward said platen to print on a record sheet thereon.

34. In a printing machine, the combination of a plurality of number printing devices, a normally inoperative ruling device interposed between two adjacent number printing devices, and means for
35 moving said ruling device into an operative position.

35. In a printing machine, the combination of a plurality of number printing devices, a plurality of normally inoperative ruling devices each interposed between two adjacent number printing
40 devices, and means for moving said ruling devices into an operative position.

36. In a printing machine, the combination of a plurality of number printing devices, a plurality of normally inoperative ruling devices each interposed between two adjacent number printing
45 devices, and means for individually moving said ruling devices into operative position.

37. In a printing machine, the combination of a ruling device, a driving device for driving said ruling device, and means for normally holding
50 said ruling device out of operative relation with said driving device.

38. In a printing machine, the combination of a normally inoperative ruling device, a driving device therefor, and means for moving said ruling device into operative relation with said driving
55 device.

39. In a printing machine, the combination of a ruling device, a driving device therefor, means for normally holding said ruling device out of operative relation with said driving device, and a
60 key for moving said ruling device into operative relation with said driving device.

40. In a printing machine, the combination of a ruling device, a driving device therefor, means for normally holding said ruling device out of operative relation with said driving device, a key
70 for moving said ruling device into operative relation with said driving device, and a second key for locking said ruling device in its operative position.

41. In a printing machine, the combination of a number printing device; means for driving said device to print a number; a ruling device; driving means for said ruling device, for causing said
80 ruling device to print a line of ruling in conjunction with and adjacent to numbers printed by said number printing device; means for normally holding said ruling device out of operative relation with its driving means; and a key for moving
85 said ruling device into operative relation with its driving means.

42. In a printing machine, the combination of a plurality of printing heads, type mounted on each of said printing heads, a plurality of guide plates one interposed between each two adjacent
90 printing heads, a type mounted on each of said guide plates, and means causing a type of said printing heads and the types of said guide plates to print in conjunction.

43. In a printing machine, the combination of a printing head, type carried thereby; a guide plate for said printing head, said guide plate carrying a type; a platen; an operating mechanism
95 for said machine; and means whereby said printing head and said guide plate each force a type against said platen during a single operation of said operating mechanism.

44. In a printing machine, the combination of a printing head; a type carried thereby; a guide plate for said printing head, said guide plate carrying a type; a platen; and means for operating
100 said printing head and said guide plate to simultaneously force their types against said platen.

45. In a printing machine, the combination of a plurality of carriers each carrying a type, a universal actuating means for all of said carriers, individual means for holding each of said carriers
110 out of operative relation with said universal actuating means, and a plurality of keys one for each of said carriers and operable for moving its respective carrier into operative relation with the universal actuating means.

46. The combination of type heads carrying printing types, and type carrying guide plates arranged between said type heads and constructed to guide said type heads and to be themselves
120 moved for printing.

47. The combination of type heads carrying printing types, type carrying guide plates arranged between said type heads and constructed to guide said type heads and to be themselves
125 moved for printing, means for guiding said guide plates.

48. In a printing machine, in combination, a plurality of carriers bearing character type, character printing type selectors, a carrier bearing a vertically disposed broken line type, a universal
130 operating mechanism, connections from said universal operating mechanism for substantially simultaneously actuating selected character type carriers and said broken line type carriers to print, whereby successive operations of said universal operating mechanism cause said broken line type to produce a broken line longer than the
135 broken line on said type.

49. In a printing machine, the combination of a printing device for printing characters, character keys for controlling said character printing device, a printing device for printing a line of
140 ruling, and a rule key for controlling said rule printing device, said character keys being operable concurrently with said rule key to control simultaneous printing of characters and a line of ruling.

50. In a printing machine, in combination, a 150

- set of character printing devices, a set of rule printing devices, a set of keys for controlling said character printing devices respectively, a set of keys for controlling said rule printing devices respectively, and means for simultaneously effecting printing from said character printing devices and rule printing devices according to the control of said keys.
51. In a printing machine, in combination, a set of printing devices, a second set of printing devices, sets of keys for controlling said first and second sets of printing devices respectively, and means for simultaneously actuating the printing devices of both of said sets according to the control of said keys.
52. In a printing machine, in combination, a set of printing devices, a second set of printing devices interspersed with the devices of said first set, sets of keys for controlling said first and second sets of printing devices respectively, and means for simultaneously actuating the printing devices of both of said sets according to the control of said keys.
53. In a printing machine, in combination, a plurality of sets of character printing type, a plurality of ruling type interspersed with said character printing type, and key controlled means for selecting any desired ruling type for printing.
54. In a printing machine, in combination, a plurality of sets of character printing type, a plurality of ruling type interspersed with said character printing type, and key controlled means for selecting any desired plurality of said ruling type for printing.
55. In a printing machine, in combination, a plurality of sets of character printing type, a plurality of ruling type interspersed with said character printing type, and keys associated with said ruling type respectively for selecting any desired ruling type for printing simultaneously with said character type.
56. In a printing machine, the combination of a plurality of printing devices each comprising a plurality of single character types, a plurality of printing devices each comprising a multiple character type, a universal device for effecting operation of the first said printing devices, and a separate universal device for effecting operation of the second said printing devices.
57. In a printing machine, the combination of a plurality of key controlled devices adapted to print a horizontal row of characters, a key controlled device adapted to print a vertical row of characters, a universal operating mechanism and connections therefrom for actuating all of said devices to simultaneously print a horizontal row and a vertical row of characters.
58. In a printing machine, the combination of a plurality of key controlled devices adapted to print a row of characters, a key controlled device adapted to print a second row of characters intersecting the first said row, and a universal operating mechanism for actuating said device to simultaneously print two intersecting rows of characters.
59. In a printing machine, the combination of a plurality of key controlled devices adapted to print a row of characters, a key controlled device adapted to print a second row of characters intersecting the first said row, and a universal operating mechanism adapted in a single operation to cause printing from all of said key controlled devices.
60. In a printing machine, in combination, a plurality of key controlled devices adapted to print a line of ruling, a key controlled device adapted to print a second line of ruling intersecting the first said line of ruling, and a universal operating mechanism adapted in a single operation to cause printing from all of said key controlled devices.
61. In a printing machine, a printing mechanism comprising a printing lever, an actuating device for moving the printing lever, a guide for said actuating device, and a single rod constituting a support for said guide and a stop for said printing lever.
62. In a printing machine, a printing mechanism comprising a pivotally mounted movable member, a ruling device, a splitting device, and a single rod constituting a pivot for said ruling device and a stop for said pivotally mounted movable member and said splitting device.
63. In a printing machine, a printing mechanism comprising a movable member, an actuating device therefor, a guide for said actuating device, a ruling device, and a single rod constituting a stop for said movable member and a support for said guide and a pivot for said ruling device.
64. In a printing machine, a printing mechanism comprising a horizontal rule device, a vertical rule device, and a single rod constituting a pivot for one of said devices and a controlling means for the other of said devices.
65. A printing mechanism comprising means for carrying a record sheet, means for successively printing on said record sheet a series of rule line elements for dividing the record sheet into column spaces, and means for successively printing on said record sheet other series of rule line elements distinctively different from the first said rule line elements for subdividing the column spaces.
66. A printing mechanism comprising means for carrying a record sheet, means for printing a series of rule line elements on said record sheet for dividing the record sheet into column spaces, means for printing on said record sheet a second series of rule line elements distinctively different from the first said rule line elements, and a key for controlling both the second said means and the third said means.
67. A printing mechanism comprising means for carrying a record sheet, means for printing a series of rule line elements on said record sheet for dividing the record sheet into column spaces, means for printing on said record sheet a series of distinctively different rule line elements simultaneously with the printing of the first said series of rule line elements, and a key for controlling both the second said means and the third said means.
68. A printing mechanism comprising means for carrying a record sheet; and a rule type which is normally in the printing position and movable toward said record sheet for printing, and movable transversely of the record sheet for rendering it ineffective.
69. A printing mechanism comprising means for carrying a record sheet, a vertical rule type normally in the printing position and movable toward said record sheet, and means for moving said vertical rule type transversely of the record sheet.
70. A printing mechanism comprising means for carrying a record sheet; a member carrying a rule type and another type, said member normally holding said rule type in printing position;

and means for moving said member for causing it to hold said other type in printing position.

71. A printing mechanism comprising means for carrying a record sheet, a rule type normally in the printing position and movable toward the record sheet, means for moving said rule type transversely of the record sheet, and a second rule type always in the printing position.

72. A printing mechanism comprising means for carrying a second sheet, a vertical rule type which is normally in the printing position and movable toward said record sheet for printing, and means for moving said vertical rule type away from said printing position in a direction other than toward said record sheet.

73. A printing mechanism comprising means for carrying a record sheet, a type carrying member, driving means for driving said member toward said record sheet, operating means for said machine, a controlling member for controlling said driving means and normally positioned out of operative relation with said operating means, automatic means for moving said controlling member into operative relation with said operating means, a key, and mechanism operable by said key for moving said controlling member into operative relation with said operating means.

74. A printing mechanism comprising means for carrying a record sheet; a plurality of type carrying members; a plurality of driving devices, one for each of said members, for driving it toward the record sheet; operating means for said machine; a plurality of controlling members, one for each of said devices, all of said controlling members being normally positioned out of operative relation with said operating means; automatic means for effecting an operative relation of each of said controlling members with said operating means; a key; and mechanism operable by said key for moving one of said controlling members into operative relation with said operating means.

75. The combination of a rotatable and axially movable platen, a bar substantially axially parallel with the platen and mounted to move with the latter in its axial direction, a member arranged to contact with said bar and move it laterally, means connecting the bar with the platen for rotating the latter, and means for adjusting the bar laterally and thereby rendering said member ineffective and effective and also varying the amount of rotation of said platen.

76. The combination of a rotatable and axially movable platen, a bar substantially axially parallel with the platen and mounted to move with the latter in its axial direction, a member arranged to move into contact with said bar and move it laterally, means connecting the bar with the platen for rotating the latter, and means for adjusting the bar laterally and thereby rendering said member ineffective and effective and also varying the amount of rotation of said platen.

77. The combination of a rotatable and axially movable and substantially radially movable platen, a bar mounted to move longitudinally in the axial direction of said platen and being operatively connected to the latter, a member mounted and impelled to move relative to said bar and to move said bar laterally, a device co-acting with said member for moving said platen in its substantially radial direction, and means for adjusting the said bar in different positions relative to the limits of movement of the said member.

78. The combination in a printing mechanism,

of a traveling carriage, a pivotally mounted frame supported by said carriage and comprising a bar extending in the direction of travel of the carriage, a platen supported by the carriage, printing type correlated with the platen, means comprising a pawl for connecting the said frame with the platen and causing said platen to rotate when the frame swings on its pivot, a device arranged to contact with said bar and swing said frame, and means for adjusting the position of said bar relative to said device for rendering the said device ineffective and effective relative to said platen and for varying the extent of rotation of the latter.

79. The combination in a printing mechanism, of a platen, a pivoted frame supporting said platen and movable about its pivot to carry said platen to and from the printing position, a fixed stop and cooperating shoulders on said frame for limiting movement of said platen both to and from the printing position, and a latch device on said frame for engaging with said stop and thereby holding the platen against movement from the printing position.

80. The combination in a printing mechanism, of a platen, a pivoted frame supporting said platen and movable about its pivot to carry said platen to and from the printing position, a fixed stop and cooperating shoulders on said frame for limiting movement of said platen both to and from the printing position, a latch device on said frame for engaging with said stop and thereby holding the platen against movement from the printing position, and spring pressed means for holding said latch in both effective and ineffective positions.

81. The combination in a printing mechanism, of a platen movable to and from the printing position, a stop for limiting movement of said platen both to and from the printing position, means operable for engaging with said stop and thereby holding the platen against movement from the printing position, and a spring operative for holding said means alternatively in and out of operative position.

82. The combination of a carriage, means for impelling the carriage in one direction, a platen supported by said carriage, a bar supported by the carriage and extending in the direction of travel of said carriage and connected with for rotating the platen, a device for actuating said bar, means correlated with the first said means for automatically rendering said device ineffective with relation to said platen, and hand actuated means for rendering said device ineffective relative to said platen.

83. The combination in a printing mechanism; of a carriage mounted and impelled to travel; a platen supported by the carriage; printing type correlated with the platen; a bar supported by the carriage and extending in the direction of travel of the latter and connected to the platen; a second bar arranged parallel with the first said bar; means operatively connected to said second bar for rotating the platen; an actuating device whereby both of said bars may be actuated; and means for adjusting the actuating device so that it will actuate one of said bars exclusively.

84. The combination in a printing mechanism; of a traveling carriage; a rotatable platen supported by the carriage; a bar connected to the platen in substantially parallel relation to the direction of travel of the carriage; a second bar supported in spaced and parallel relation to the first said bar and movable relative thereto; a

pusher mounted and arranged to move into contact with one of said bars and thereby move the platen at an angle to said direction of travel; means for rendering said pusher operative with relation to the said second bar for moving the latter; means coacting with the said second bar for rotating the platen; and printing type correlated with the platen.

85. The combination in a printing mechanism, of a traveling carriage, a frame pivotally mounted on the carriage and provided with a bar extending in the direction of travel of the carriage, a platen supported by the frame, printing type arranged for movement relative to said platen, and a device comprising a member impelled in a direction at an angle to the length of said bar and into contact therewith for swinging the platen toward the type.

86. The combination in a printing mechanism, of a traveling carriage, a frame movably mounted on the carriage and provided with a bar extending in the direction of travel of the carriage, a platen supported by the frame, a second bar movably mounted in spaced and parallel relation to the first said bar, printing type arranged for movement relative to said platen, a device comprising a member impelled in a direction at an angle to the length of said bars and into contact therewith for swinging the platen toward the type, and means cooperating with said second bar and said device for rotating the platen.

87. The combination in a printing mechanism, of a traveling carriage, a frame pivotally mounted on the carriage and provided with a bar extending in the direction of travel of the carriage, a platen supported by the frame, a second bar pivotally mounted in spaced and parallel relation to the first said bar, printing type arranged for movement relative to said platen, a device comprising a member impelled in a direction at an angle to the length of said bars and into contact therewith for swinging the platen toward the type, and means cooperating with said second bar and said device for rotating the platen.

88. The combination of a carriage mounted to travel in opposite directions; a frame movably mounted on said carriage and comprising a bar extending in the directions of travel of the carriage; a platen supported by said frame; a device arranged on the carriage for rotating the platen and comprising a bar substantially parallel with the first said bar; a member mounted and impelled to move in one direction for actuating said bars; and means for effecting movement of said member in a direction transverse to its actuating movement and thereby rendering it ineffective relative to one of said bars.

89. The combination of a carriage mounted to travel in opposite directions; a frame movably mounted on said carriage and comprising a bar extending in the directions of travel of the carriage; a platen supported by said frame; a device arranged on the carriage for rotating the platen and comprising a bar substantially parallel with the first said bar; a member mounted and impelled to move in one direction for actuating said bars; and means for effecting movement of said member in a direction transverse to its actuating movement and thereby rendering it ineffective relative to the second one of said bars.

90. The combination of a carriage mounted and impelled to travel in one direction, a platen supported by the carriage, printing type correlated with the carriage, a device supported by the carriage and comprising two bars extending in the

direction of travel of the carriage for effecting movements of the platen relative to the carriage, a movable rest, a device supported by said movable rest, means for actuating and causing the last said device to actuate said bars, and means for moving said rest and thereby rendering the last said device ineffective with relation to only one of said bars.

91. The combination of a carriage mounted and impelled to travel in one direction, a platen supported by the carriage, printing type correlated with the carriage, a device supported by the carriage and comprising two bars extending in the direction of travel of the carriage for effecting movements of the platen relative to the carriage, a pivotally mounted rest, a device supported by said pivoted rest, means for actuating and causing the last said device to actuate said bars, and means for moving said rest and thereby rendering the last said device ineffective with relation to only one of said bars.

92. The combination of a rotatable bar, a bearing member non-removably seated on said bar and provided with a radially extending screw device, a supporting member to which said screw device is removably secured, and a spring arm provided with a detent and extending from said bearing member into yieldable engagement with said rotatable bar.

93. The combination of a rotatable bar, a bearing therefor, a bearing member non-removably seated on the bar and provided with a radially extending screw device, and a supporting member provided with a notch and a communicating countersink, said screw device being seated in said notch and provided with a boss removably engaged with said countersink.

94. The combination of a rotatable bar, a bearing therefor, a bearing member non-removably seated on the bar and provided with a radially extending screw device, and a supporting member provided with a notch in which said screw is removably secured.

95. The combination of a carriage, a stop bar mounted on said carriage, a spring for driving said carriage, and means controllable by said stop bar for stopping said carriage and thereby receiving the strain of said spring without permitting said strain to be exerted on said stop bar.

96. A stop bar comprising a body portion, a plurality of longitudinally and radially extending plates projecting from said body portion, said plates being each formed into a series of stops.

97. A stop bar comprising a body portion and a plurality of longitudinally and radially extending plates projecting from said body portion, said plates being each formed into a series of spaced stops, the stops of each series being differently spaced from those of any other series.

98. A rotatably mounted bar comprising a plurality of series of radial projections, each projection having an inclined surface lying in a plane cutting the axis of rotation, and each of said projections having an axially parallel surface.

99. A rotatably mounted bar comprising a straight row of projections, each of said projections comprising an axially parallel surface and two inclined surfaces each adjoining the axially parallel surface and each lying in a plane which cuts the axis of rotation of said bar.

100. A rotatable bar having thereon a plurality of straight rows of projections, the projections of each row being equally spaced apart and being spaced differently from the projections of other of said rows, each of said projections be-

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ing formed with an axially parallel surface and an adjoining surface inclined toward the axis of rotation.

101. A rotatable bar comprising a plurality of straight rows of radial projections, each projection having oppositely inclined faces lying respectively in planes cutting the axis of rotation, and each projection having a surface substantially parallel with said axis, the projections of each row being equally spaced apart and spaced differently from those of other of said rows.

102. In a machine of the character described, an adjustable carriage stopping device comprising a bar provided with engaging elements, a stop tooth adjustable on said bar, said stop tooth comprising a flat top, inclined portions extending from said flat top and adapted to engage said engaging elements, side portions extending from said flat top and adapted to embrace said bar, spring holding devices on said side portions, and a spring interposed between said side portions and said bar, whereby said inclined portions are held in engagement with said engaging elements.

103. The combination in a printing mechanism, of a plurality of type, a carriage for carrying paper to be printed upon by said type, a carriage controlling device for effecting movements of the carriage, a hand operated device for controlling said carriage controlling device, an operating mechanism independent of said hand operated device and arranged for effecting the printing by said type, and means for releasing said carriage from its operative relation with said carriage controlling device and correlating it with said operating mechanism in proper relation to be operated by the latter.

104. In combination, a plurality of type; a carriage comprising a platen adapted to receive impressions from said type; an inked ribbon cooperating with the carriage and type for printing; a spring for moving the carriage in one direction; means, other than said spring, for moving the carriage in said direction and in the opposite direction alternately; and means for freeing the carriage from control of said spring and temporarily subjecting it to the exclusive control of the first said means.

105. In combination, a plurality of type; a carriage comprising a platen adapted to receive impressions from said type; an inked ribbon cooperating with the carriage and type for printing; a spring for moving the carriage in one direction; means, other than said spring, for moving the carriage in said direction and in the opposite direction alternately; and means for simultaneously freeing the carriage from control of said spring and temporarily subjecting it to the exclusive control of the first said means.

106. In combination; printing type; a carriage comprising a platen adapted to receive impressions from said type; an inked ribbon correlated with the carriage and type for printing; means for automatically moving the carriage step by step in one direction; and means, separate from the first said means, for moving said carriage in said direction and in the opposite direction.

107. In combination; printing type; a carriage comprising a platen adapted to receive impressions from said type; an inked ribbon correlated with the carriage and type for printing; means for automatically moving the carriage step by step in one direction; and means, sepa-

rate from the first said means, for moving said carriage in said direction and in the opposite direction alternately.

108. In combination; printing type; a carriage comprising a platen adapted to receive impressions from said type; an inked ribbon correlated with the carriage and type for printing; means for automatically moving the carriage step by step in one direction; means, separate from the first said means, for moving said carriage in said direction and in the opposite direction; and means for freeing the carriage from the control of the first said means and temporarily subjecting it to the exclusive control of the second said means.

109. In a printing machine, the combination of a paper carriage, hand operated means for shifting the carriage in opposite directions, mechanically operated means for shifting the carriage in said directions independently of the first said means, mechanism for subjecting said carriage to the control of said mechanically operated means, means cooperating with said mechanically operated means for portioning a sheet of paper into column spaces and locating the inter column lines of the paper, type for printing on the paper, and means cooperating with said mechanically operated means for stopping the carriage after each printing operation with an inter column line of the paper opposite one of said type.

110. In a printing machine, the combination of a paper carriage, means cooperating with the carriage for portioning a sheet of paper into columns and locating the inter column lines and moving the carriage back and forth in steps each equal to one half of a column space from a printing position to an inter column position; and means cooperating with the first said means to cause the carriage to move a plurality of column spaces from one inter column position to another inter column position at a single step.

111. In a printing machine, the combination of a paper carriage, means cooperating with the carriage for portioning a sheet of paper into columns and locating the inter column lines and moving the carriage back and forth in steps each equal to one half of a column space from a printing position to an inter column position and allowing it to rest at the inter column position between printing operations; and means cooperating with the first said means to cause the carriage to move a plurality of column spaces from one inter column position to another inter column position at a single step.

112. In combination, a carriage constructed for carrying paper and locating column spaces and inter column lines on the paper; type for printing in said column spaces; mechanism for shifting the carriage at a single step from one inter column position past a second inter column position and stopping it in a third inter column position; and means for changing the location of the inter column lines of the paper without adjusting any element of the carriage and without adjusting the paper relative to the carriage.

113. A printing mechanism comprising a carriage constructed for supporting a record sheet, a device cooperating with the carriage for portioning the record sheet into pairs of column spaces, a device for shifting the carriage alternately back and forth from printing position of one column space to printing position of the other column space of a pair of column spaces; and a

key controlled device, operable while the second said device is operative, for shifting the carriage to move one pair of column spaces out of and another pair of column spaces into operative relation with the second said device.

114. A printing mechanism comprising type and a platen adapted to receive impressions from said type, a platen carriage, operating mechanism for taking an impression from said type on said platen, means for automatically moving said carriage alternately back and forth as an incident to the operation of said operating mechanism, and means for varying the extent of such automatic movement of the carriage.

115. A printing mechanism comprising a carriage, printing type, operating mechanism for causing printing by said type, automatic means for moving said carriage back and forth with relation to said type as an incident to the operation of said operating mechanism, and means for adjusting said automatic means so that it will move said carriage a greater or less distance at each operation.

116. In combination, a paper carriage, type cooperatively related with the paper carriage for printing in separate columns on paper carried by the carriage; means for shifting the carriage by steps from an inter column position to a printing position and thence to an inter column position; and means for changing the length of said steps and thereby changing the distance between printing positions.

117. In combination, a paper carriage; type cooperatively related with the paper carriage for printing in separate columns on paper carried by the carriage; means for shifting the carriage by steps from an inter column position to a printing position and thence to rest at an inter column position; means for controlling the first said means so as to effect movement of the carriage in either of the two opposite directions from said inter column position, at the will of the operator; and means for changing the length of said steps and thereby changing the distance between printing positions.

118. In combination, a paper carriage; type cooperatively related with the paper carriage for printing in separate columns on paper carried by the carriage; means for shifting the carriage in one direction; means independent of the first said means for shifting the carriage by steps from an inter column position to a printing position and thence to an inter column position; and means for changing the length of said steps and thereby changing the distance between printing positions.

119. A printing mechanism comprising a carriage adapted to carry a record sheet, printing type correlated with said carriage for printing on said record sheet, automatic means for moving said carriage back and forth with relation to said type for printing in each of a pair of columns alternately, and means for adjusting said automatic means so that it will space said columns a greater or less distance apart.

120. In combination, a paper carriage, type operable for printing on material supported by the paper carriage, mechanism for moving the paper carriage by steps, and a screw by rotation of which the length of steps of the carriage is varied.

121. In combination, a carriage adapted to carry a record sheet, a spring for moving said carriage by steps in one direction, means for varying the length of said steps, a device for automatically moving said carriage by steps in either

of two directions, and means for varying the length of the last said steps.

122. In combination, a carriage adapted to support a record sheet, type operable for printing on said record sheet, means for moving said carriage in one direction, automatic mechanism for moving said carriage in either of two directions, and means for uniformly varying the length of movement of said carriage by said automatic mechanism.

123. In combination, a carriage adapted to support a record sheet, type operable for printing on said record sheet, means for moving said carriage in one direction, automatic mechanism for moving said carriage in either of two directions, and a device separate from said carriage for varying the length of movement of said carriage by said automatic mechanism.

124. In combination, a paper carriage; type correlated with said paper carriage for printing on paper supported by said paper carriage; mechanism for moving the paper carriage in opposite directions by steps into and out of printing position and in such manner as to permit said type to be impressed upon the paper alternately in two different columns; and means for adjusting said mechanism and thereby causing the length of its steps to be varied at the will of the operator.

125. In combination, a paper carriage; type operable for printing on paper supported by the carriage; means for moving the carriage in one direction; means, independent of the first said means, for moving the carriage in said direction and in the opposite direction and thereby bringing the paper alternately into printing position and inter column position and thence into a second printing position and again into an inter column position, substantially as specified; and means, supplementing and cooperating with the second said means, for causing the carriage to move at a single step from one inter column position past a second inter column position and stop at a third inter column position.

126. In combination, a paper carriage; type operable for printing on paper supported by the carriage; means for moving the carriage in one direction; means, independent of the first said means, for moving the carriage in said direction and in the opposite direction and thereby bringing the paper alternately into printing position and inter column position and thence into a second printing position and again into an inter column position, substantially as specified; and means for affecting the second said means so that it will vary the distance moved by the carriage from printing position to inter column position, at the will of the operator.

127. In combination, a paper carriage; type operable for printing on material supported by the carriage; means for moving the carriage in one direction; means independent of the first said means for moving the carriage in said direction and in the opposite direction and thereby bringing the paper alternately into printing position and inter column position and thence into a second printing position and again into an inter column position; means, supplementing and cooperating with the second said means, for causing the carriage to move at a single step from one inter column position past a second inter column position and stop at a third inter column position; and means for affecting the second said means so that it will vary the distance moved by the carriage from printing position to inter column position, at the will of the operator.

128. In combination, a gear member mounted for movement in opposite directions, a reversing member operatively connected to said gear member and pivotally mounted and provided with two engagement elements, and a device movable alternatively into engagement with one or the other of said engagement elements and operable for imparting movement to said reversing member. 80
129. A printing mechanism comprising a carriage; type correlated therewith; a reversing member operatively connected with the carriage for causing the latter to move back and forth with respect to the type, said reversing member being pivotally mounted and provided with two engagement elements; and a device movable alternatively into engagement with one or the other of said engagement elements and operable for imparting movement to said reversing member. 85
130. A printing mechanism comprising a carriage, a device connected with for moving the carriage in opposite directions and comprising a gear member, a reversing member operatively connected to said gear member and pivotally mounted and provided with two engagement elements, and a device movable alternatively into engagement with one or the other of said engagement elements and operable for imparting movement to said reversing member. 90
131. A printing mechanism comprising a carriage; type correlated therewith; a reversing member operatively connected with the carriage for causing the latter to move back and forth with respect to the type, said reversing member being provided with two engagement elements; a device normally in engagement with one of said engagement elements; key operated means for moving said device into engagement with the other engagement element; and means for moving said device so as to impart movement to said reversing member. 95
132. The combination of a carriage, a gear device operatively connected with the carriage, a rock lever operatively connected to said gear device and provided with two engagement elements, a bar, a shiftable member pivotally mounted on said bar and operable for engagement with one or the other of said engagement elements, means for causing said bar to move said shiftable member and thereby move said rock lever, and means for varying the extent of movement of said bar and thereby varying the extent of movement of the carriage. 100
133. In combination, a circular member, a member carried by said circular member and extending on diametrically opposite sides thereof, and a spring coiled around said circular member and having its end portions crossed and connected to the opposite sides of the second said member. 105
134. In combination, a rotatably mounted clutch member, a hub mounted for rotation relative to said clutch member and carrying a non-cylindrical element, a clutch member mounted to move on said non-cylindrical element in the radial direction of the hub, separately and independently mounted means for holding said clutch members normally out of engagement with each other, and means for moving said clutch members into mutual engagement. 110
135. In combination, a power device, a rock lever operable by said power device, a shaft, a hub rotatable on the shaft and carrying a non-cylindrical element and being operatively connected to said rock lever, a hub secured to said shaft and carrying a clutch member, a clutch member mounted to slide radially on said non-cylindrical element and to move into and out of engagement with the first said clutch member, and a spring surrounding the first said hub and having its ends connected to the second said clutch member. 115
136. In combination, a power device, a rock lever operable by said power device, a shaft, a hub rotatable on the shaft and carrying a non-cylindrical element and being operatively connected to said rock lever, a hub secured to said shaft and carrying a clutch member, a clutch member mounted to slide radially on said non-cylindrical element and to move into and out of engagement with the first said clutch member, means for holding the second said clutch member out of engagement with the first said clutch member, and key controlled means for engaging the second said clutch member with the first said clutch member. 120
137. In combination, a power device, a rock lever operable by said power device, a shaft, a hub rotatable on the shaft and carrying a non-cylindrical element and being operatively connected to said rock lever, a hub secured to said shaft and carrying a clutch member, a clutch member mounted to slide radially on said non-cylindrical element and to move into and out of engagement with the first said clutch member, a toothed clutch member mounted to slide radially on said non-cylindrical element and having its teeth in position for engagement and disengagement with said spur gear wheel; and a spring surrounding the second said hub and having its end portions crossed and connected to opposite sides of said clutch member and coacting with said hub for normally holding said clutch member in mesh with the teeth of said spur gear wheel. 125
138. In a clutch, a rotatable device comprising a hub and a spur gear wheel; a second device comprising a hub in axial alignment with the first said hub and rotatable relative thereto, the second said hub carrying a non-cylindrical element; a toothed clutch member mounted to slide radially on said non-cylindrical element and having its teeth in position for engagement and disengagement with said spur gear wheel; and a spring surrounding the second said hub and having its end portions crossed and connected to opposite sides of said clutch member and coacting with said hub for normally holding said clutch member in mesh with the teeth of said spur gear wheel. 130
139. In combination, a carriage; a spring for driving said carriage; a ratchet wheel connected to and operable by said spring; a pawl adapted to engage with said ratchet for rendering said spring ineffective; a clutch member normally out of and adapted to be thrown into operative relation with for controlling said carriage; and means for simultaneously engaging said pawl with said ratchet wheel and throwing said clutch member into operative relation with said carriage. 135
140. In combination, a carriage; a spring for driving said carriage; a ratchet wheel connected to and operable by said spring; a pawl adapted to engage with said ratchet for rendering said spring ineffective; a clutch member normally out of and adapted to be thrown into operative relation with for controlling said carriage; and key controlled means for simultaneously engaging said pawl with said ratchet wheel and throwing said clutch member into operative relation with said carriage. 140
141. In combination, a carriage, a spring for driving said carriage, a shaft rotatable by said spring through the medium of said carriage, a second spring, and means operable by said second spring for rotating said shaft and thereby moving said carriage. 145
142. In combination, a carriage, a spring for 150

driving said carriage, a shaft rotatable by said spring through the medium of said carriage, a second spring, and key controlled means operable by said second spring for rotating said shaft and thereby moving said carriage.

143. In combination, a carriage; a spring for driving said carriage; a shaft rotatable by said spring through the medium of said carriage; a second spring; normally inoperative means correlated with said second spring for rotating said shaft and thereby moving said carriage; and key controlled means for rendering the first said means operative.

144. In combination, a carriage; a spring for driving said carriage; a shaft rotatable by said spring through the medium of said carriage; a second spring; normally inoperative means correlated with said second spring for rotating said shaft and thereby moving said carriage; and key controlled means for rendering the first said means operative and rendering the first said spring ineffective.

145. In combination, a carriage, a platen mounted on said carriage and adapted to carry a record sheet, a type for printing on said record sheet, mechanically operated means for moving said carriage back and forth relative to said type, a tappet carrying member connected with and operable by said means, automatic means for rotating said platen to feed said record sheet, and a device operable by said tappet carrying member for rendering the last said means ineffective.

146. A machine comprising an operating device; an oscillatory member carrying two engagement elements; a shiftable member; means for shifting the shiftable member into engagement with one or the other of said engagement elements; a movable member cooperative with said shiftable member for oscillating said oscillatory member; and means for operatively connecting and disconnecting said movable member and said operating device.

147. A machine comprising an operating device; an oscillatory member carrying two engagement elements; a shiftable member; means for shifting the shiftable member into engagement with one or the other of said engagement elements; a movable member cooperative with said shiftable member for oscillating said oscillatory member; means for operatively connecting and disconnecting said movable member and said operating device; and means for varying the extent of movement of said movable member.

148. A machine comprising an operating device; a carriage; an oscillatory member provided with two engagement elements; means including a clutch for operatively connecting said carriage with said oscillatory member; a shiftable member; means for shifting the shiftable member into engagement with one or the other of said engagement elements; a movable member cooperative with said shiftable member for oscillating said oscillatory member; and means for simultaneously controlling said clutch and operatively connecting said movable member with said operating device.

149. A machine comprising an operating device; a carriage; an oscillatory member provided with two engagement elements; means including a clutch for operatively connecting said carriage with said oscillatory member; a shiftable member; means for shifting the shiftable member into engagement with one or the other of

said engagement elements; a movable member cooperative with said shiftable member for oscillating said oscillatory member; and key controlled means for simultaneously controlling said clutch and operatively connecting said movable member with said operating device.

150. The combination of a carriage, a rotary device operatively connected with the carriage, an oscillatory member operatively connected with said rotary device and carrying two engagement elements, a shiftable member normally in engagement with one of said engagement elements and operable for oscillating said oscillatory member, and key controlled means for moving said shiftable member into engagement with the other of said engagement elements.

151. In a printing machine, the combination of a carriage comprising a platen, a spring for driving said carriage in one direction, a mechanism for driving said carriage in either direction transversely of the machine, means for releasing said carriage from the control of said spring and bringing it under the control of said mechanism, a driving bar for driving said mechanism, and automatic means cooperative with said driving bar for causing it to drive said carriage in opposite directions alternately.

152. In a printing machine, the combination of a carriage, a platen carried thereby, printing devices cooperative therewith, a spring for moving said platen to position successive columns in operative relation with said printing devices, mechanism for moving said carriage to position either of a pair of columns in operative relation with said printing devices, means for releasing said carriage from the control of said spring and bringing it under the control of said mechanism, a driving bar for driving said mechanism, and means cooperative with said driving bar for causing it to drive said mechanism to move the columns of a pair alternately into operative relation with said printing devices.

153. In a printing machine, the combination of a carriage, a platen carried thereby, printing devices cooperative therewith, a spring for moving said platen to position successive columns in operative relation with said printing devices, mechanism for moving said carriage to position either of a pair of columns in operative relation with said printing devices, means for releasing said carriage from the control of said spring and bringing it under the control of said mechanism, normally inoperative means cooperative with said driving bar for causing the latter to drive said mechanism to move the columns of a pair alternately into operative relation with said printing devices, and key controlled mechanism for rendering the last said means operative.

154. In a printing machine, the combination of a carriage, a track upon which said carriage is mounted to travel, a reversing member adapted to drive said carriage along said track in either direction, engagement elements on said member, an actuating bar for actuating said reversing member, said bar being adapted to engage with either of said engagement elements, and automatic means for causing engagement of said bar with each of said engagement elements alternately for moving said carriage alternately in opposite directions along said track.

155. In a printing machine, the combination of a carriage, a track upon which said carriage is mounted to move, normally inoperative mechanism for automatically moving said carriage in opposite directions alternately along said track,

and a plurality of keys for rendering said mechanism operative.

156. In a printing machine, the combination of a carriage; a track upon which said carriage is mounted to move; a normally inoperative member for moving said carriage in either direction along said track; key controlled means for rendering said member operative; an actuating bar for actuating said member; two engagement elements mounted on said member and adapted to be engaged separately with said actuating bar; hand controlled selecting means for selecting the one of said elements to be engaged by said actuating bar; and automatic means for causing said actuating bar to engage said engagement elements alternately.

157. In a printing machine, the combination of a carriage; a track upon which said carriage is mounted to move; a normally inoperative member for moving said carriage in either direction along said track; key controlled means for rendering said member operative; an actuating bar for actuating said member; two engagement elements mounted on said member and adapted to be engaged separately with said actuating bar; hand controlled selecting means for selecting the one of said elements to be engaged by said actuating bar; normally inoperative means for automatically causing said actuating bar to engage said elements alternately; and key controlled means for rendering said normally inoperative means operative.

158. In a printing machine, the combination of a carriage; a track upon which said carriage is mounted to move; a normally inoperative member for moving said carriage in either direction along said track; key controlled means for rendering said member operative; an actuating bar for actuating said member; two engagement elements mounted on said member and adapted to be engaged separately with said actuating bar; hand controlled selecting means for selecting the one of said elements to be engaged by said actuating bar; normally inoperative means for automatically causing said actuating bar to engage said elements alternately; a member operatively connected with the last said means; a key for positioning the last said member in a position to be operated; and a key for operating the last said member to cause it to render said normally inoperative means operative.

159. A printing mechanism comprising a carriage; type correlated therewith; a reversing member operatively connected with for causing the carriage to move back and forth with respect to the type, said reversing member being provided with a plurality of engaging elements; a device normally in engagement with one of said engaging elements; key operated means for moving said device into engagement with other of the engaging elements; means for causing said device to engage with one and another of said elements alternatively, and means for moving said device so as to impart movement to said reversing member.

160. The combination of a carriage, a rotary device operatively connected with the carriage, an oscillatory member operatively connected with said rotary device and carrying two engagement elements, a shiftable member normally in engagement with one of said engagement elements and operable for oscillating said oscillatory member, key controlled means for moving said shiftable member into engagement with the other of said engagement elements, and means independ-

ent of said key controlled means for shifting said shiftable member into engagement with one or the other of said engagement elements.

161. The combination of a carriage; a rotary device operatively connected with the carriage; an oscillatory member operatively connected with said rotary device and carrying two engagement elements; a shiftable member normally in engagement with one of said engagement elements and operable for oscillating said oscillatory member; key controlled means for moving said shiftable member into engagement with the other of said engagement elements; means independent of said key controlled means for shifting said shiftable member into engagement with one or the other of said engagement elements; a movable device for moving said carriage through the medium of said shiftable member and said oscillatory member and said rotary device; and means for varying the extent of movement of said movable device and thereby varying the extent of movement of said carriage.

162. An alternating mechanism comprising two engaging elements and a bar adapted to engage with either of said elements, each of said elements being adapted to hold said bar in engagement with the other element during the operation of the mechanism.

163. The combination of a rock lever provided with two engagement elements, a member mounted for movement alternately into engagement with said engagement elements and provided with oppositely facing track faces, and means for moving said member so as to oscillate said rock lever and cause one of the engagement elements to move along the adjacent track face while the other engagement element is engaged with and moved by said member.

164. The combination of a rock lever provided with two engagement elements, a member mounted for movement alternately in opposite directions and provided with engagement elements and with track faces one adjacent to each of the last said engagement elements, means for moving said member so as to cause its engagement elements respectively to engage alternately with the respective engagement elements of said rock lever, and means for moving said member so as to oscillate said rock lever and thereby cause one of the first said engagement elements to travel along the adjacent track face and retain the other of the first said engagement elements in engagement with one of the second said engagement elements.

165. The combination of a carriage, a rotary device operatively connected with the carriage, an oscillatory member operatively connected with said rotary device and carrying two engagement elements, a shiftable member normally in engagement with one of said engagement elements and operable for operating said oscillatory member, a key, mechanism operable by said key and by said shiftable member, and means for rendering said shiftable member incapable of operating said mechanism.

166. In a printing machine, the combination of a plurality of printing devices; a plurality of members one for each printing device and each operable to prevent its printing device from printing; a connection from each of said members to its next adjacent member; means for operating one of said members to cause it, through the medium of said connections, to operate successive ones of said members; and means for disconnecting any two adjacent ones of said members.

167. A printing mechanism comprising a plurality of printing type, an inked ribbon cooperative with the type for printing, a ribbon feeding device, and means controllable by said ribbon feeding device to prevent printing by certain of said type.
168. In a printing machine, the combination of a plurality of printing devices, an inked ribbon cooperative with said devices for printing, a ribbon feeding device, means for causing said printing devices to print items, devices for causing said printing devices to print totals, and means correlated with said ribbon feeding device and the total printing devices for preventing certain of said printing devices from printing during total printing.
169. A printing mechanism comprising printing type, an inked ribbon, means including an actuator for forcing the type against the ribbon, a ribbon feeding device, and means controllable by said ribbon feeding device for blocking movement of said actuator.
170. A printing mechanism comprising a plurality of printing type, an inked ribbon, means including a plurality of actuators for forcing the type against the ribbon, a ribbon feeding device, and means controllable by said ribbon feeding device for blocking movement of certain of said actuators without affecting operation of the remaining actuators.
171. A printing mechanism comprising a plurality of printing devices, an inked ribbon cooperative with said devices for printing, a ribbon feeding device, a plurality of members one for each of said printing devices and operable to prevent the printing movement thereof, and a device operable by said ribbon feeding device for positioning certain of said members.
172. In a printing machine, the combination of a plurality of printing devices operable for printing items and the totals thereof, connecting means from each printing device to its next adjacent printing device, and a key operable for disconnecting said connecting means between two of said printing devices and also affecting said printing devices during total printing.
173. A printing mechanism comprising a plurality of printing type, mechanism for causing said printing type to print a plurality of columns of digits and the totals of said columns, and means for separating certain of said columns by the printing of a vertical rule line and for preventing the printing of totals on one side of said vertical rule line without preventing the printing of totals on the opposite side of said vertical rule line.
174. In a printing machine, the combination of a plurality of tappet levers, a carriage, a tappet, and a shaft carried by said carriage and adapted to hold up said tappet in position to cooperate with any of said tappet levers.
175. In a printing machine, the combination of a plurality of tappet levers, a carriage, a tappet, and a shaft carried by said carriage and adapted to hold up said tappet in position to cooperate with any of said tappet levers and adapted to hold said tappet in a position out of operative relation with all of said tappet levers.
176. The combination of a shaft having a plurality of annular grooves formed in its surface, a tappet provided with an opening and an interior annular groove, and an annular spring seated in the groove of said tappet and adapted to cooperate with any of said grooves of said shaft for positioning said tappet on said shaft.
177. The combination of a shaft having an annular groove formed in its surface, a frame for supporting said shaft and provided with an opening for the passage of said shaft therethrough, and an annular spring carried by said frame and adapted to cooperate with said annular groove for retaining said shaft in proper relationship with said frame.
178. The combination of a shaft having an annular groove formed in its surface; a frame comprising a flange for supporting said shaft, said flange being provided with a plurality of openings for the passage of said shaft; a keeper plate secured to said flange; and a plurality of annular springs seated in said keeper plate and each surrounding one of said openings in said flange, each spring being adapted to engage with the annular groove of said shaft.
179. In a shiftable carriage, the combination of a member formed with substantially parallel and oppositely apertured flanges, a shaft formed with several depressions and seated in two opposite apertures of said member, and an apertured member through which said shaft extends, said apertured member being located between said flanges and movable longitudinally of said shaft and provided with a spring for engagement with each of said depressions.
180. In a printing machine, the combination of a carriage, a plurality of levers separate from the carriage, and means comprising a device mounted on the carriage for moving all of said levers into and out of operative position.
181. In a printing machine, the combination of a carriage, a plurality of levers separate from the carriage, and means comprising a device mounted on the carriage for moving all of said levers simultaneously into and simultaneously out of operative position.
182. In a printing machine, the combination of a carriage, a plurality of tappets mounted thereon, a plurality of alternatively operative and inoperative tappet levers adapted to cooperate with said tappets, and means comprising a device mounted on said carriage for moving said tappet levers into operative relation with said tappets.
183. In a printing machine, the combination of a plurality of alternatively operative and inoperative tappet levers, a carriage, a plurality of tappets carried by said carriage and adapted to cooperate with said tappet levers, a support on said carriage for said tappets, and a lever mounted on said support and adapted to move said tappet levers into operative relation with said tappets.
184. In a printing machine, the combination of a plurality of alternatively operative and inoperative tappet levers, a carriage, a plurality of tappets carried by said carriage and adapted to cooperate with said tappet levers, a support on said carriage for said tappets, a lever mounted on said support adapted to move said tappet levers into operative relation with said tappets, and means for retaining the last said lever in either of two positions one of which is operative and the other inoperative.
185. In a printing machine, the combination of a plurality of alternatively operative and inoperative tappet levers, a carriage, a plurality of tappets, and means whereby said carriage may bring said tappet levers into operative relation with said tappets.
186. In a printing machine, the combination of a plurality of tappet levers, a pivot rod for

all of said tappet levers, a movable plate having a cam slot cooperative with said rod, a carriage, a plurality of tappets carried by said carriage, and means whereby said carriage moves
 5 said plate to bring said tappet levers into operative relation with said tappets.

187. In a printing machine, the combination of a plurality of tappet levers, a pivot rod for all of said tappet levers, a movable plate having
 10 a cam slot cooperative with said rod, locking means for said plate, a carriage, a plurality of tappets carried by said carriage, means whereby said carriage moves said plate to bring said tappet levers into operative relation with said tappets, and means for releasing said plate from the
 15 locking means.

188. In a printing machine, the combination of an alternatively operative and inoperative device, a carriage, an actuating member on the
 20 carriage, and means whereby said carriage may be caused to move said device into operative relation with said actuating member.

189. In a printing machine, the combination of an alternatively operative and inoperative device, a carriage, a roller on the carriage, and
 25 means whereby said carriage may be caused to move said device into operative relation with said roller.

190. In a printing machine, the combination of a carriage, operable mechanism associated with the carriage, a controlling device comprising a plurality of rollers, and means cooperative
 30 with said rollers and with said carriage for controlling said operable mechanism.

191. In a printing machine, the combination of a plurality of tappet levers, a carriage, a frame supported by said carriage, a shaft supported
 35 by said frame and projecting therethrough, a tappet mounted on said shaft and movable thereon to different operative positions, a device carried by said frame and adapted to bring said
 40 tappet levers into operative relation with said tappet, means for locking said tappet levers in their operative position, and means cooperative with the projecting end of said shaft for releasing
 45 said tappet levers from their locking means.

192. In a printing machine, the combination of a carriage, operable mechanism associated with the carriage, and a controlling device comprising
 50 an adjustably mounted roller cooperative with the carriage for controlling said operable mechanism.

193. In a printing machine, the combination of a carriage formed with spaced and parallel flanges, a key controlled mechanism, a controlling
 55 device positioned between said flanges of the carriage, and means operable by said controlling device for controlling said key controlled mechanism.

194. In a printing machine, the combination of a carriage formed with spaced and parallel flanges, a key controlled mechanism, a controlling
 60 device secured to the carriage between said flanges, and means operable by said controlling device for controlling said key controlled mechanism.

195. In a printing machine, the combination of a carriage, a key controlled mechanism, a controlling device secured on a vertical side of the
 70 carriage and positioned between the body of said carriage and said key controlled mechanism, and means operable by said controlling device for controlling said key controlled mechanism.

75 196. In a printing machine, the combination

of a controllable mechanism, a controlling key therefor, a carriage, a device carried by the carriage and operable for controlling said mechanism, a device for connecting the first said device
 80 with said mechanism, and means for locking the second said device.

197. In a printing machine, the combination of a plurality of controllable mechanisms, a plurality of controlling keys therefor, a carriage, a
 85 plurality of devices carried by the carriage and operable for controlling said mechanisms, a plurality of devices for connecting the first said devices with said mechanisms, and means for locking any of the second said devices.

198. In a printing machine, the combination of a plurality of controllable mechanisms, a plurality of controlling keys therefor, a carriage, a plurality
 90 of devices carried by the carriage and operable for controlling said mechanisms, a plurality of devices for connecting the first said devices with said mechanisms, and a plurality of locking devices one for each of the second said devices.

199. In a printing machine, the combination of a plurality of controllable mechanisms, a plurality of controlling keys therefor, a carriage, a
 100 plurality of devices carried by the carriage and operable for controlling said mechanisms, a plurality of devices for connecting the first said devices with said mechanisms, a plurality of locking
 105 devices one for each of the second said devices, and universal controlling means for all of said locking devices.

200. In a printing machine, the combination of a controllable mechanism, a controlling key therefor, a carriage, a device carried by the carriage
 110 and operable for controlling said mechanism, an alternatively operative and inoperative device for connecting the first said device with said mechanism, and a device capable of locking the second said device in its operative position
 115 and incapable of locking the second said device in its inoperative position.

201. In a printing machine, the combination of a plurality of mechanisms to be controlled, a plurality of keys for controlling said mechanisms, a carriage, a plurality of devices carried by the
 120 carriage and operable for controlling said mechanisms independent of said keys, a plurality of devices between the first said devices and said mechanisms, a plurality of locking devices one for each of the second said devices, and universal
 125 controlling means for all of said locking devices and capable of rendering all of said locking devices operative and inoperative, said universal controlling means being so arranged as to allow
 130 movement of said locking devices independent of each other.

202. In a printing machine, the combination of a plurality of normally inoperative members; a carriage; means whereby said carriage may
 135 move each of said members to an operative position; a plurality of normally inoperative locking devices, one for each of said members; and a universal controlling device for said locking devices for causing movement of the latter to a position for locking said members in their operative
 140 position, said locking devices and said universal controlling device being so correlated as to allow movement from an inoperative to an operative position, while said locking devices are operative, of any of said members not already
 145 locked by said locking devices.

203. In a printing machine, the combination of a plurality of tappet levers, tappets for shifting each of said tappet levers, means for auto-
 150

matically locking said tappet levers in their shifted position, and means for automatically releasing said tappet levers from said locking means.

5 204. In a printing machine, the combination of a carriage, means whereby said carriage may control different mechanisms of the machine, locking means for the first said means, and releasing means for said locking means.

10 205. In a printing machine, the combination of a plurality of tappet levers, a carriage, means whereby the carriage may set said tappet levers, locking devices one for each of said levers, and universal means for rendering all of said locking devices operative and inoperative.

15 206. In a carriage mechanism, a roller provided with an aperture, an annular recess communicating with said aperture, and an annular spring seated in said recess and having its internal diameter normally less than that of said aperture and its external diameter less than that of said recess.

20 207. In a carriage mechanism, a roller provided with an aperture, a recess communicating with said aperture, and a spring seated in said recess and normally extending into said aperture and adapted to be depressed wholly into said recess.

25 208. In a carriage mechanism, a tappet provided with an aperture, an annular recess communicating with said aperture, and an annular spring seated in said recess and having its internal diameter normally less than that of the aperture and its external diameter less than that of said recess.

30 209. In a carriage mechanism, a roller formed from two disks each having a central opening therethrough and having a depression surrounding the central opening, said disks being secured together with their depressions facing inward so as to form an annular recess around said central opening.

35 210. In a carriage mechanism, a roller formed from two disks each having a central opening therethrough and having a depression communicating with the central opening, said disks being secured together with their depressions facing inward so as to form a spring seat, and a spring in said seat and extending into said central opening.

40 211. In a carriage mechanism, a roller formed from two disks each having a central opening therethrough and having a depression surrounding the central opening, said disks being secured together with their depressions facing inward so as to form an annular recess around said central opening, and an annular spring in said annular recess.

45 212. In a printing machine, the combination of a carriage, a frame removably secured to the carriage, a shaft removably secured to the frame, a tappet removably secured to the shaft, and mechanism operable by said tappet.

50 213. In a printing machine, the combination of a carriage, a frame removably secured to the carriage, a shaft adjustably secured to the frame, a tappet adjustably secured to the shaft, and mechanisms each individually operable by said tappet.

55 214. In a printing machine, the combination of a carriage, mechanisms correlated with the carriage, and a tappet supported on the carriage and being removable therefrom and being adjustable on its support for alternatively bringing said tappet into operative relation with each of said mechanisms exclusive of the other of said mechanisms.

215. In a printing machine, the combination of a carriage, controllable mechanisms correlated with the carriage, and a tappet supported on the carriage in position to control one of said mechanisms and being capable of vertical adjustment for bringing it into controlling relation with other of said mechanisms without removing said tappet from its support.

80 216. The combination of a driven carriage, mechanism operable for limiting movement of the carriage to a single letter space, a platen on the carriage, mechanism for rotating the platen, and means for simultaneously actuating the first said mechanism and rendering the second said mechanism ineffective.

85 217. In a printing machine, the combination of a driven carriage; controlling mechanism for permitting said carriage to move a plurality of letter spaces at each step; means operable in connection with said mechanism for limiting movement of the carriage to a single letter space at each step; a platen supported on said carriage for carrying a record sheet; automatic means for rotating said platen to line space said record sheet; and means connected with the first said means for rendering said automatic means ineffective.

90 218. In combination, a carriage constructed to carry paper having column spaces located thereon; types correlated with the carriage; means for reciprocating the carriage for allowing the types to print alternately in two columns; means, cooperative with an element of the first said means, for controlling the carriage so as to allow it to move forward only the distance of substantially a single type face at each step; means, cooperative with an element of the first said means, for moving the carriage backward the distance of substantially only a single type face at each step.

110 219. In combination, a carriage constructed to carry paper, types for printing on the paper; means for moving the carriage in one direction; carriage movement controlling means enabling steps of carriage movement equal to the width of a plurality of type; means cooperating with said carriage movement controlling means for limiting the length of the steps of carriage movement to substantially the width of one type; and means cooperating with an element of the second said means for moving the carriage in the opposite direction.

115 220. A printing mechanism comprising a carriage, a platen carried thereby, mechanism for effecting step by step forward movement of the carriage substantially a letter space at each step, types correlated with the platen for printing a plurality of characters simultaneously on a record sheet, and means for moving the carriage backward by steps each substantially equal to a letter space.

120 221. In a printing machine, in combination, a frame, printing members carried by said frame, a carriage movable transversely on said frame, a carriage track comprising a vertically disposed channel bar secured to said frame, carriage guiding and supporting means formed in the exterior surfaces of the flanges of said channel bar, function controlling members mounted on said frame and extending through the web of said channel bar, and actuating means for said function controlling devices mounted on said carriage and extending into said channel bar.

125 222. In a printing machine comprising a frame, 150

printing members carried by said frame, and a movable carriage comprising a platen adapted to cooperate with said printing members; in combination, a rack mounted on said carriage, a gear wheel on said frame engaging with said rack, and means for adjusting the rack longitudinally with relation to the carriage.

223. In a printing machine comprising a frame, printing members carried by said frame, and a movable carriage comprising a platen adapted to cooperate with said printing members; in combination, a rack mounted on said carriage, a gear wheel for engaging with the rack and controlling movement of the carriage, and means for moving the rack longitudinally and laterally with relation to the carriage.

224. In a printing machine comprising a frame, printing members carried by said frame, and a movable carriage comprising a platen adapted to cooperate with said printing members; in combination, a rack mounted on said carriage, a gear wheel for engaging with the rack and controlling movement of the carriage, means for moving the rack laterally of the carriage, and means for adjusting the rack with relation to the carriage.

225. In a printing machine comprising a frame, printing members carried by said frame, and a movable carriage comprising a platen adapted to cooperate with said printing members; in combination, a rod movably mounted on said carriage, a rack supported by said rod longitudinally of said carriage, a gear wheel meshing with said rack, a spring for yieldably holding the rack in mesh with the gear wheel and moving said rack longitudinally, and means for moving said rack against the tension of said spring.

226. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a carriage moving mechanism comprising a strap, means on said frame cooperating with said strap for moving said carriage, a second means for moving said carriage, and a device independent of both the first and second said means for taking up slack in said strap.

227. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a strap for moving said carriage in one direction, means independent of said strap for moving the carriage in the said direction, and means for taking up slack in said strap when the first said means is operative.

228. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a strap, means cooperative with said strap for moving said carriage, a device for rendering said means ineffective, a second means for moving said carriage, and a device independent of both the first and second said means for taking up slack in said strap.

229. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, means comprising a strap and a spring for moving the carriage, a device for rendering said means ineffective, a device independent of said spring for moving said carriage, and a device for taking up slack in said strap when said carriage is operable by the second said device.

230. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a strap for moving said carriage in one direction, a spring for exerting carriage driving power on said strap, means independent of said spring for moving said carriage in the said direction, and a spring operable independent of the first said spring for taking up slack in said strap when the said means is operative.

231. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a drum, a spring within said drum for rotating the latter, and a spring for rotating the drum mounted exteriorly thereof and connected therewith.

232. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a drum correlated with the carriage, a spring for rotating the drum, and a separate spring for rotating the drum.

233. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a drum correlated with the carriage, means for rotating the drum in one direction, and a second means for rotating the drum in said direction.

234. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a drum correlated with the carriage, a spring for rotating the drum in one direction, and a second spring for rotating the drum in said direction.

235. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a drum, a main spring for rotating the drum, and a second spring weaker than said main spring and correlated with said drum for rotating the latter.

236. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a drum, a spring for rotating the drum, means for rendering the spring ineffective relative to the drum, and a second spring for rotating the drum when the first said spring is ineffective.

237. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a drum, means for operatively connecting the carriage and the drum, a spring for rotating the drum, and a relatively weak spring for rotating the drum independently of the first said spring.

238. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a drum, a strap, connecting the carriage and the drum, a spring for rotating the drum, means for rendering said spring ineffective, and a relatively weak spring for rotating the drum and

thereby taking up slack in said strap when the first said spring is ineffective.

239. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a drum, a second drum rotatable within the first said drum, a spring within the said second drum, and a spring connecting the first and second said drums.

240. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a driven drum, and a second drum encircling the first said drum and operable thereby for driving said carriage.

241. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a spring actuated drum, a second drum encircling the first said drum and operable thereby for driving said carriage, and a spring for actuating said second drum independent of the first said drum.

242. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a spring actuated drum, a second drum encircling the first said drum and operable thereby for driving said carriage, a spring for actuating said second drum independent of the first said drum, and means for limiting movement of said second drum.

243. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a drum, a spring for actuating said drum, a second drum rotatable within the first said drum, and a separate spring for rotating the said second drum.

244. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a drum, a spring for actuating said drum, a second drum rotatable within the first said drum, a separate spring for rotating the second said drum, and means for connecting the said

second drum with for driving the first said drum.

245. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a drum, a spring for actuating said drum, a second drum mounted for relative movement with respect to the first said drum, a spring for causing said relative movement, and means for limiting said relative movement.

246. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a driven drum for actuating said carriage, and a second drum which is correlated with and actuated by said carriage.

247. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a spring actuated drum for actuating said carriage, means independent of said drum for actuating said carriage, and a drum which is actuated by the carriage when said carriage is under the control of said means.

248. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a spring for exerting driving power on said carriage, and means for relieving the carriage of the power of said spring without lessening the power stored in the spring.

249. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a spring for exerting driving tension on said carriage, and means for automatically relieving the carriage of the tension of said spring.

250. In a printing machine comprising a frame, printing members mounted in said frame, and a carriage comprising a platen adapted to cooperate with said printing members; in combination, a spring for exerting driving tension on said carriage, a ratchet wheel operable by said spring, and a pawl operable to engage said ratchet wheel for relieving the carriage of the tension of said spring.

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