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Fig. 1

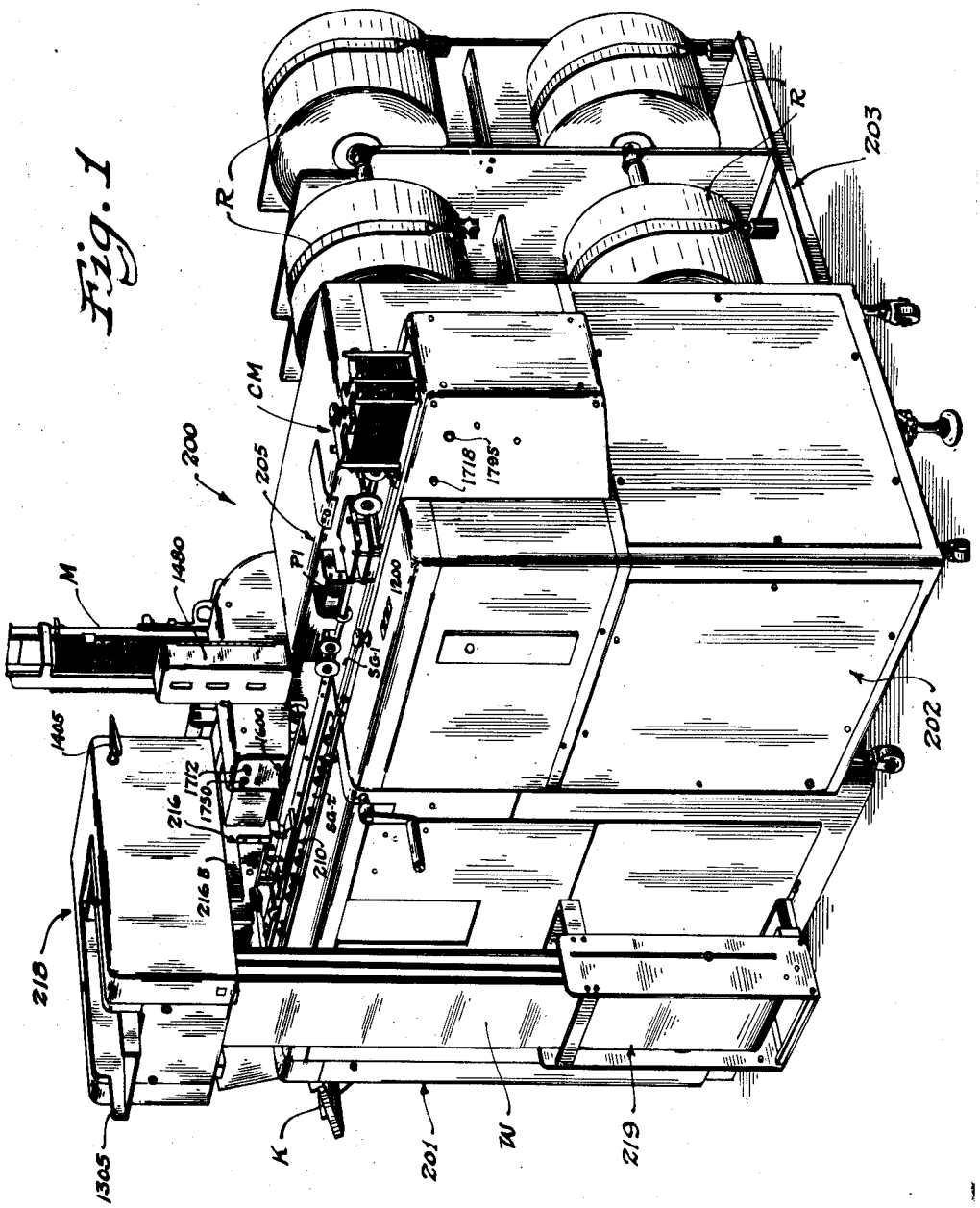

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Fig. 2

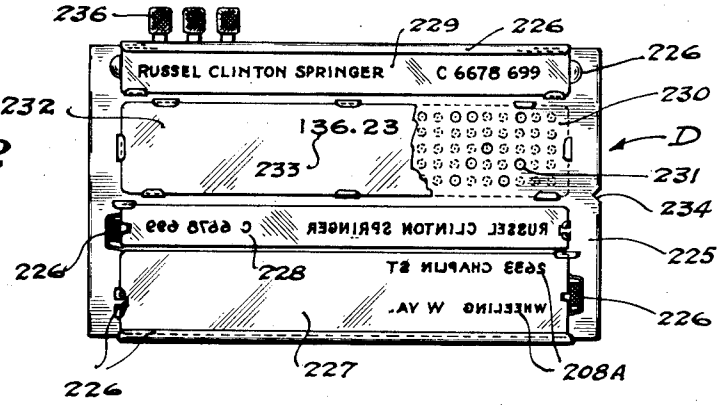

Fig. 3

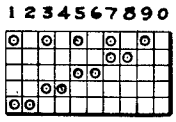

Fig. 4

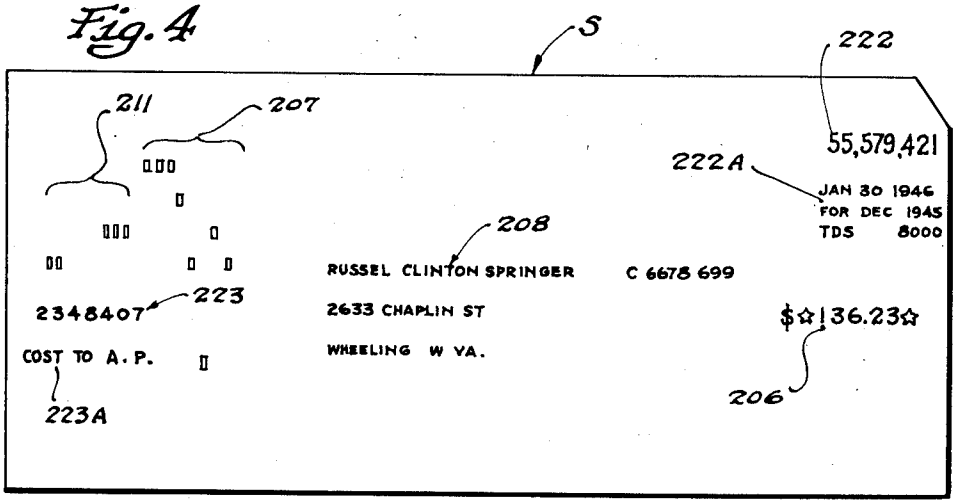

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Fig. 5

PS-1

CLARENCE L PAUSTENBACH 1239 LEIGHMAN AVE NEW KENSINGTON PA	C 6677 179	456.78	55,580,685
CHRISTENE LITTERAL AS UNREMARRIED WIDOW OF NEWT LITTERAL CONLEY KY	XC-3663742	123.45	55,580,686

220 221 215

Fig. 6

PS-2

BIRDIE M TURNER 34 E NEWTON ST BOSTON MASS	XC-3738877	234.56	55,580,758
JACK SKEENS SOUTH CLINCHFIELD VA	XC-3643126	901.23	55,580,759
		49,345.04 T1	

Fig. 7

PS-3

		567.89	55,580,848
RUSSEL CLINTON SPRINGER 2633 CHAPLIN ST WHEELING W. VA	C 6678 699	890.12	55,580,849
		8,476.24 T1	
		14,686.39 T2	

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Fig. 8

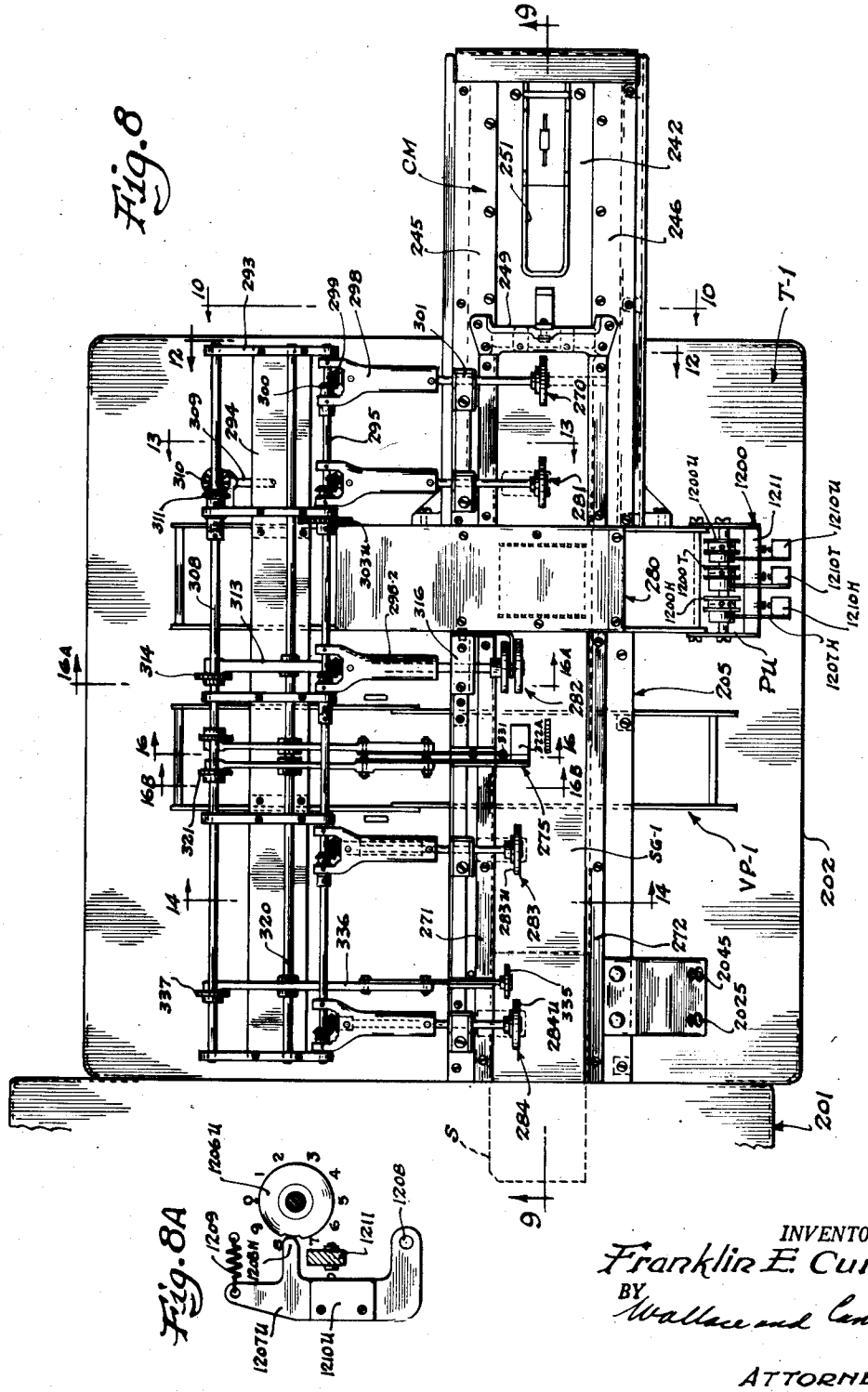

Fig. 8A

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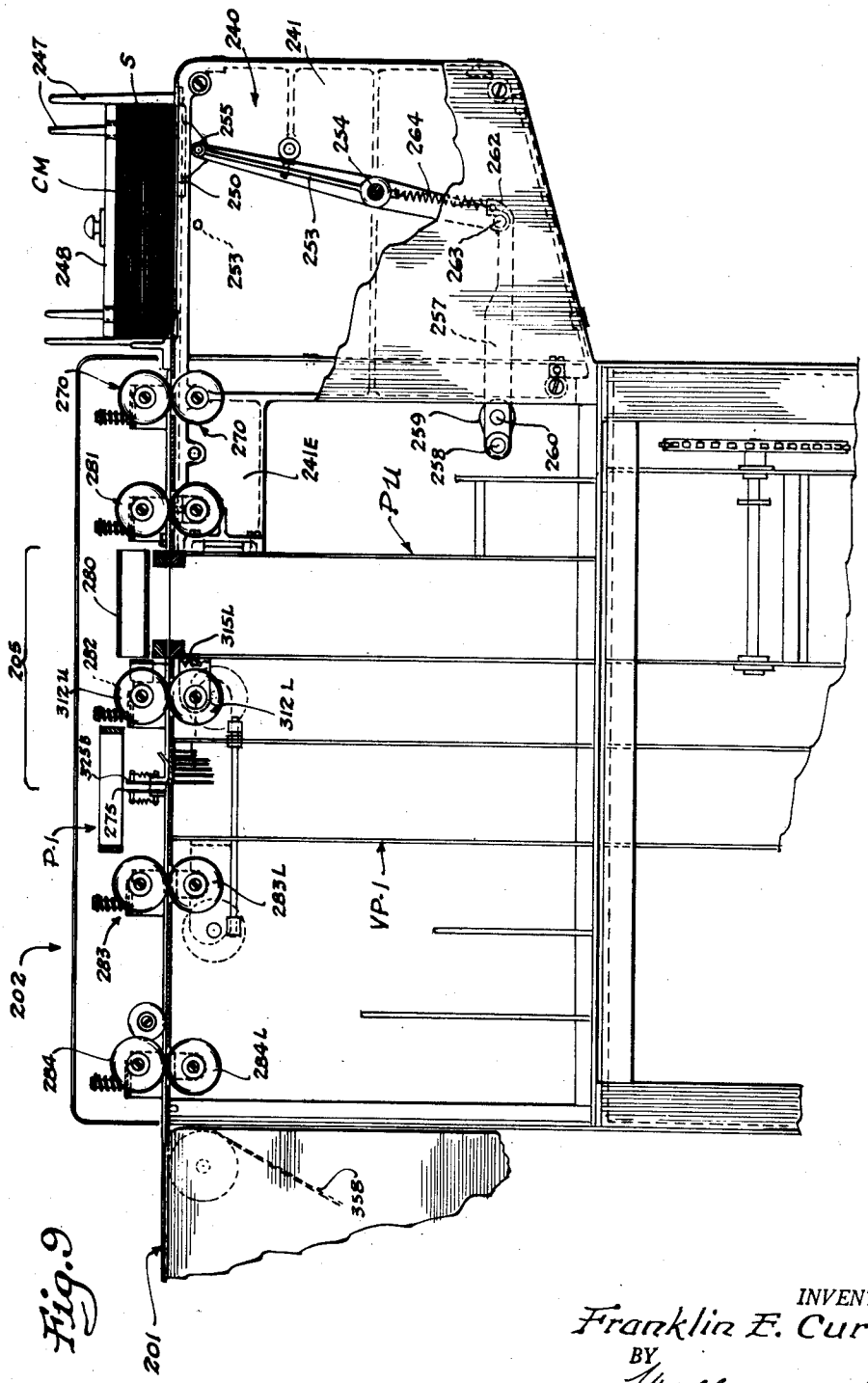

Fig. 9

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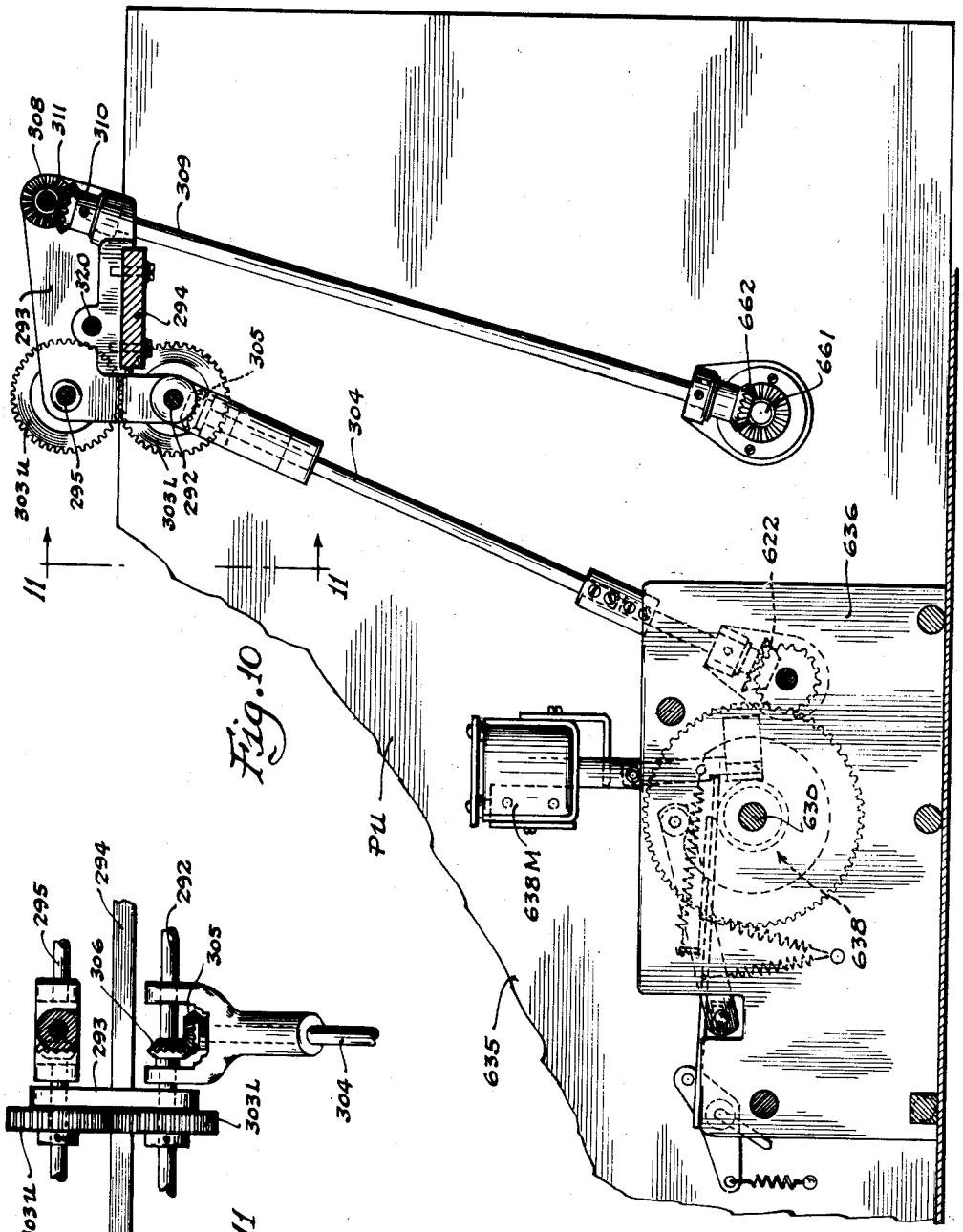

Fig. 10

Fig. 11

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Fig. 12

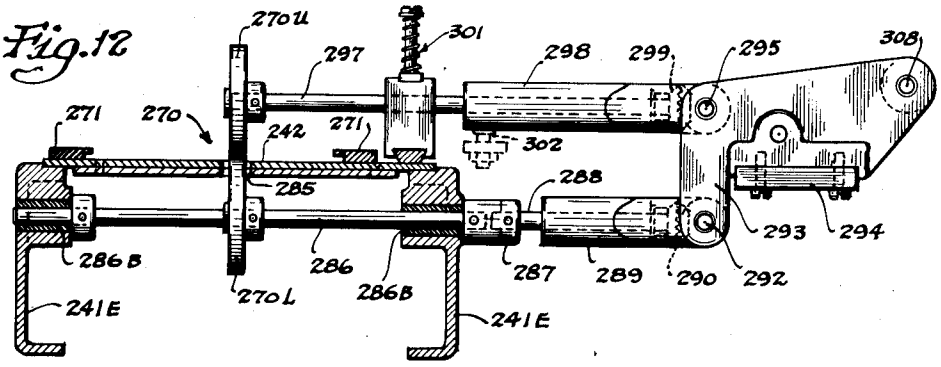

Fig. 13

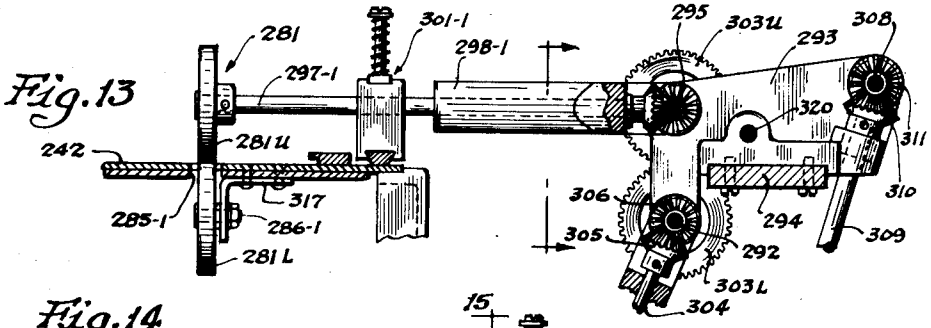

Fig. 14

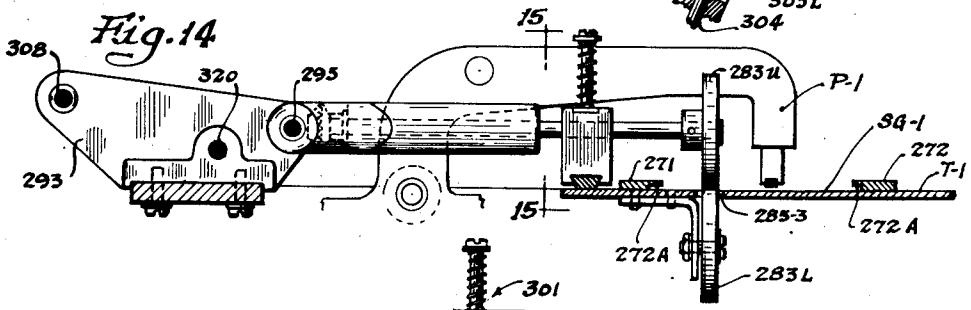

Fig. 15

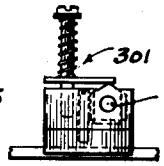

Fig. 16

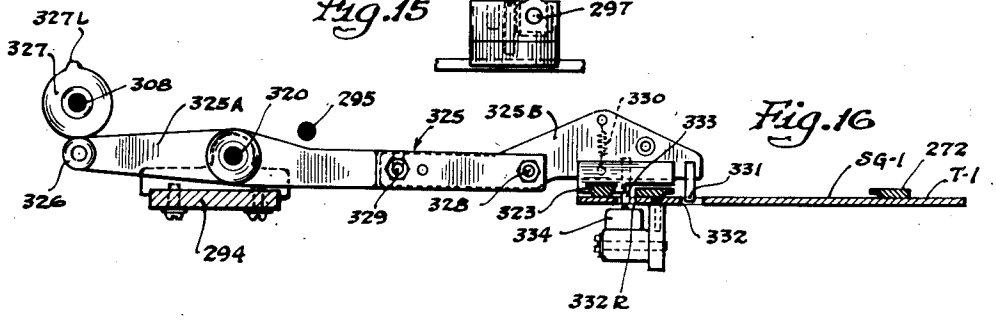

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Fig. 16A

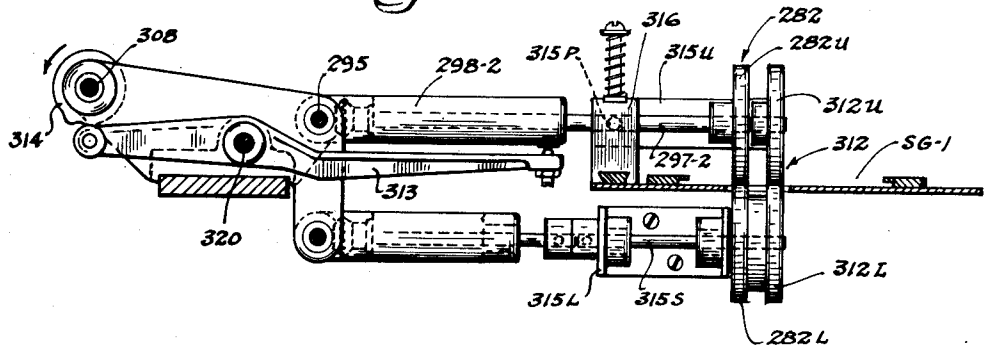


Fig. 16B

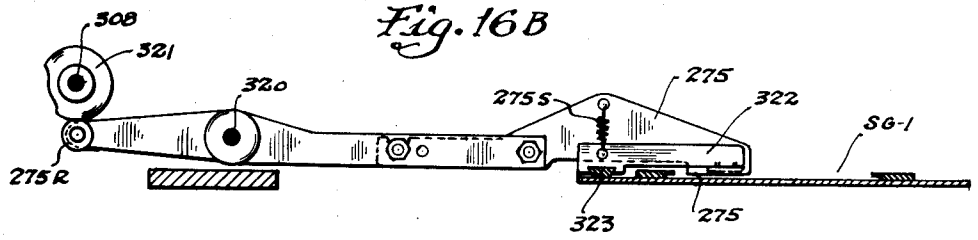


Fig. 16C

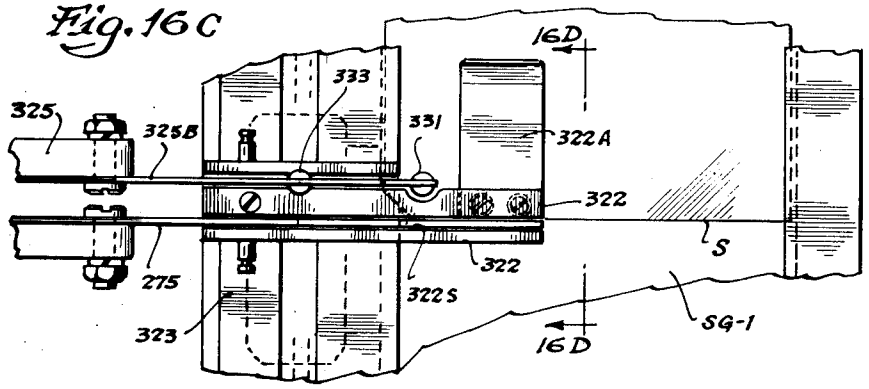
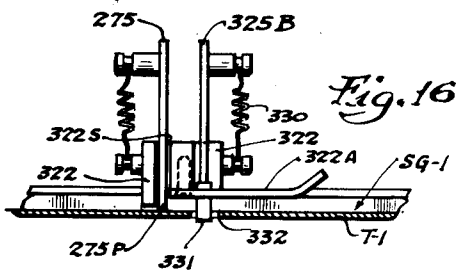


Fig. 16D



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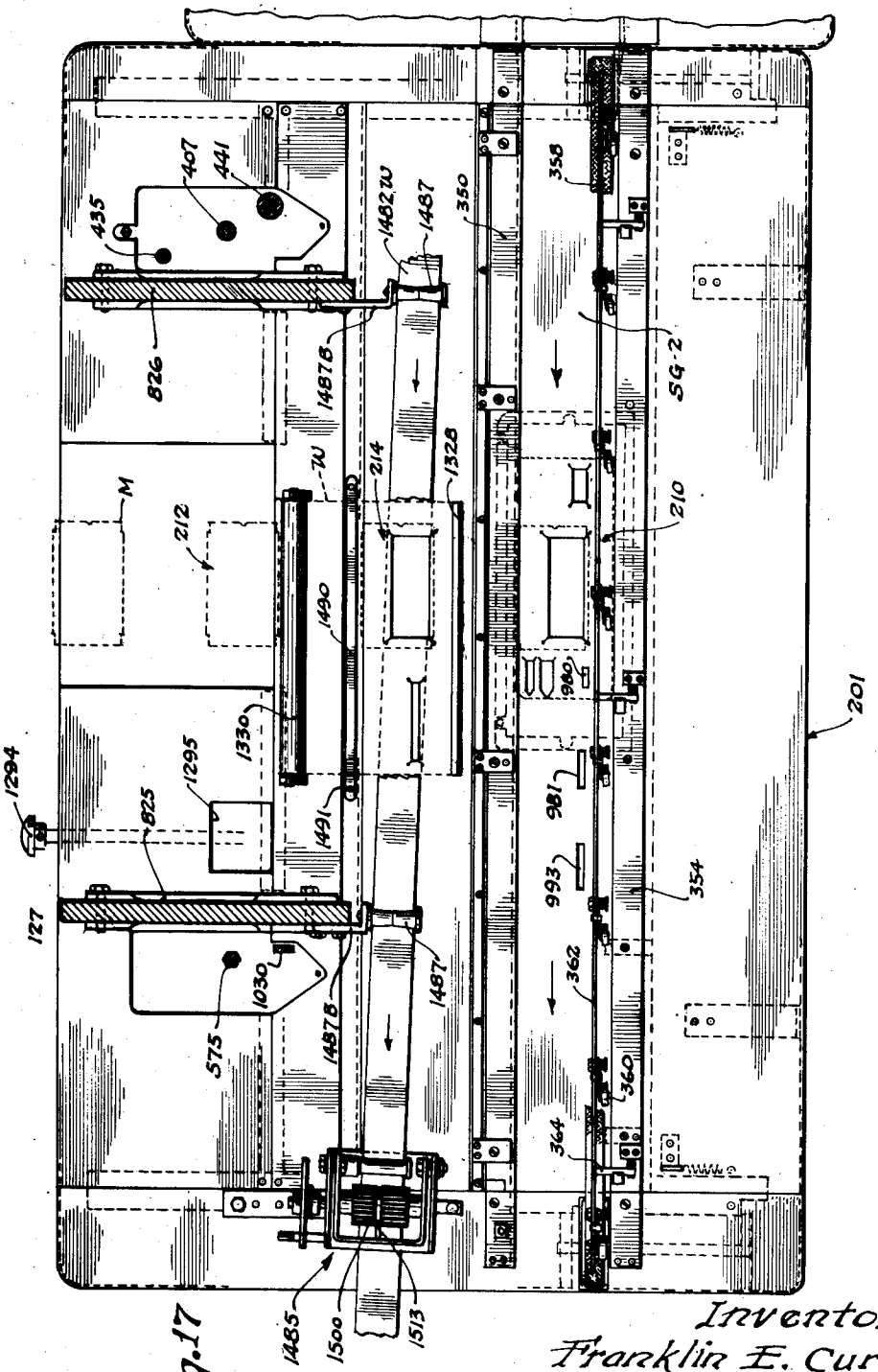

Fig. 17

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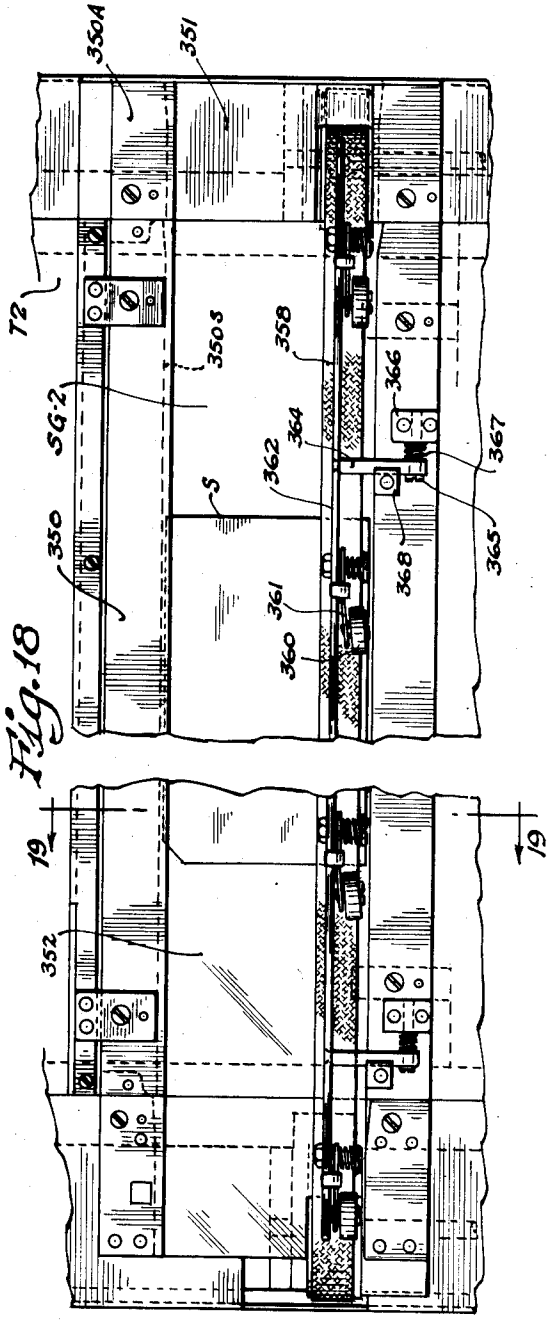

Fig. 18

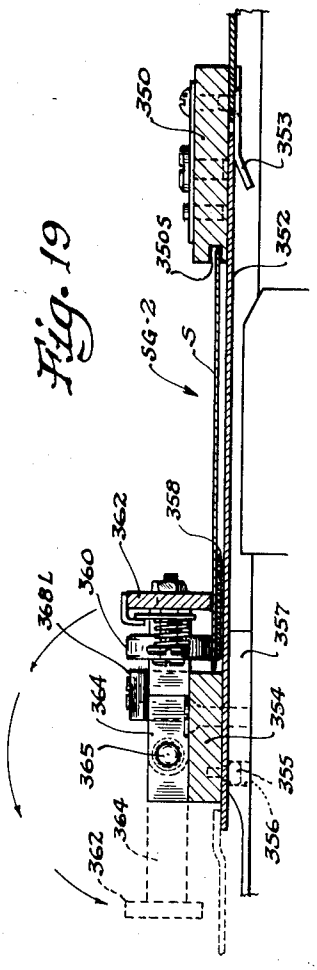

Fig. 19

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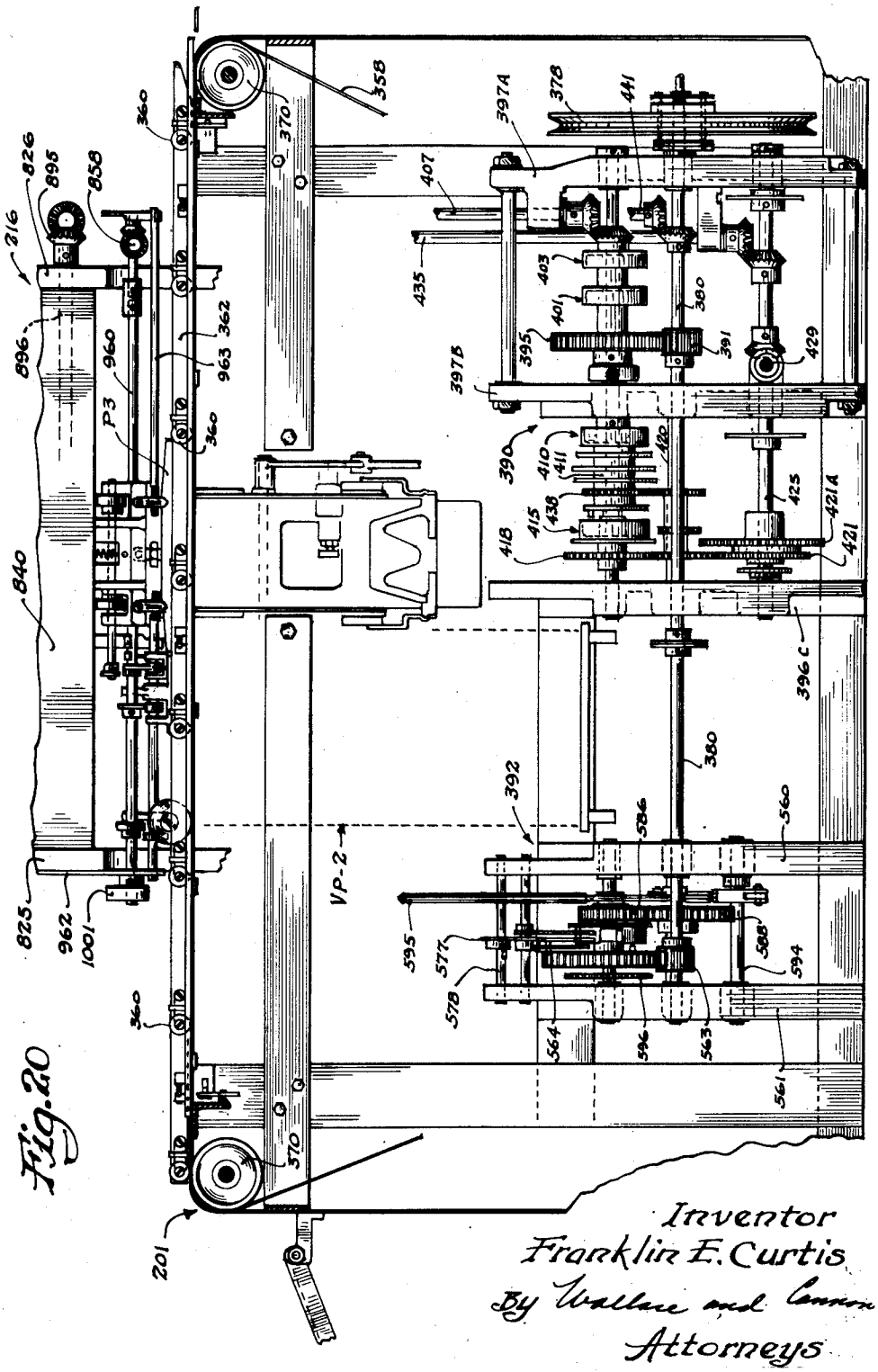

Fig. 20

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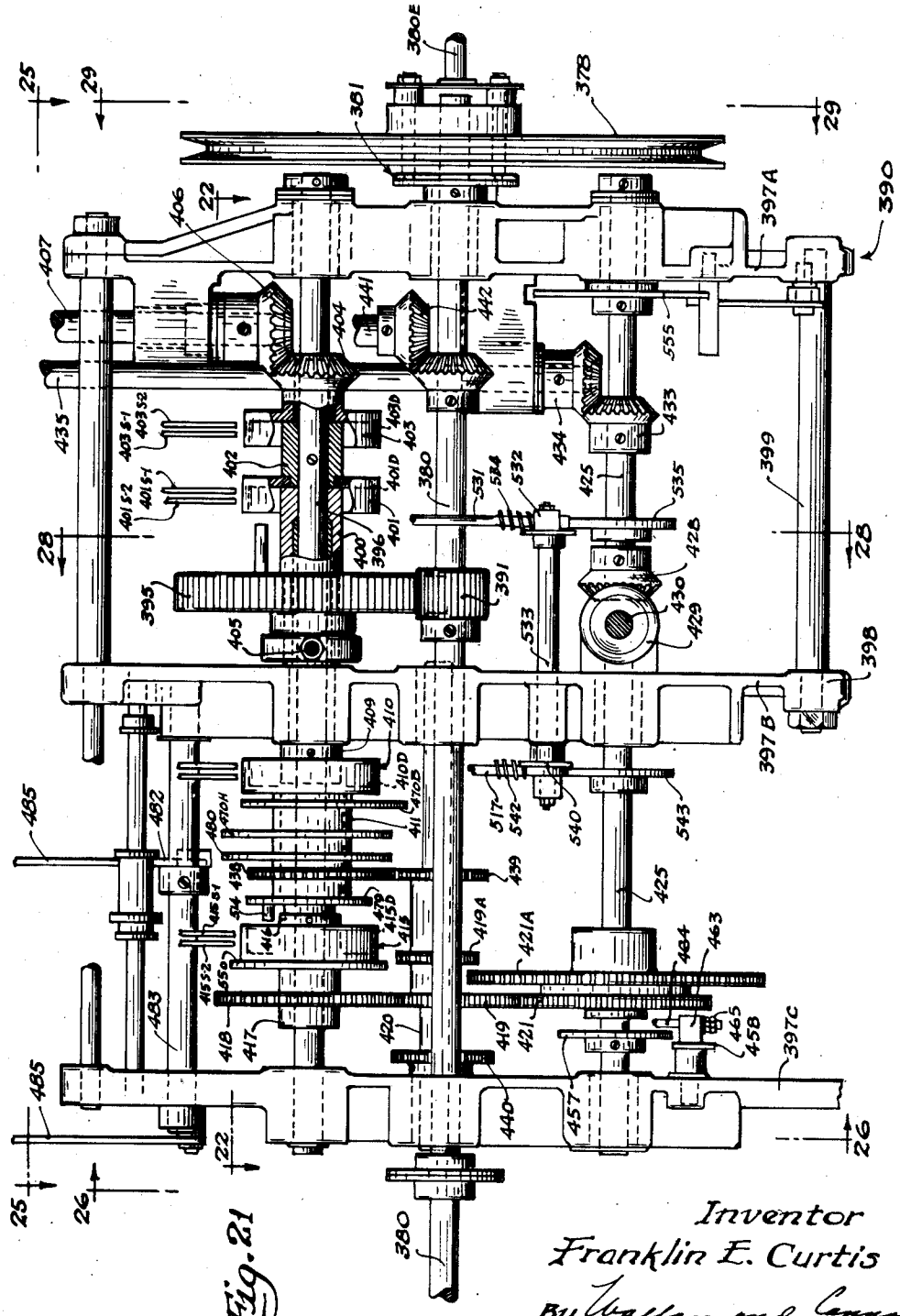

Fig. 21

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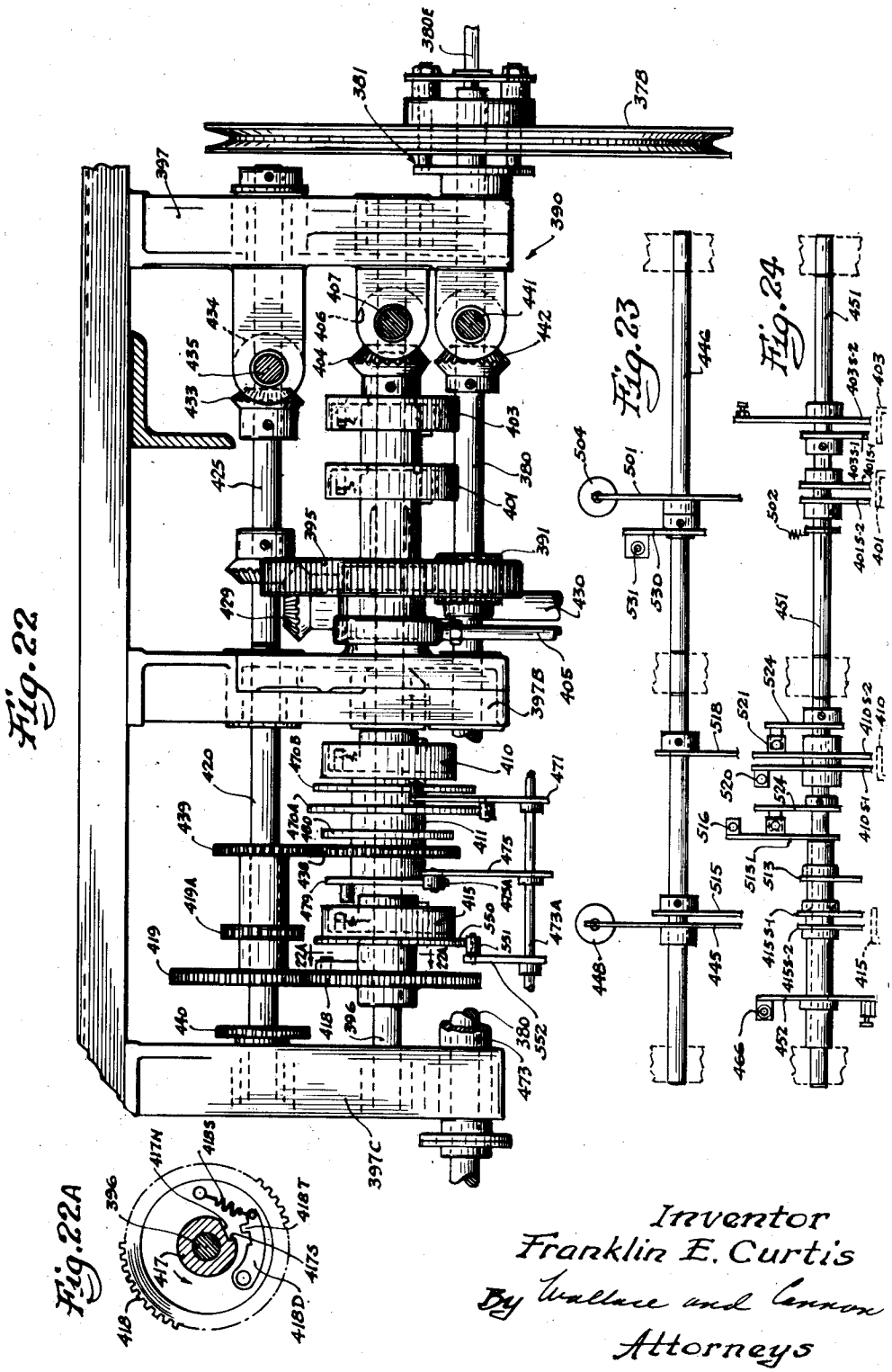

Fig. 22

Fig. 22A

Fig. 23

Fig. 24

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Fig. 25

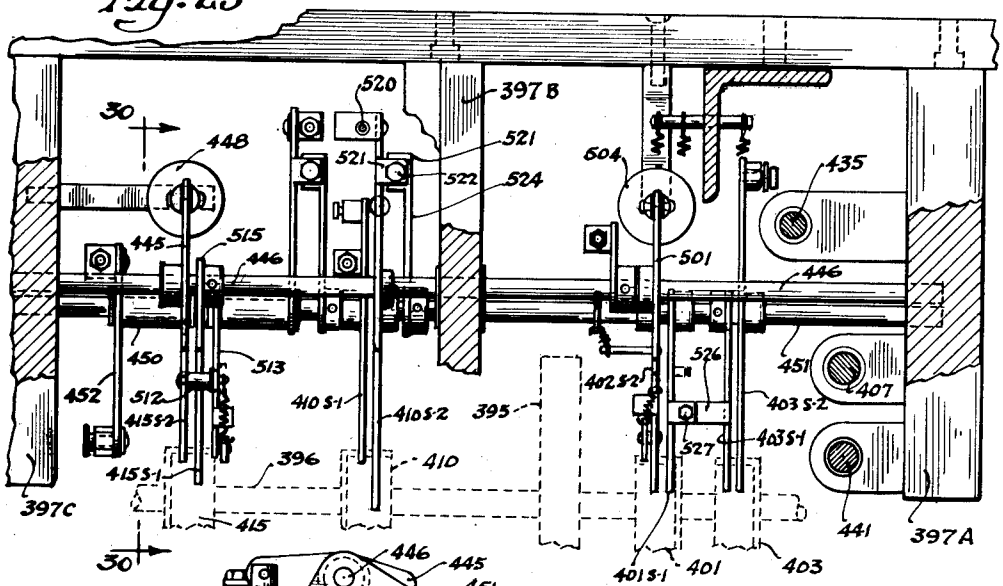

Fig. 26

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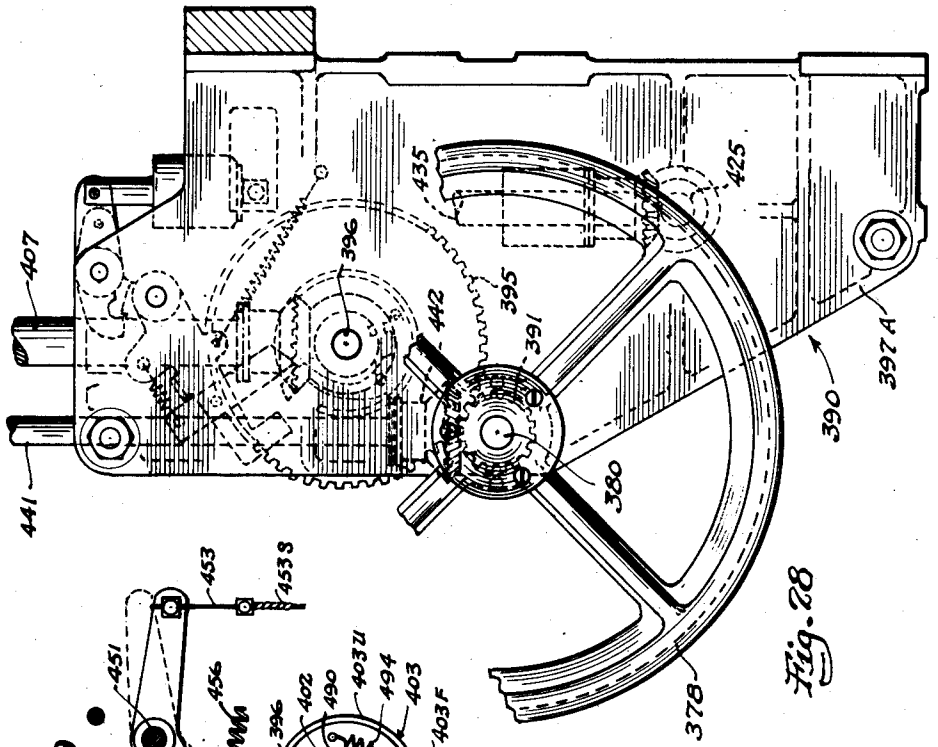

Fig. 28

Fig. 29

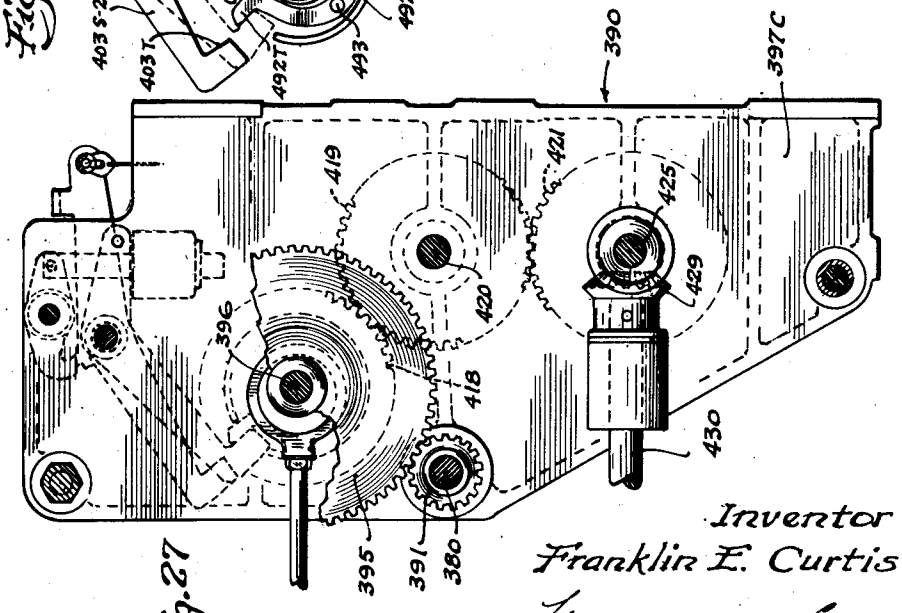

Fig. 27

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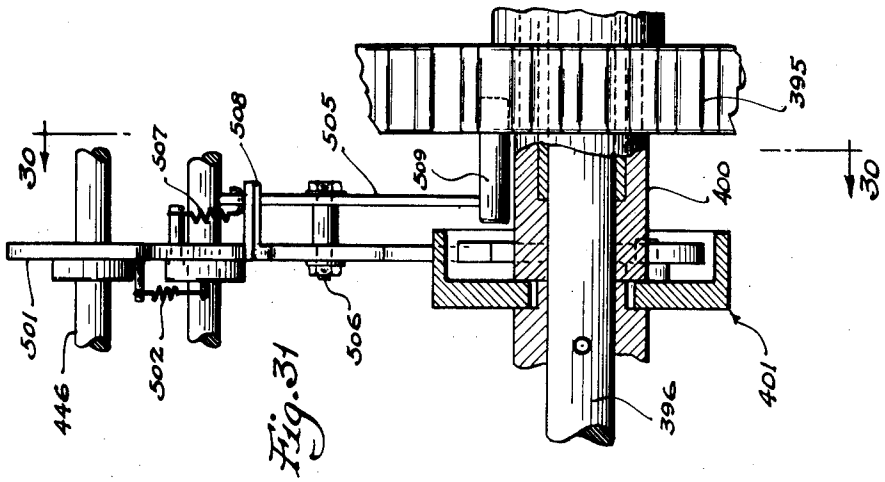

Fig. 31

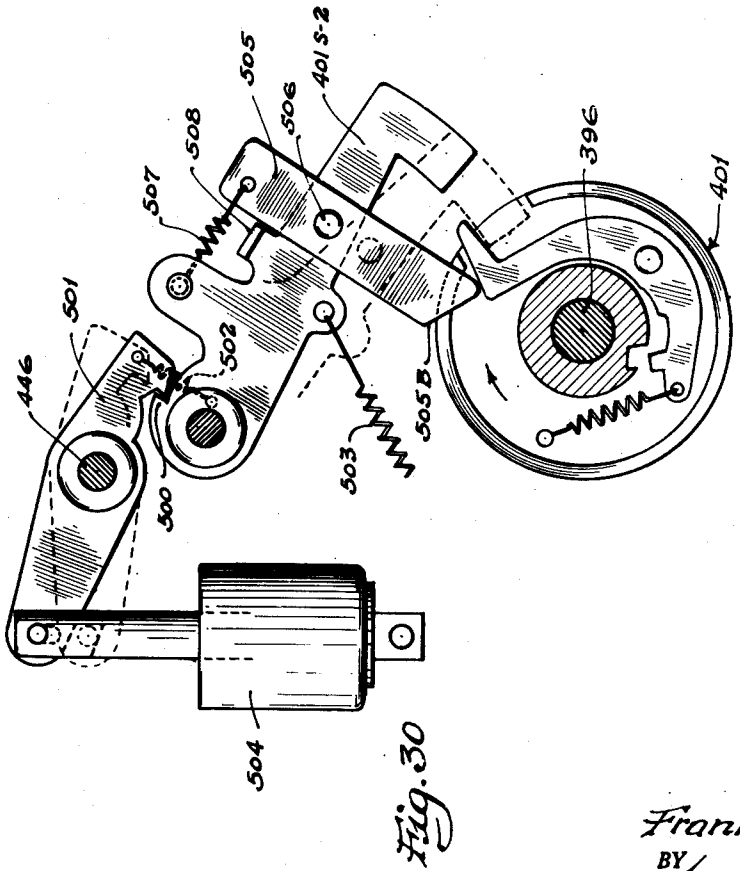

Fig. 30

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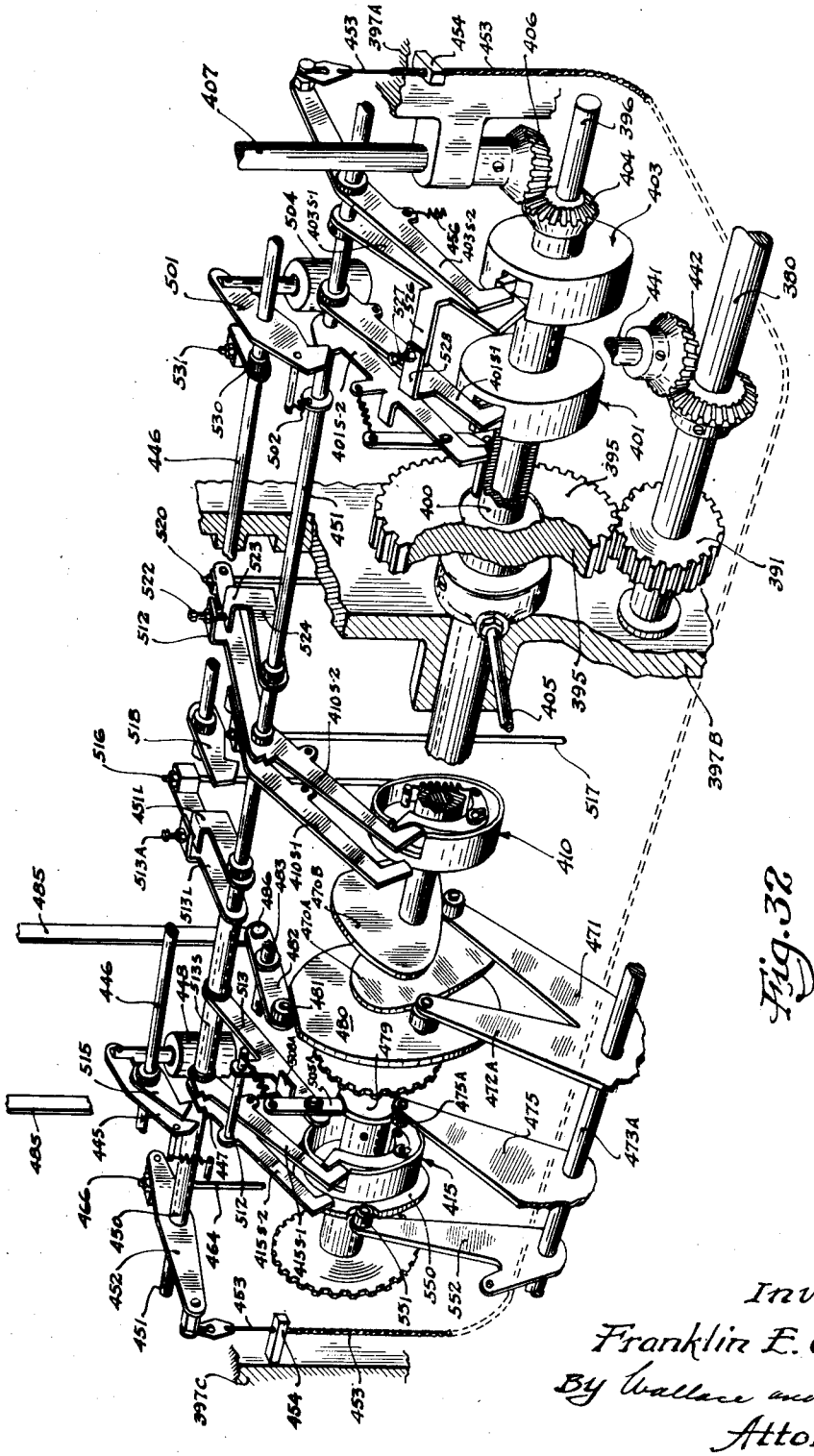

Fig. 32

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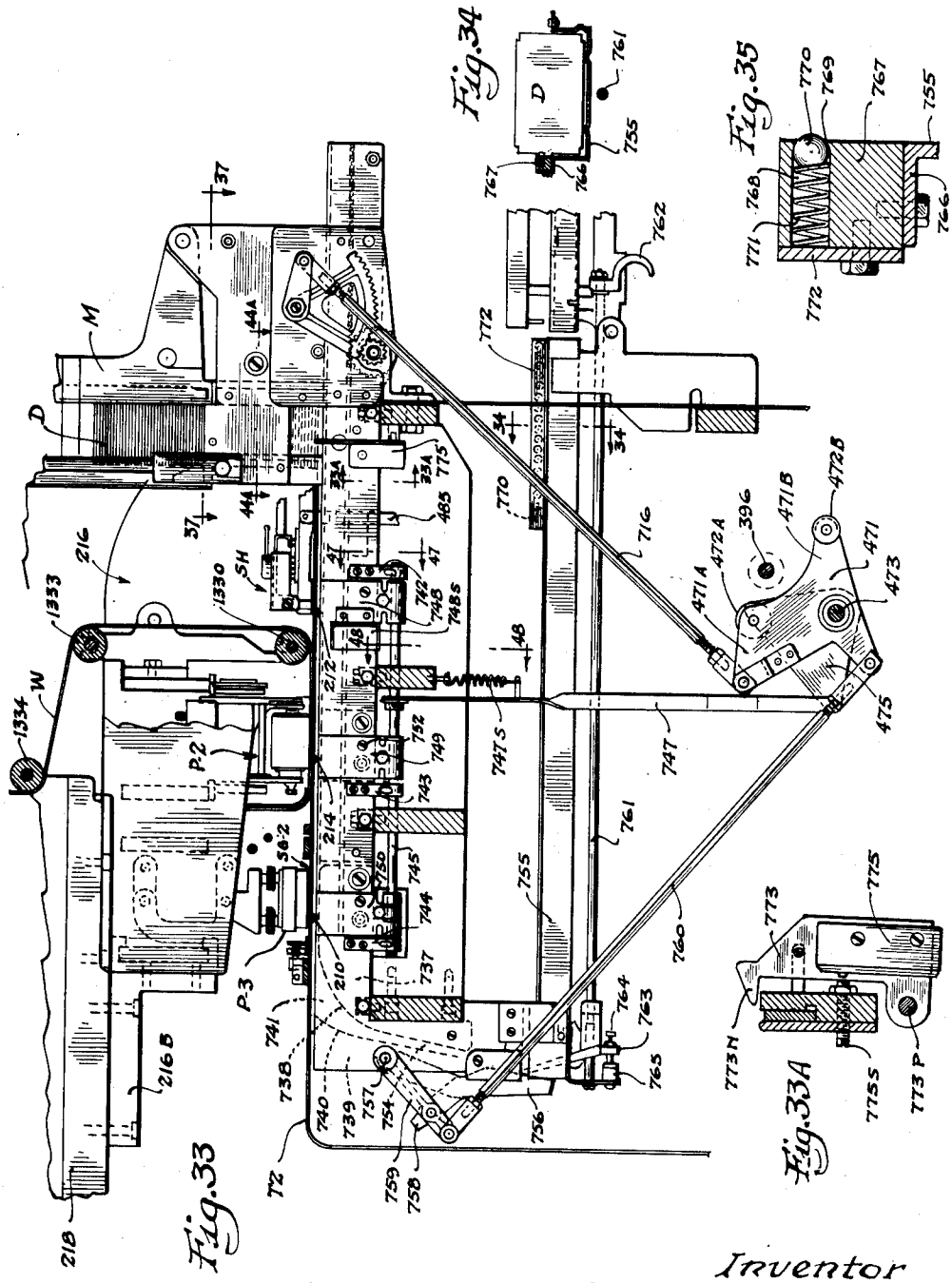

Fig. 33

Fig. 33A

Fig. 34

Fig. 35

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Fig. 36

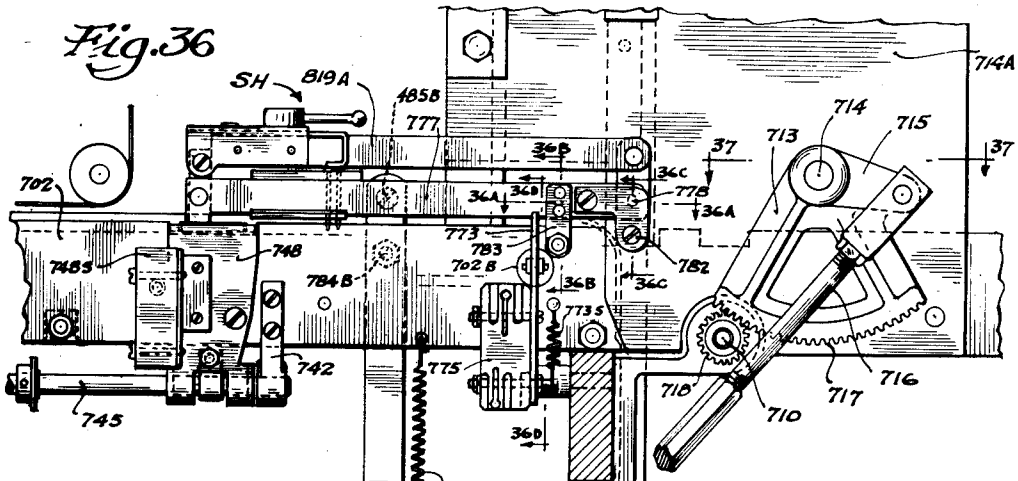


Fig. 36B

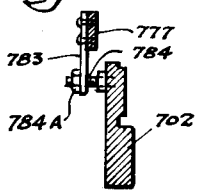
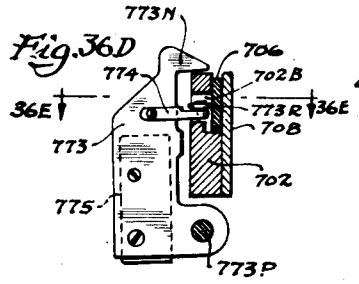


Fig. 36A

Fig. 36C

Fig. 36D



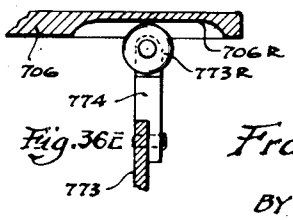


Fig. 36E

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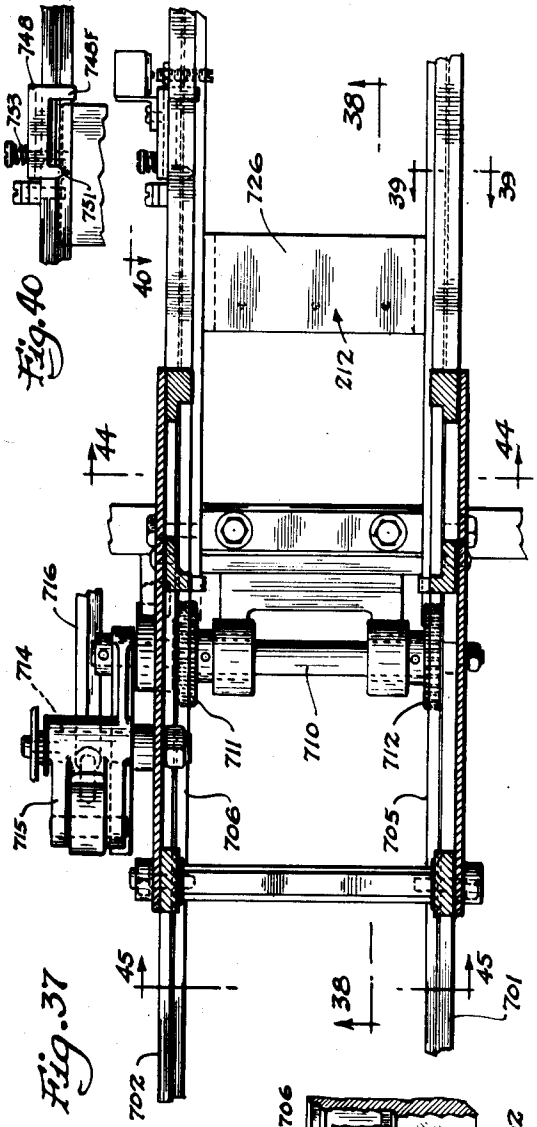

Fig. 40

Fig. 37

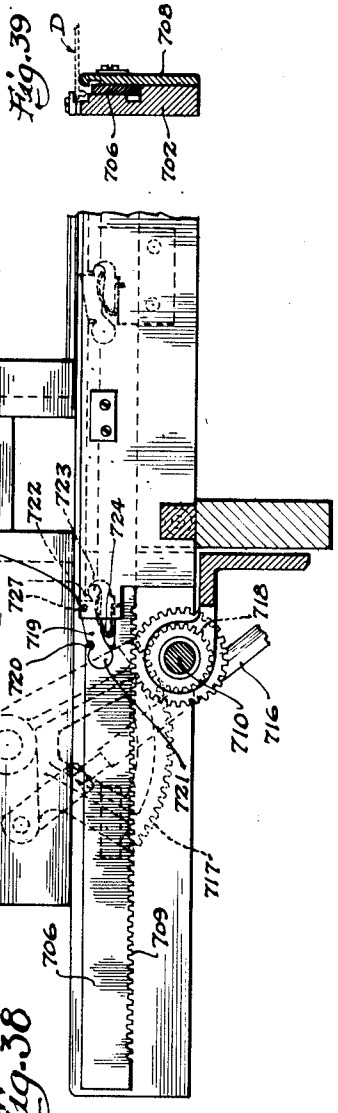

Fig. 39

Fig. 38

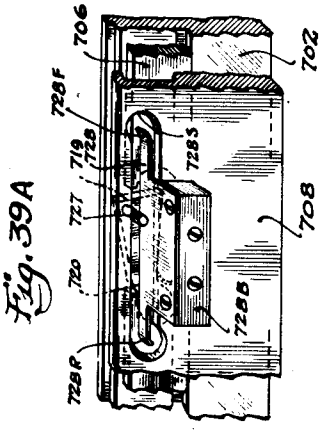

Fig. 39A

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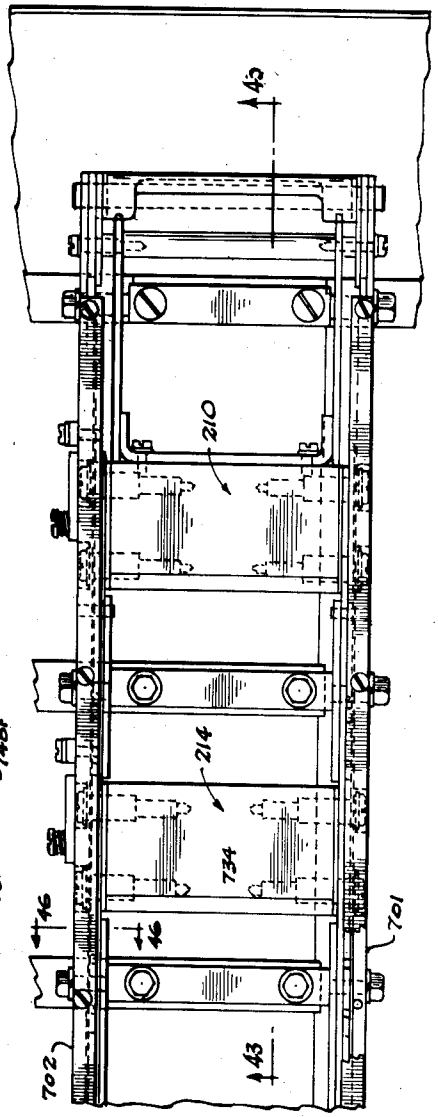

Fig. 41

Fig. 42

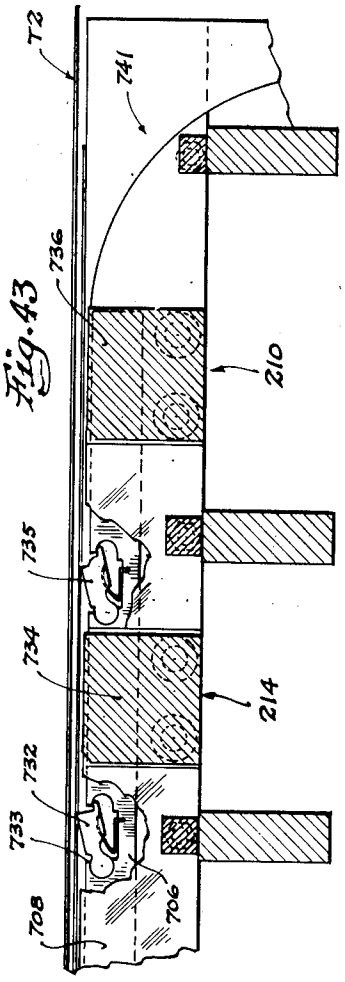

Fig. 43

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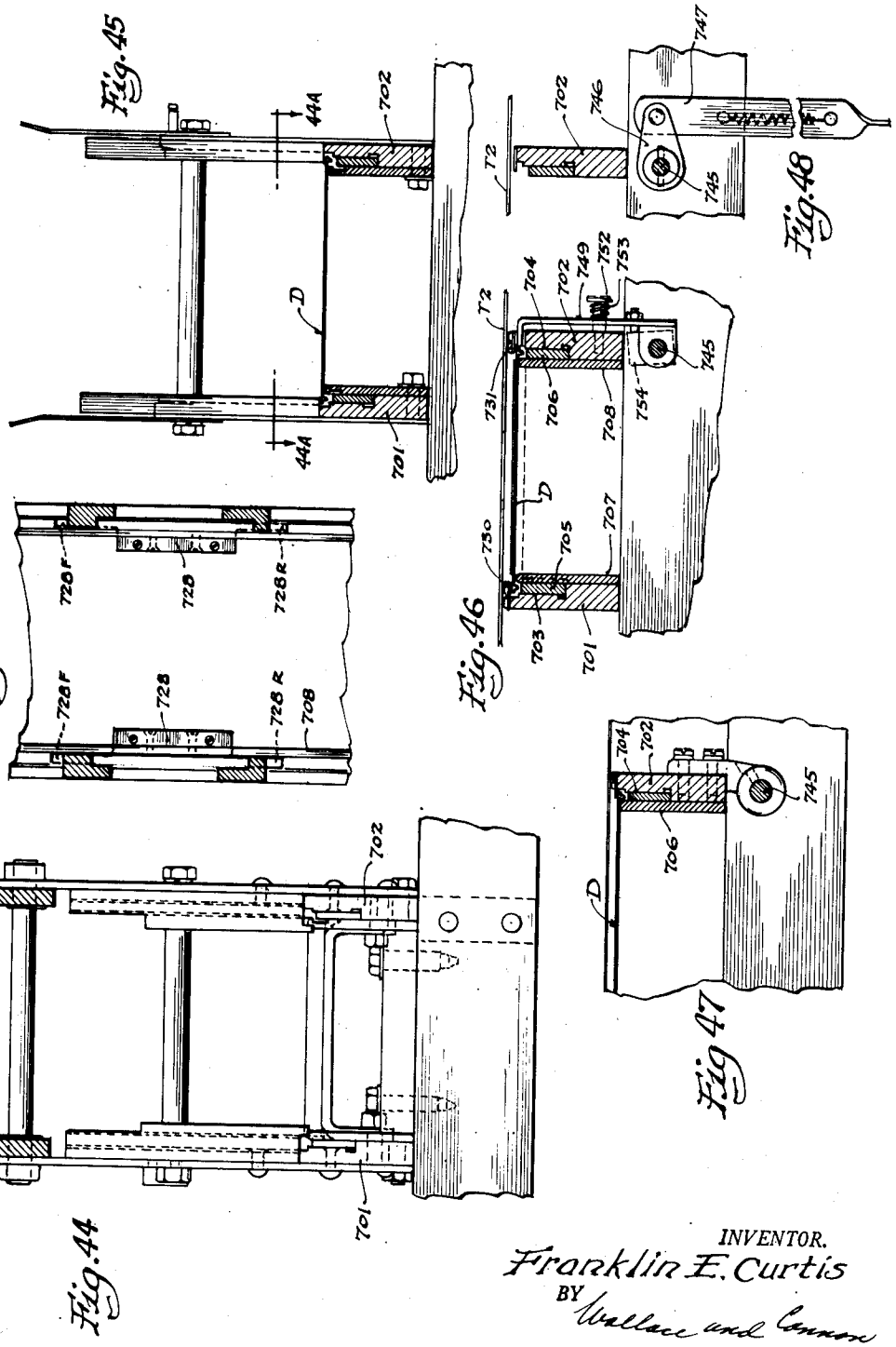

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Fig. 49

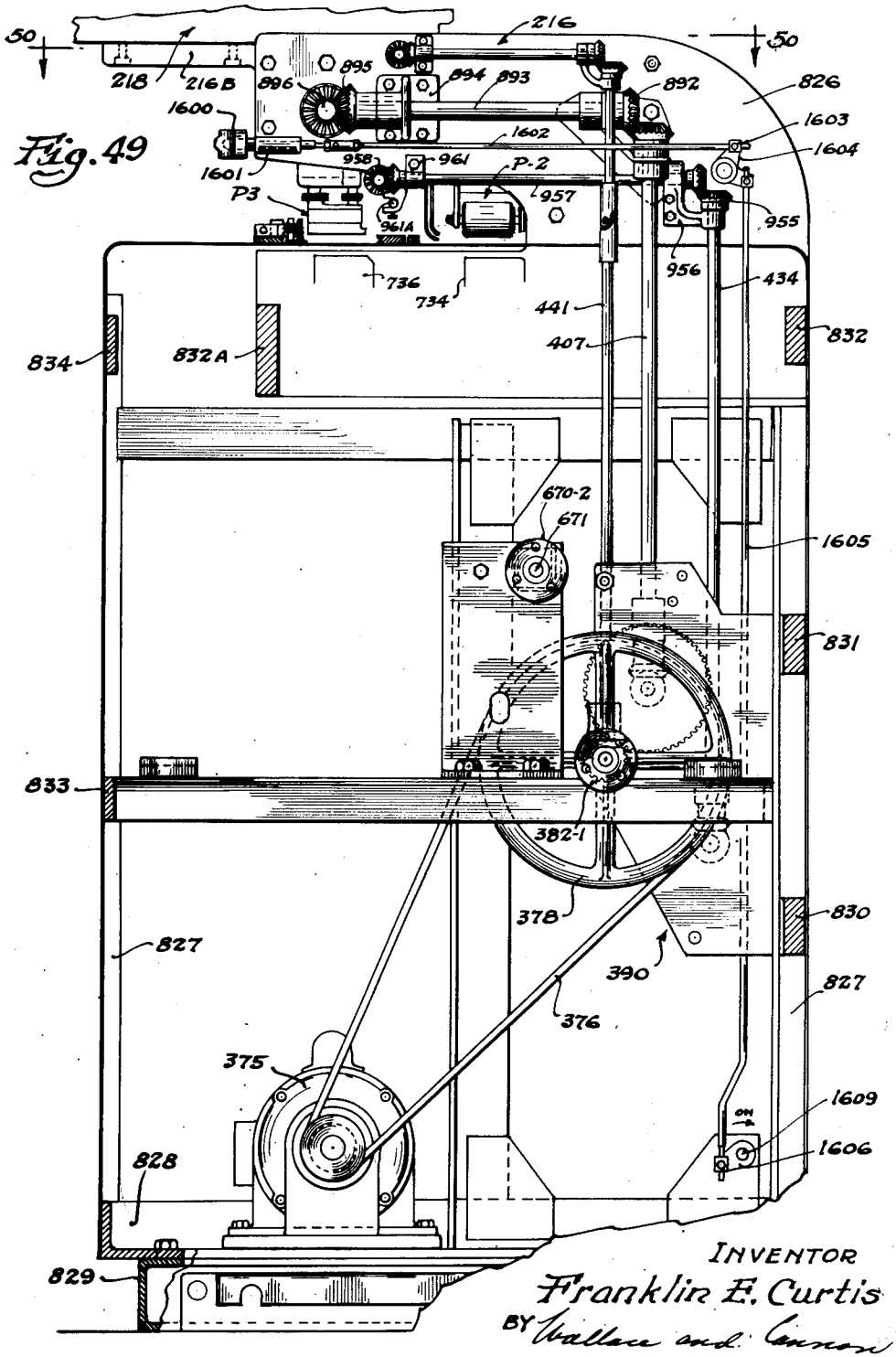

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Fig. 50

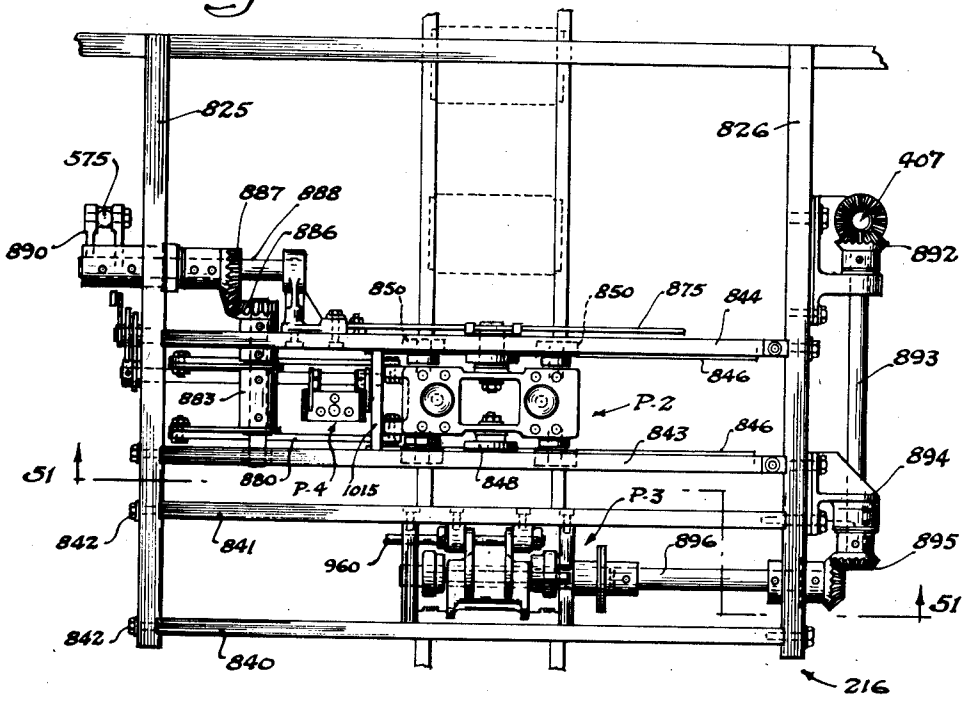
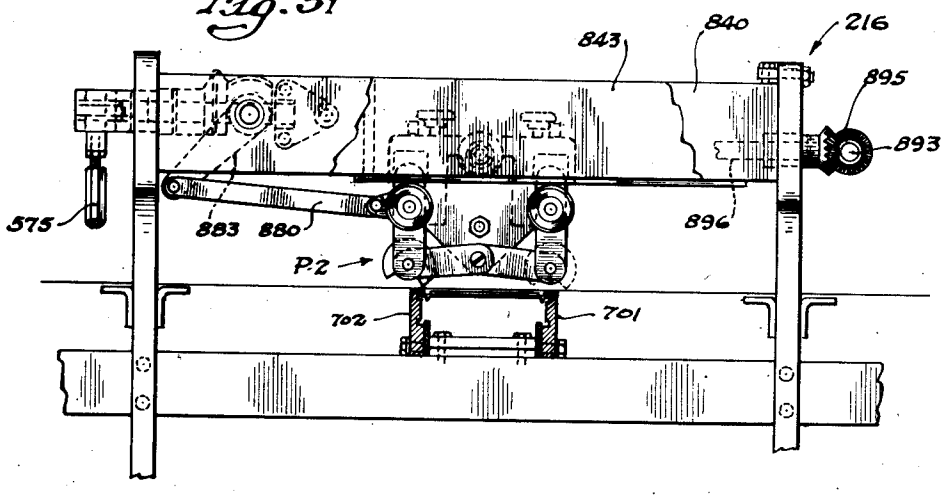


Fig. 51



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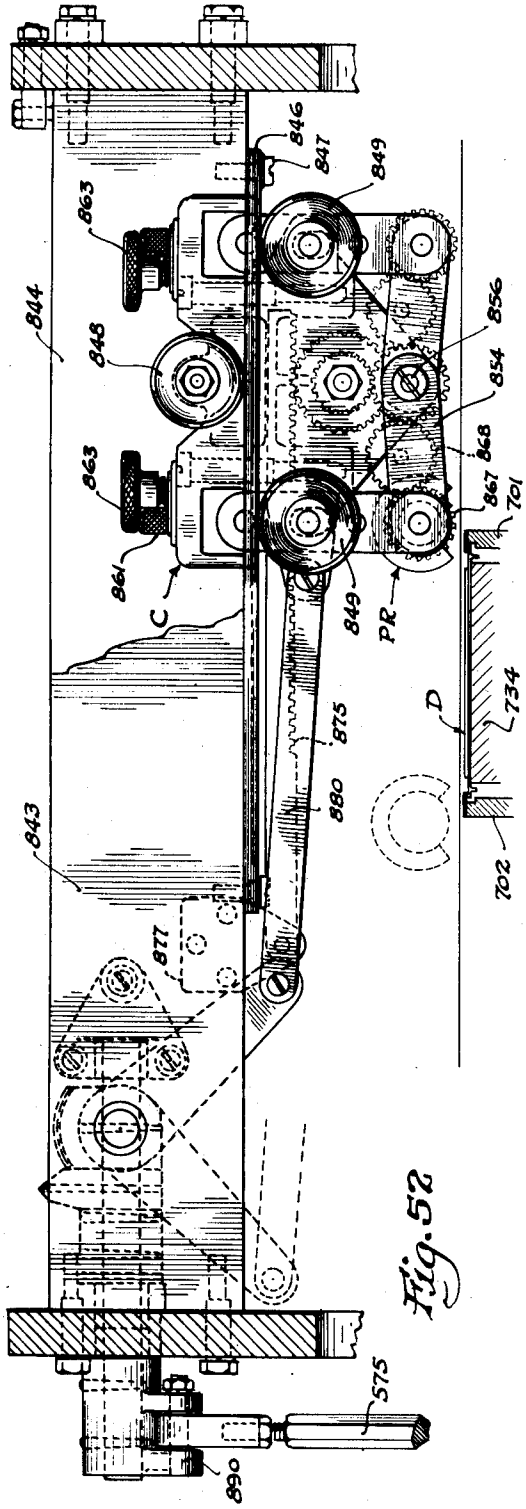

Fig. 52

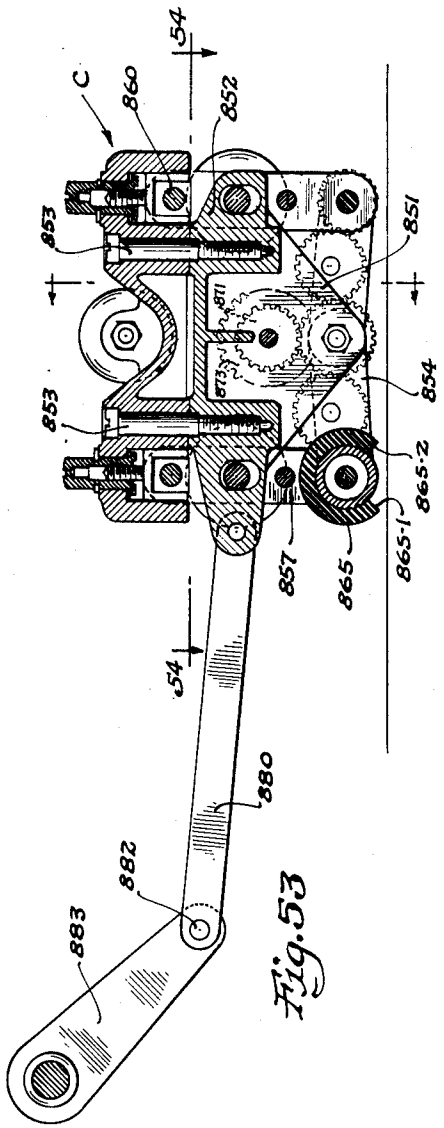

Fig. 53

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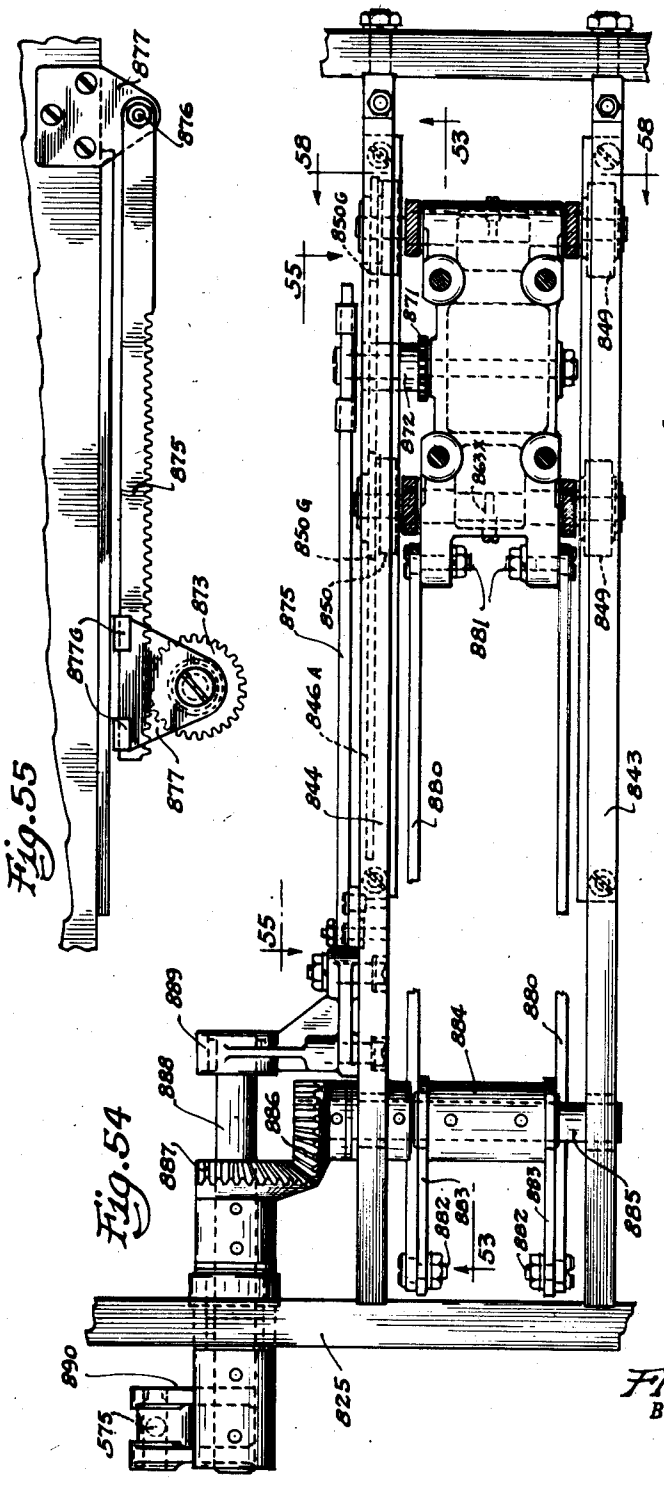

Fig. 55

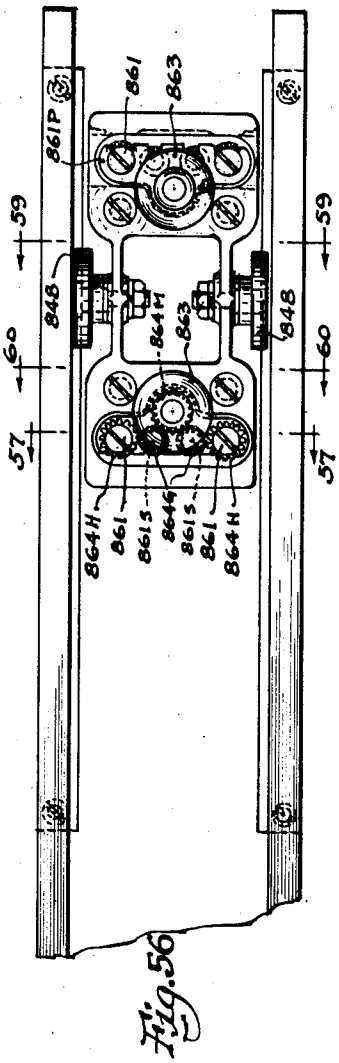

Fig. 56

Fig. 54

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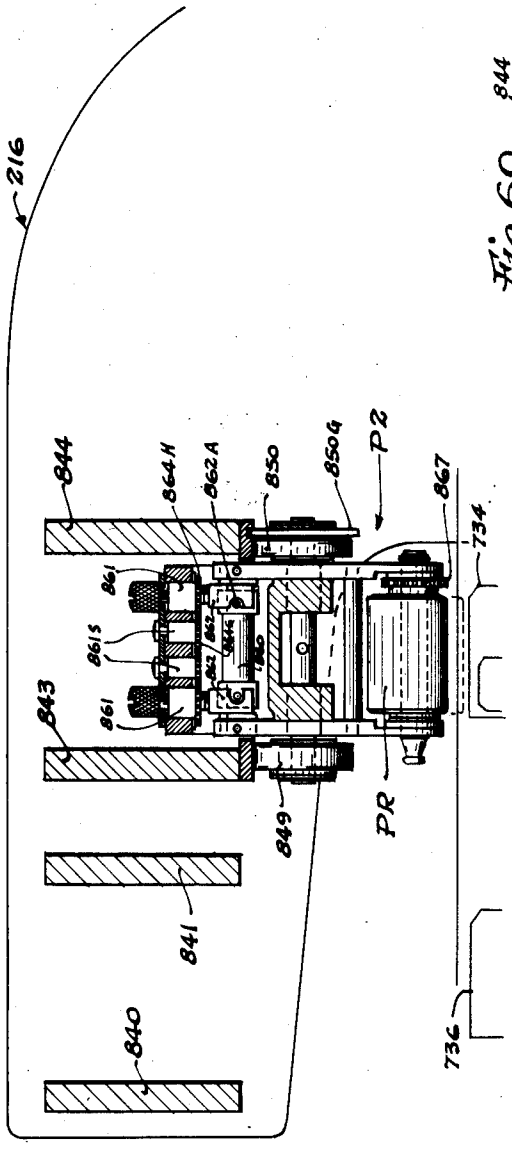

Fig. 57

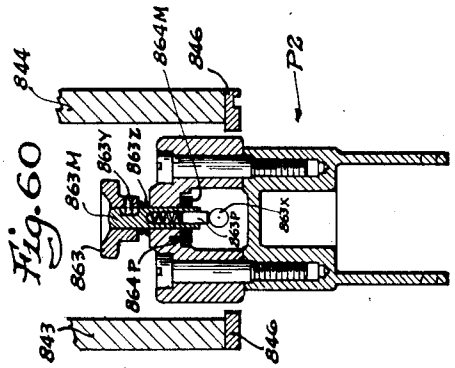

Fig. 60

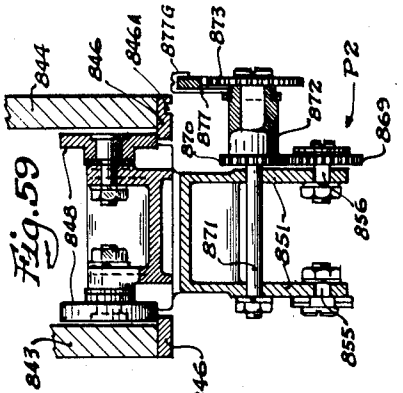

Fig. 59

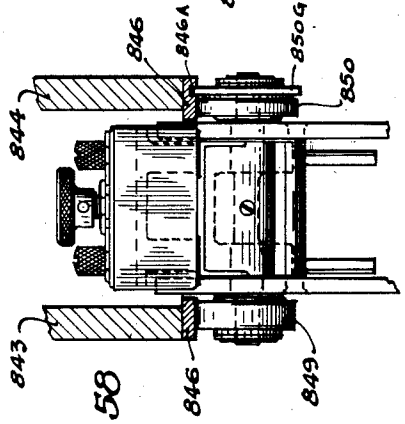

Fig. 58

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Fig. 61

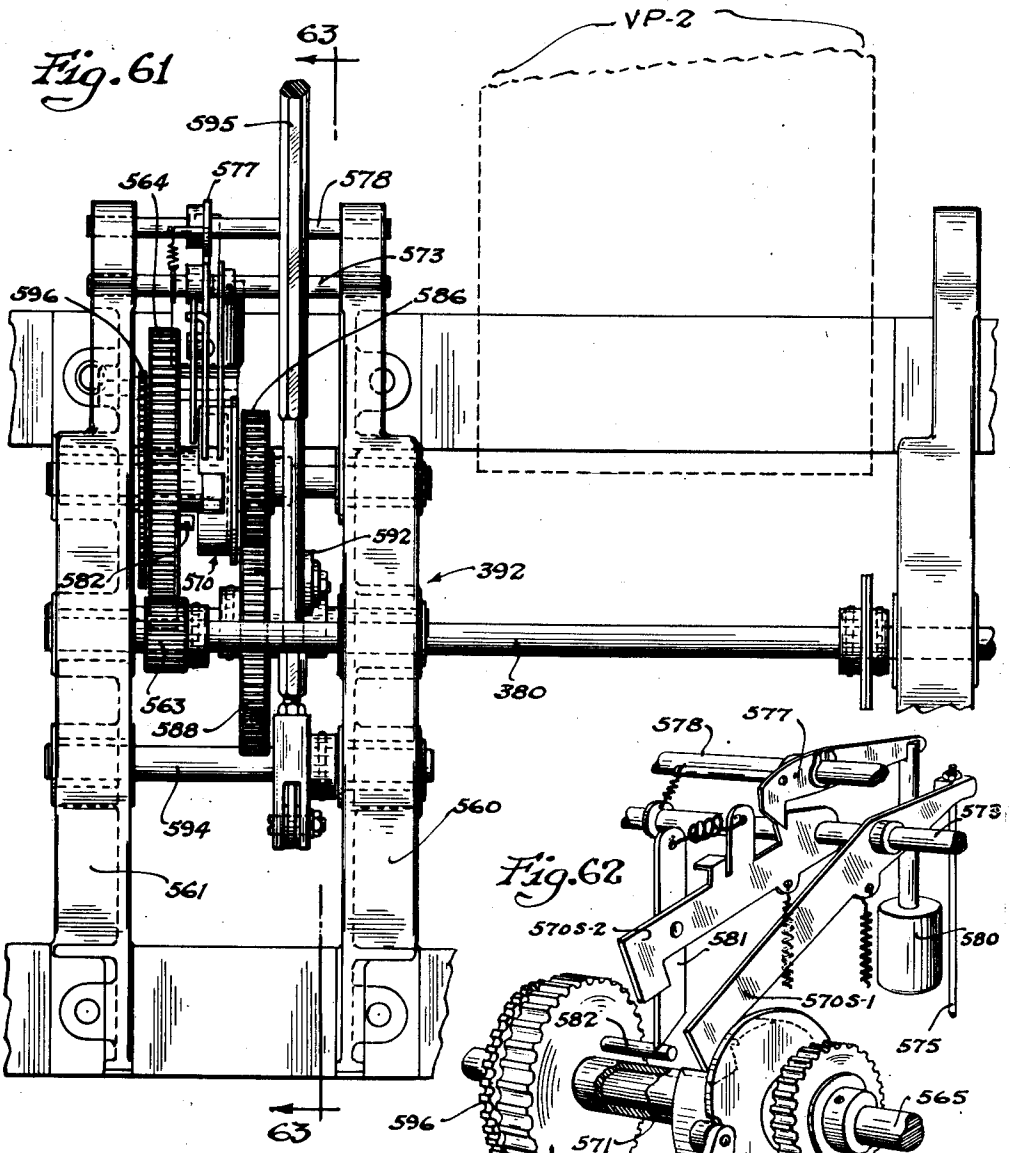

Fig. 62

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Fig. 64

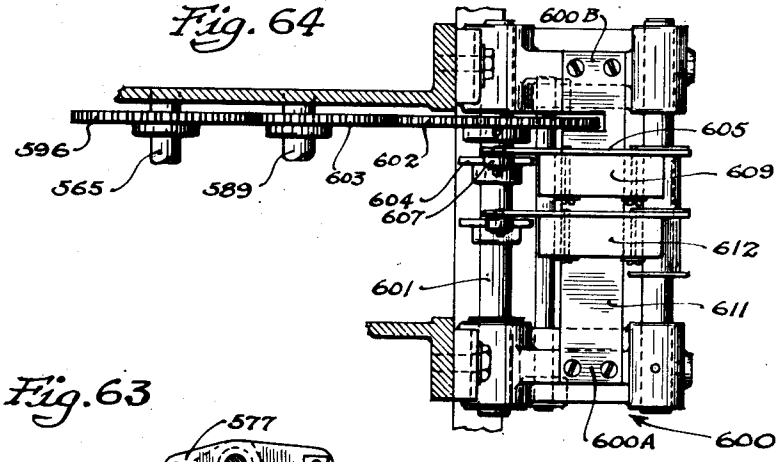

Fig. 63

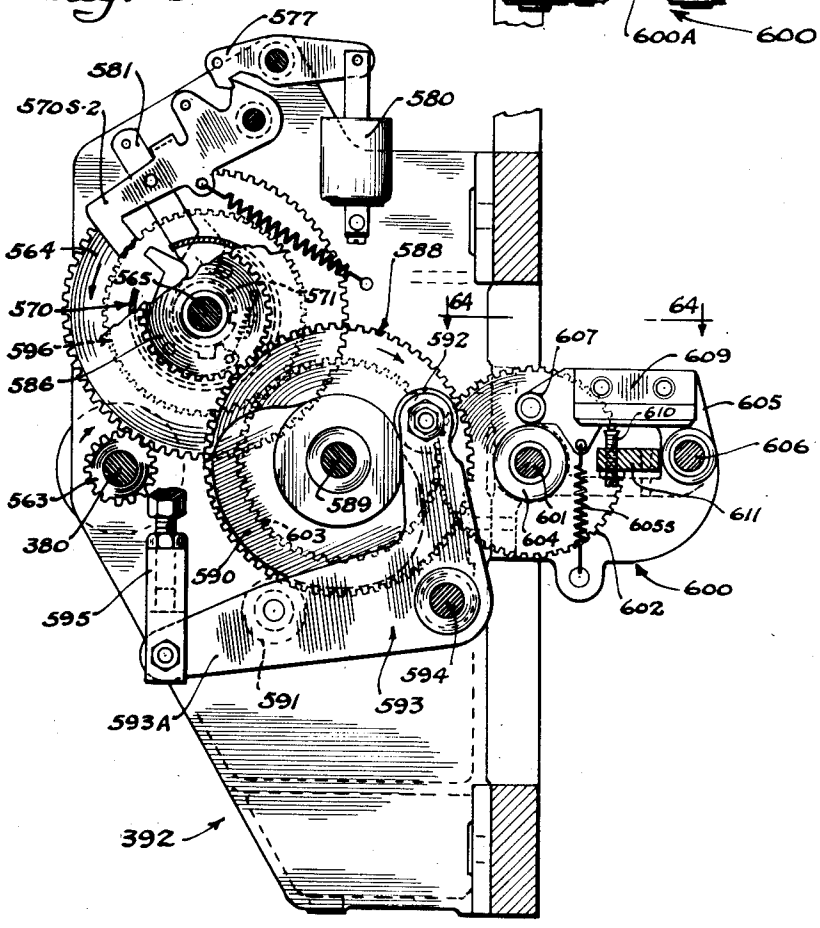

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Fig. 65

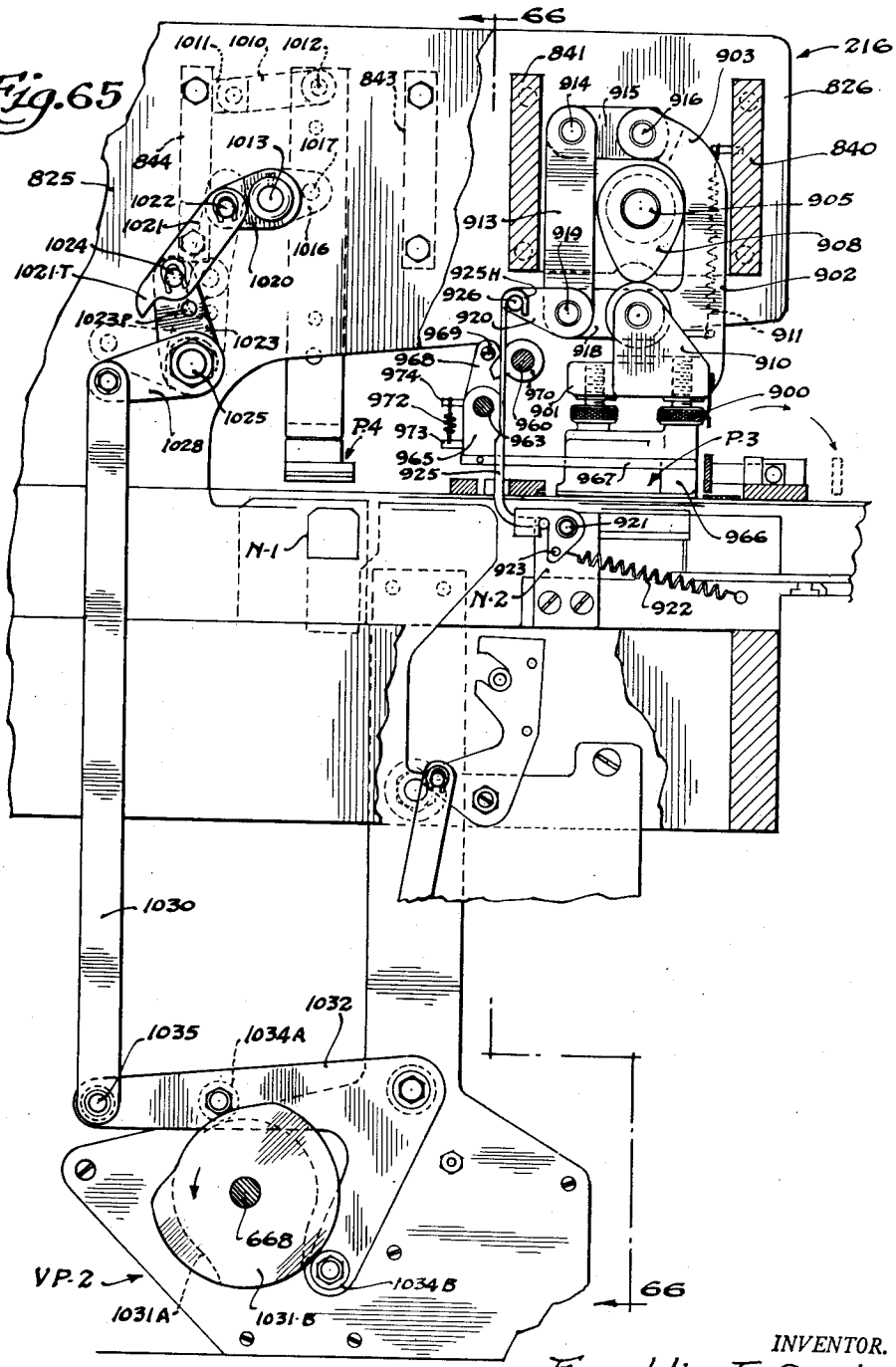

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Fig. 66

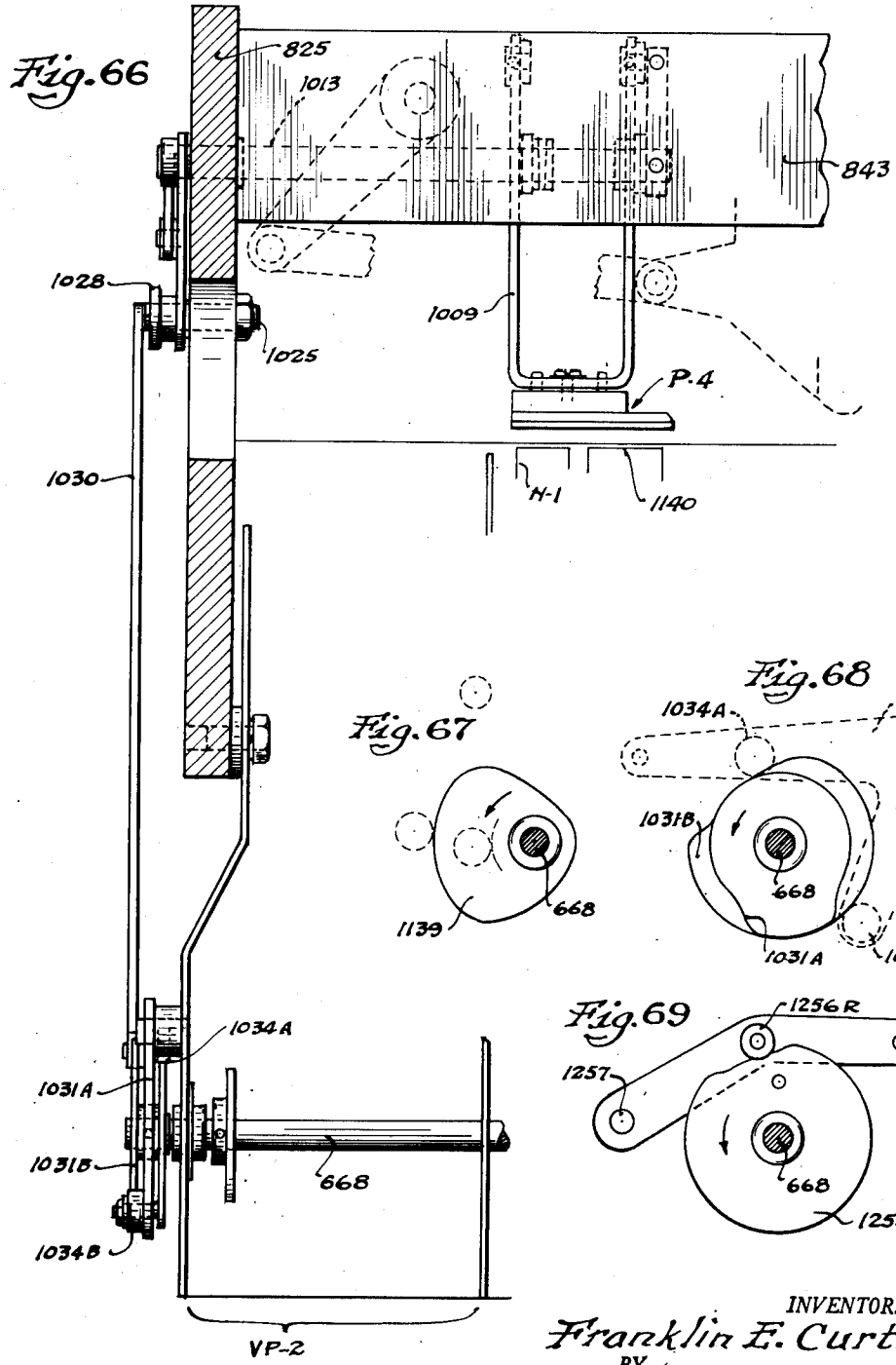

Fig. 67

Fig. 68

Fig. 69

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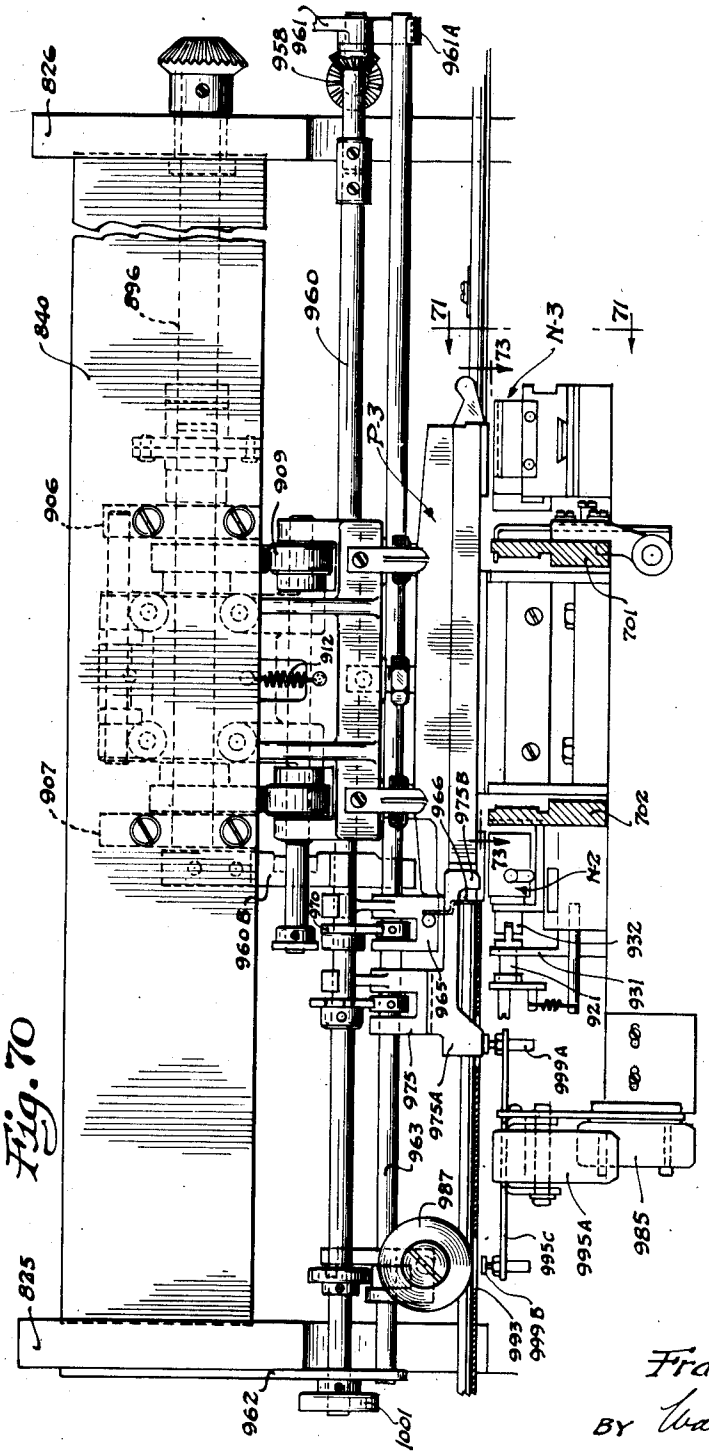

Fig. 70

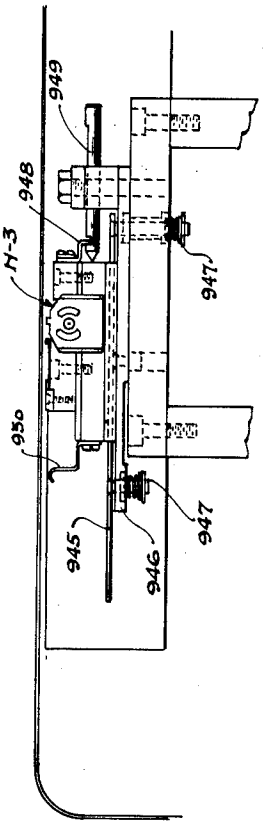

Fig. 71

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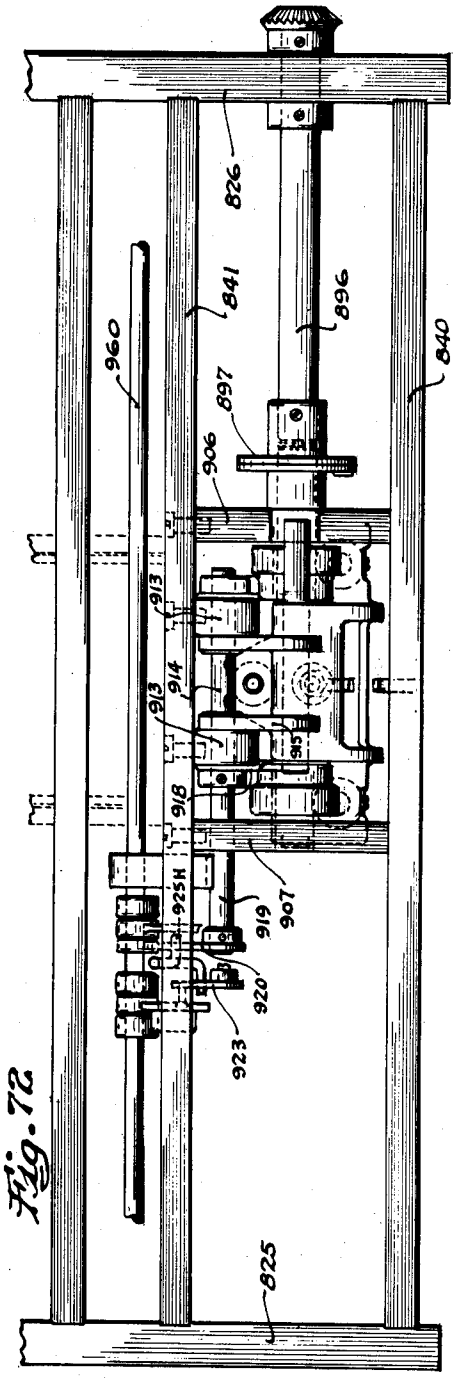

Fig. 72

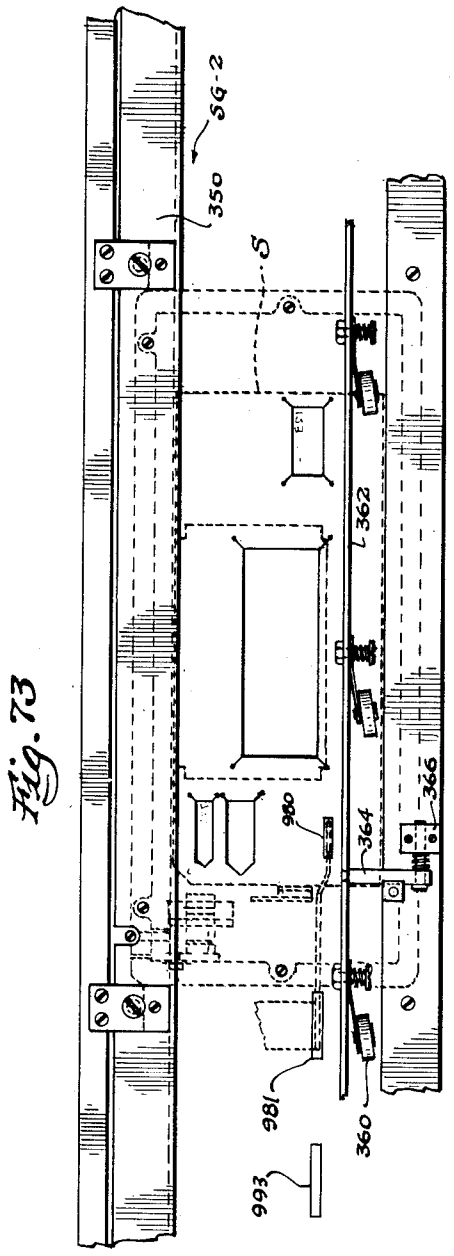

Fig. 73

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Fig. 74

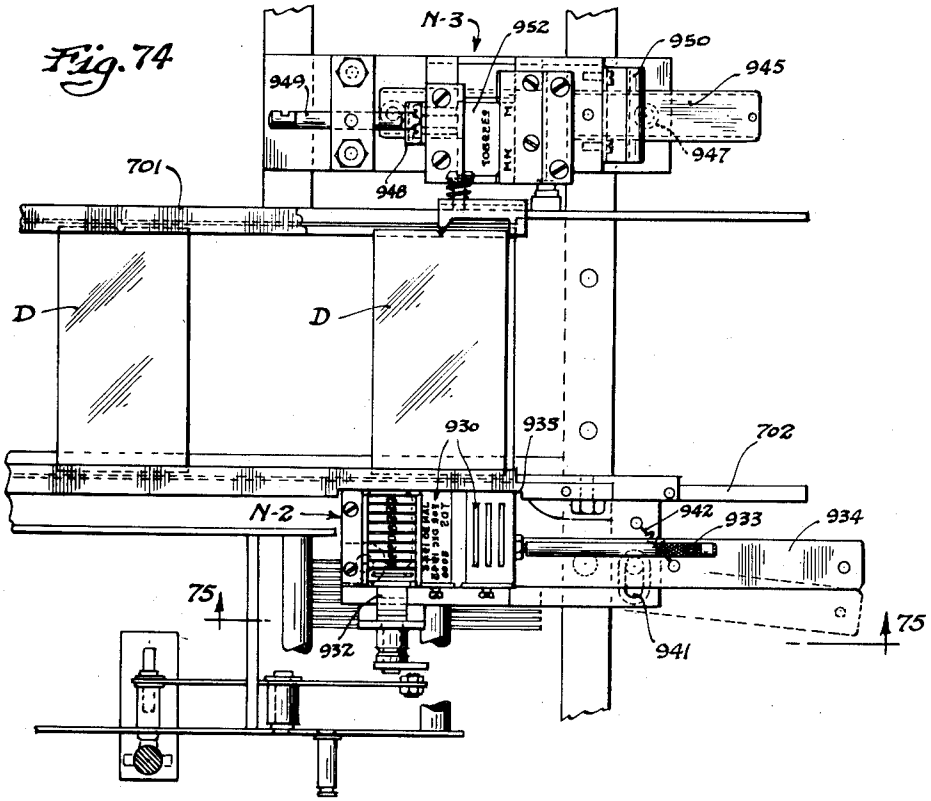

Fig. 75

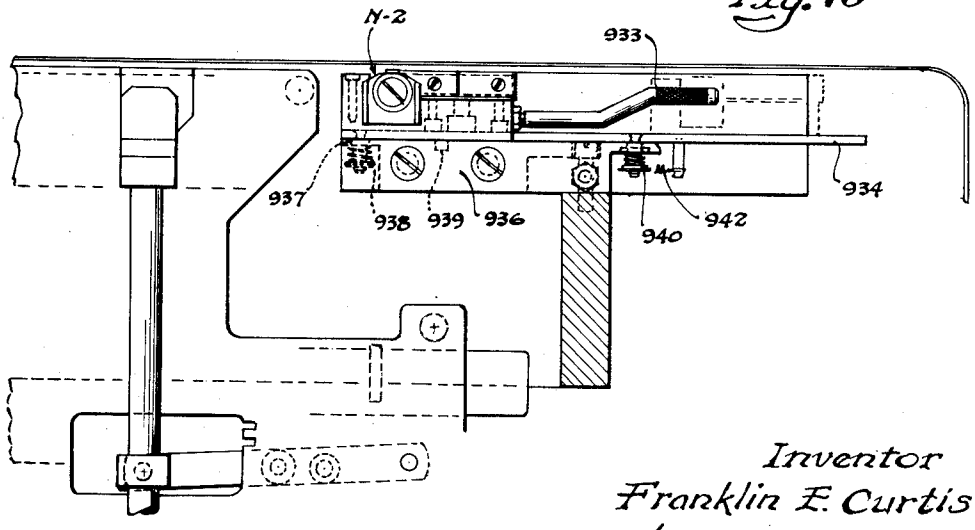

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Fig. 77

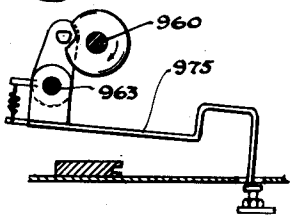

Fig. 76

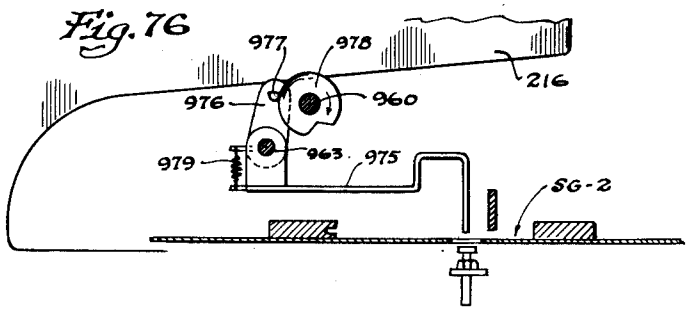

Fig. 78

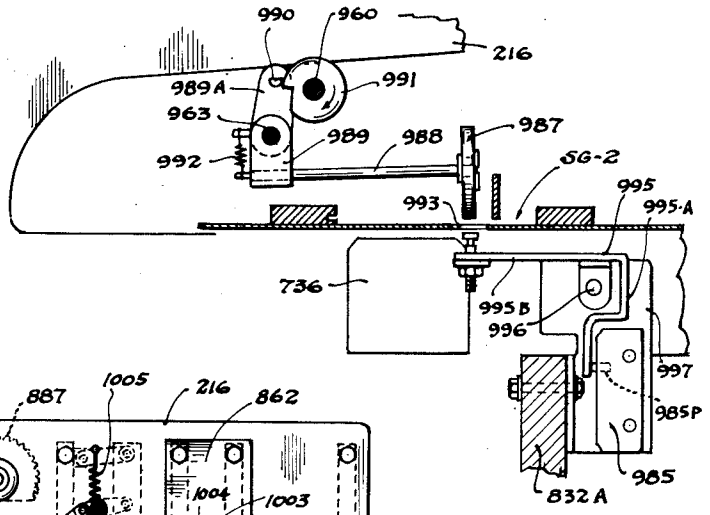

Fig. 79

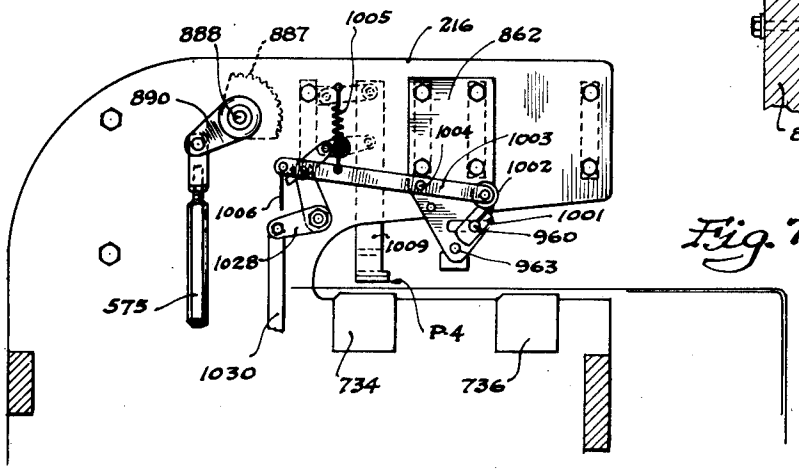

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Fig. 80

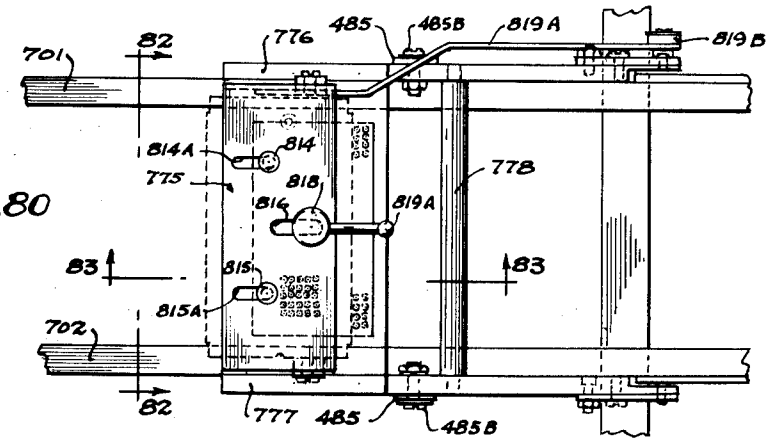

Fig. 81

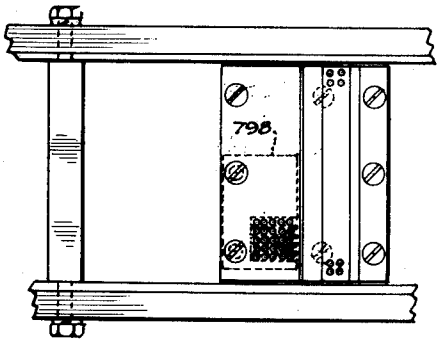

Fig. 81A

Fig. 82

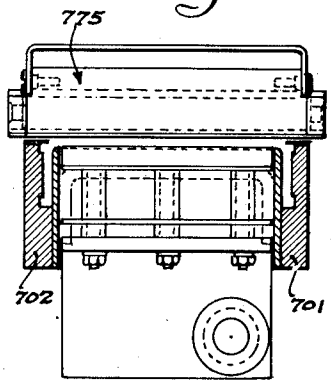

Fig. 83

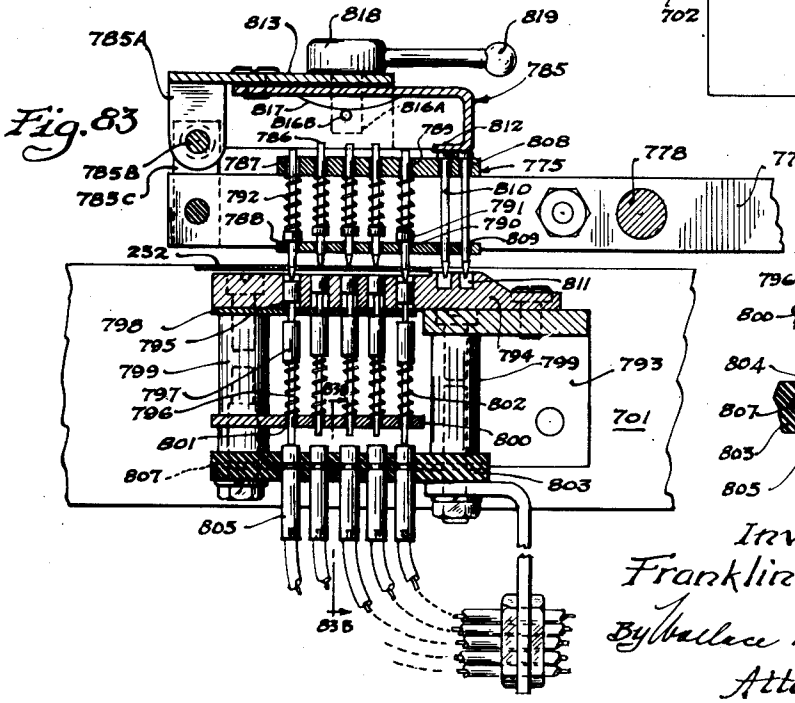

Fig. 83B

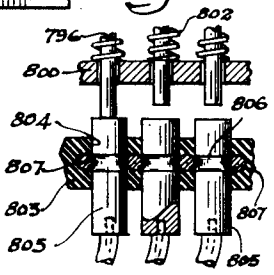

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Fig. 84

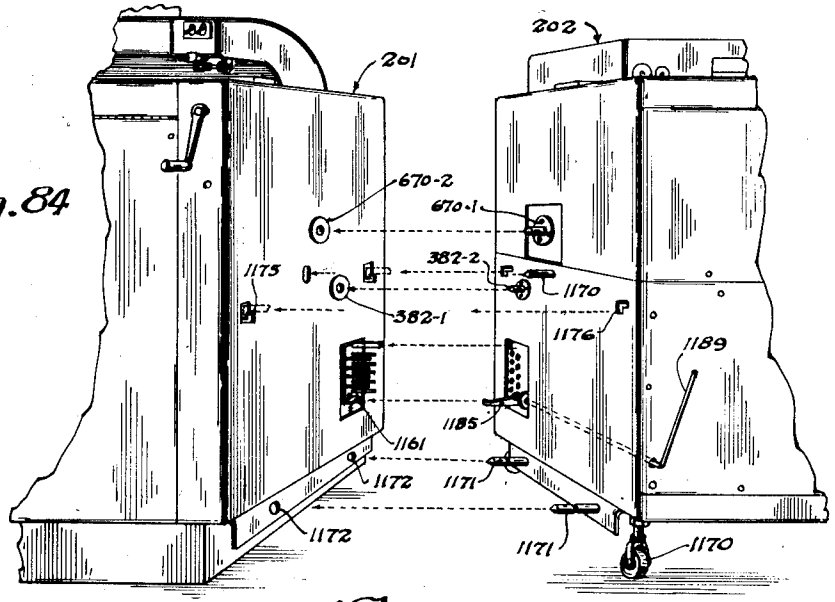


Fig. 85

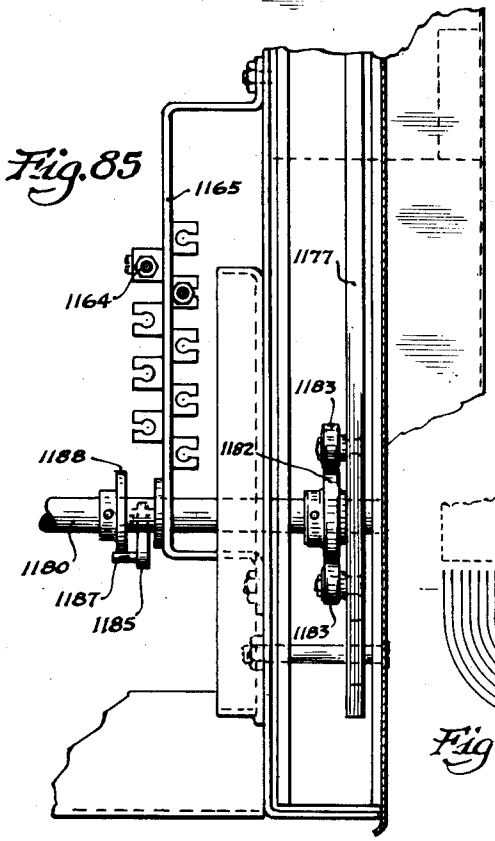


Fig. 86

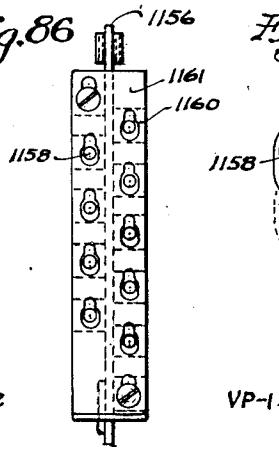
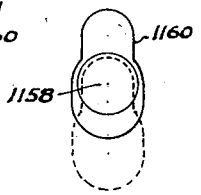


Fig. 87



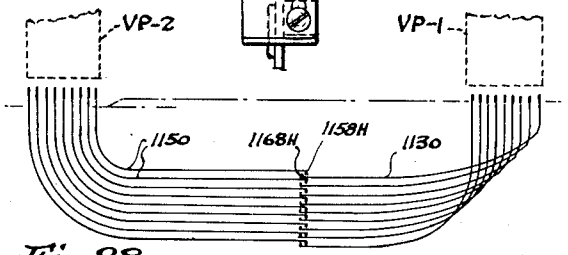


Fig. 88

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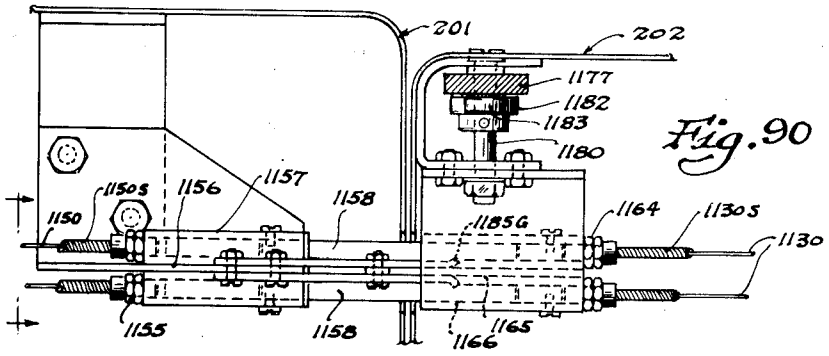

Fig. 90

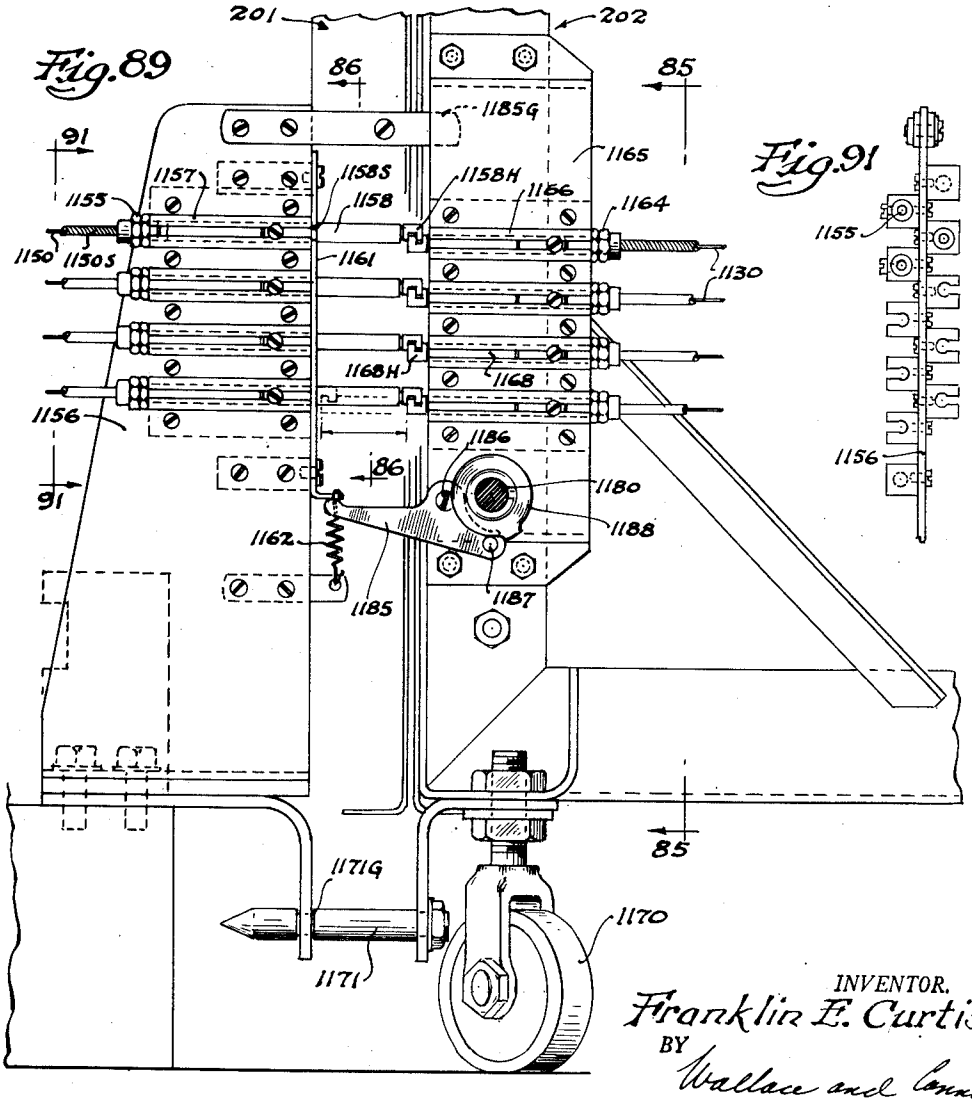

Fig. 89

Fig. 91

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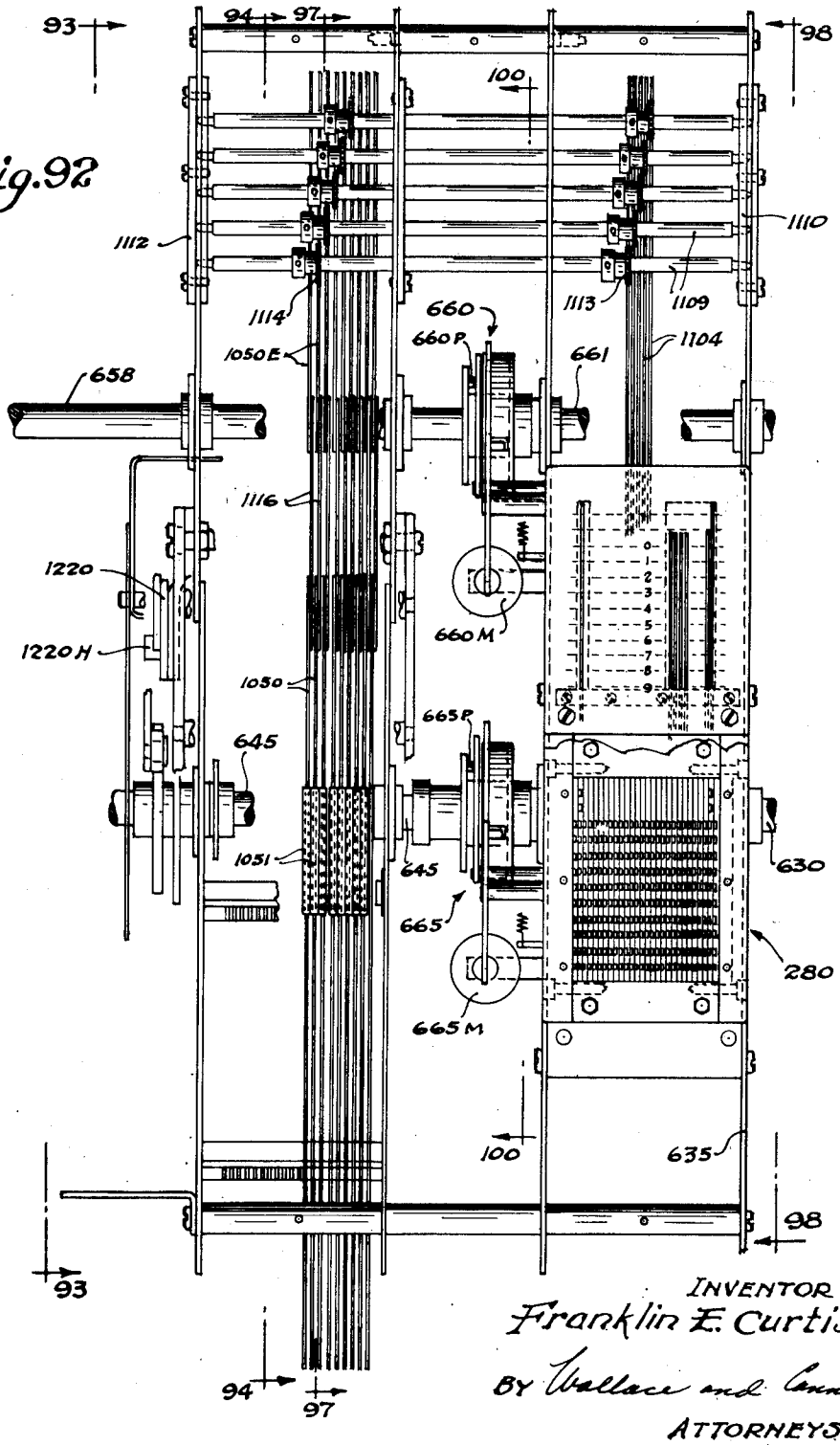
Fig. 92



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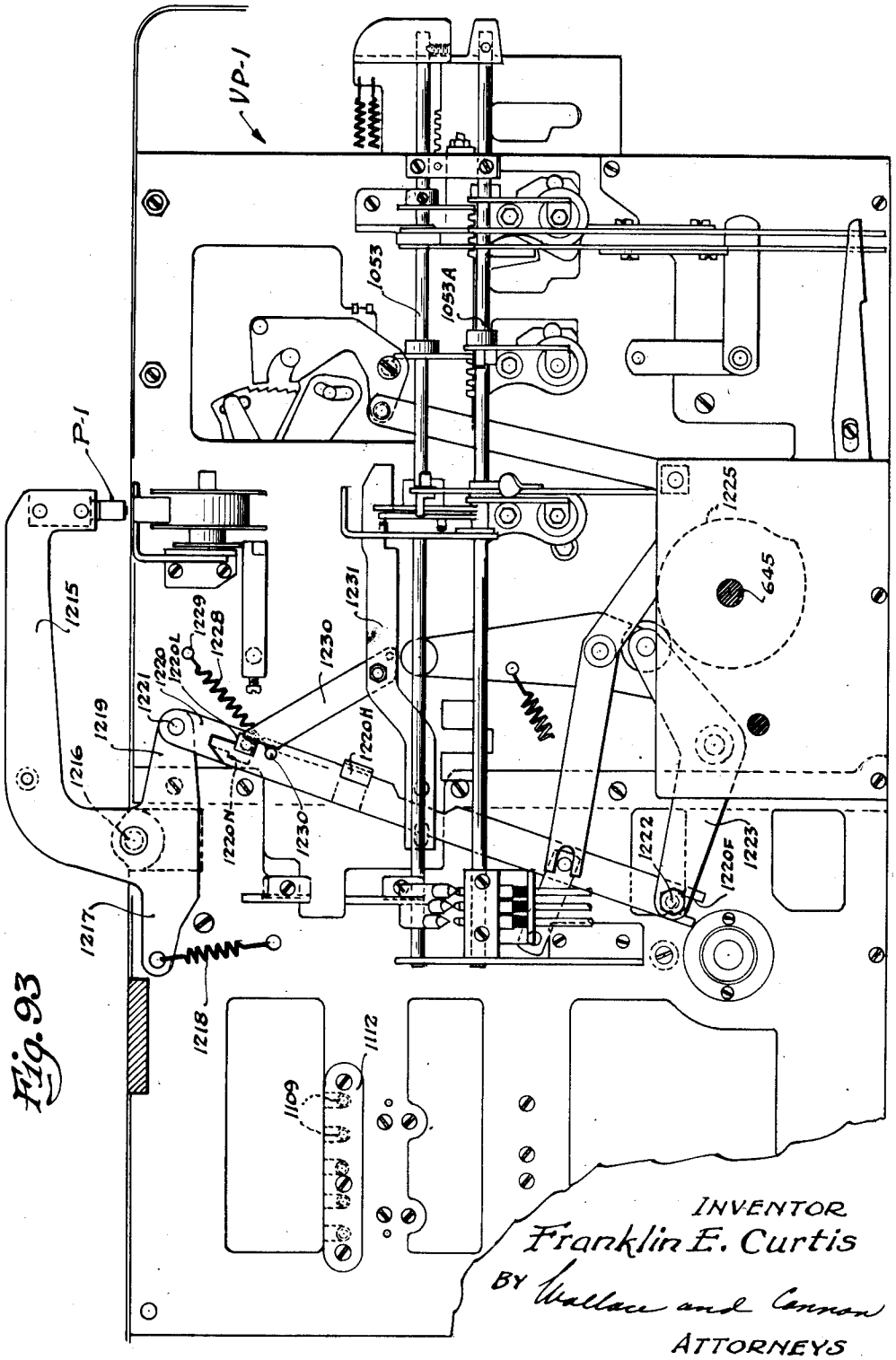

Fig. 93

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Fig. 94

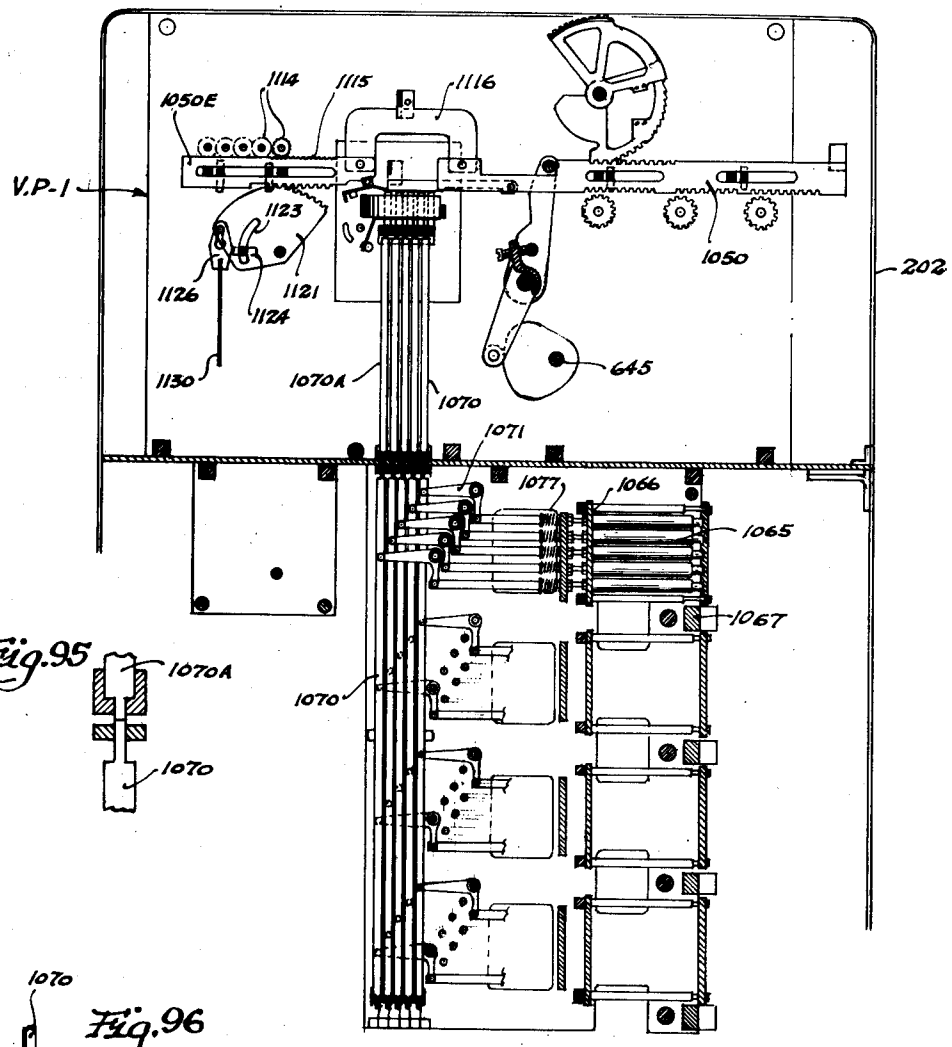
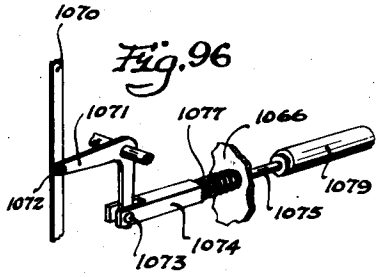


Fig. 95

Fig. 96



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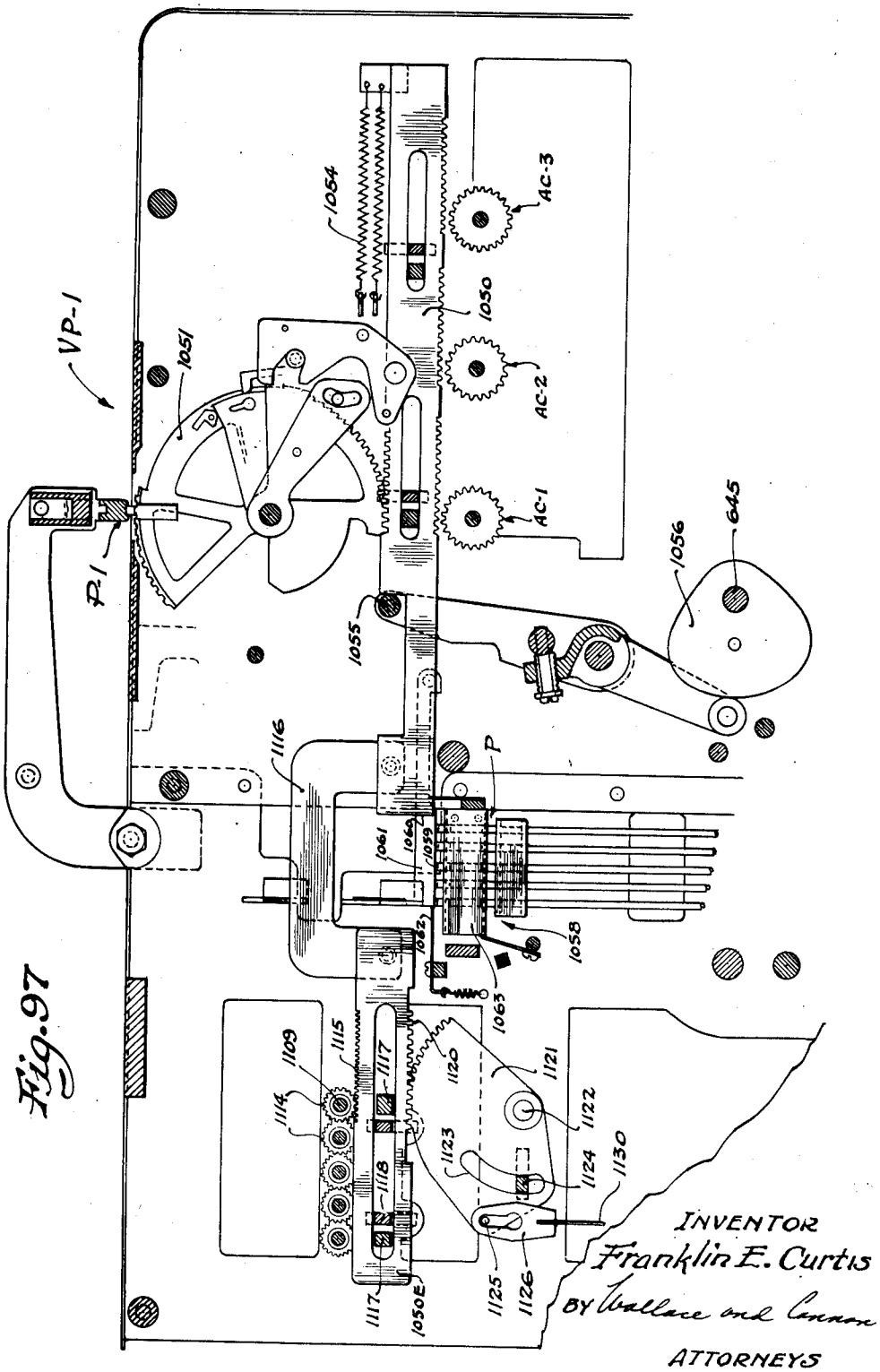

Fig. 97

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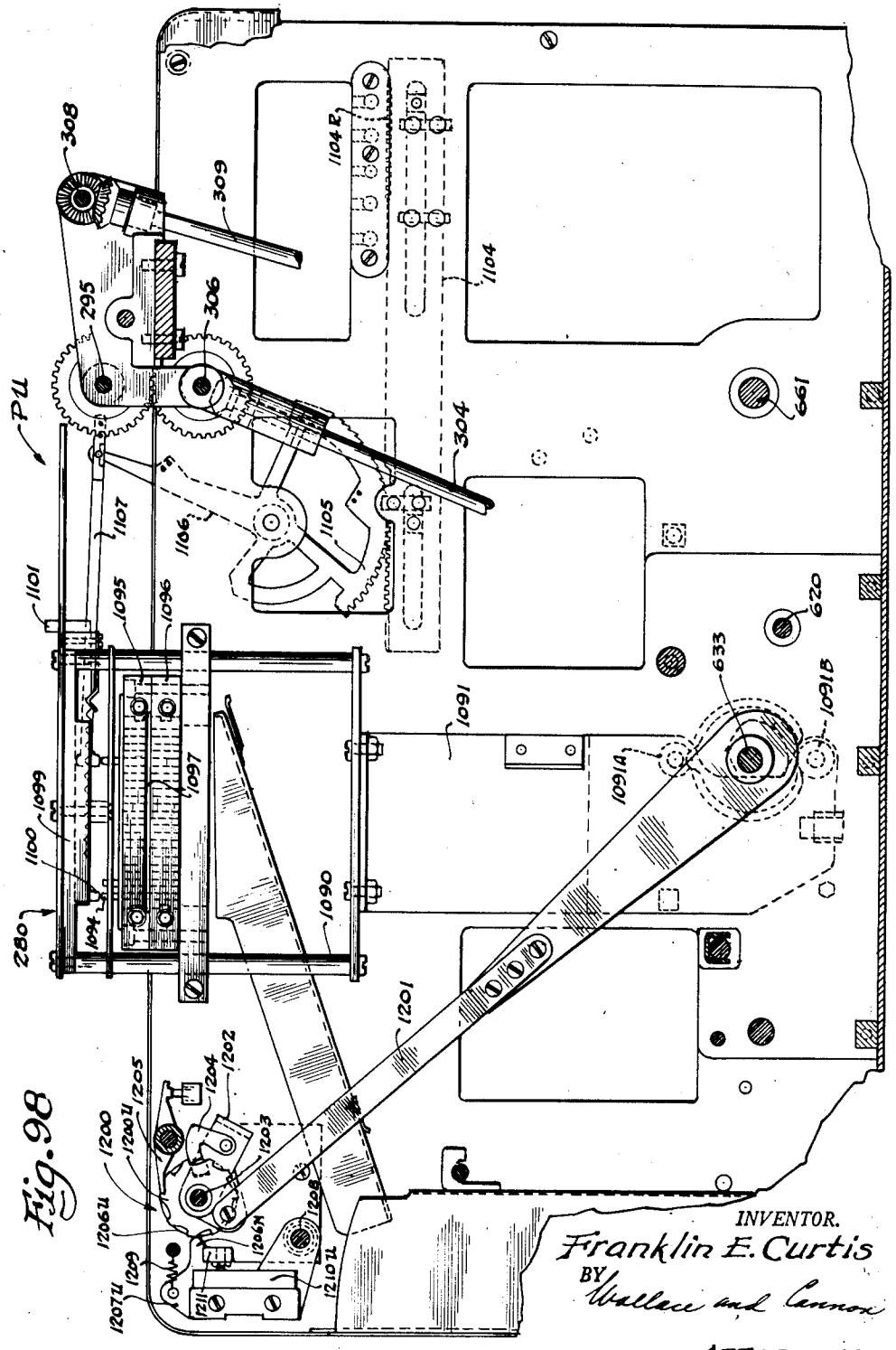

Fig. 98

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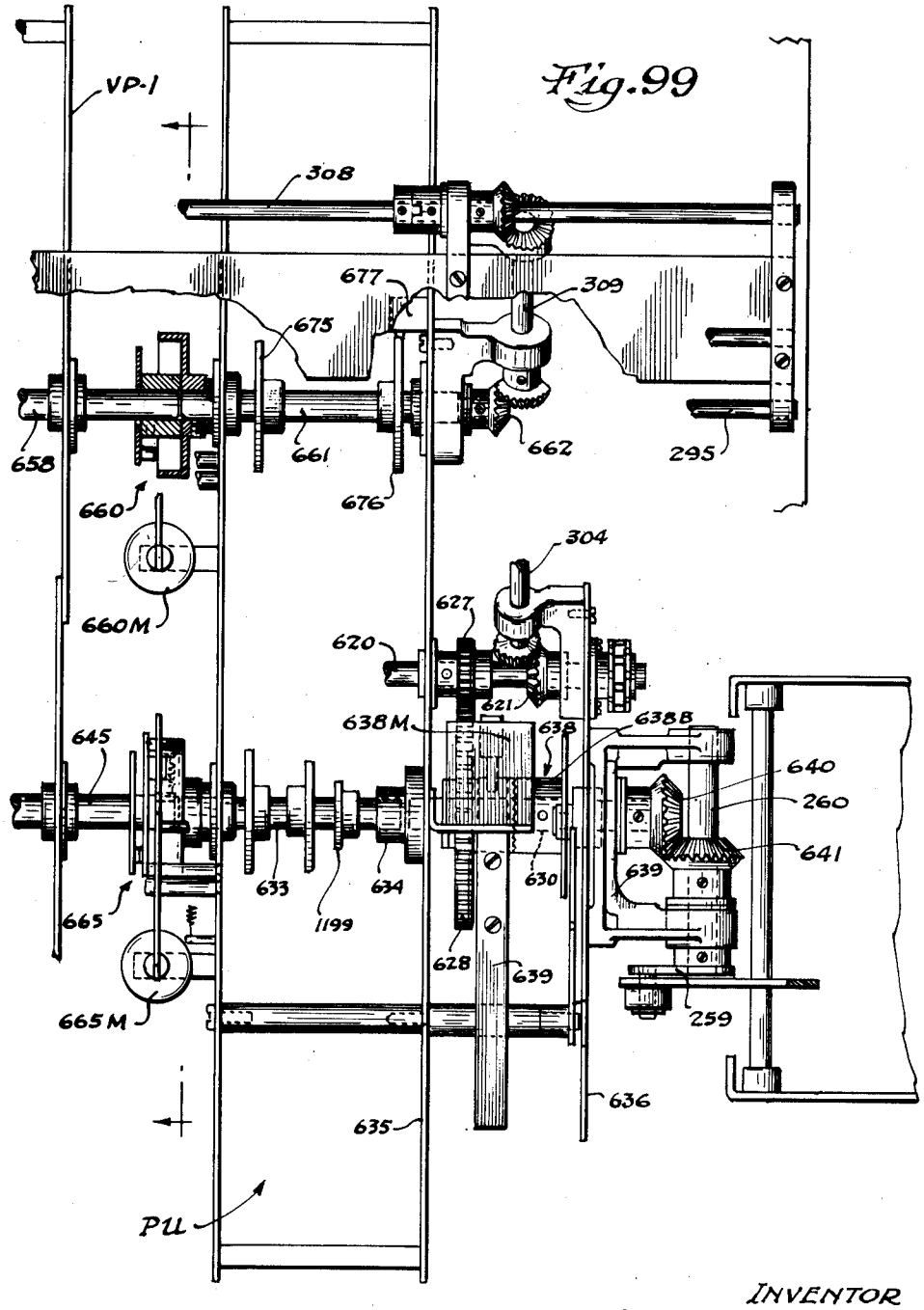
Fig. 99



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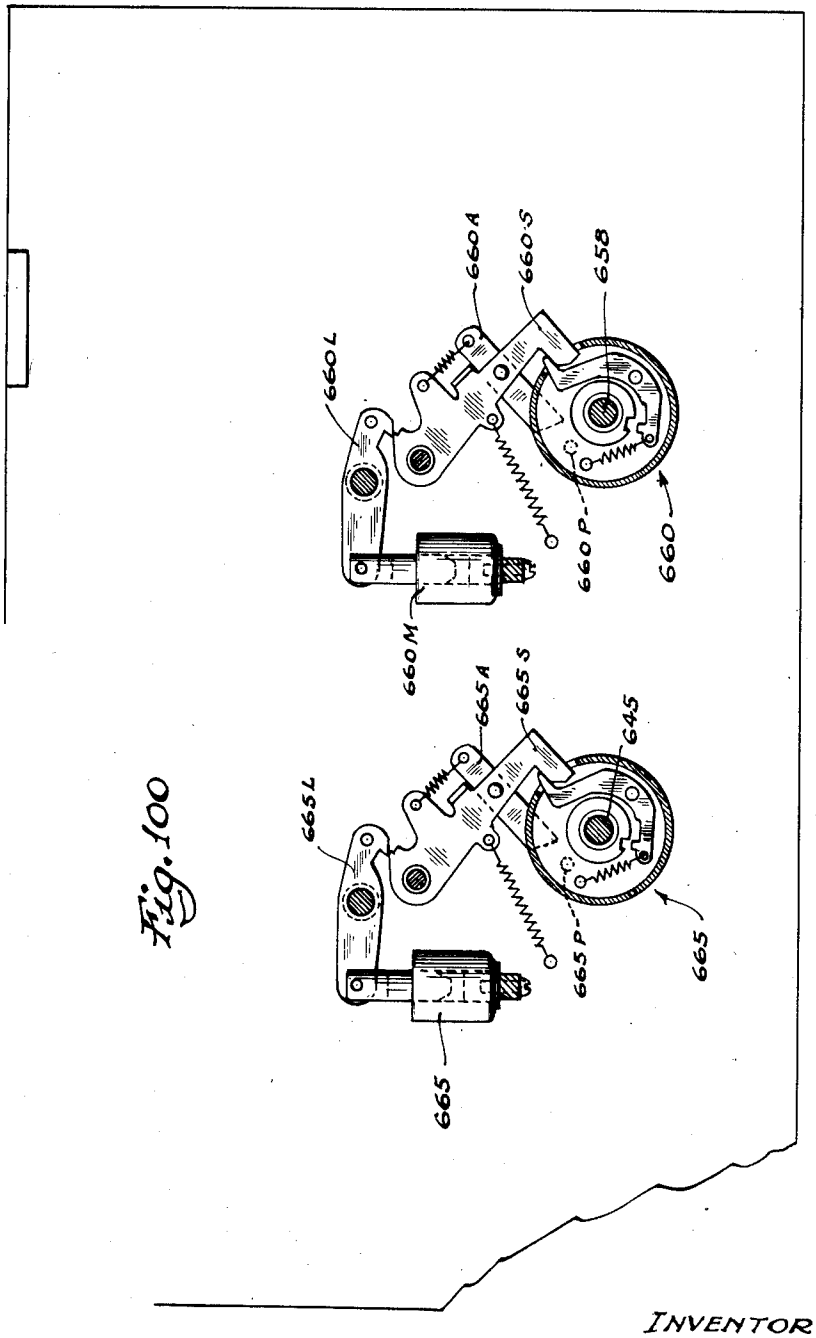

Fig. 100

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Fig. 101

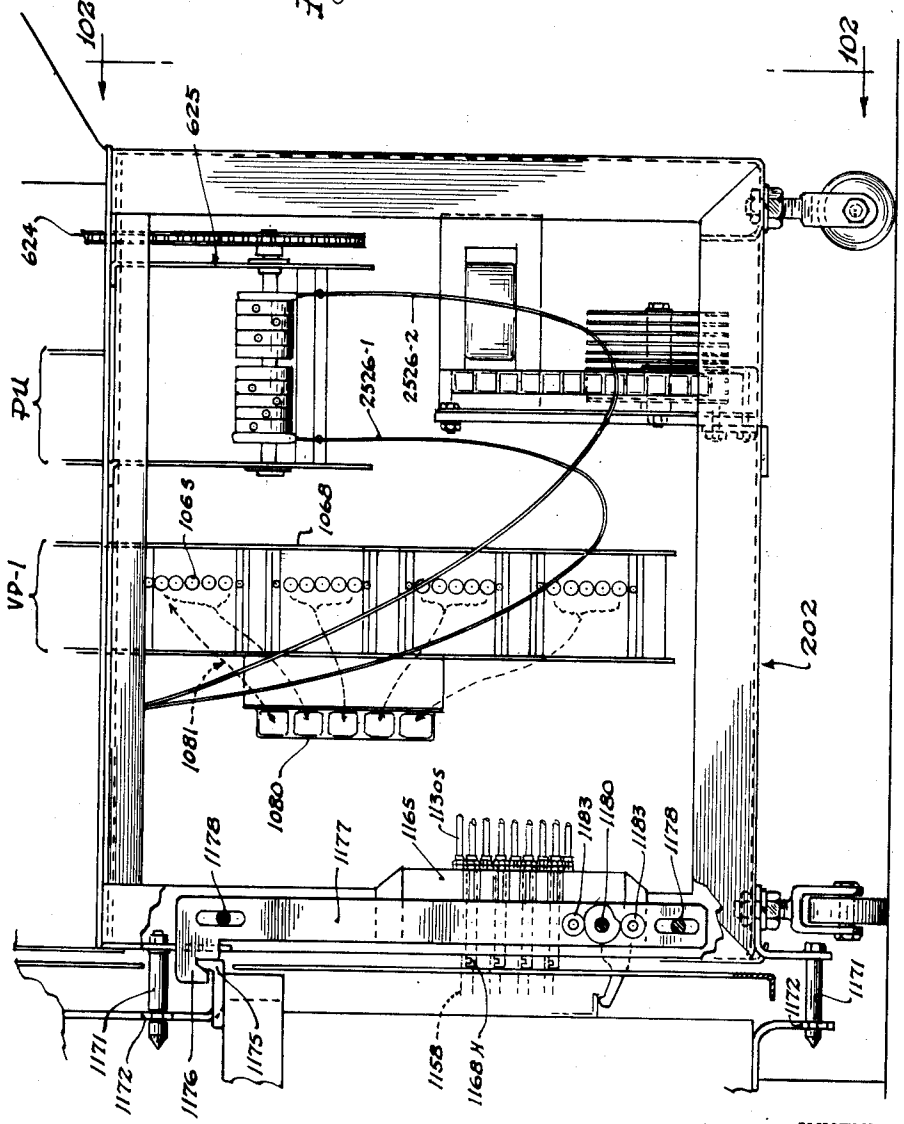

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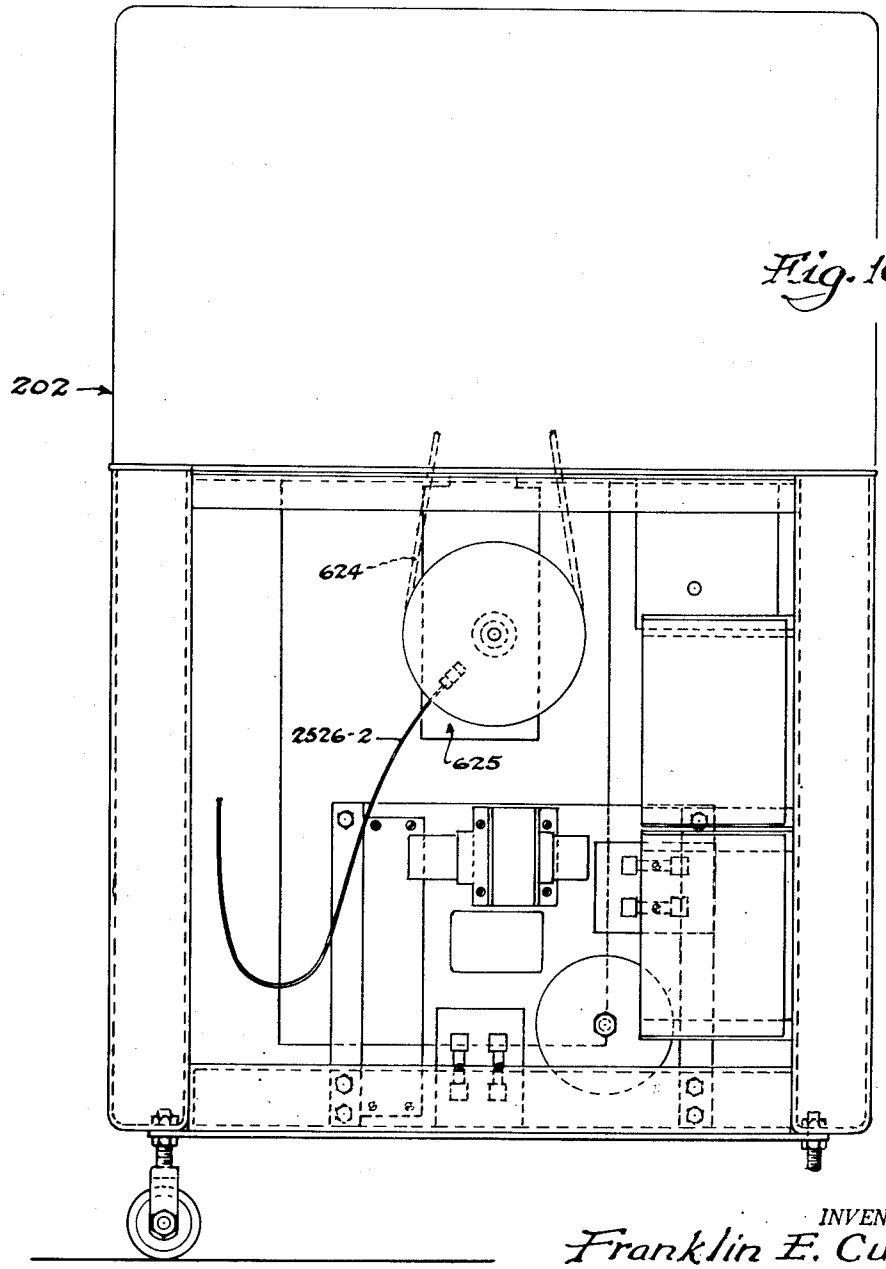
Fig. 102



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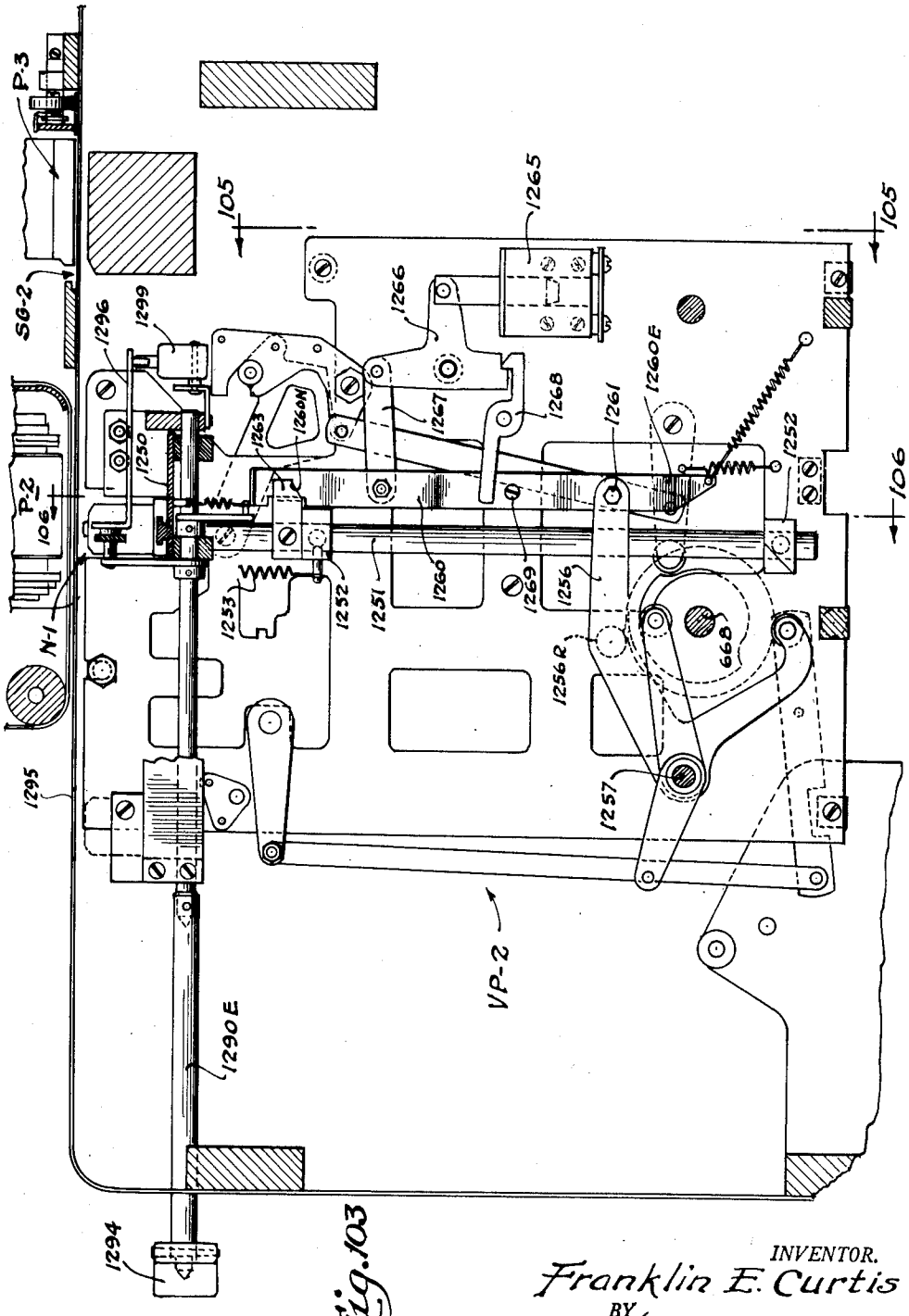

Fig. 103

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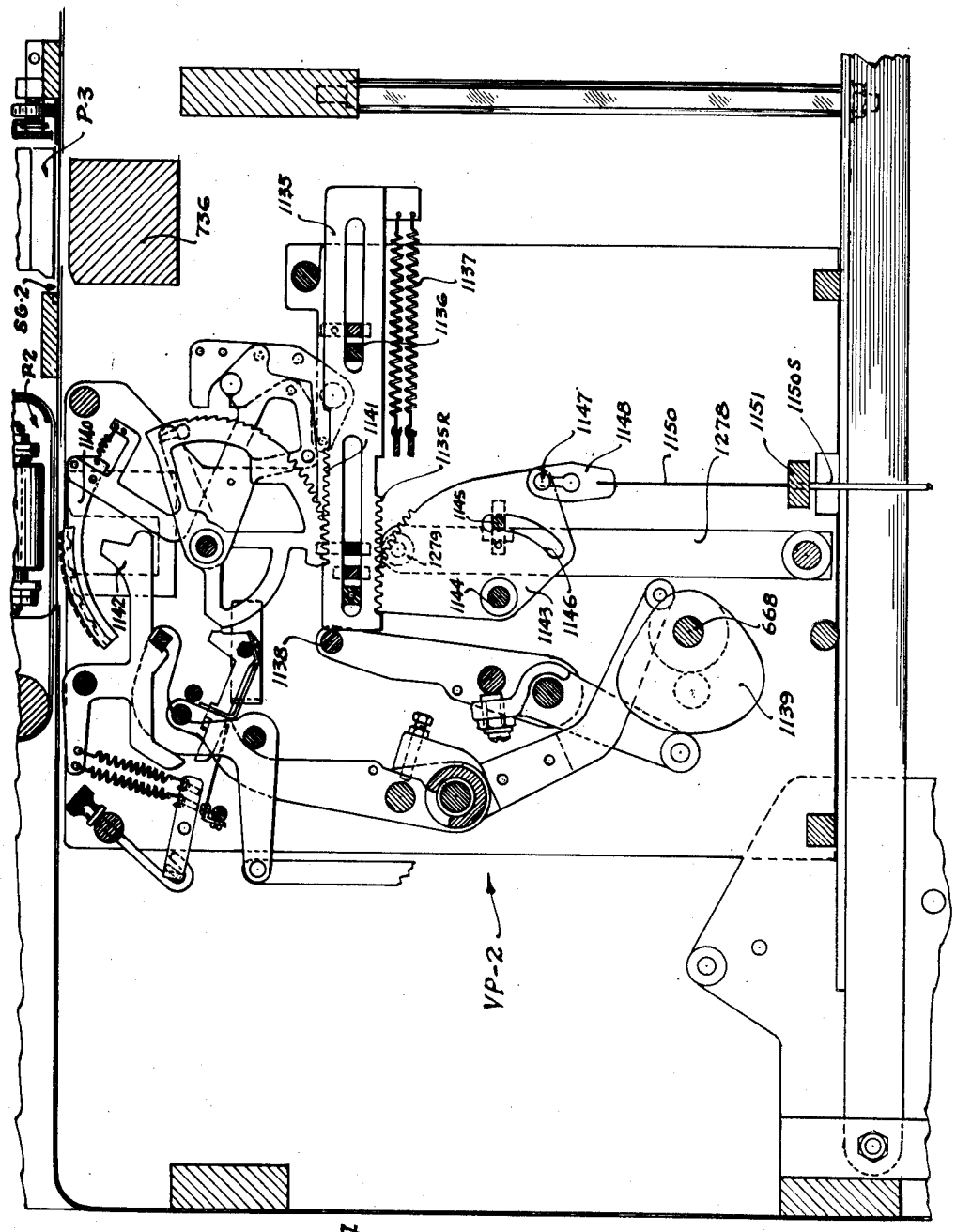

Fig. 104

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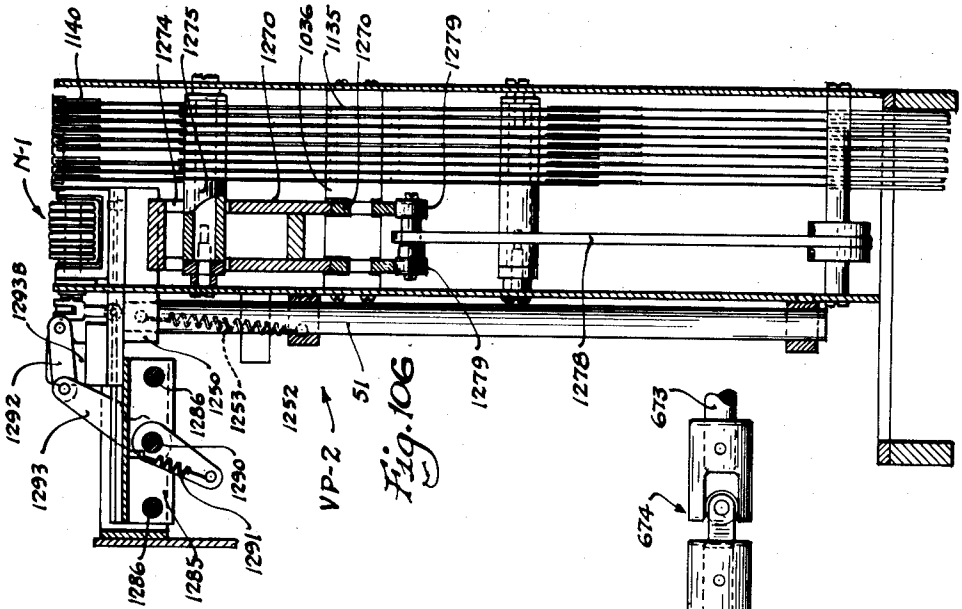

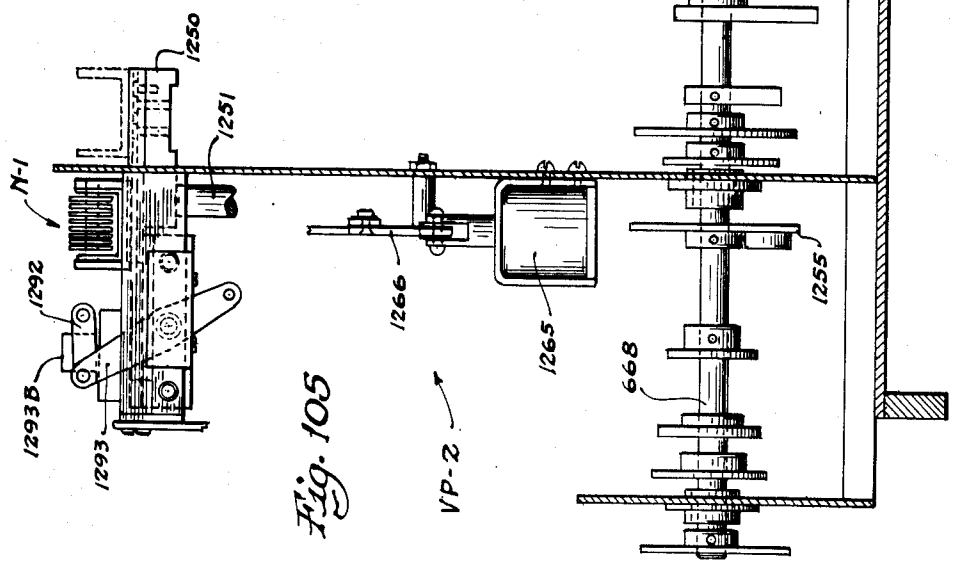

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Fig. 108

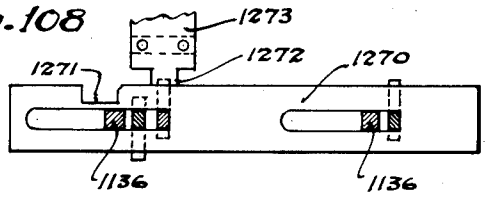


Fig. 110

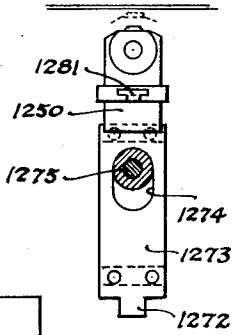
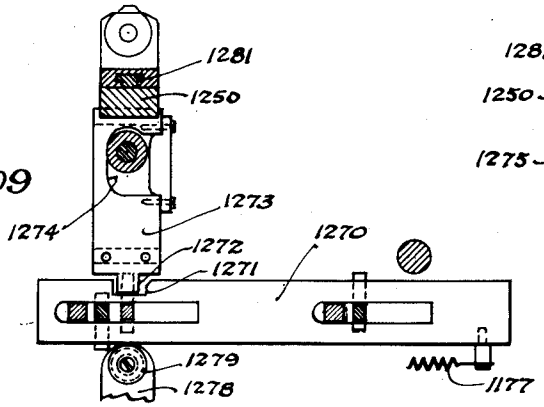


Fig. 109



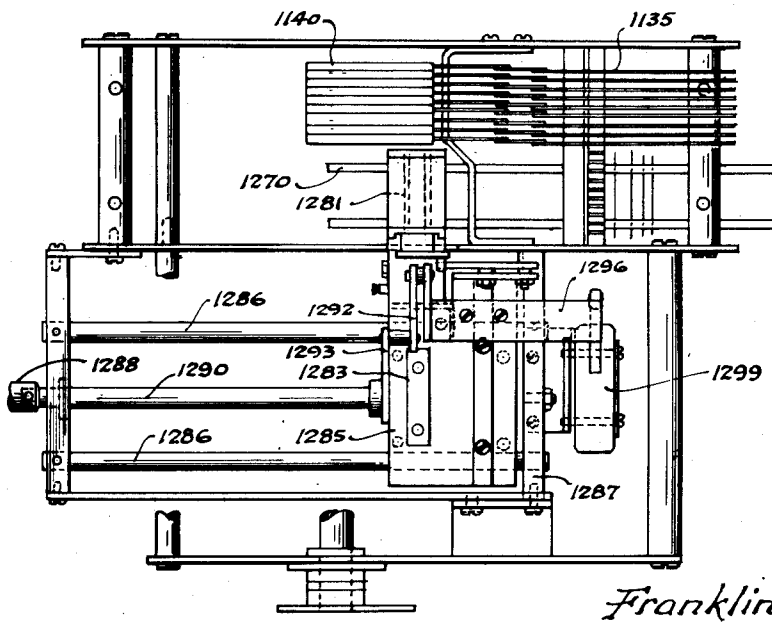


Fig. 107

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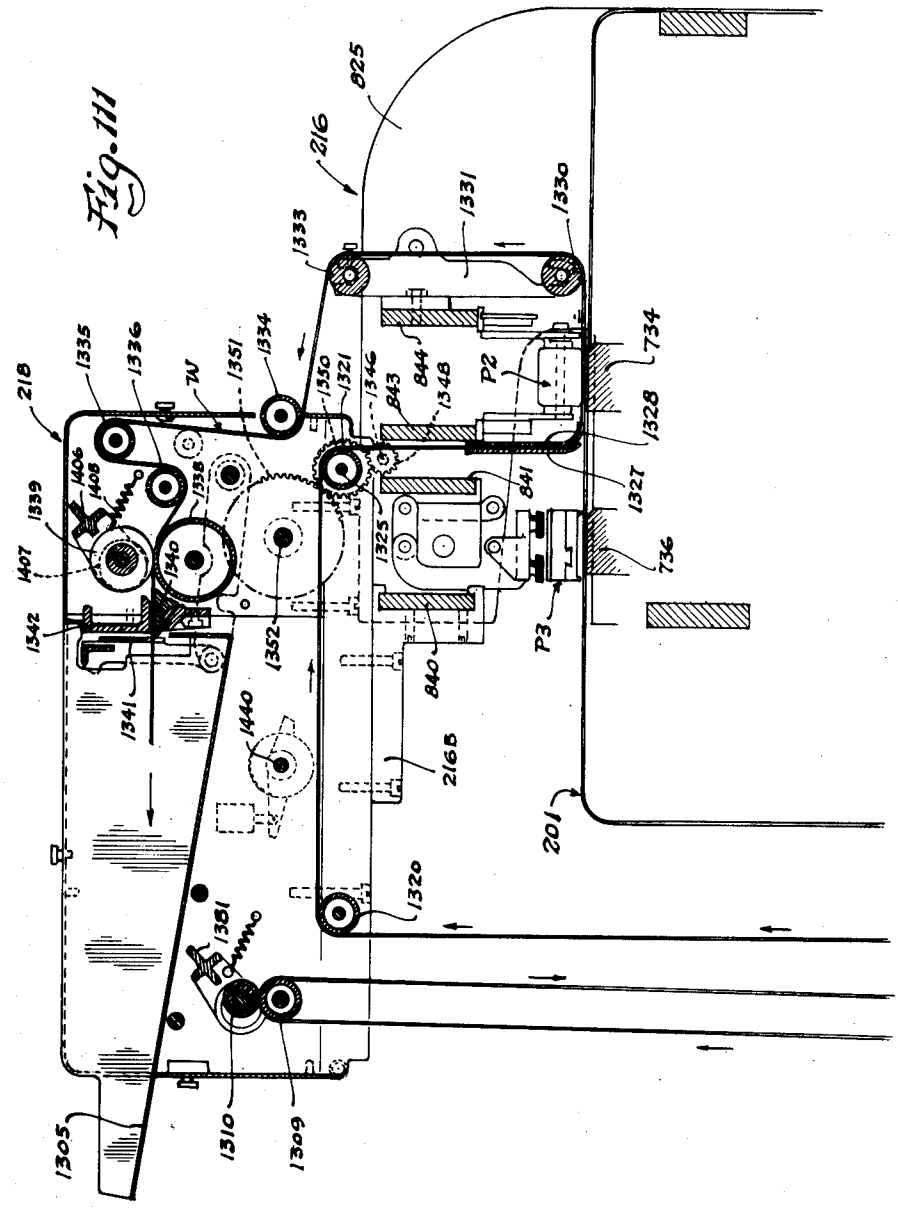
Fig. 111



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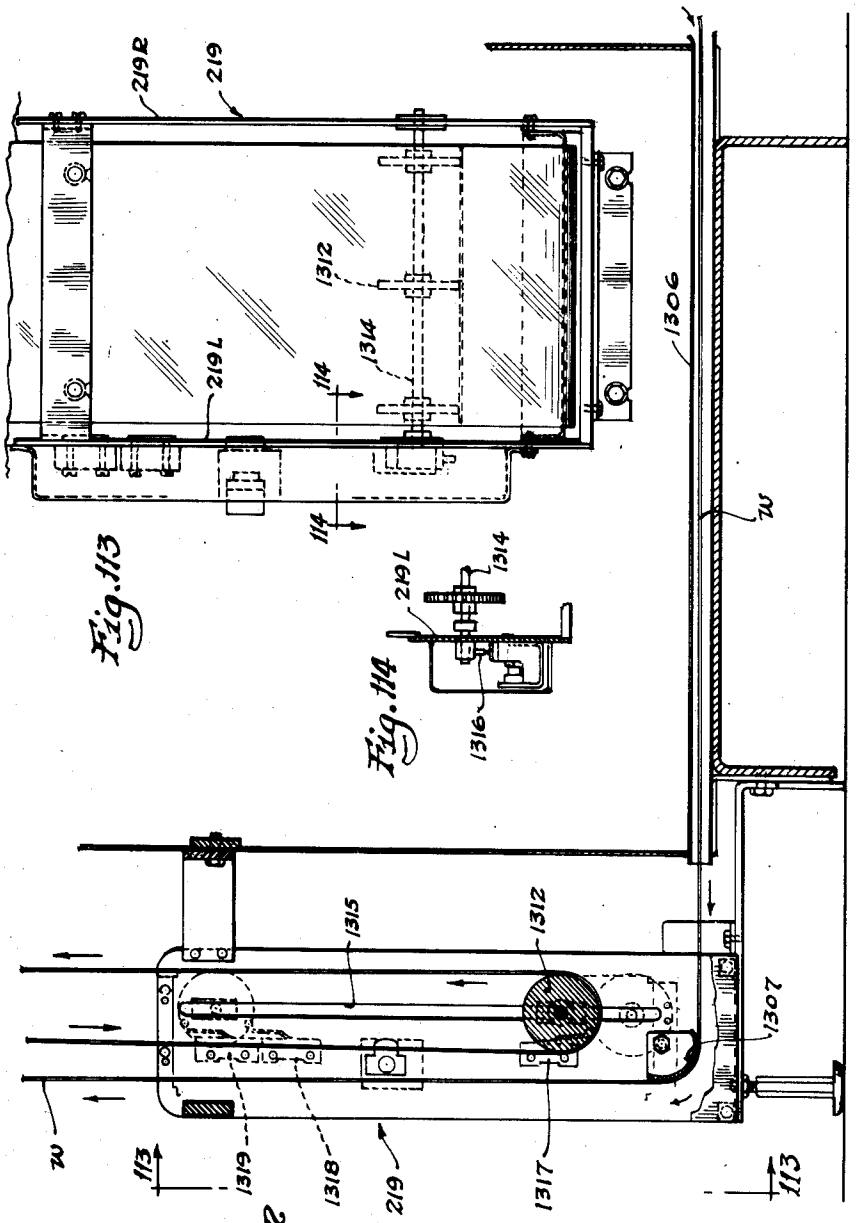

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Fig. 115

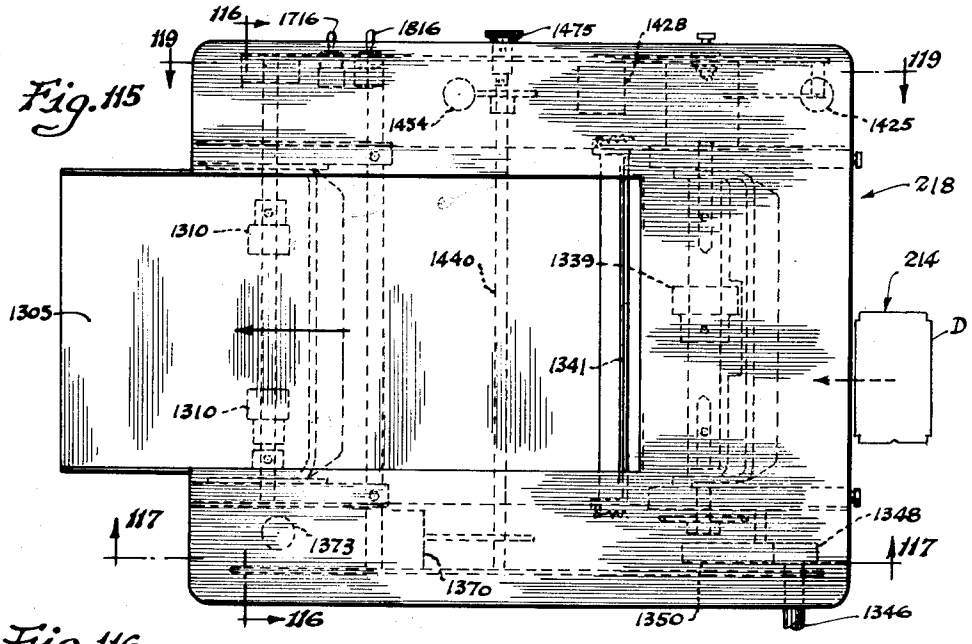
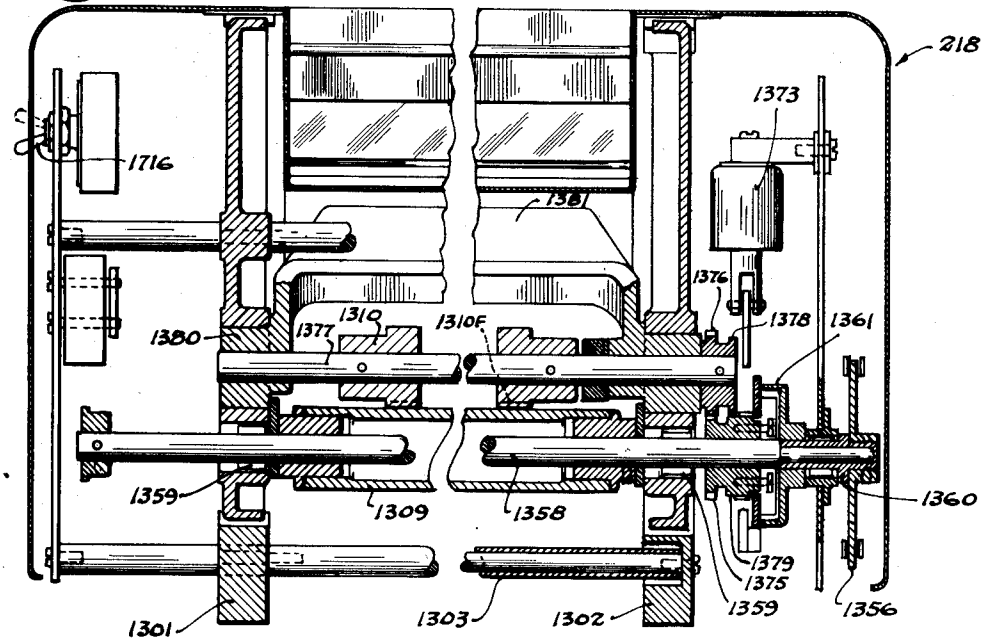


Fig. 116



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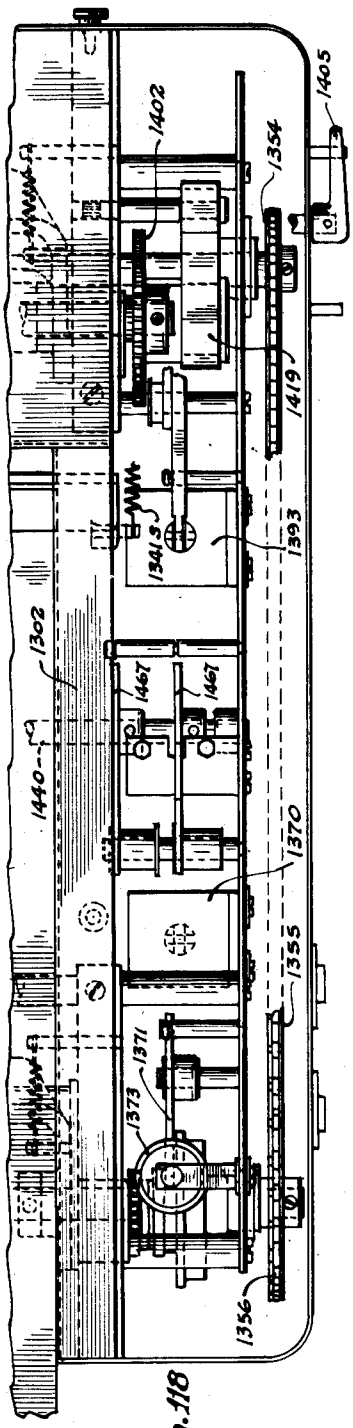

Fig. 118

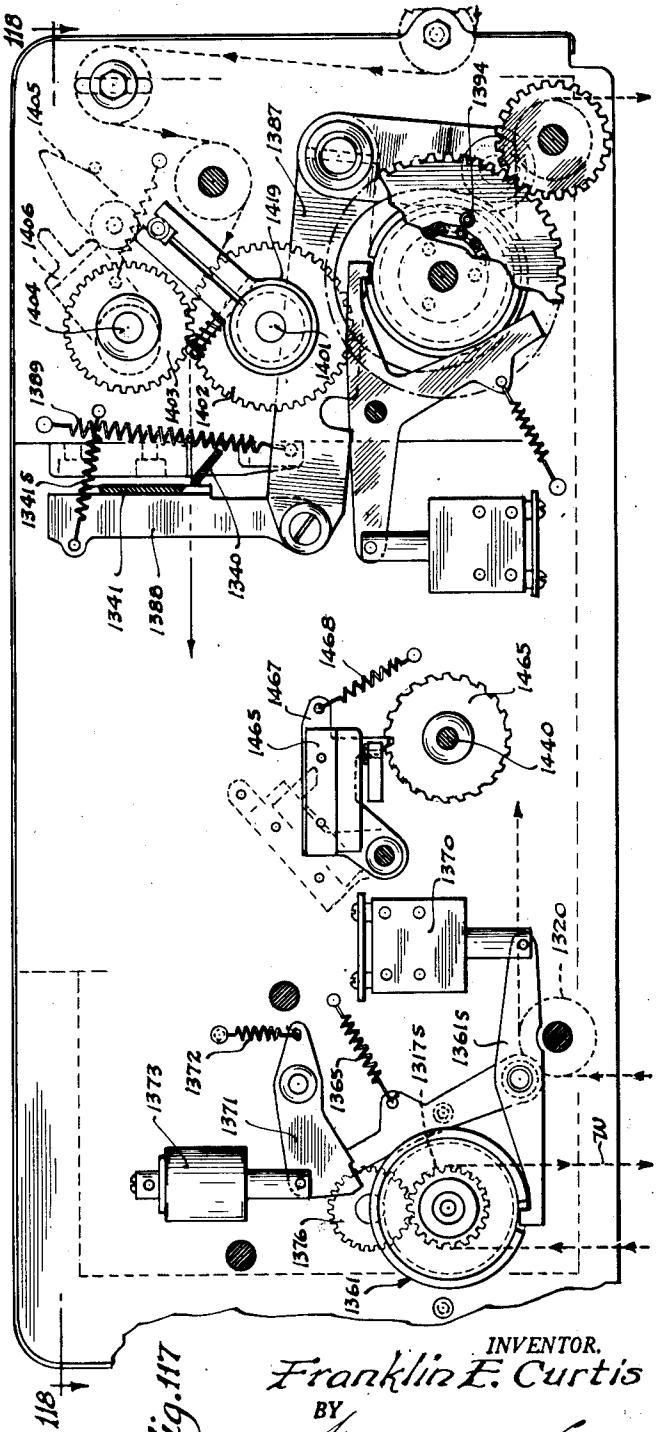

Fig. 117

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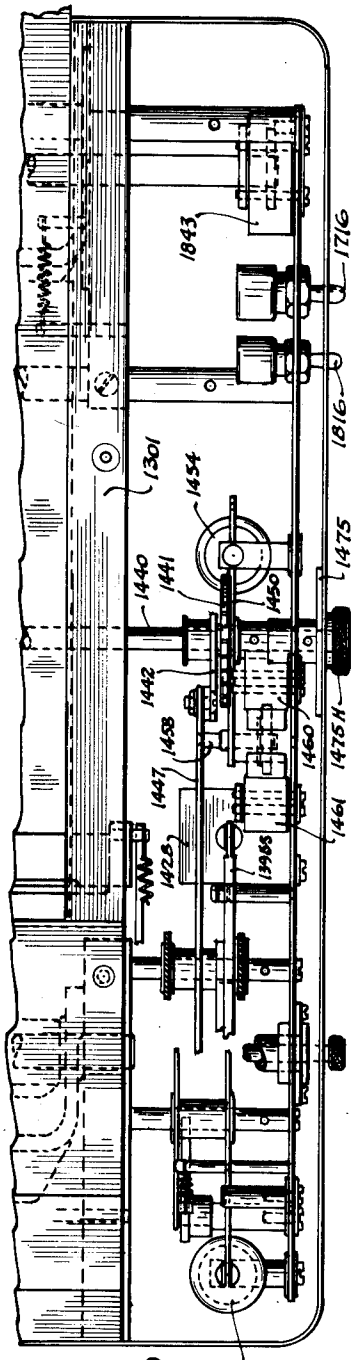

Fig. 120

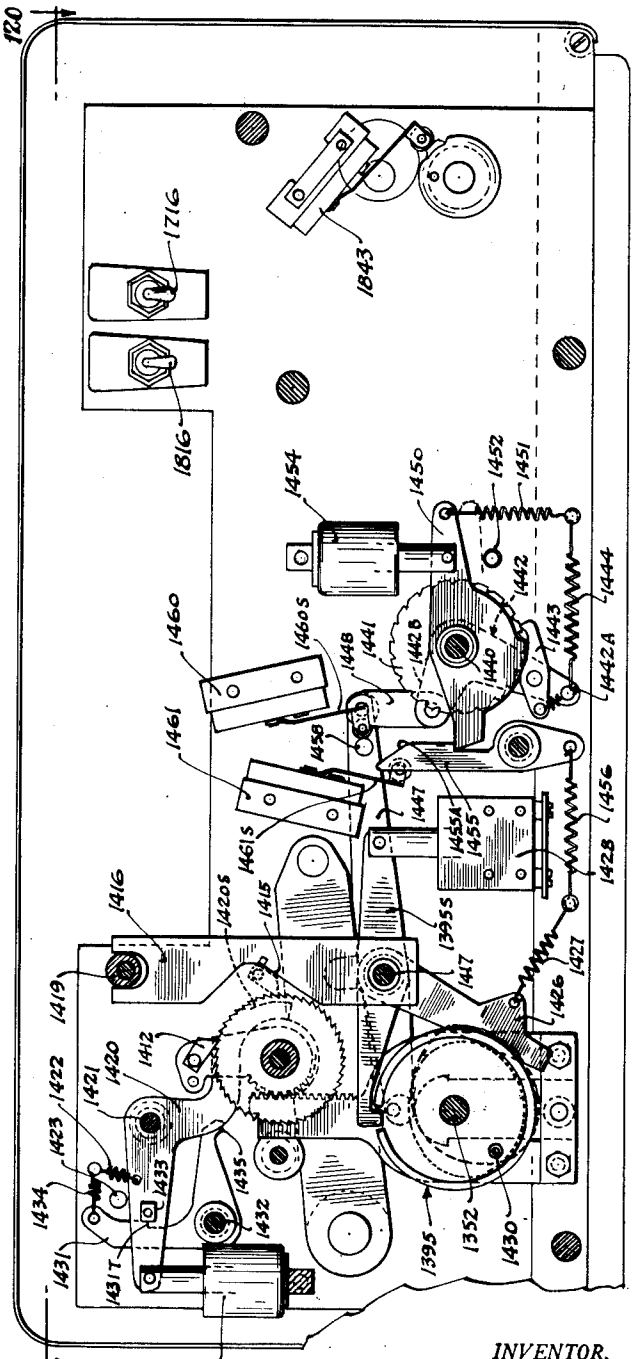

Fig. 119

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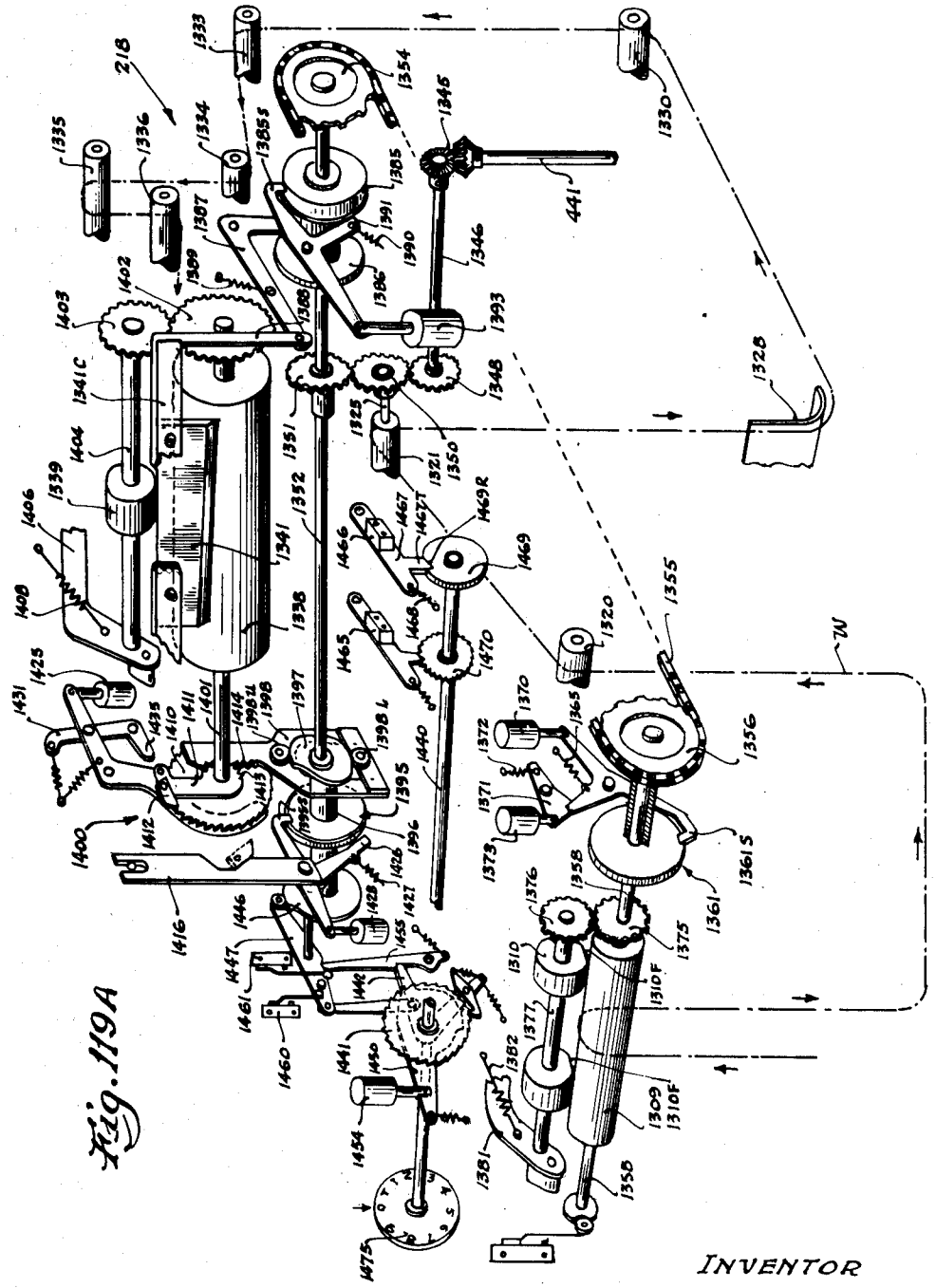

Fig. 119A

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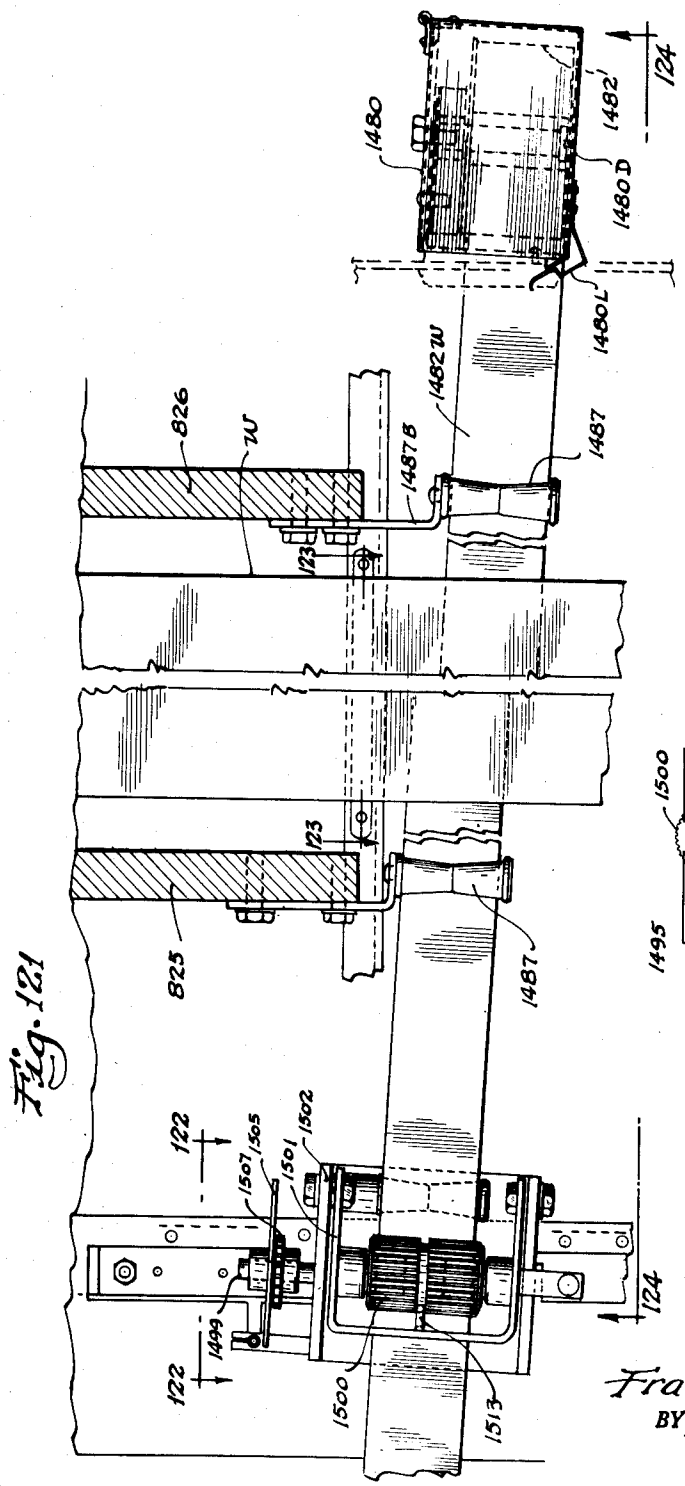

Fig. 121

Fig. 123

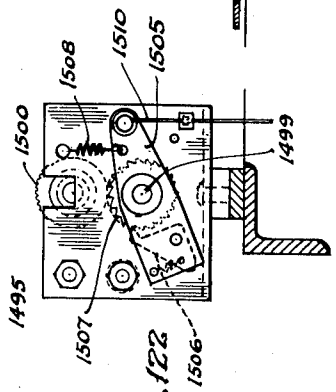

Fig. 122

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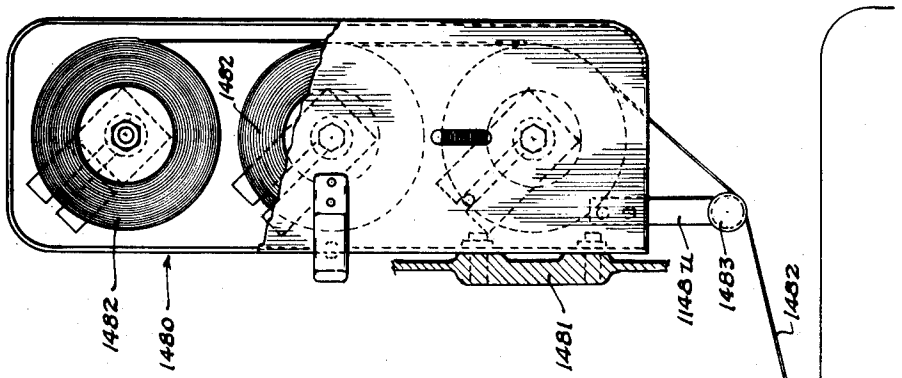

Fig. 124

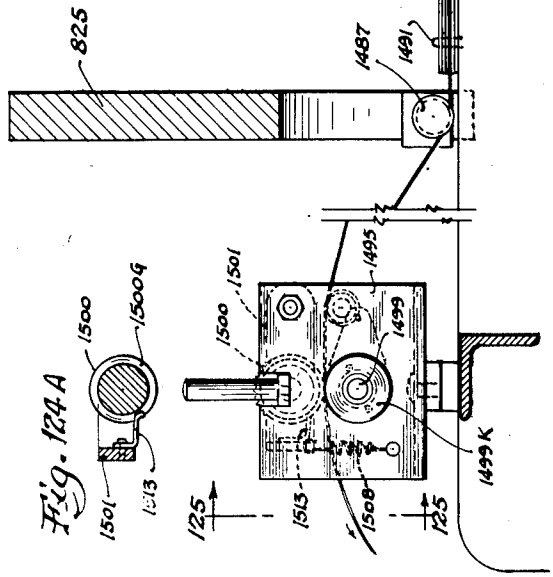

Fig. 124A

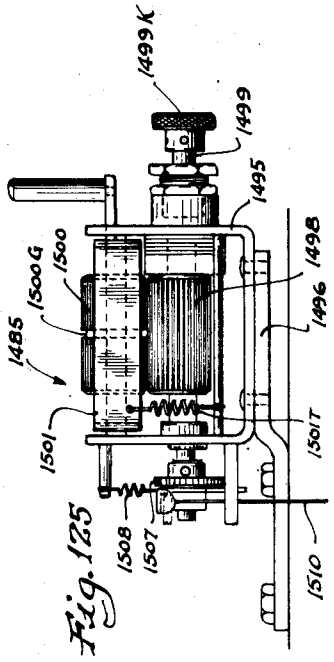

Fig. 125

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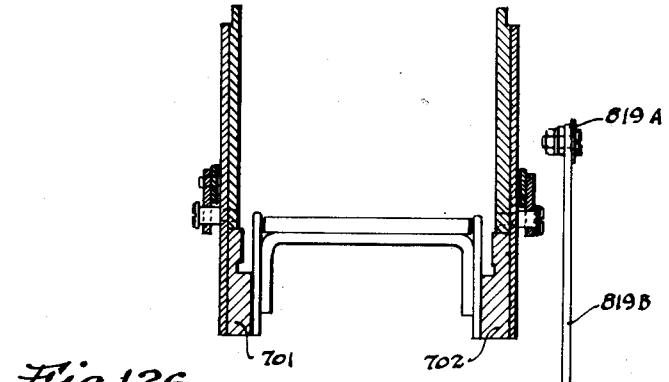

Fig. 126

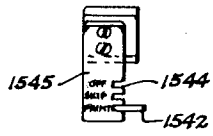

Fig. 127

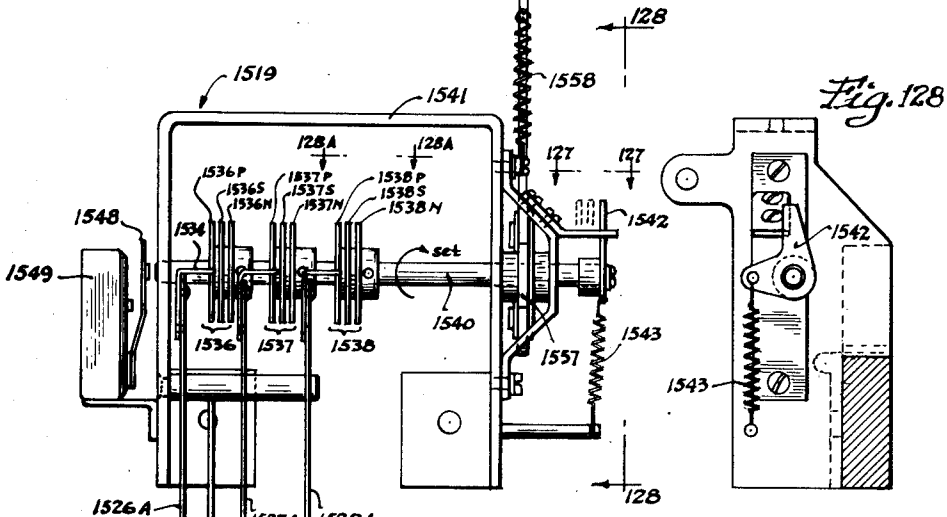

Fig. 128

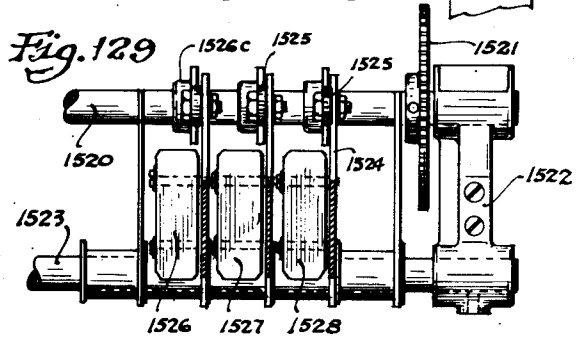

Fig. 129

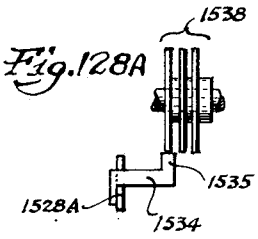

Fig. 128A

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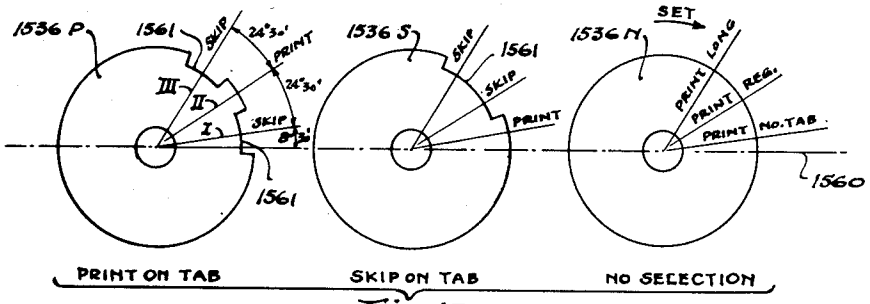

Fig. 130

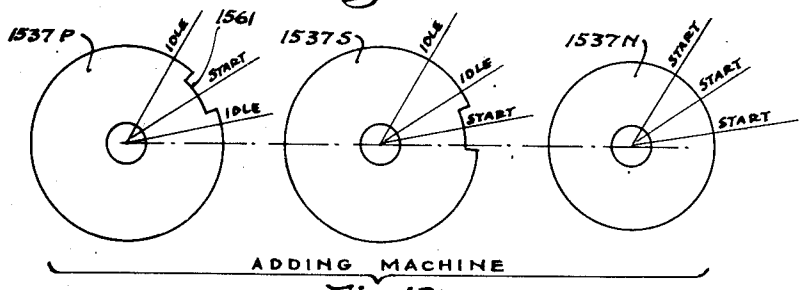

Fig. 131

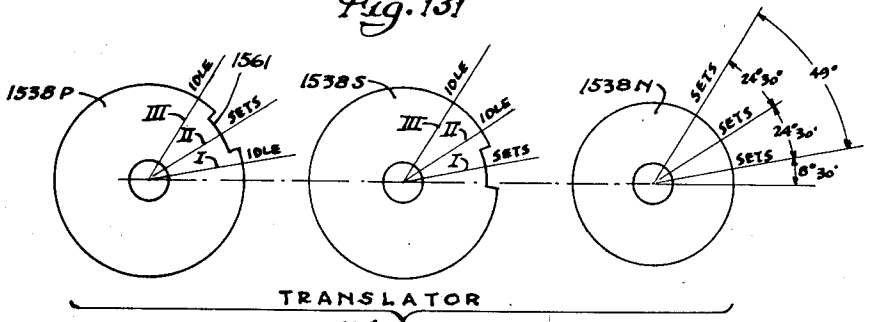

Fig. 132

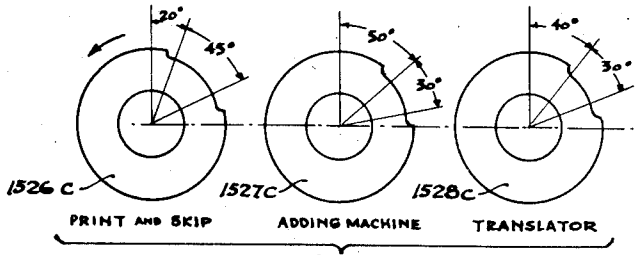

Fig. 133

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Fig. 135

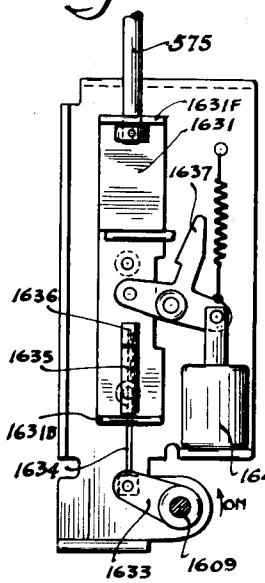


Fig. 136

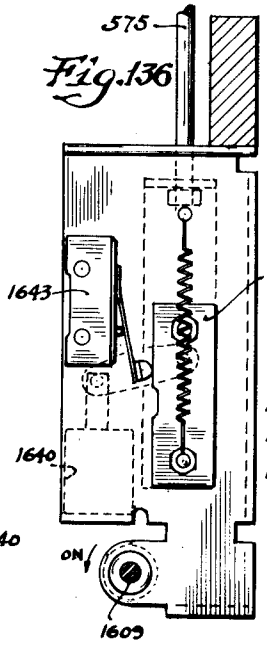


Fig. 140

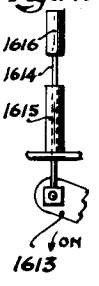


Fig. 137

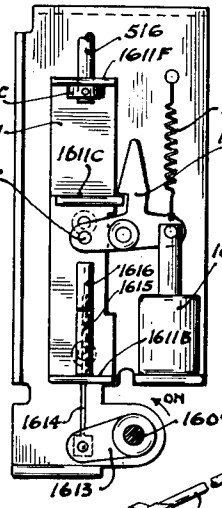
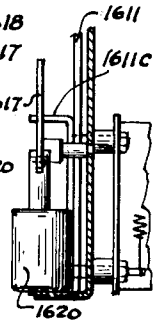


Fig. 139



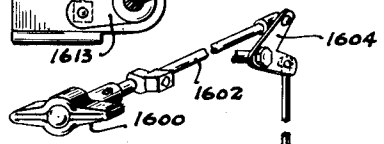
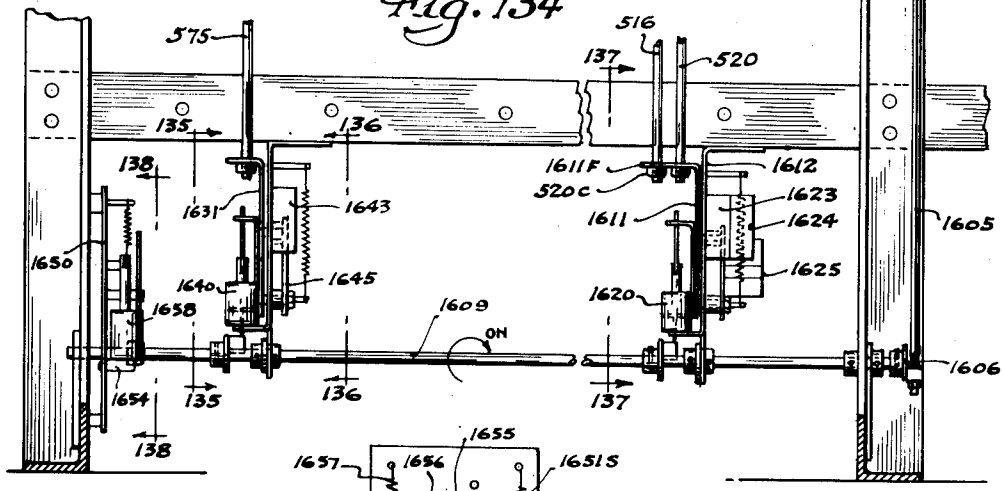


Fig. 134



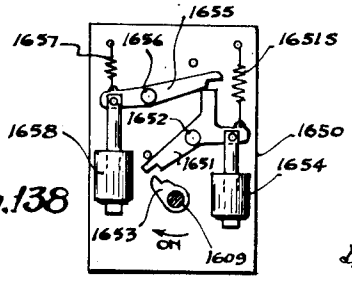


Fig. 138

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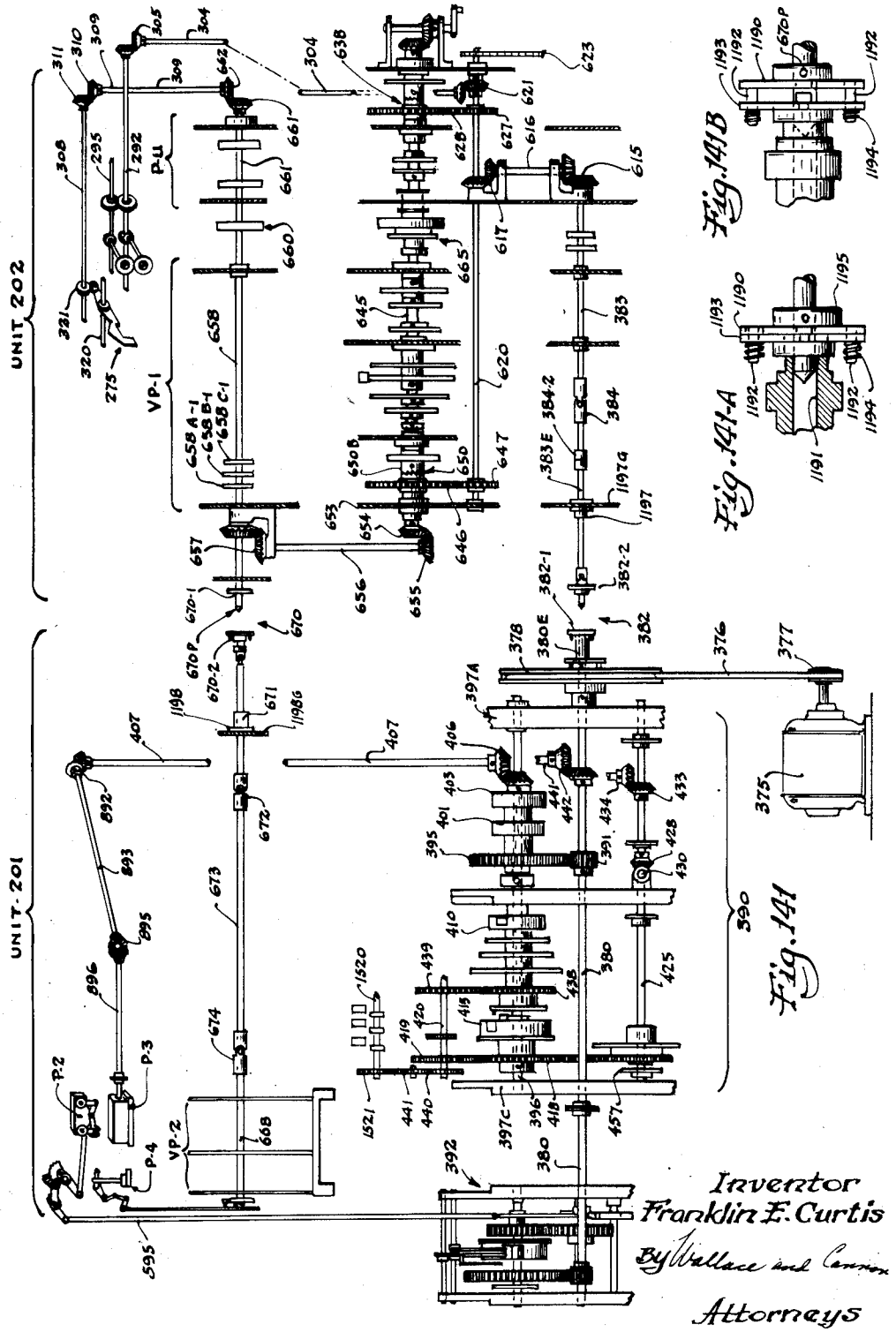

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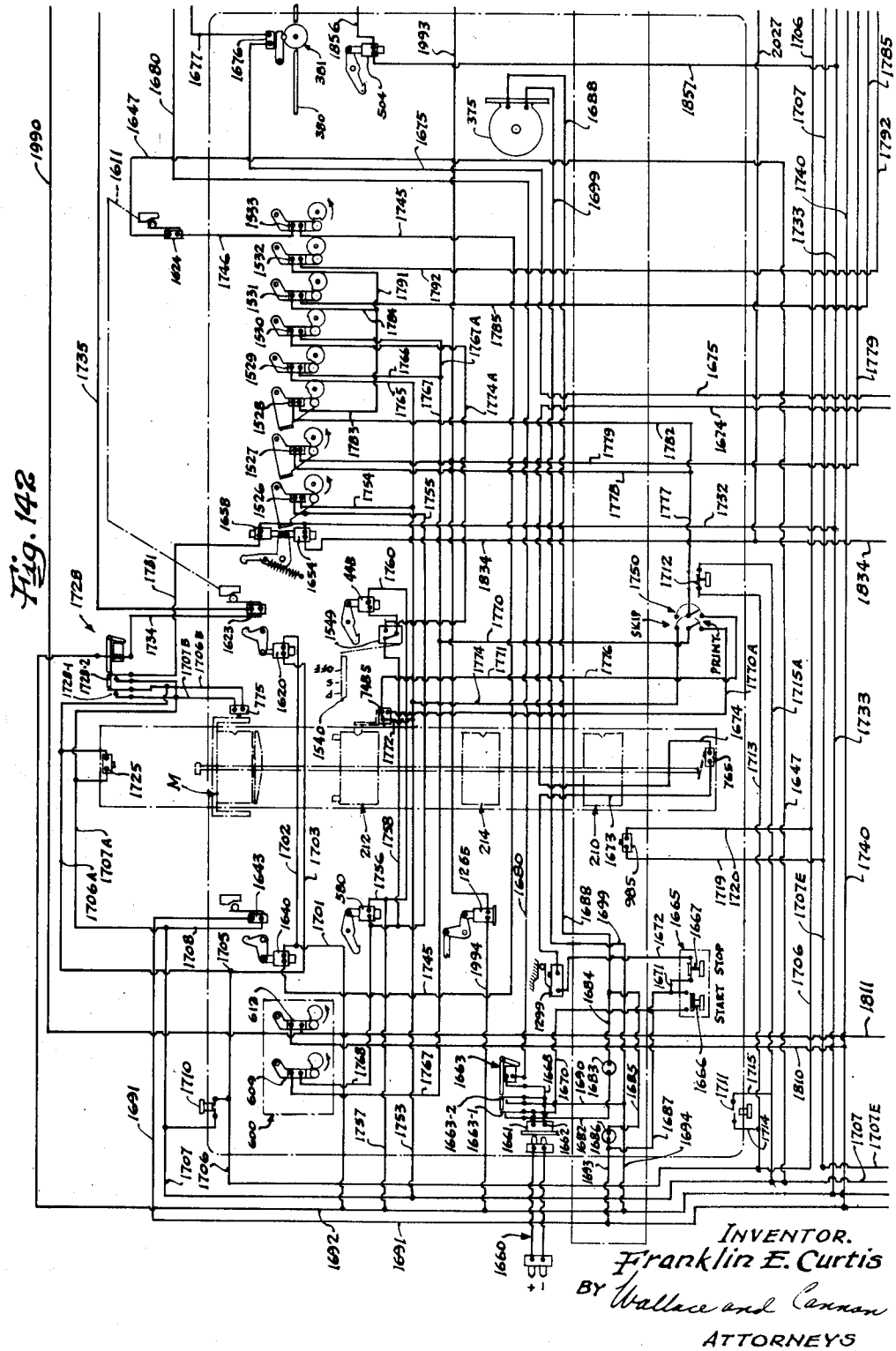

Fig. 142

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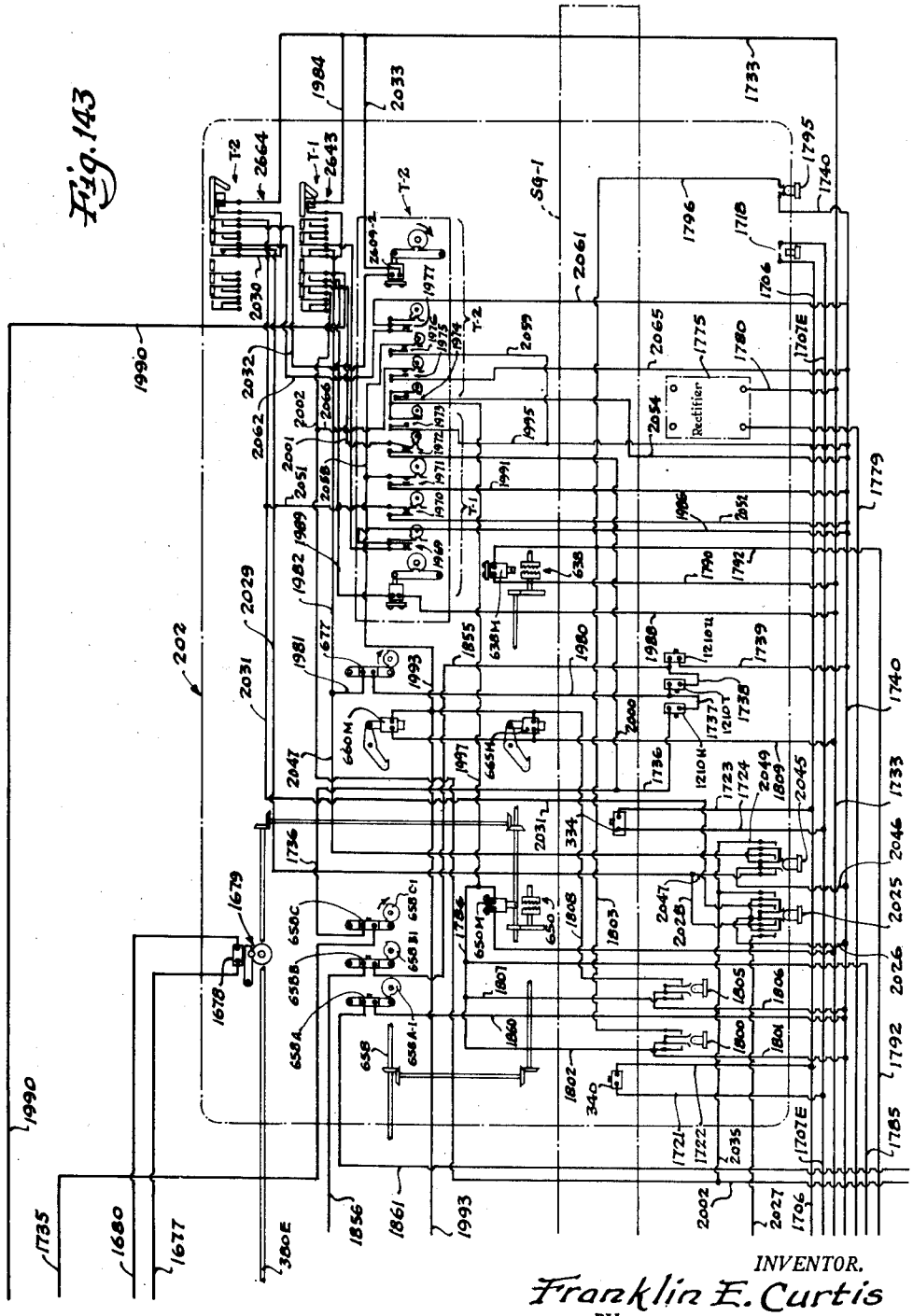
Fig. 143



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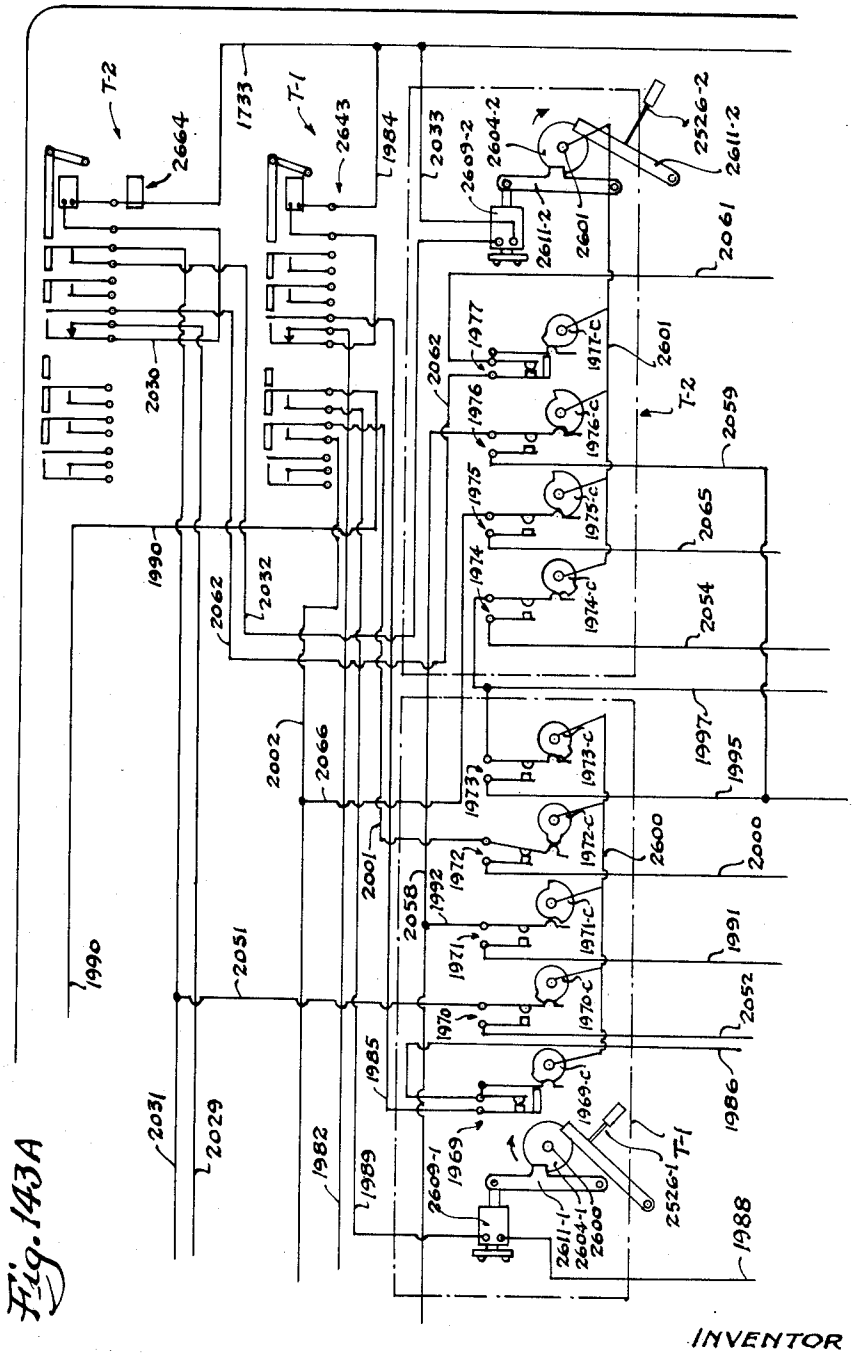

Fig. 143A

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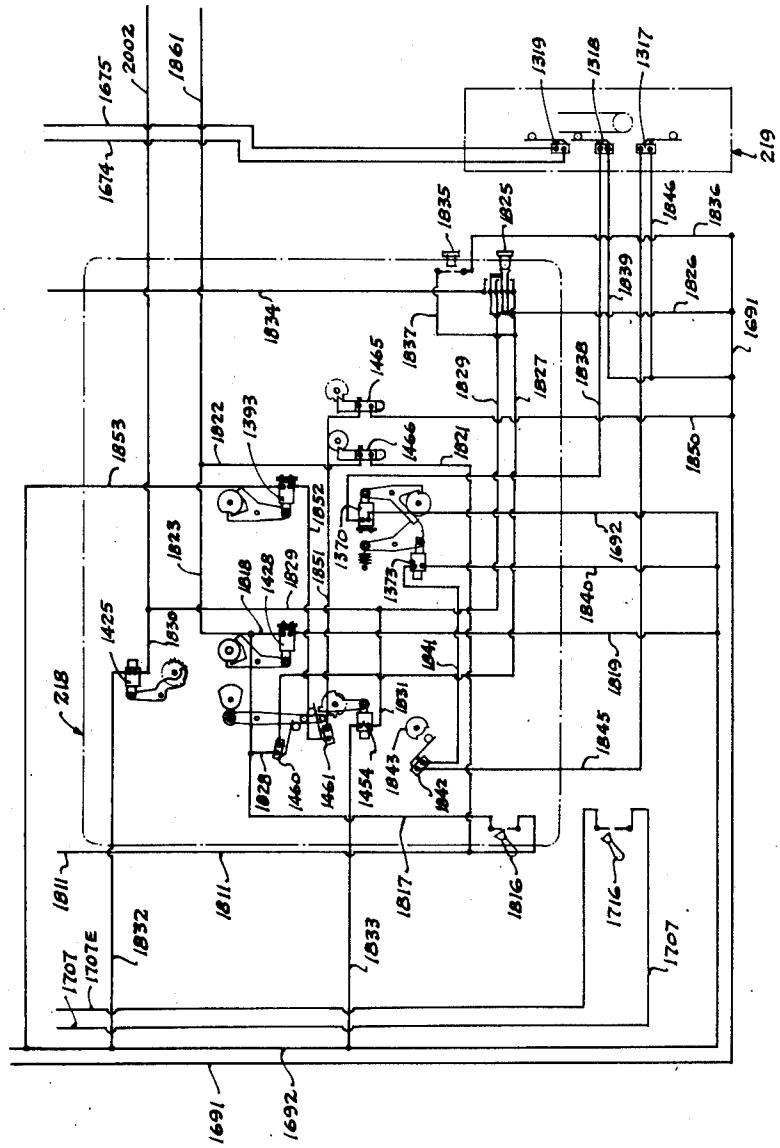

Fig. 144

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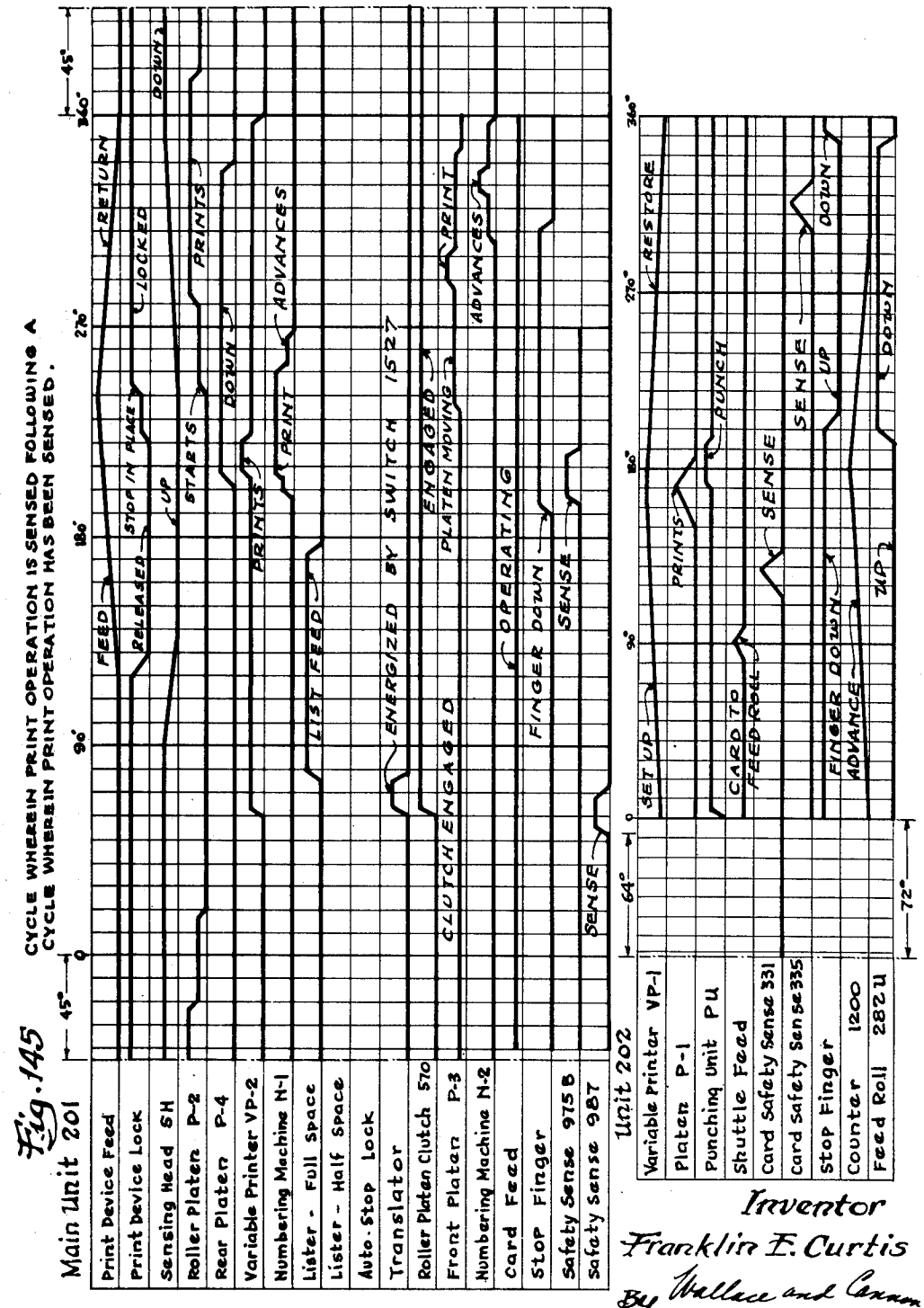

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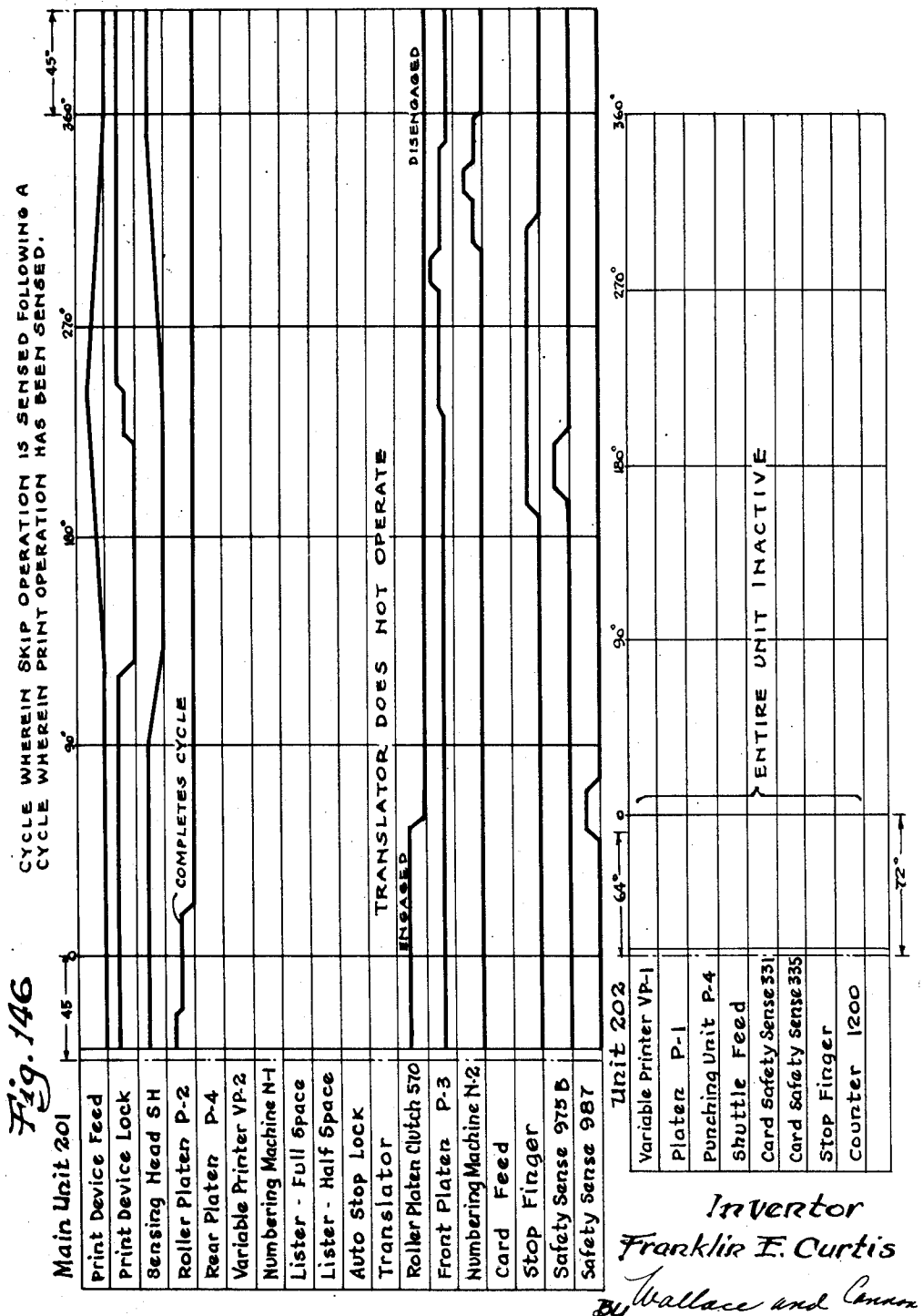

Fig. 146

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By Wallace and Cannon
Attorneys

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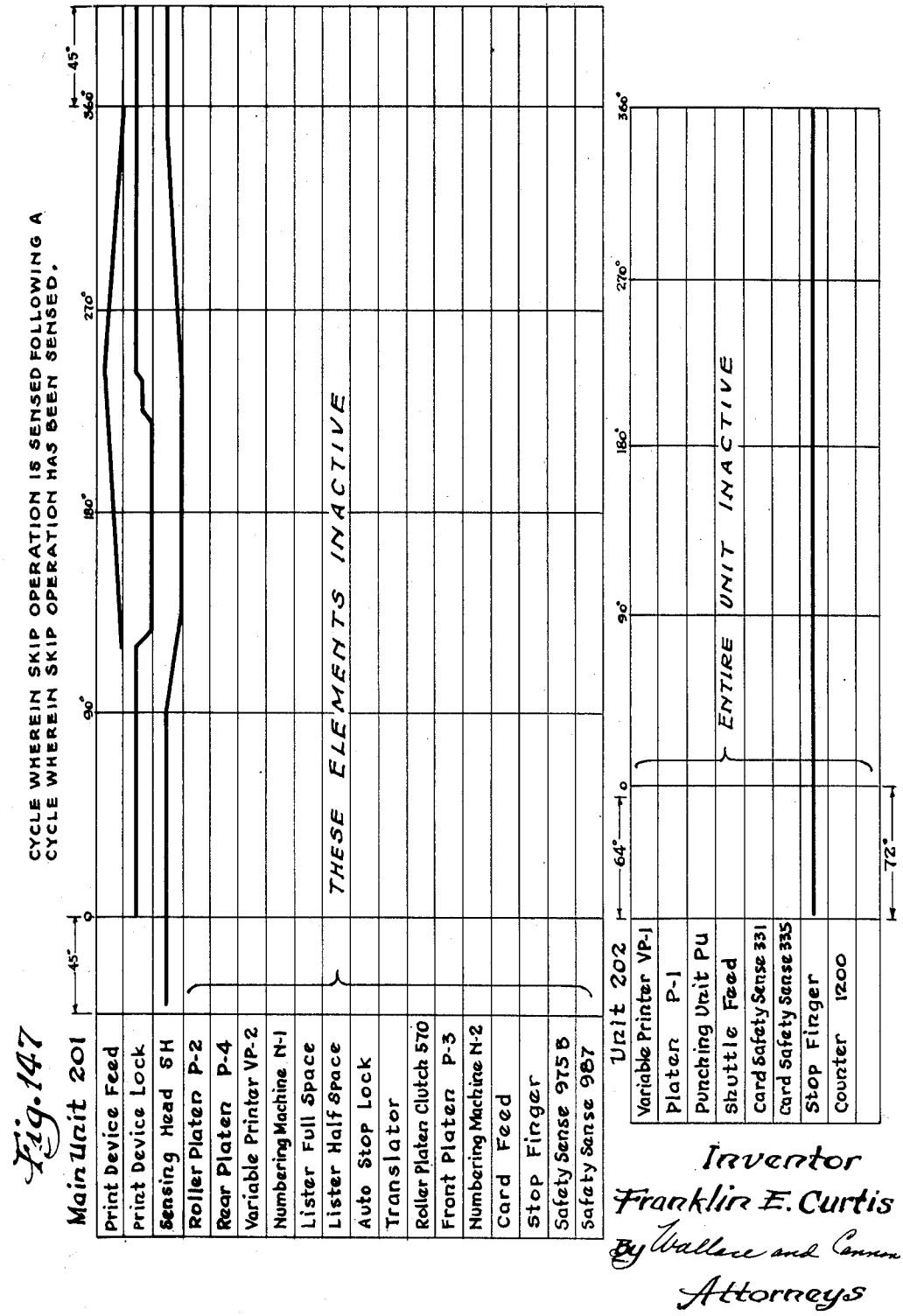

Fig. 147

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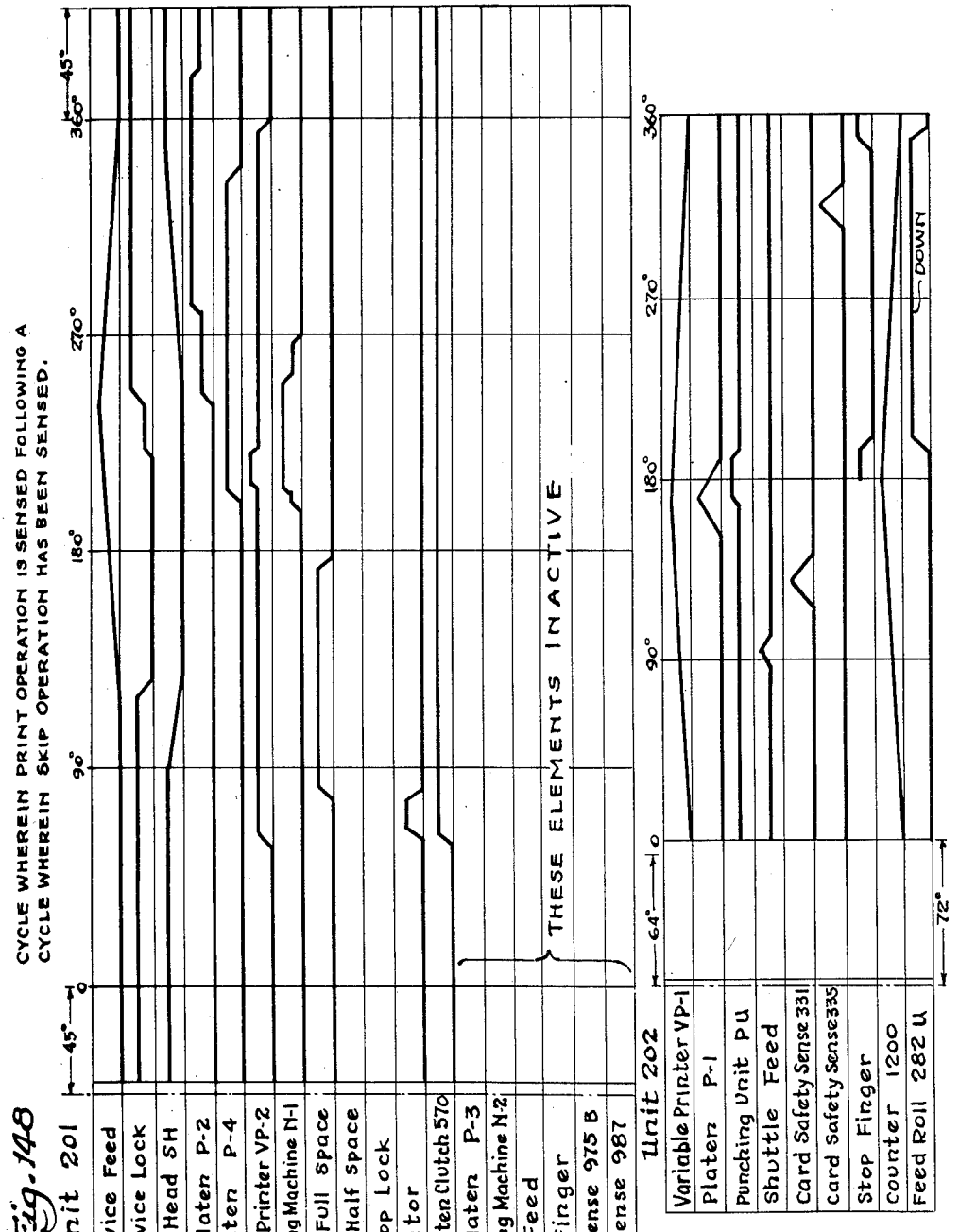

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By Wallace and Cannon
Attorneys

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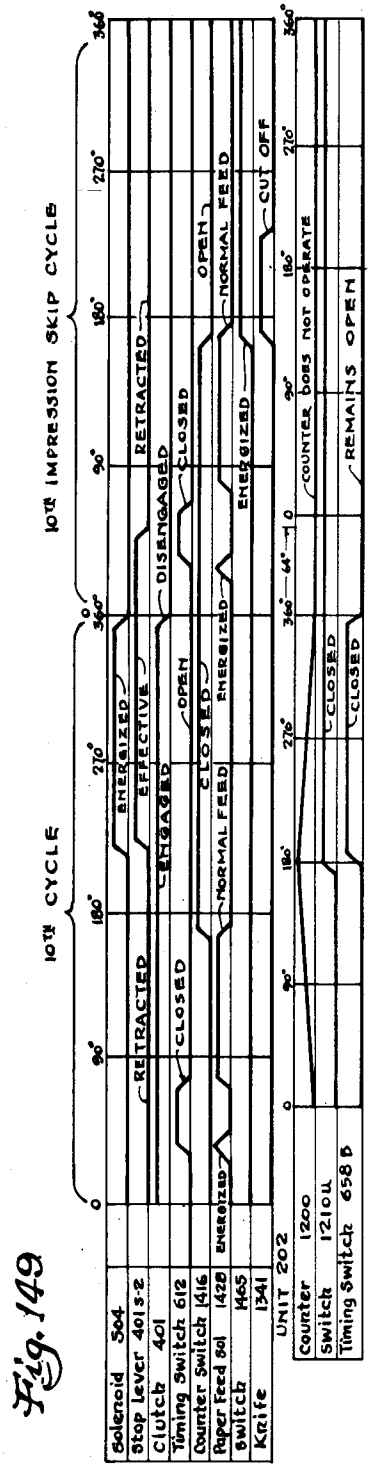

Fig. 149

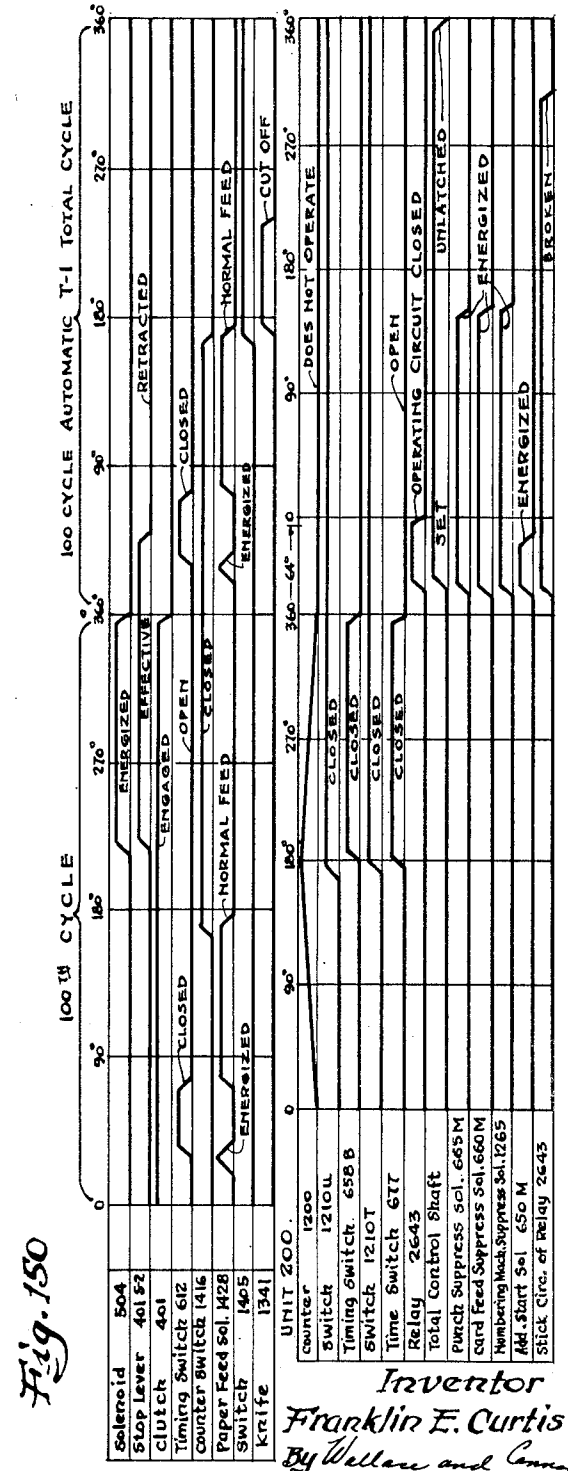

Fig. 150

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Oct. 20, 1953 F. E. CURTIS 2,656,103

PRINTING MACHINE

Filed Feb. 24, 1949 73 Sheets-Sheet 73

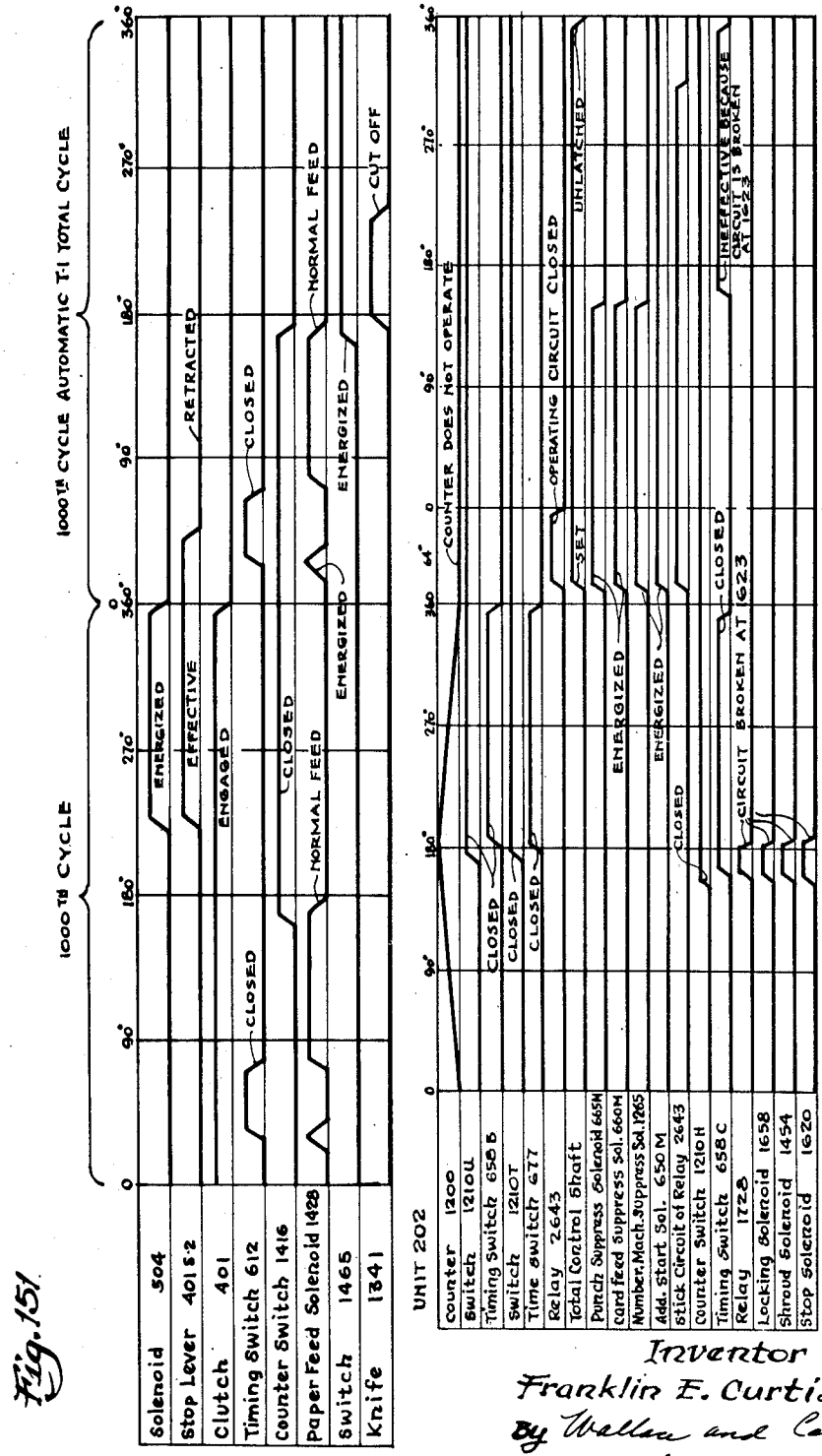

Fig. 151.

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Patented Oct. 20, 1953

2,656,103

UNITED STATES PATENT OFFICE

2,656,103

PRINTING MACHINE

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Application February 24, 1949, Serial No. 78,205

34 Claims. (Cl. 235—61.9)

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This invention relates to printing machines and particularly to printing machines for producing business instruments from and under control of individual printing and control devices that are passed one by one through the machine.

In the production of checks, bills and like business instruments that involve money amounts, it has been found to be advantageous to utilize individual printing and control devices for the printing of the changeable data included in the successive business instruments, and since such printing and control devices may bear coded representations of numerical amounts, it is also advantageous to utilize such coded data representations for controlling the printing of money amounts on such business instruments. The primary object of the present invention is to facilitate such use of printing and control devices in the production of business instruments, and a further and related object is to enable this to be accomplished in such a way that proof sheets may be concurrently produced showing the changeable data and the money amounts included in such individual business instruments.

Where individual printing and control devices are passed through a machine for the production of business instruments, the numerical or money amounts that are to be produced in printed form on the individual business instruments are governed by the coded data representations included on such printing and control devices, and a further object of the present invention is to enable such data representations on individual printing and control devices to concurrently govern and set up all of the printing and other means which are to produce numerical data on the individual sheets as well as on the proof sheets.

Further and related objects of the present invention are to enable punching means and printing means to be concurrently set up, and to enable this to be readily accomplished from and under control of data representations carried by individual printing devices. More specifically, it is an object of the present invention to afford a simple and positive interconnection between the set-up means of a variable printing mechanism and a punching mechanism so that these mechanisms will be concurrently set up to produce representations of identical numerical amounts. A related object is to utilize such a variable printer including accumulating means and to so interconnect the driving mechanisms of such a variable printer and punching mechanism that the variable printer may, upon occasion, be utilized to take and control the printing of totals while the punching mechanism remains inactive, and more specifically, it is an object to enable the feeding of individual business instruments through the machine to be controlled by the punching mechanism while the set-up of the total control means are controlled by the variable printer and its related adding mechanism.

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In printing machines of the character to which the present invention relates, it is desirable to cause continuous operation of the machine wherever possible, and to this end means have been afforded in prior machines whereby a new supply of printing and control devices might be loaded into the machine during continued operation of the machine, and means have also been afforded for enabling printing and control devices to be withdrawn from the collecting tray during continuous operation of the machine. Such means for enabling the removal of printing and control devices from the collecting tray have, however, been relatively complicated and expensive, and a further object of the present invention is to simplify the structure for accomplishing this result. A related object is afford resilient retaining means in the collecting tray for acting upon the printing and control devices to retain the same in upright positions, even though the most advanced of these printing and control devices may be manually removed from the tray, and a further object is to eliminate the necessity for the presence of a follower in a collecting tray in certain portions of the tray filling operations.

In printing machines of the aforesaid character, it is quite common to use roller platen structures whereby a resilient platen roller is moved across the paper so as to press the same into printing cooperation with the printing means of the printing and control devices, and an important object of the present invention is to improve such roller platen structures. More specifically, it is an object of the present invention to afford a printing machine in which a roller platen structure attains its printing cooperation with the printing means of the printing and control devices simply through movement of the platen in a horizontal plane, and a related object is to enable such a roller platen structure to attain the desired printing cooperation without the necessity for imparting upward or withdrawing movements to the platen roller at the end of its printing operation.

Printing machines of the aforesaid character are, of course, relatively complicated in their structure and operation, particularly where selector mechanisms are afforded for attaining print-skip operation of the machine under control of identifying means on the individual printing and control devices, and a further object of the present invention is to enable such printing machines to be constructed in major units that may readily be moved into assembled relationship. Other and related objects are to enable major units of such a printing machine to be connected together in such a way that drive or power connections between the individual units are established as an incident to the physical association of such units, and to enable selective set-up arrangements involving physical motion transmitting means to be similarly associated in the course of the connection of such machine units.

In the operation of machines of the aforesaid character where selector mechanism is employed, the operation of such selector mechanism is to prevent operation of mechanisms such as the platen of the machine where a printing device is to be skipped, and a further object of the present invention is to simplify the attainment of such controlling operations. More specifically, it is an object of the present invention to afford a control clutch arrangement in such printing machines whereby the clutch normally tends to remain in its engaged and driving relationship and wherein means are afforded for disengaging such clutch for but a single cycle in response to a simple control operation that is rendered effective upon the clutch control mechanism. More specifically, it is an object of the invention to afford a clutch mechanism which may be readily disconnected by a simple control operation that may be performed by electrical means, and to afford means in association with the clutch whereby in response to mechanical movements of the other elements of the machine the clutch may be quickly restored to its connected relationship in proper timed relationship with respect to movements of other elements of the machine.

Where sheets are fed through a printing machine by means including a feed tape, it is customary to employ skid rollers for maintaining the sheets in the desired engagement with the feed tape, and it is a further object of the present invention to improve the mounting of such skid rollers and to accomplish this in such a way that the skid rollers of the printing machine are readily shiftable as a unit from their normal operating positions to out-of-the-way positions so as to enable the sheet guideway to be readily cleared when the need to do this arises.

Where numerical data representations are included on printing and control devices and are utilized to govern associated means in the machine such as a variable printer, it will be recognized that a sensing operation performed at a sensing station when no printing device is present will normally cause a setting-up operation, because all of the sensing elements will become effective, and under normal conditions this obviously incorrect sensing operation would be transmitted to the mechanism that is set up or controlled in accordance with the sensing operation. It is, therefore, another and important object of the present invention to render the transmission of the results of such a sensing operation dependent upon the presence or absence

of a printing and control device at the sensing station, and more specifically it is an object of the present invention to sense the presence or absence of a printing device at the sensing station in each operation of the sensing means, and to govern the controlling action of the numerical sensing means in accordance with the sensed presence or absence of a printing and control device at the sensing station.

In printing machines of the aforesaid character in which selector mechanism has been used, it has been the usual practice to sense the identifying means of the printing and control devices in the cycle preceding the cycle in which the printing operation is to take place, and where it has been necessary to utilize such printing and control device to perform more than one printing operation, it has been necessary either to perform all of such printing operations in the next machine cycle, or to afford storage mechanism whereby to preserve the results of the selector operation until the subsequent cycle in which the additional impression is to be made from the printing and control devices. In view of the foregoing, it is a further object of the present invention to enable the sensing operations in respect to each printing device to be accomplished in the same cycle in which the first printing operation is to take place with respect to such printing device, thereby to simplify the operation and control of printing machines of the kind to which the present invention relates. More specifically it is an object of the present invention to enable printing and control devices to be sensed insofar as the identifying means thereof may be concerned in a first portion of a particular machine cycle, and to thereafter move the printing device to a first printing station where the printing operation is controlled in accordance with such sensing operation, and at the same time to set up the controls that are to be effective in the next machine cycle wherein the printing device will be advanced to another printing station. Related objects are to enable the sensing of the identifying means for selecting purposes to be accomplished in such a way as to materially simplify the setting up of related variable printers, punches and the like, and to accomplish this in such a way that the selector-control action on successive printing operations in respect to each printing and control device are materially simplified.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, shows a preferred embodiment of the present invention and the principle thereof and what I now consider to be the best mode in which I have contemplated applying that principle. Other embodiments of the invention embodying the same or equivalent principle may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention.

In the drawings:

Fig. 1 is a perspective view of a machine embodying my invention;

Fig. 2 is a plan view of a printing and control device of the nature passed through the machine illustrated in the accompanying drawings;

Fig. 3 is a diagrammatic view illustrating the code in accordance with which perforations are afforded in the printing and control device shown

in Fig. 2 to afford representations of numerical amounts;

Fig. 4 is an elevational view of a typical sheet printed in the machine shown in the accompanying drawings, this sheet in the present instance being in the form of a check;

Figs. 5, 6 and 7 are fragmentary elevational views showing different forms of proof sheets and totals imprinted thereon in the course of operation of the machine;

Fig. 8 is a plan view of a portion of the mechanism appearing at the right-hand end of Fig. 1 and in which the apparatus is illustrated with certain of the cover plates removed;

Fig. 8A is a view illustrating the way in which the counters on the punching unit serve to control switches associated therewith;

Fig. 9 is a vertical sectional view taken substantially on the line 9—9 on Fig. 8;

Fig. 10 is a transverse sectional view taken substantially on the line 10—10 on Fig. 8;

Fig. 11 is a fragmentary detail view taken substantially on the line 11—11 on Fig. 10;

Figs. 12, 13 and 14 are transverse sectional detail views taken substantially and respectively on the lines 12—12, 13—13 and 14—14 on Fig. 8;

Fig. 15 is a detail view taken substantially on the line 15—15 on Fig. 14;

Fig. 16 is a transverse sectional view taken substantially on the line 16—16 on Fig. 8;

Fig. 16A is a vertical sectional view illustrating the feed roller mechanism between the punching unit and the adjacent variable printing unit;

Fig. 16B is a view taken along the lines 16B—16B of Fig. 8;

Fig. 16C is a plan view of the mechanism shown in Fig. 16B;

Fig. 16D is a sectional view taken along the line 16D—16D of Fig. 16C;

Fig. 17 is a plan view of a portion of the apparatus illustrated at the left-hand end of Fig. 1 and in which certain parts are broken away;

Fig. 18 is a plan view of a portion of the apparatus illustrated in Fig. 17 and drawn to a larger scale than Fig. 17;

Fig. 19 is a transverse sectional detail view taken substantially on the line 19—19 on Fig. 18 and drawn to a larger scale than Fig. 18;

Fig. 20 is a vertical sectional view showing certain of the mechanisms illustrated in plan view in Figs. 8 and 17;

Fig. 21 is a vertical view drawn to an enlarged scale of the portion of the mechanism illustrated at the lower right-hand corner of Fig. 20;

Fig. 22 is a horizontal sectional view taken substantially on the line 22—22 on Fig. 21;

Fig. 22A is a cross sectional view illustrating details of an overrunning clutch, the view being taken along the line 22A—22A of Fig. 22;

Figs. 23 and 24 are fragmentary detail plan views of portions of the control mechanism for the apparatus illustrated in Figs. 21 and 22;

Fig. 25 is a plan sectional detail view taken substantially on the line 25—25 on Fig. 21;

Figs. 26 to 29, inclusive, are vertical transverse sectional views taken substantially and respectively on the lines 26—26, 27—27, 28—28 and 29—29 on Fig. 21;

Fig. 30 is a transverse sectional detail view taken substantially on the line 30—30 on Fig. 25 and drawn to a larger scale than Fig. 25;

Fig. 31 is a detail sectional view taken substantially on the line 31—31 on Fig. 30;

Fig. 32 is a perspective detail view of the driving means and controls therefor shown in Figs. 20, 21 and 22;

Fig. 33 is a vertical sectional detail view taken along the guideway through which the printing and control devices are advanced through the machine and looking toward the left as the machine is viewed in Fig. 1;

Fig. 33A is a sectional view taken along the line 33A—33A on Fig. 33;

Fig. 34 is a vertical sectional detail view taken substantially on line 34—34 on Fig. 33;

Fig. 35 is a sectional detail view drawn to an enlarged scale of a portion of the mechanism illustrated in Fig. 34;

Fig. 36 is a fragmentary detail view of a portion of the mechanism illustrated at the left hand end of Fig. 33 and drawn to a larger scale than Fig. 33;

Figs. 36A, 36B, 36C and 36D are sectional views taken substantially and respectively on the lines 36A—36A, 36B—36B, 36C—36C and 36D—36D on Fig. 36;

Fig. 36E is a sectional view taken along the line 36E—36E of Fig. 36D;

Fig. 37 is a fragmentary plan view taken substantially on the line 37—37 on Fig. 36 and drawn to a larger scale than Fig. 36;

Fig. 38 is a vertical longitudinal sectional view taken substantially on the line 38—38 on Fig. 37;

Fig. 39 is a sectional detail view taken substantially on the line 39—39 on Fig. 38;

Fig. 39A is a perspective detail view of a spring plate employed in the means effective to advance printing and control devices through the guideway therefor;

Fig. 40 is a fragmentary detail view taken substantially on the line 40—40 on Fig. 37;

Fig. 41 is a plan view similar to Fig. 37 showing the forward end of the guideway through which the printing and control devices are advanced through the machine;

Fig. 42 is a fragmentary plan view of a portion of the printing device guideway from which certain of the parts have been removed;

Fig. 43 is a longitudinal sectional view taken substantially on the line 43—43 on Fig. 41;

Figs. 44 and 45 are transverse sectional views taken substantially and respectively on the lines 44—44 and 45—45 on Fig. 37;

Fig. 44A is a horizontal sectional view taken substantially on the line 44A—44A on Fig. 33;

Fig. 46 is a transverse sectional view taken substantially on the line 46—46 on Fig. 41;

Figs. 47 and 48 are sectional detail views taken substantially and respectively on the line 47—47 and 48—48 on Fig. 33;

Fig. 49 is a transverse vertical sectional view taken along the platen mechanism of the illustrated machine looking toward the left as the machine is viewed in Fig. 1;

Fig. 50 is a detail plan view taken substantially on the line 50—50 on Fig. 49;

Fig. 51 is a vertical transverse sectional view taken substantially on the line 51—51 on Fig. 50;

Fig. 52 is a sectional view showing a portion of the apparatus illustrated in Fig. 51 in another position thereof and which is drawn to a larger scale than Fig. 51;

Fig. 53 is a longitudinal sectional view taken substantially on the line 53—53 on Fig. 54;

Fig. 54 is a fragmentary plan view taken substantially on the line 54—54 on Fig. 53;

Fig. 55 is a fragmentary detail view taken substantially on the line 55—55 on Fig. 54;

Fig. 56 is a fragmentary plan view of a portion of the apparatus illustrated in Fig. 54;

Fig. 57 is a sectional detail view taken substantially on the line 57—57 on Fig. 56;

Fig. 58 is a sectional detail view taken substantially on the line 58—58 on Fig. 54;

Figs. 59 and 60 are sectional detail views taken substantially and respectively on the lines 59—59 and 60—60 on Fig. 56;

Fig. 61 is a vertical fragmental elevational view of the drive unit for the platen devices illustrated in Figs. 49 to 60, inclusive;

Fig. 62 is a perspective detail view of a clutch arrangement employed in the drive unit shown in Fig. 61;

Fig. 63 is a vertical transverse sectional view taken substantially on the line 63—63 on Fig. 61;

Fig. 64 is a plan detail view taken substantially on the line 64—64 on Fig. 63;

Fig. 65 is a vertical transverse view of a portion of a special platen arrangement employed in the machine;

Fig. 66 is a vertical sectional view taken substantially on the line 66—66 on Fig. 65;

Figs. 67, 68 and 69 are detail views of the cam arrangement appearing at the lower end of Fig. 66;

Fig. 70 is a vertical view partly in section looking in at the front of the machine toward another of the platen devices employed in the machine;

Fig. 71 is a fragmentary detail view taken substantially on the line 71—71 on Fig. 70;

Fig. 72 is a plan view of the device illustrated in Fig. 70;

Fig. 73 is a plan view taken substantially on the line 73—73 on Fig. 70;

Fig. 74 is a fragmentary plan detail view of the portion of the printing device guideway that is associated with the platen mechanism shown in Figs. 70 and 72;

Fig. 75 is a longitudinal sectional view taken substantially on the line 75—75 on Fig. 74;

Figs. 76, 77 and 78 are transverse detail views, partly in section, illustrating safety devices employed in association with the feed illustrated in the machine;

Fig. 79 is a transverse sectional detail view, partly in section, of a portion of the driving elements employed in the machine;

Fig. 80 is a fragmentary plan view of a portion of the guideway through which the printing and control devices are advanced through the machine and showing a part of the sensing mechanism adapted for cooperation with the printing and control devices;

Fig. 81 is also a fragmentary detail plan view of the arrangement shown in Fig. 80 but from which the sensing head has been eliminated;

Fig. 81A is a detailed view of a guide element included in the structure of Fig. 81;

Figs. 82 and 83 are sectional detail views taken substantially and respectively on the lines 82—82 and 83—83 on Fig. 80;

Fig. 83A is a plan detail view of a plate included in the structure shown in Fig. 83;

Fig. 83B is a sectional detail view taken substantially on the line 83B—83B on Fig. 83;

Fig. 84 is a fragmentary perspective detail view showing the manner in which the two main units of the machine as illustrated in Fig. 1 may be separated one from the other;

Fig. 85 is a vertical detail view illustrating a portion of the elements including the unit appearing at the right-hand side of Fig. 84 through the intermediary of which interconnections are established between operative elements and devices respectively included in the units shown in separated relation in Fig. 84, such view being taken on the line 85—85 on Fig. 89;

Fig. 86 is a detail view of elements related to those shown in Fig. 85 as these are included in the unit appearing at the left in Fig. 84, such view being taken on the line 86—86 on Fig. 89;

Fig. 87 is a detail view, drawn to an enlarged scale, of the connecting devices shown in Fig. 86;

Fig. 88 is a schematic view illustrating the manner in which an operative connection is established between devices respectively included in the two units shown in separated relation in Fig. 84;

Fig. 89 is a vertical view showing the interconnection established between operative devices respectively included in the units shown in separated relation in Fig. 84, these units and these elements shown in interconnected relation in Fig. 89;

Fig. 90 is a fragmentary plan view of the arrangement shown in Fig. 89;

Fig. 91 is a detail view taken substantially on the line 91—91 on Fig. 89;

Fig. 92 is a plan view of the elements included in the unit appearing at the right in Fig. 84 from which the cover plates have been eliminated to thereby disclose the mechanisms included in such unit;

Fig. 93 is a vertical sectional view taken substantially on the line 93—93 on Fig. 92;

Fig. 94 is a sectional view taken substantially on the line 94—94 on Fig. 92;

Fig. 95 is a fragmentary sectional detail view, drawn to an enlarged scale, of a portion of the translating mechanism illustrated in Fig. 94;

Fig. 96 is a fragmentary perspective detail view of a portion of a typical operating element included in the translating mechanism shown in Fig. 94;

Figs. 97 and 98 are sectional views taken substantially and respectively on the lines 94—94 and 95—95 on Fig. 92;

Fig. 99 is a plan sectional view of the driving mechanism for the device shown in Figs. 92 to 98, inclusive;

Fig. 100 is a sectional detail view taken substantially on the line 100—100 on Fig. 92;

Fig. 101 is a vertical view, partly in section, of the base unit of the adding and punching units and related mechanisms;

Fig. 102 is an end elevational view taken substantially on the line 102—102 on Fig. 101;

Fig. 103 is a vertical transverse view showing one side of a variable printing mechanism included in the main machine adjacent to the guideway through which the printing and control devices are advanced to the machine;

Fig. 104 is a transverse sectional view of the mechanism illustrated in Fig. 103;

Figs. 105 and 106 are sectional detail views taken substantially and respectively on the lines 105—105 and 106—106 on Fig. 103;

Fig. 107 is a plan detail view of one of the numbering mechanism employed in the machine;

Figs. 108, 109 and 110 are detail views illustrating the manner in which the numbering mechanism shown in Fig. 107 is retained in the machine;

Fig. 111 is a transverse sectional view through the pager and proofer mechanism embodied in the machine of this invention, the upper portion of this mechanism being shown in this view;

Fig. 112 is a view similar to Fig. 111 showing the lower portion of the pager and proofer mechanism and the relation thereof to the main machine;

Fig. 113 is a fragmentary view taken substantially on the line 113—113 on Fig. 112;

Fig. 114 is a sectional detail view taken substantially on the line 114—114 on Fig. 113;

Fig. 115 is a plan view of the pager and proofer mechanism illustrated in Fig. 111;

Figs. 116 and117 are sectional views taken substantially and respectively on the lines 116—116 and 117—117 on Fig. 115;

Fig. 118 is a plan sectional view taken substantially on the line 118—118 on Fig. 117;

Fig. 119 is a vertical sectional view taken substantially on the line 119—119 on Fig. 115;

Fig. 119A is a schematic perspective view showing the drive and control mechanisms of the pager and proofer;

Fig. 120 is a plan sectional view taken substantially on the line 120—120 on Fig. 119;

Fig. 121 is fragmentary plan view, partly in section, illustrating the means by which carbon paper is advanced between sheets fed through the pager and proofer mechanism;

Fig. 122 is a sectional detail view taken substantially on the line 122—122 on Fig. 121;

Fig. 123 is a sectional detail view taken substantially on the line 123—123 on Fig. 121;

Fig. 124 is a vertical view taken substantially on the line 124—124 on Fig. 121;

Fig. 124A is a vertical section illustrating a detailed construction of the carbon ribbon advancing means;

Fig. 125 is a fragmentary detail view taken substantially on the line 125—125 on Fig. 124;

Fig. 126 is a view in part take transversely of the guideway through which the printing and control devices are advanced through the machine and showing elements of a selector mechanism embodied in the machine;

Figs. 127, 128 and 129 are detail views taken substantially and respectively on the lines 127—127, 128—128 and 129—129 on Fig. 126;

Fig. 128A is a top plan view taken along the line 128A—128A on Fig. 126;

Figs. 130 to 133, inclusive, are schematic views showing control disks employed in the selector mechanism employed in Fig. 126;

Fig. 134 is a vertical fragmentary detail view of control devices employed in the machine;

Figs. 135 to 138, inclusive, are views taken substantially and respectively on the lines 135—135, 136—136, 137—137 and 138—138 on Fig. 134;

Fig. 139 is a detail view looking in at the right-hand side of Fig. 137;

Fig. 140 is a fragmentary detail view showing certain of the operative mechanisms illustrated in Fig. 137 in a different operative position;

Fig. 141 is a partially schematic view of the driving elements of the machine as included in the two units shown in separated relation in Fig. 84;

Fig. 141A and 141B are detailed views showing one of the disconnectable power transmitting devices;

Figs. 142 to 144, inclusive, are wiring diagrams of electrical circuits employed in the machine;

Fig. 143A is an enlarged portion of the structure shown in Fig. 143;

Figs. 145 to 148 are timing charts showing the various normal machine cycles where print-skip selector operation is attained;

Fig. 149 is a timing chart illustrating the operation of the machine in the eleventh space idle cycle;

Fig. 150 is a timing diagram illustrating the operation of the machine when an automatic total is taken after one hundred normal impressions; and

Fig. 151 is a timing chart illustrating the operation of the machine in an automatic total cycle taken after one thousand impressions.

GENERAL DESCRIPTION

For purposes of disclosure, the invention is herein illustrated as embodied in a printing and computing machine 200, Fig. 1, whereby sheets S, Fig. 4, in the form of card checks bearing both printed data and perforations representative of related numerical data may be produced from and under control of printing and control devices D that are passed one by one through the machine 200, and concurrently with the production of individual sheets S, proof sheets PS–1, PS–2 or PS–3, shown in Figs. 5, 6 and 7, respectively, are produced so that the information and related numerical amounts included in the individual sheets S that are produced are printed on the various proof sheets, together with appropriate totals.

The machine 200 illustrated in Fig. 1 of the drawings comprises two separately related main units 201 and 202, and a supplemental paper supply unit 203 that is also separably related to the units 201 and 202. The main unit 201 includes the primary printing mechanisms of the machine, while the unit 202 includes punching, printing, and accumulating mechanisms that are operated primarily from and under control of the printing devices D that are passed through the main printing unit 201 of the machine.

The sheets S are supplied to the various printing and punching mechanisms of the machine from a supply magazine CM that is located at the right-hand end of the unit 202, and sheets S are fed one by one to the left in Fig. 1 and through a sectional sheet guideway that includes a first section SG–1 extending along the top of the unit 202 and an aligned sheet guideway SG–2 that extends along the top of the unit 201, so that the sheets S, after passing the full length of the sheet guideway sections SG–1 and SG–2, are discharged from the left-hand end of the guideway SG–2 and onto a collecting stacker mechanism K shown in Fig. 1 of the drawings.

As such sheets S move along the guideway SG, they are brought to rest first at a printing and punching station 205, Fig. 1, such printing and punching station being located on the top of the unit 202. At this printing and punching station 205, identical numerical amounts are represented on the sheet S by a printed impression 206, Fig. 4, and by coded perforation 207, Fig. 4, and this numerical amount that is thus printed and punched on the sheets S is derived from a related printing device D that has been sensed in this same machine cycle at the sensing station of the machine, and from which printing and control device D, a printed identifying impression 208 that may take the form of a name and address, is to be thereafter printed when the particular sheet S reaches a printing station 210 that is afforded along the sheet guideway SG–2 on the unit 201 of the machine.

The printed impression 206 is formed on the sheet S by a variable printer VP–1 that is located in the unit 202 as shown, for example, in Figs. 8 and 9 of the drawings, and this variable printer

is of the same general construction as the variable printer disclosed in Figs. 37 to 90 of the application of Walter T. Gollwitzer, Serial No. 676,329, filed June 12, 1946, now issued as Patent No. 2,501,444, patented March 21, 1950. This variable printer includes an accumulator mechanism whereby totals of the numerical amounts set up on the variable printer VP–1 may be accumulated, and such totals may be printed as on the proof sheets PS–1 to PS–3 by a variable printed VP–2 that is included in the unit 201 and is set up under control of the variable printer VP–1, as will hereinafter be described.

As will be evident in Fig. 1 of the drawings, the variable printer VP–1 includes a platen P–1 that is disposed over the sheet guideway SG–1 so that the platen P–1 may be normally disposed in an elevated position to permit the desired movement of the sheets S along the sheet guideway SG–1, and yet this platen P–1 may be moved downwardly to serve as a backing member in the course of the production of the printed impression 206, as will hereinafter be described in detail.

The data representing perforations 207 are formed in the sheets S at the station 205 by a punching unit PU that is illustrated generally in Figs. 8 and 9, and this punching unit is substantially similar in most respects to the punching unit shown in the copending application of Walter T. Gollwitzer, Serial No. 587,579, filed April 10, 1945, now Patent No. 2,570,112, and reference may be had to such copending application for details of form and construction as well as for details of operation. It should be pointed out that this punching unit PU includes a plurality of selectively operable punches arranged in a plurality of orders, the punching mechanisms in certain of such orders being adapted for manual setting movement while the punching mechanisms in other of the orders are adapted to be automatically set up from and under control of data representations carried by the printing and control devices D, as will hereinafter be explained.

At the same time that the printed numerical impression 206 is produced by the variable printer VP–1 and the coded perforations 207 are formed by the punching unit PU in the sheet S at the printing and punching station 205, additional numerical data is represented on the sheet S by perforations 211 that are formed by the manually settable mechanism in the punching apparatus as will hereinafter be described in detail.

The printing devices D are supplied to the machine 200 from a magazine M located near the rear edge of the main unit 201, and these printing devices are advanced one by one in a forward direction toward the printing station 210, and in such movement, each printing device D comes to rest at a sensing station 212, Fig. 17, at which sensing station 212 numerical representations carried by the printing device D are sensed by a sensing head SH, shown for example, in Figs. 33 and 36, so as to control the operation of the unit 202 in producing the printed impression 206 and the coded perforations 207 on the sheet S. Each printing device D is then advanced to a printing station 214, Fig. 17, at which printed impressions 215 are made on the proof sheet, as PS–1.

The printed impression 215 is formed at the proofing station 214 by the action of a platen mechanism P–2 which, as shown in Fig. 33 of the drawings, is in the form of a roller platen mechanism that moves across the proofing station 214 parallel to the lines of embossed characters carried on the printing and control devices D. This platen mechanism P–2 is carried on a rigid printing frame 216 that is arranged so as to extend upwardly near the rear edge of the machine and then to extend forwardly so as to be disposed over the printing stations 214 and 210. The printing device D then advances in the same cycle to printing station 210 where the impression 208 is made in this cycle on the sheet S, such impression 208 being made from the embossed type characters 208–A on the printing device D. In producing such impression 208, the machine affords a platen P–3 that is shown, for example, in Fig. 33 of the drawings. This platen P–3 as herein illustrated, is of the stamper type and is carried on the rigid printing frame 218 forwardly of the platen P–2 and is, of course, disposed over the sheet guideway SG–2 at the printing station 210. Such printing device is thereafter advanced to a collecting mechanism as will hereinafter be described.

The proof sheets as PS–1 are produced in a pager and proofer mechanism 218, this mechanism being supported on the printing frame 216 above and forwardly of the printing station 210, and the paper is supplied to the pager and proofer magazine from a plurality of rolls R located rearwardly of the unit 202 on the paper supply unit 203. The webs W of paper from the several rolls R are threaded and guided through the machine near the bottom of the unit 201, and is then guided upwardly to the pager and proofer mechanism 218 through a diablo mechanism 219, Fig. 1.

When an impression 215 is made from a printing device D at the proofing station 214, the numerical amount that is printed at 206 on a related sheet S when such related sheet S is at the station 205, is also printed on the proof sheet at 220 in association with the related impression 215, and this numerical amount that is thus printed at 220 is printed by the variable printer mechanism VP–2, which is set up concurrently with the variable printing mechanism VP–1 which produces the impression 206 and the punching mechanism which produces the perforations 207. At the same time, at the proofing station 214, a serial number 221 is printed by a numbering machine N–1, Figs. 104, 106 and 107, this serial number 221 being printed on the proof sheet PS–1 in association with the identifying impression 215. This serial number 221 is also closely associated on the proof sheet PS–1 with the numerical amount impression 220, as will be evident in Fig. 5 of the drawings.

In the production of the numerical amount impression 220 and the serial numbering impression 221, a backing action is afforded by a platen P–4, Fig. 65, which is disposed over the proofing station 214 and which is carried on the rigid printing frame 216. The backing platen P–4 is generally of the stamper type, and is normally in the raised position illustrated in Fig. 65 of the drawings, and when an impression is to be made from the variable printer VP–2 and the numbering machine N–1, the platen P–4 is moved downwardly to the operative position in timed relation to the operation of the numbering machine N–1 and the printing elements of the variable printer VP–2.

A similar serial number 222 is printed on the corresponding sheet S, as will be evident in Fig.

4 of the drawings, and this serial number is printed by a numbering machine N–2, that is shown, for example, in Fig. 70 of the drawings. As will be evident, for example, in Fig. 70 of the drawings, the numbering machine N–2 cooperates with the stamper platen P–3 in producing the serial numbering impression 222. At the same time, a secondary impression 222A, which may include the date and other pertinent information of a reoccurring character, is made on the sheet S adjacent to a serial numbering impression 222, and as will hereinafter be described in detail, this supplemental impression 222A is made from a suitable embossed printing plate that is mounted on the shiftable mounting block of the numbering machine N–2.

Similarly, at the printing station 210, an identifying number in the form of an impression 223, Fig. 4, is made on the sheet S, and this impression is made on the sheet S by a manually settable numbering machine N–3, Figs. 70 and 71. At this same time, other reoccurring data may be printed adjacent to the impression 223, as at 223A, Fig. 4, and this supplemental impression thus may be made by an embossed printing plate carried on the mounting block of the manually settable numbering machine N–3. The identifying number 223 is in the nature of a group identification which remains the same on a larger number or group of sheets S.

The printing device D

The machine 200 that is herein illustrated is adapted particularly for use with printing devices D of the character shown in Fig. 2 of the drawings and as will be evident in Fig. 2. This printing device D comprises a flat carrier 225 of the general type shown in Gollwitzer Patent No. 2,132,412, dated October 11, 1938. This carrier 225 is formed from sheet metal and is generally rectangular in form, and on its upper face the carrier 225 has a plurality of retaining devices 226 whereby a plurality of printing plates and cards may be removably held in place on the upper face of the carrier. In the present instance, two embossed printing plates 227 and 228 are provided, and on these two plates 227 and 228, embossures are afforded for printing the identifying impressions 215 and 208 on the proof sheet PS–1 and the sheet S, respectively. Near the upper edge of the carrier 225, a movable index card 229 is held in position by certain of the retaining devices 226, and this index card 229 may carry a portion of the identifying text that is afforded by the embossures 208A. Between the index card 229 and the uppermost printing plate 228, a control area or field 230 is afforded in which coded data-representing perforations 231 may be formed, and as herein shown, such data-representing perforations are formed in accordance with the five element numerical code illustrated in Fig. 3 of the drawings. The five index positions of such code are arranged in a series of vertical columns as will be evident in Fig. 2, and perforations 231 may be made in these index positions so as to represent numerical amounts that are to be printed in association with the impression made from the embossed identifying data 208A carried by the printing device D.

Since the numerical amounts that are thus to be printed under the control of the perforations 231 may change from time to time, the retaining devices 226 on the printing device D may be utilized to retain the covering element over the field 230, thereby to enable the represented numerical amount to be changed merely by changing or substituting such covering member. In the present instance, this covering member takes the form of a card 232 which may constitute an index card upon which the represented numerical amount may be printed as at 233.

The numerical amount that is thus represented by perforations 231 in the field 230 is sensed by the sensing head SH, Fig. 33, when the printing device is in the sensing station 212, Fig. 17, and in order that proper sensing operation may be assured, the printing device D has a locating notch 234 formed in one end edge thereof as shown in Fig. 2 of the drawings.

In the instances where printing and control devices D are utilized to produce printed sheets or documents such as the sheet S and the proof sheet PS–1, it often happens that it is desirable to produce a sheet S from only selected ones of the printing devices D that are passed through the machine, and as will hereinafter become apparent, the present machine is adapted to so operate under the control of identifying means carried at one or more of a plurality of identifying positions afforded on the printing device. Thus, in the form illustrated in Fig. 2 of the drawings, the printing device D has a plurality of mounting positions disposed along the upper edge thereof to selectively receive identifying means in the form of tabs 236, and the production of a sheet S from any particular printing device D may be controlled by selector mechanism in accordance with the presence or absence of a tab at 236 at any selected position along the upper edge of the printing device D, as will hereinafter be described.

THE SHEET FEEDING MECHANISM

The sheets S, being afforded in the present instance in the form of card checks, are arranged to be fed into the right-hand end of the sheet guideway SG–1 by means of a card picker or shuttle mechanism 240, Figs. 8 and 9, and this shuttle mechanism is, of course, arranged directly beneath the supply magazine CM. The card magazine CM is supported on a frame 241 that projects to the right from the right-hand end of the unit 202 of the machine, and the bottom of the card magazine is provided by a plate 242 that constitutes an extension of the table top T–1 of the unit 202. On the opposite sides of the plate 242, fixed guide rails 245 and 246 are secured, these guide rails 245 and 246 being arranged to afford an extension of the sheet guideway SG–1. The cards or sheets S are supported over the plate 242 by upstanding guide members 247, and the cards or sheets S are held downwardly by a weight 248 so that the lowermost card may be readily engaged and advanced into the sheet guideway SG–1 by the picker or shuttle mechanism 240. At the left-hand end of the supply magazine CM, a gate is afforded by a transverse member 249 that is associated with the upstanding guide members 247, and the picker mechanism is arranged to advance the lowermost card or sheet S to the left and beneath the gate 249.

The picker or shuttle mechanism 240 is afforded by a longitudinally reciprocable slide or card picker 250 that is movable longitudinally beneath the supply magazine CM in a guide slot or guideway 251, and it is by reciprocation of the card picker 250 in the guideway 251 that the lowermost card is engaged and advanced in a left-hand direction in the sheet guideway SG–1.

The desired reciprocating movements of the card picker 250 are controlled in accordance with

the selector mechanism of the machine so that a card or sheet S is discharged from the magazine CM only when a printed and perforated sheet S is to be produced. Thus, in the present instance, the card picker 250 is actuated by a rocking arm 253 that is pivoted on the frame 241 on a horizontal pivot shaft 254. The upper end of the rocking arm 253 has a pin and slot connection 255 with the card picker 250 so that by rocking movement of the arm 253, the card picker 250 may be reciprocated. The desired reciprocation is imparted to the arm 253 by means including a link 257 which, at its left-hand end, is connected at 258 to an arm 259 that extends radially from a drive shaft 260, and, as will hereinafter be explained, the drive shaft 260 is rotated through a full revolution each time that a sheet S is to be discharged from the magazine CM. The right-hand end of the link 257 is operatively associated with the lower end of the rocking arm 253, and in the present instance this association is of such a character as to afford an overload release mechanism. Thus, the right-hand end of the link 257 has an upwardly extending notch 262 formed therein so as to be adapted to engage a laterally projecting pin 263 carried on the lower end of the rocking arm 253, and a spring 264 acting between the right-hand end of the link 257 and the shaft 254 serves normally to maintain the notch 262 in the desired driving engagement with the pin 263. The way in which the rotative movements of the actuating shaft 260 are controlled will be described in detail hereinafter.

When a card or sheet S is thus discharged to the left from the magazine CM, it passes through the gate 249 and into the bight of a feed-roller couple 270 that is located in association with the sheet guideway SG–1 so that the sheet is advanced to the left along the sheet guideway SG–1 and toward the printing and punching station 205.

The sheet guideway SG–1 is afforded by a pair of guide strips 271 and 272, as shown in Figs. 8, 14 and 16, these guide strips being secured in fixed positions on the table top T–1 in the proper spaced relation and in an aligned relationship with respect to the card magazine CM. As will be evident in Figs. 8, 14 and 16, the adjacent edges of the guide rails 271 and 272 are cut away at their lower corners as at 271A and 272A, thereby to afford a guideway that will be engaged by the opposite border portions of the sheet S so as to hold the sheets downwardly and in position against the table top T–1.

The advancing movement of the sheets S along the guideway SG–1 is attained through the successive action of a plurality of feed-roller couples, generally similar to the feed-roller couple 270, and the arrangement is such that the card or sheet S passes from one to the other of these feed-roller couples as the sheet moves along the sheet guideway SG–1.

In the course of the advancing movement of the sheet S along the sheet guideway SG–1, such sheet comes to rest at the printing and punching station 205, which is indicated in Figs. 8 and 9 of the drawings, and this is accomplished by means of a stop finger 275, Figs. 8, 9, 16, 16B, 16C and 16D. This stop finger 275 is arranged to be controlled in timed relation to the operation of the variable printing unit VP–1 and the punching unit PU, and this is accomplished by means including a control cam shaft that is driven in timed relation with the variable printing unit VP–1, as will be described.

As will be evident in Figs. 1, 8 and 9, the punching unit PU has an upwardly projecting punching head 280 that is disposed over the sheet guideway SG–1 somewhat to the right of the platen P–1, and the various feed-roller couples that are associated with the sheet guideway SG–1 must, of course, be distributed along the guideway between and on opposite sides of the variable printing unit VP–1 and the punching unit PU. Thus, between the gate 249 and the punching head 280, one additional feed-roller couple 281 is provided relatively close to the punching unit. Between the punching unit and the variable printing unit, a third feed-roller couple 282 is provided, and it might be observed that in some respects this couple 282 is somewhat different from the other feed-roller couples, as will hereinafter be explained.

To the left of the variable printing unit VP–1, two additional feed-roller couples 283 and 284 are provided, these feed-roller couples being in spaced relationship so that the feed-roller couple 284 acts to discharge the sheets from the sheet guideway SG–1 and into the sheet guideway SG–2, where the driving or advancing function is taken over by other means that are afforded in the unit 201 of the machine.

The several feed-roller couples are each arranged to include an upper roller which is driven, and a lower roller which is in the nature of an idler roller is afforded in the couples 281, 283 and 284, while the lower roller is in the nature of a driven roller in the feed-roller couples 270 and 282.

Thus, in respect to the feed-roller couple 270, attention is particularly directed to Fig. 12 of the drawings in which the details of the mounting and drive for the feed-roller couple 270 are illustrated. Thus, it will be evident that the picker or shuttle feed frame 241 has a pair of extensions 241E which are also shown in Fig. 9 of the drawings, and the plate 242 extends as shown in Figs. 8 and 12 substantially to the punching head 280 of the punching unit PU. The plate 242 has a clearance opening 285 formed therein as shown in Fig. 12, and the couple 270 has a lower driven roller 270L having the upper edge thereof extended through the clearance opening 285 and to a point just slightly above the upper surface of the plate 242. The lower feed-roller 270L is fixed on a rotative shaft 286, the opposite ends of which are supported in bearings 286B in the frame extensions 241E. The shaft 286 extends through what may be termed the rear bearing 286B and is connected by a coupling 287 to a shaft 288 and this shaft extends rearwardly through a bearing bracket 289 so that a bevel gear 290 on the rear end of the shaft 288 meshes with a bevel gear fixed on a drive shaft 292 that extends parallel to the sheet guideway SG–1. The bracket 289 is carried on the shaft 292 in a known manner, and this shaft 292 is in turn carried in a plurality of stationary bearing brackets 293 which are in turn fixed upon a mounting bar 294. The mounting brackets 293 also serve to support a similar drive shaft 295 that is directly above the shaft 292, and the shaft 295 serves to drive an upper feed-roller 270U of the couple 270. Thus, the roller 270U is supported at the forward end of the shaft 297 that extends rearwardly through a bearing bracket 298 which is pivoted on the shaft 295. At its

rear end, the shaft 298 has a bevel gear 299 fixed thereto, and this bevel gear meshes with a bevel gear 300 that is fixed on the shaft 295. Forwardly of the forward end of the bearing bracket 298, the shaft 297 extends under an adjustable guiding and spring pressure device 301, that serves to adjustably determine the downward pressure exerted by the roller 270U on the sheets as they pass between this roller and the lower driven roller 270L. Provision is also preferably made by means of an adjustable stop mechanism 302, to limit the downward movement of the shaft 297 and the bracket 298, and by this arrangement, the action of the feed-roller couple on the sheets may be accurately adjusted and determined.

The two shafts 292 and 295 are driven in timed relation and in opposite directions by meshed gears 303U and 303L that are fixed respectively on the shafts 295 and 292, and the two shafts are driven at the proper speed by means including a downwardly extending transmitting shaft 304, Fig. 13, which has a bevel gear 305 thereon meshing with a bevel gear 306 fixed on the shaft 292.

The brackets 293 are also arranged to support a timing cam shaft 308 that is disposed rearwardly of and parallel to the shaft 295, and the cam shaft 308 is driven in timed relation to the printing operations of the variable printing unit VP–1, by means including a downwardly extended transmitting shaft 309 and meshed bevel gears 310 and 311 fixed respectively on the shafts 308 and 309.

The couple 282 has a bottom roller 282L that is constructed and driven in a manner somewhat like the lower feed-roller 270L, hereinbefore described, this construction being shown in Fig. 16A of the drawings, and in respect to the upper roll 282U, it should be observed that this roll is also driven from the upper drive shaft 295 in a manner that is quite similar to the drive of the roller 270U. However, in association with the drive roller couple 282, an additional retaining feed roller couple 312 is provided. Moreover, provision is made for raising the upper feed-roller 282U when the sheet S is to remain stationary at the printing and punching station 205 during the printing and punching operations that are to be performed. Thus, as will be evident in Fig. 16A, the bracket 298—2 of the upper roller 282U has a rocking control arm 313 associated therewith, this control arm 313 being pivoted on an intermediate shaft 320 so that it extends rearwardly and is operatively associated with the timing cam 314 that is fixed on the timing shaft 308. The forward end of the arm 313 underlies a forward portion of the bracket 298—2 so that the roller 282U may be raised and lowered by the action of the cam 314.

The double roller 282L—312L is fixed on a driven shaft 315S that is mounted on a bracket 315L so that the upper edges of the rollers 282L and 312L extend upwardly through a clearance opening in the table top T–1, as shown in Fig. 16A. The upper roller 312U is mounted on a bracket 315U so as to be positioned in the sheet guideway SG–1 above and normally in contact with the driven roller 312L. The mounting of the roller 312U is accomplished by pivoting the bracket 315U to a fixed mounting block 316, as at 315P, and it will be observed that this mounting block forms part of a spring pressure device through which the shaft 297—2 of the upper feed-roller 282U passes so that the roller 282U is urged downwardly against the action of its control cam 314. The roller 312U acts by gravity to hold the sheet S against the driven roller 312L and hence the sheet is effectually urged at all times toward the stop finger and accurate registry is assured.

The other feed-roller couples are somewhat different in construction in that the lower roller thereof is in each instance an idler roller rather than driven roller. Thus, in respect to the feed-roller couple 281, attention is directed to Figs. 8 and 13 wherein it will be evident that the upper driven feed-roller 281U is mounted on a shaft 297—1 that extends rearwardly and is supported at its rear end in a bearing 298—1. This shaft 297—1 has a similar bevel gear driving connection with the upper drive shaft 295, and a spring pressure device 301—1 is associated with the shaft 297—1 to enable the downward pressure of the roller 281U to be adjusted.

The lower roller 281L extends upwardly through a clearance opening 285—1 in the plate 242, and this lower roller is supported on a stub-shaft 286—1 that is carried in a bracket 317 fixed in position beneath the plate 242.

The feed-roller couples 283 and 284 are similar to the couple 281 just described, and are driven in the same manner, but the location thereof is somewhat different transversely of the guideway SG–1, as will be evident in Fig. 14, wherein the structure of the feed-roller couple 283 is illustrated. Thus, it will be evident that this feed-roller couple is disposed relatively close to the rear rail 271 of the sheet guideway SG–1, the lower idler roller 283L being arranged to extend upwardly through a clearance opening 285—3 in the table top T–1. In other respects, this feed-roller couple is substantially the same as the feed-roller couple 281.

As the sheets S are advanced through the sheet guideway SG–1, they are brought to rest at the printing and punching position 205 by the stop finger 275, Figs. 8, 16B, 16C and 16D, and this stop finger is pivotally mounted on the shaft 320 that is parallel to the shaft 295 and is supported somewhat rearwardly of this shaft by the several brackets 293. The stop finger 275 extends rearwardly beyond the mounting shaft 320 and has a cam roller 275R thereon arranged to extend beneath a timing cam 321 that is fixed on the timing shaft 308. For cooperation with the stop finger 275, a stationary guide member 322 is mounted on a stationary mounting bar 323 so as to extend into a position over the guideway, and a forwardly extending arm 322A is arranged to overlie a portion of the leading end edge of a sheet so as to guide such end edge into the proper relationship with respect to the stop finger 275. The forward end portion of the stop finger 275 is guided in a vertical slot 322S formed in the guide member 322, and a spring 275S acting between the stop finger and the member 322 urges the stop finger downwardly against the action of its control cam 321. Near its forward end, the stop finger 275 has a downward projection 275P which extends downwardly to the left of the left end of the guide plate 322A to effectually stop the sheet S when the stop finger is lowered.

Just to the right of the stop finger 275, a sensing arm 325 is provided for determining whether or not a sheet S has moved into position at the station 205, and this sensing arm 325 is afforded by a main lever 325A that is pivotally mounted

on the mounting shaft 320. The rear end of the lever 325A has a roller 326 thereon which engages the lower edge of a cam 327 that is mounted on the timing shaft 308. The forward end of the lever 325A extends beneath the shaft 235 in spaced relation thereto, and at its forward end the lever 325A has an adjustable extension 325B that is pivoted at 328, Fig. 16, and a clamping screw and nut device 329, Fig. 16, enables the forward end of the adjustable extension 325B to be accurately adjusted in a vertical direction in respect to the location of the lever 325A. The forward end of the lever 325 is urged in a downward direction by a spring 330 that is connected between the extension 325B and the stationary arm 322, and this tends to cause a sensing pin 331 that is carried by the forward end of the extension 325B to move downwardly through a clearance opening 332 that is formed in the table top T–1 just to the right of the stop finger 275. At the time when a sheet S is about to be advanced into the station 205, a lobe 327L on the cam 327 actuates the sensing lever 325 so as to withdraw the sensing pin 331 in an upward direction, thereby to allow such a sheet to advance beneath the sensing pin 331 and into contact with the stop finger 275. The lobe 327L then moves out of engagement with the roller 326 and the sensing pin 331 is moved yieldingly in a downward direction by the spring 330. Thus, if the sheet is in position at the station 205, the sensing finger will engage this sheet S and will not complete its downward movement. When, however, the sheet S has failed to move into the proper position in the printing and punching station 305, the sensing finger 331 is moved downwardly to the position shown in Figs. 16 and 16D of the drawings, and when this occurs, an actuating finger 333 carried on the extension 325B, as shown in Fig. 16, moves downwardly through a clearance opening 332R that is formed in the table top T–1 just rearwardly of the sheet guideway SG–1. When this occurs, the actuating finger 333 engages the plunger of a control switch 334 that is included in a circuit, as will be hereinafter described, in such a way that this actuation of the switch 334 will cause the machine to stop.

After the desired printing and punching operations have been performed at the station 205, the stop finger 275 and the sensing arm 325 are raised and the upper feed-roller 282U is lowered, thereby to cause the sheet S to move in an advancing direction toward the left in Fig. 8 and into the bight of the feed-roller 283. The sheet or check S is thus advanced by the feed-roller couple 283 into the bight of the feed-roller couple 284, and after the card has moved to substantially the position shown in dotted outline in Fig. 8, it is desirable to verify the advancing movement or positioning of such sheet. For this purpose, a sensing roller 335 is mounted on a lever 336 which is pivoted on the mounting shaft 320. The sensing roller 335 is arranged so as to be lowered with a yielding action when the sheet S reaches the position shown in dotted outline in Fig. 8, and this is accomplished by a timing cam 337 on the shaft 308 that is arranged at its lower edge to act on the rearwardly extended portion of the lever 336. Thus, the sensing roller 335 is moved downwardly with a yielding action, and in the event that the sheet S has not been properly discharged from the printing and punching station 205, and is not in substantially the position shown in Fig. 8, then this sensing roller 335 passes through an appropriate opening 338 formed in the table top T–1 and actuates a switch 340 that is arranged to act in the same manner as the switch 334, thus to cause the machine to be stopped.

When the sheet S is discharged from the left-hand end of the sheet guideway SG–1, it passes into a right-hand end of the sheet guideway SG–2 of the main unit 201 of the machine. This sheet guideway SG–2 is afforded by a stationarily mounted rear rail 350 that has a slot 350S formed in its forward edge so that the rear edge of the sheet S may travel longitudinally along the slot 350S. Near the right-hand end edge of the unit 201, the rail 350 is formed as a separate section 350A, which is independently mounted, and in this portion of the guideway, the bottom of the sheet guideway SG–2 is afforded by a plate 351. Just to the left of the plate 351, however, the bottom of the sheet guideway is afforded by a removably mounted plate 352, the rear edge of which is arranged to slide rearwardly into a plurality of spring retaining brackets 353, Fig. 19, so as to support the rear edge portion of the plate 352 in engagement with the lower face of the rail 350.

The plate 352 serves to carry the front portion of the sheet guideway SG–2, and as shown in Figs. 18 and 19, the forward side of the sheet guideway is afforded by a rail 354 that is secured on the upper surface of the plate 352. Beneath the rail 354, a plurality of pins 355 project downwardly so that these pins may enter recesses 356 formed in a supporting rail 357 of the machine frame, and thus when the rear edge of the plate 352 is in position on the brackets 353, the retaining pins 355 may move into the position shown in Fig. 19.

The advancing movement for the sheets S in the sheet guideway SG–2 is caused by a driven belt 358 that extends along the upper surface of the plate 352 just rearwardly of the rail 354, and a sheet S is held in engagement with the driving belt 358 by means of a plurality of angularly disposed skid rollers 360 that are so arranged as to cause the forward edge of the card S to engage with the edge of the forward guide rail 354.

It is well understood in the art to which the present invention relates that it sometimes becomes necessary to remove the sheets S from the guideway without the aid of the driving or feeding mechanism, and to enable this to be done, the skid rollers 360 are arranged so that they may be readily and easily moved out of their normal positions to enable ready access to the sheets S in the guideway SG–2.

Thus, as will be evident in Figs. 17, 18 and 19, the various skid rollers 360 are carried on resiliently mounted supporting arms 361, and all of these arms are in turn carried on a common mounting rail 362 that extends longitudinally of the sheet guideway. This mounting rail 362 is in turn carried on a plurality of forwardly projecting arms 364 that are pivoted by means of pivot pins 365. These pivot pins 365 are all in alignment as will be evident in Figs. 17 and 18, and such pins are fixed in position in supporting blocks 366 carried on the rail 354. The forward ends of the arms 364 are arranged for sliding movement along their respective supporting pins 365, and each pin 365 has an expansive coil spring 367 disposed in a surrounding relation thereto and acting between the supporting block 366 and the related arm 364 so as to urge such arm in a left-hand direction, Fig. 18.

When the mounting rail 362 is in its normal position, shown in full lines in Fig. 19, each arm

364 is arranged so as to be disposed beneath a retaining lip 368L formed on a retaining block 368. The arrangement is such that by moving the mounting bar 362 to the right from the position shown in Fig. 18, the respective arms 364 may be moved out of engagement with respect to the retaining lip 368, and when this is done, the entire skid roller assembly may be moved upwardly and forwardly about the pivots 365 and into the out-of-the-way position shown in dotted outline in Fig. 19 of the drawings. This enables any sheets that may be in the sheet guideway SG–2 to be engaged near their forward edges and lifted out of the sheet guideway SG–2, and thus the use of the machine is materially simplified.

As will be evident in Fig. 20 of the drawings, the feed tape or belt 358 is guided at its opposite ends by supporting rollers 370 and extends downwardly to driving mechanism included within the unit 201 so that this belt 358 may be operated in those machine cycles when a sheet S is to be advanced through the unit 201.

THE POWER SUPPLY AND TRANSMISSION MECHANISMS

The driving power for the various mechanisms of the present machine is derived from a constantly driven motor 375 that is shown in Figs. 49 and 141, this motor being included in the base of the main unit 201. The motor 375 has a belt connection 376 from a relatively small pulley 377 on the motor shaft to a relatively large pulley 378 mounted on a main drive shaft 380, and the pulley 378 is preferably connected to the main drive shaft 380 by means including an overload release mechanism 381. The principal power transmitting and controlling mechanisms are shown schematically in Fig. 141 of the drawings, and for the purposes of the present general description, particular attention is directed to this schematic view. Thus, the main drive shaft 380 has a right-hand extension 380E that extends to the right-hand end of the main unit 201, and one element 382–1 of a releasable drive connection 382 is fixed on this extension 380E. Within the lower portion or base of the unit 202 of the machine, a shaft 383 is mounted, and this shaft 383 has an extension 383E extended to the left and carrying the other element 382–2 of the releasable connector 382 so that when the releasable connector 382 is connected, the rotative motion of the shaft 380 will be transmitted to the shaft 382 in the unit 202 of the machine. It will be observed that the extension 383E is connected to the shaft 383 by a universal joint 384 so as to simplify the connection of the units 201 and 202 as will hereinafter be described. Thus, a constant source of power is afforded by the shaft 380 in the unit 201 and by the shaft 383 in the unit 202, and within these respective units, the power is transmitted through various gearing and clutch arrangements whereby the desired operating and control relationships are attained.

The drive and control elements in the unit 201

Thus, in the main unit 201, the shaft 380 is connected to a main gear box 390 by means including a pinion 391 fixed on the shaft 380, and is also connected to a second gear box 392 by means including a pinion 393 that is also fixed on the shaft 380. The gear box 392 serves as the driving and control means for the roller platen P–2, as will hereinafter be explained, while the gear box 390 is arranged to afford actuation and interrelated control for the main stamper platen P–3, the printing device advancing mechanism, the stop finger mechanism at the main printing station 210, the feed belt or tape 358 and the related mechanisms. Thus, as will be evident in Figs. 21, 32 and 141, the pinion 391 is meshed with a relatively large gear 395 that is loosely mounted on an upper shaft 396. The shaft 396, as well as the main shaft 380 are supported in spaced and rigidly related mounting plates 397A, 397B and 397C, and these plates are held in rigid spaced relation by means including tie rods 398 and spacer sleeves 399.

The pinion 391 and the gear 395 are located a short distance to the right of the plate 397B, as will be evident in Fig. 21 of the drawings, and the gear 395 has a sleeve 400 fixed thereto and extended to the right so as to afford the driving element of a one-revolution clutch 401 which constitutes the main clutch of the present machine. This clutch includes a driven member 401D that is supported in fixed relation on the shaft 396 by a sleeve 402 which is pinned to the shaft and projects to the right as shown in Fig. 21, and this sleeve 402 constitutes the driven element of another clutch 403 that includes a driven member 403D that is also loosely mounted on the shaft 396. The driven member 403D has a bevel gear 404 fixed thereto, and this bevel gear constitutes the power output member for the clutch 403. An eccentric mechanism 405 is associated with the shaft 396 to afford a ribbon drive in a conventional manner, thereby to advance the inked ribbons of the machine whenever the main shaft 396 is operated.

While the specific structure of the clutches 401 and 403 will be described hereinafter, it might be pointed out that these clutches are of the one-revolution type and each of the clutches is adapted to be controlled by a plurality of control elements. Thus, the clutch 401 has a stop lever 401S–1 that constitutes the main stop lever for disengaging the clutch 401, and a second stop lever 401S–2 is also provided which may be utilized to disengage the clutch 401 at certain times in the operation of the machine in order to effect proper operation of the machine under control of its elector mechanism. The clutch 403 has a main stop lever 403S–1 and a supplemental stop lever 403S–2 that may be similarly utilized in respect to the clutch 403.

The clutch 403 serves as the driving means for the main stamper platen P–3, and drive is, therefore, transmitted from the bevel gear 406 that is fixed on the lower end of an upwardly extending transmitting shaft 407, the shaft 407 being operatively connected to the platen P–3 as will hereinafter be described in detail.

So long as the main clutch 401 is engaged, the shaft 396 is constantly driven, and means are afforded between the plates 397B and 397C to utilize this constant power in driving certain other elements of the machine. Thus, the shaft 396, between the plates 397C and 397B, has a sleeve 409 pinned thereto as shown in Fig. 21, so as to constitute the driving element of a clutch 410. This clutch constitutes the control clutch for the printing device feed mechanism, and the clutch includes a driven member 410D that has a relatively long sleeve 411 fixed thereto so as to loosely support the driven member 410D on the shaft 396. The clutch 410 has a main stop lever 410S–1 and a supplemental stop member 410S–2 that may serve to disengage the clutch, as will hereinafter be described, and the sleeve 411 serves to carry the various power transmitting elements that are to be driven when the clutch 410

is engaged, such power transmitting elements being described hereinafter.

A substantial distance to the left from the clutch 410, a second clutch 415 is provided, this clutch having a driven element 416 that is pinned on the shaft 396 as shown in Fig. 21. The clutch 415 has a driven member 415D which is loosely mounted on the shaft 396 by means including a sleeve 417, and the clutch 415 is adapted to be controlled by either one of a pair of stop levers 415S–1 and 415S–2.

The clutch 415 is utilized to control the operation of the advancing belt or tape 358, and the stop finger and safety mechanism at the main printing station 210. Thus, the clutch sleeve 417 has a gear 418 loosely mounted thereon, and in normal operation of the machine, the gear 418 is arranged to be driven by the sleeve 417 through a single position, one-way clutch mechanism. As shown in Fig. 22A of the drawings, the gear 418 has a pivoted clutch dog 418D mounted thereon and urged by a spring 418S so as to tend to engage a tooth 418T of the clutch dog with a notch 417N formed in the sleeve 417. It will be observed that the notch 417N has a steep side or edge 417S which will engage the tooth 418T to drive the gear 418 in a counterclockwise direction, Fig. 22A. However, the other side of the notch 417N is sloping so that in the event it becomes desirable to advance the driven mechanism associated with the gear 418 independently of the clutch sleeve 417, this may be done and the dog 418D will ride out of the notch as the gear 418 is advanced in a counter-clockwise direction with respect to the then stationary sleeve 417. The gear 418 meshes with an idler gear 419 that is loosely mounted on a shaft 420 that extends between the plates 397B and 397C, the shaft 420 being located rearwardly of and slightly above the shaft 380. The idler gear 419 meshes with a gear 421 that is fixed on a shaft 425, and additional gears such as the gear 419A and the gear 421A may be associated, respectively, with the gears 419 and 421 so as to afford a change-speed relationship for driving the shaft 425 at different speed ratios with respect to the rotative speed of the shaft 396. This is done to enable what is termed multi-print operation to be attained, but in the present instance, the engagement of the gear 421 with the gear 419 drives the shaft 425 at such a speed ratio as to attain what is termed consecutive operation of the machine, or, in other words, operation in which a single document or sheet S is produced from each of the printing devices D. The shaft 425, of course, in such consecutive operation, is driven in a one-to-one relationship with respect to the shaft 396 and, therefore, the shaft 425 makes one revolution each time the clutch 415 is engaged for a single revolution.

The shaft 425 is arranged to drive the feed tape 358 and the stop finger mechanism at the main stamper platen P–3. Thus, as will be evident in Figs. 21 and 141, the shaft 425 has a bevel gear 428 fixed thereon which meshes with a bevel gear 429 fixed on a forwardly extending transmitting shaft 430 which is arranged to drive the feed tape 358 whenever the shaft 425 is driven.

The shaft 425 also has a bevel gear 433 fixed thereon that is meshed with a bevel gear 434 fixed on the lower end of an upwardly extending shaft 435 which is utilized to drive the stop finger mechanism and related means at the main stamper platen P–3, as will hereinafter be described.

The printing device feed clutch 410 serves, as hereinbefore pointed out, to control operation of the printing device feeding means, and the operation of the sensing head SH as will hereinafter be described, and the sleeve 411 that is driven by the clutch 410 also has a pinion 438 fixed thereon which is effective to drive the main timing shaft of the machine, as will hereinafter be described. As shown in Figs. 22 and 141 of the drawings, however, a gear 439 is meshed with the gear 438, and this gear is fixed to the shaft 420 so that the shaft 420 is driven in timed relation to the rotation of the driving element of the clutch 410. Substantially to the left of the gear 439, the shaft 420 has a gear 440 fixed thereon, and this gear affords a driving connection to the main timing shaft of the machine, as will hereinafter be described.

The drive shaft 380 also serves as a power source for the pager and proofer unit 218, and for this purpose a vertical transmission shaft 441 is connected at its lower end to the shaft 380 by bevel gears 442.

The main stamper platen P–3 must, of course, be governed by the selector mechanism of the machine so as to prevent operation of the platen P–3 when a particular printing device D is to be skipped, and in order to coordinate such selector operation and the operation of the platen P–3 with the multi-print operation of the machine when this is used, the operation of the clutches 403 and 415 are synchronized, and this is accomplished through connection of the stop lever 415S–2 with the stop lever 403S–2, the stop lever 415S–2 being the one that is directly controlled from the selector mechanism of the machine. The way in which the stop lever 415S–2 is governed will be described in some detail hereinafter, but for present purposes it should be pointed out that a latch 445 loosely mounted on a shaft 446 is arranged normally to be urged toward an engaged relationship with respect to a notch 447 in the stop lever 415S–2 so that when the latch 445 engages the notch 447, the stop lever 415S–2 will be maintained in its released position. A solenoid 448 has the armature thereof connected to the rear end of the latch 445 so that when this solenoid 448 is energized through the action of the selector mechanism as will hereinafter be described, the latch 445 will be released and under normal conditions the stop lever 415S–2 would tend to assume its stopping relationship. As will hereinafter be pointed out, this movement of the stop lever 415S–2 to its stopping position is delayed in multi-print operation until the completion of the final impression from the printing device that is then in printing position, and the mechanism by which this is accomplished will be described presently.

As pointed out hereinabove, the stop levers 415S–2 and 403S–2 are coordinated so as to move to their stopping positions at the same time, and this is accomplished by means including a sleeve 450 that is loosely mounted on a mounting shaft 451 which supports the various stop fingers of the various clutches. The sleeve 450 is fixed at one end to the stop lever 415S–2, and at its other or left end is fixed to a rocker lever 452. The rocking lever 452 is connected at its forward end to one end of a Bowden wire 453, the sheath 453S of which is anchored in a block 454 fixed to the mounting plate 397C. The other end of the Bowden wire 453 is connected to the rearwardly projecting end of the stop lever 403S–2, the adjacent end of the sheath 453S being anchored at 454 on the mounting plate 397A. The

clutch stop lever 403S–2 is urged to its normal stopping relationship by a spring 456, and hence when the stop lever 415S–2 moves to its stopping position, the actuation of the Bowden wire 455 allows the spring 456 to concurrently move the stop lever 403S–2 to its stopping position.

In consecutive operation of the machine wherein a single sheet S is to be produced from each printing device that is selected, the actuation of the solenoid 448 releases the latch 445 and the stop levers 415S–2 and 403S–2 move immediately to their stopping positions, but in multi-print work, it is desired to delay this movement of these stop levers to their effective positions, and this is accomplished under control of a cam 457, Figs. 21 and 26, this cam 457 being pinned on the multi-print control shaft 425 adjacent to the plate 397C and substantially in the plane of the rocking lever 452. The cam 457 has a dwell surface throughout substantially its entire periphery, and a recess 457R is afforded on the cam 457 in what may be termed the home position, such that a recess 457 is located at the lowermost position at the end of the revolution of the multi-print control shaft 425. The cam 457 is arranged to cooperate with a lever 458 that is pivoted at its forward end on a pivot 459 carried on the mounting plate 397C. Beneath the cam 457, the lever 458 has a cam roller 460 that bears against the periphery of the cam, and a spring 461 acting on the lever 458 maintains the roller 460 in engagement with the periphery of the cam 457. Rearwardly of the cam roller 460, a pivot block 463 is fixed on the lever 458, and a link 464 is slidably extended through a transverse bore in this pivot block 463. A pair of lock nuts 465 on the lower end of the link 464 afford an abutment that may be engaged by the block 463 to pull the link 464 in a downward direction. The upper end of the link 464 is connected by a pivot block 466 to the rear end of the rocking lever 452 so that when the cam roller 460 is in engagement with the dwell surface of the cam 457, the link 464 will be held in a lower position such that the stop lever 415S–2 will not be able to move to its stopping position even though the latch 445 may have been released. Hence, when the machine is being used in multi-print operation, the release of the latch 445 merely conditions the stop lever 415S–2 for its movement to its stopping position, and such movement will take place only when the cam recess 457R has reached the home position shown in Fig. 26, this occurring after the desired number of impressions have been made from the printing device that is at station 410 in the printing machine.

In Fig. 26 it will be noted that the latch 445 is in its engaged position so that the stop lever 415S–2 is in its released position, and because the latch 445 has not been released, the rocking lever 452 has remained in its most counterclockwise position, Fig. 26, even though the cam recess 457R is disposed in its home position opposite the roller 460. Under such conditions it will be observed that the link 464 remains in its lower position while the pivot block 463 moves upwardly so as to be slightly spaced above the lock nuts 465 as shown in Fig. 26.

The printing device advancing clutch 410 is arranged, as hereinbefore described, to drive the sleeve 411, and on this sleeve 411, a pair of complementary conjugated cams 470A and 470B are afforded for driving the printing device feeding mechanism and packing mechanism through a cycle of operation when the clutch 410 operates through its one revolution cycle. The conjugated cams 470A and 470B are arranged to cooperate with a cooperating rocker 471, Figs. 32 and 33, that has arms 471A and 471B extending in a diverging relation, and the arm 471A has a cam roller 472A fixed thereon so as to engage the upwardly and forwardly facing edge of the cam 470A. The rocking lever 471 is carried on a mounting sleeve 473 that surrounds the shaft 380 between the frame elements 397B and 397C. This sleeve 473 is schematically indicated in Fig. 22 at 473A for clarity, and the physical location is shown in Figs. 22 and 26 at 473. The lever 471 has its arm 471B formed so that it extends rearwardly so that a cam roller 472B engages the rearwardly and downwardly facing edge of the cam 470B. This relationship is such that the cam 470A actuates the rocker 471 in a counter-clockwise direction, Fig. 33, while the cam 470B actuates the rocker 471 in a clockwise direction, and thus the movement of the rocker 471 is positive in both directions. Such positive rocking movement of the rocker 471 is utilized as will hereinafter be described to operate the printing device feeding mechanism and the related backer mechanism.

The mounting shaft 473 also carries a rocking plate 475, and a cam roller 475A on the rocking plate 475 is arranged to engage the forward edge of a cam plate 479 that is also fixed on the sleeve 411, as will be evident in Figs. 21 and 22. This cam 479 is effective to rock the plate 475 in such a way as to enable the desired cycle of timed movement to be imparted by such plate to the plate positioning pawls that are associated with the printing device guideway, as will hereinafter be described.

In addition to the various cams just described, the sleeve 411 also carries a cam 480 that is utilized to effect the desired sensing operation of the sensing head SH. This cam 480 is arranged to be engaged by a cam roller 481 carried on the forward end of a lever 482 that is fixed on a mounting shaft 483. The cam roller 481 is urged toward engagement with the cam 480 by spring means that are associated with the sensing head SG, as will hereinafter be described, and the motion of the arm 482 is transmitted in an equalized and balanced manner to the sensing head SH by a pair of vertically extending links 485, one of which is pivoted at 486 to the rearwardly extended end of the lever 482, and the other of which is similarly connected to a similarly projecting arm fixed to the shaft 483 at an appropriate point thereon.

The clutches that are included in the present machine, including those that are mounted on the shaft 396, as well as other clutches to be presently described, are fundamentally of the same construction, but the control or stop lever mechanisms thereof are arranged in different ways so as to enable different controlling connections to be attained through the use of such clutches. The fundamental construction of such clutches may be described with reference particularly to the clutch 403, the details of which are illustrated in Fig. 29 of the drawings. Thus, it will be evident that the driving element 402 has a notch 490 formed therein that is adapted to be engaged by a tooth 491 afforded on one end of a relatively long and arcuately shaped clutch pawl 492. The driven member 403D of the clutch is generally of a cup-shaped form affording an outer flange 403F, and the clutch pawl 492 is mounted within the driven member of the clutch

by a pivot 493 anchored in the side wall of the clutch and disposed intermediate the two ends of the clutch pawl 492. A spring 494 disposed within the driven member 493D acts on the clutch pawl at the end adjacent to the clutch pivot 491 so as to tend normally to rock the clutch pawl 492 in such a direction as to engage the clutch tooth 491 with the notch 490 in the driven element such as the sleeve 492. When the clutch is to be disengaged, the clutch pawl 492 is rocked in a clockwise direction, Fig. 29, to thereby withdraw the tooth 491 from the notch 490, and this is accomplished by extending the other end of the clutch pawl 492 into an exposed position wherein it may be engaged by a stop mechanism such as a stop lever in the course of rotation of the driven member 493D of the clutch. For this purpose, the rim or flange 493F of the driven member of the clutch has a slot 495 formed therein, and the other end of the pawl 492 has a projecting tooth 492T that extends outwardly through the slot 495. Thus this projecting tooth 492T may be engaged by suitable stop mechanism, such as a stop lever, to cause the desired releasing movement of the clutch pawl 492.

The various clutches that are included in the machine have stop levers of different forms, one such form of stop lever being shown in Fig. 29 of the drawings. This stop lever is the stop lever 493S–2, and it will be observed that this stop lever extends over the rim of the driven member of the clutch and has a tooth 493T that extends downwardly and somewhat rearwardly so that the end of this tooth may rest against the outer periphery of the driven member of the clutch. When the stop lever 493S–2 is allowed to move in a counter-clockwise direction under the action of its spring 456, the tooth 493T engages the outer surface of the driven member 493D and is thus disposed in the path of the projecting tooth 492T of the clutch pawl. Hence, when the driven member advances, the tooth 492T engages the tooth 493T of the stop lever and the clutch is disengaged, and it should be noted that as such disengagement takes place, the end of the tooth 493T tends to enter into that portion of the slot 495 that is then disposed in a counter-clockwise direction from the location of the tooth 492T. When the clutch is to be again engaged, the stop finger 493S–2 is rocked in a clockwise direction, thereby to withdraw the tooth 493T to the position shown in full lines in Fig. 29 of the drawings. This releases the clutch pawl 492 so that its spring 494 may move the tooth 491 into the slot 490 of the driving sleeve when this slot 490 moves into alignment with the tooth 491.

It will be observed, of course, that the various clutches included in the machine are provided in most instances with at least two stop levers, and these stop levers may take different forms insofar as both actuation and control are concerned.

In Figs. 30 and 31 there is illustrated another form of stop lever that has been used in different ways in association with the various clutches used in the present machine. As shown in Figs. 30 and 31, the stop lever 401S–2 is provided with a notch 500 that is adapted to be engaged by a latch 501 that is mounted on the latch mounting shaft 448. This latch 501 has a spring 502 urging the same to its effective position, as shown in Fig. 32 of the drawings, and when the latch 501 is engaged with the notch 500, it acts to maintain the stop lever 401S–2 in its released or ineffective position, against the force of a spring 503 that tends to urge the stop lever to such effective or stopping position. A solenoid 504 has the armature thereof connected to the rearwardly projecting end of the latch 501 so that by energization of the solenoid 504 under control of the selector mechanism of the machine, the latch 501 may be released. When this takes place, the stop lever 401S–2 moves into its effective or stopping position, and means are associated with the stop lever 401S–2 whereby a moving element of the mechanism may thereafter shift the stop lever to its retracted or ineffective position wherein it will then be latched by the latch 501. For this purpose, an actuating pawl 505 is pivoted at 506 on the stop lever 401S–2, and this actuating lever 505 is urged in a counterclockwise direction by a spring 507 to a relationship that is determined by a laterally projecting stop 508 formed on the stop lever 401S–2. When the actuating lever or arm 505 is in this relationship, the lower end thereof, which is beveled as at 505B, is disposed in such a radially spaced relationship with respect to the axis of the shaft 396 that this beveled surface 505B may be engaged by a pin such as the pin 509. Such a pin 509 is so mounted that it is rotated about the axis of the shaft 396, and in respect to the clutch 401, this pin is carried on the driven element of the clutch. In other words, the pin 509 projects from the gear 395. With this arrangement, the momentary operation of the solenoid 504 causes the stop lever to move to its stopping relation so as to thereby disengage the clutch, and such disengagement is maintained only for a single revolution of the shaft 396. This result follows from the fact that the pin 509 which actuates the stop lever to its latched ineffective position is carried on the driving element. Therefore, the clutch as thus controlled constitutes a single revolution clutch disengaging means. It should be observed, however, that in other instances, the restoring of such a stop lever to its latched ineffective position may be rendered dependent upon operation of some related mechanism that is operated only intermittently rather than continuously as is the shaft 396.

Thus, in respect to the stop lever 415S–2, it will be observed that a control pin 512 extends to the right as shown in Figs. 25 and 32, and this pin 512 is fixed to a lever 513 that is carried on the shaft 451 in a loose relationship. The lever 513 is utilized in the present instance to carry a restoring lever 505A, and a stop 508A is arranged to cooperate with the lever 505A in the manner described in respect to Fig. 30. The lever 513, through its connection by the pin 512, may serve to actuate the stop lever 415S–2 to its retracted position, and in respect to this stop lever such return actuation is obtained by disposing the lower cam edge of the restoring lever 508A in a position wherein it may be engaged by a pin 514 carried on the cam disk 479. The cam disk 479 is fixed on the sleeve 411 that is actuated by the printing device feed clutch 410, and hence when the stop lever 415S–2 is unlatched by operation of the solenoid 448 so as to thereby move to its stopping position, such stop lever will not be immediately restored to its ineffective position as described in respect to the structure shown in Fig. 30, but will be returned to this ineffective position only when the next engagement of the printing device feed clutch 410 causes operation of the printing device feed mechanism, and particularly the sleeve 411 and the cam 479.

The stop lever 415S–1 is arranged so that it may be latched in its ineffective position by a latch 515, and as will be evident in Figs. 23, 25 and 32, this latch 515 is fixed to the latch shaft 446 by means such as a set screw, so that this latch may be released upon rocking movement of the latch shaft 446. The stop lever 415S–1 is shifted to its retracted position by means including a sleeve 513S that is mounted in a rotatable relationship on the shaft 451, and which serves as a bearing to loosely support the arm 513. At its left end, Fig. 32, the sleeve 513S is fixed to the stop lever 415S–1, while at its right end the sleeve has a rearwardly projecting lever 513L. At its rear end the lever 513L has a pivot block connection with the upper end of an actuating rod 516. A lateral ear on the lever 513L has a set screw 513A therein which is adapted to engage an underlying ear on a lever 451L that is fixed to the shaft 451. Thus, actuation of the stop lever 415S–1 also acts through the shaft 451 to release other stop levers as will be described.

At the clutch 410, the stop lever 410S–1 does not have a latching means of any kind, and the projecting rear end of this stop lever has a downwardly extending operating link 517 associated therewith whereby operation of this stop lever may be controlled by the cam mechanism associated with the multi-print shaft 425 as will hereinafter be described.

The stop lever 410S–2 is, however, arranged so that it may be latched in its ineffective position by means of a latch 518 that is fixed on the latch shaft 446 by a set screw as shown in Figs. 23, 25 and 32. The stop pawl 410S–2 extends rearwardly and has a downwardly extending operating rod 520 whereby the stop pawl 410S–2 may be actuated to its ineffective position by the main control mechanism of the machine as will hereinafter be described. The rearwardly projecting end of this stop lever has a laterally projected ear 521 thereon in which an adjustable set screw 522 is mounted, and this set screw 522 is arranged so that in the downward actuation of the control rod 520, the set screw 522 will engage an ear 523 on an arm 524 that is fixed as by a set screw on the stop lever mounting shaft 451. Thus, when the stop lever 410S–2 is actuated by the control rod 520, the arm 524 will be actuated so as to rock the shaft 451 and correspondingly shift certain other stop levers as will hereinafter be described.

The stop lever 401S–1 at the clutch 401 is mounted loosely on the shaft 451, and is urged downwardly toward an engaged relation by a spring similar to those hereinbefore described in respect to the various stop levers, and this stop lever 401S–1 is arranged so as to be moved to its disengaged relation concurrently with the stop lever 403S–1, this last mentioned stop lever 403S–1 being fixed on the mounting shaft 451 by means of a set screw so that this stop lever will be disengaged concurrently with the rocking movement of the shaft 451 that may be imparted thereto as, for example, by operation of the control rod 520. In order that the release of the stop lever 403S–1 may control the stop lever 401S–1, an ear 526 extends to the left from the stop lever 403S–1 so as to underlie an adjustable screw 527 carried on an extending ear 528 formed on the stop lever 401S–1.

It will be observed that the solenoid operated latches 445 and 501 are loose on the latch shaft 446, while the latches 515 and 518 are fixed to the latch shaft 446, and this latch shaft 446 may be rocked so as to concurrently release the latches 515 and 518. This is accomplished by an actuating arm 530 that is secured by a set screw to the latch shaft so as to extend rearwardly therefrom, and an operating rod 531 extends downwardly from the arm 530 so that this latch shaft 446 may be rocked in a proper timed relationship that is utilized particularly in connection with multi-print operations to enable a machine-stopping impulse or control operation to take place at any time, but at the same time to enable the effectiveness of the control operation to be delayed until completion of a particular series of multi-print operations which may then be in progress. Thus, the rod 531 extends downwardly, and at its lower end, this link 531 is associated with a rocking lever 532 that is pivoted on a stud 533, Fig. 21. The rod 531 has a spring 534 surrounding its lower end so that the lever 532 may exert a yielding upward pressure on the rod 531, thereby to yieldingly urge the latch shaft 446 in a latch engaging relationship. The lever 532 is arranged to have a cam follower relationship with the upper edge of a cam 535 that is fixed on the multi-print control shaft 425. The cam 535 has a dwell surface throughout substantially its entire periphery, and the lever 532 is arranged to cooperate with the upper edge of the cam 535. This cam, however, has a cam recess that is arranged to actuate an upper position when the shaft 425 is in its home position, and thus if a machine control stopping operation is performed at the time when the machine is in a multi-print cycle, the latches associated with the latch shaft 446 will remain effective until the recess in the cam 535 moves to its upper or home position, at which time the control rod 531 will be allowed to move downwardly so as to release the latches that are fixed on the latch shaft 446. This controlling operation takes place by reason of the way in which certain of the stop levers of the various clutches are related. Thus, it will be evident that the latches 515 and 518 will serve to maintain the stop levers 415S–1 and 410S–2 in their released positions. The clutch 415 will thus remain engaged and continue to drive the multi-print control shaft 425. With respect to the clutch 410, the stop lever 410S–2 will be maintained in its ineffective position, but in a multi-print operation this clutch will at this time be disengaged because of the downward movement of the clutch lever 410S–1, as will be described presently. Since the clutch stop lever 410S–2 is at this time in its ineffective position, the connection afforded by the ears 521 and 523 and the related screw 522 will hold the arm 524 in a predetermined position, and since this arm 524 and the stop lever 403S–1 are both fixed to the shaft 451, the stop lever 403S–1 will also be maintained in its ineffective position. Similarly, the ears 526 and 528 and the related screw 527 will serve to hold the stop lever 401S–1 in its disengaged or ineffective position. Hence, if the control operation has been performed in the course of a multi-print cycle of the machine, these various stop levers will be maintained in their ineffective positions until the completion of the multi-print cycle has caused the control rod 531 to release the latch shaft 446 for movement to its released position.

It was mentioned hereinbefore that in a cycle of multi-print operation, the stop lever 410S–1 is maintained in its effective position so as to prevent feeding of a printing device until a prede-

termined number of printing impressions had been made from such printing device, and this is accomplished by control rod 517 which extends downwardly and is associated with an operating lever 540 that is pivoted on the left-hand side of the mounting plate 397B as shown in Fig. 21 of the drawings. This lever is associated with the rod 417 by means including a spring 542, and the lever 540 is arranged to cooperate as a cam follower with the upper edge of a cam 543 fixed on the multi-print control shaft 425. This cam 543 has a dwell surface throughout substantially its entire periphery, and a cam recess is afforded in the edge in such a position that it will be faced upwardly when the shaft 425 reaches its home position. A spring 545 associated with the lever 540 urges this lever downwardly so that when the cam recess in the cam 543 reaches the upper position, the spring 545 will act on the lever 540 to withdraw the rod 417 in a downward direction. It will be evident, of course, that when a multi-print cycle is started, the rotation of the cam 543 will cause the rod 417 to be yieldingly raised, thereby to move the stop lever 410S–1 to its effective position. This stop lever will be retained in such effective position, thereby to suppress the printing device feeding operations until the rotation of the multi-print control shaft 425 has been completed.

In machines of the character to which the present invention relates, it is desirable that when the drive to any particular element is disconnected, such driven element be brought to rest definitely in its home position, and for this purpose mechanisms that may be termed indexing or locating devices are associated with such driven elements. Thus, as shown in Figs. 21 and 22, the clutch sleeve 417 has a locating disk 550 associated in a fixed relation thereto, and this disk has a notch therein that is adapted to be engaged by a positioning roller 551 that is carried on a spring urged rocking lever 552. This structure is illustrated in Fig. 26 of the drawings. It will be recalled that there is an overrunning connection between the sleeve 417 of the clutch 415 and the gear 418, and for this reason an additional indexing or locating device is associated with the multi-print control shaft 425. Thus, as will be evident in Fig. 21 of the drawings, a positioning disk 555 is fixed on this shaft adjacent to the mounting plate 397A, and a similar spring pressed locating lever is arranged to cooperate with a notch in the disk 555 when the multi-print control shaft 425 is in its home position.

As pointed out hereinbefore, the main high speed drive shaft 380 extends to the left and serves as a constant driving element for the mechanisms included in the gear box 392. Thus the gear box 392 includes spaced mounting plates 560 and 561 that are mounted in a spaced relation, and the shaft 380 extends through and between these two mounting plates. On the shaft 380, a pinion 563 is fixed so as to mesh with a large gear 564 that is loosely mounted on a shaft 565 that extends between the two mounting plates 560 and 561. This gear 564 is arranged to constitute the driving element of a one-revolution clutch 570, and for this purpose the gear 564 has a sleeve 571 fixed thereto so as to project to the right and into position within the driven member of the clutch 570. The clutch 570 is arranged to be controlled by a pair of stop levers 570S–1 and 570S–2 that are mounted on a stop lever supporting shaft 573 that extends between the two mounting plates 560 and 561 of the gear box. The main stop lever 570S–1 is arranged so that it may be controlled through an operating rod 575 from the main starting and stopping mechanism of the machine as will hereinafter be described. The other stop lever 570S–2 is of the kind hereinbefore described, particularly with respect to Figs. 30 and 31 of the drawings. Thus, this stop lever 570S–2 has a latch 577 associated therewith, this latch being mounted on a mounting shaft 578 that extends between the plates 560 and 561. A solenoid 580 has its armature connected with the latch 577 so that this latch may be released and the stop lever 570S–2 allowed to move toward its effective position under the action of its operating spring. The stop lever 570S–2, however, has a return actuating lever 581 mounted thereon in the manner hereinbefore described, and this lever 581 is adapted to be engaged by a pin 582 carried on the gear 564 so that upon release of the latch 577 the clutch 570 will be disengaged for but a single revolution, and this characteristic is utilized in enabling the mechanism to be readily controlled by the selector mechanism of the machine.

The driven member of the clutch 570 has a positioning or indexing disk 584 fixed thereon, and this indexing disk is arranged to be engaged by the roller of a spring indexing pawl 585 to hold the driven element of the clutch yieldingly in its home position in a manner similar to the indexing mechanisms previously described in respect to the other clutches.

The driven member of the clutch has a pinion 586 fixed thereto so that this pinion will be driven when the clutch 570 is engaged, and such pinion 586 engages a gear 588 that is rotatably mounted on a shaft 589 that extends between the two mounting frames 560 and 561. The gear ratio between the pinion 586 and the gear 588 is such that the gear 588 rotates through one revolution for each two revolutions of the driven member of the clutch 570, and this relationship is utilized in imparting the desired cycle of operation to the roller platen P–2. Thus, the gear 588 has a cam 590 fixed thereto, and this cam is engaged by rollers 591 and 592 carried on the opposite arms of a rocking bell crank lever 593 that is mounted for rocking movement on a transverse shaft 594 that extends between the mounting plates 560 and 561. The lower arm 593A of the bell crank lever 593 is arranged to extend forwardly, and an upwardly extending link 595 is pivoted thereto and is extended upwardly for association with the roller platen mechanism P–2 as will hereinafter be described.

The timing unit 600

The constantly driven gear 564 also has another and somewhat smaller gear 596 associated therewith, and this gear 596 is constantly driven and is utilized as a source of power for driving a constantly operated timing unit 600 that is mounted on the machine just rearwardly of the gear box 392. The timing unit includes a timing shaft 601, Figs. 63 and 64, and the timing shaft 601 has a gear 602 fixed thereon and operatively connected to the gear 596 by an intermediate idler pinion 603, the idler pinion 603 being included in the gear box 392 and being loosely supported on the shaft 589.

Thus, the timing shaft 601 is constantly driven from the main drive shaft 380, and in its rotation, a cam 604, fixed on the shaft 601, is arranged

to operate a rocking lever 605. The rocking lever 605 is pivoted at its rear end on a mounting shaft 606 that extends between a pair of end frames 600A and 600B that constitute the frame of the timing unit 600, and the rocking lever 605 extends forwardly and has a roller 607 at its forward end that bears against the upper edge of the cam 604. The rocking lever 605 is arranged to carry a microswitch 609 that has an operating element thereof facing in a downward direction, and in downward movement of the microswitch 609, this operating element is adapted to engage and be actuated by an adjustable abutment screw 610 that is carried on a stationary mounting bar 611 that extends between the two frame elements of the timing unit. It will be observed, of course, that the lever 605 is urged downwardly by a spring 605S.

The timing unit 600 also includes a second microswitch 612 that is operated by a similar cam and other mechanisms similar to that hereinbefore described in respect to the microswitch 609, and the function of these timing switches in the operation of the machine will hereinafter be described.

The drive and control elements in the unit 202

As hereinbefore described, the main shaft 380 that is constantly driven during operation of the machine is connected to the shaft 303 in the unit 202 so as to afford a constantly operating source of power in such unit, and the transmission and control of such power within the unit 202 will now be described. The shaft 303 is located in the base of the unit 202, and connection is extended upwardly from the shaft 303 by a pair of bevel gears 615, Fig. 141, a vertical shaft 616, and another pair of bevel gears 617 to a high speed drive shaft 620 that is extended horizontally through the variable printing unit VP–1 and the punching unit PU in relatively close association with the main operating cam shafts of such machines. The shaft 620 has a bevel gear 621 fixed thereon which engages a bevel gear 622 fixed on the lower end of the shaft 304 so that the feed roller drive in the unit 202 is driven from the shaft 620. Similarly, a sprocket 623 is fixed on the right-hand end of the shaft 620, and this sprocket is connected by a chain 624, Fig. 101, that extends downwardly and serves as a constant drive for a total control unit 625 which is utilized in governing the total taking operation of the variable printing unit VP–1, as will be hereinafter described.

The high speed shaft 620 also serves as a power source for driving the shuttle feed, and to this end, a pinion 627 that is fixed on the high speed shaft 620 is arranged to drive a gear 628 that is loosely mounted on a stub shaft 630 that is disposed in a horizontal position just to the right of the frame of the punching unit PU and in alignment with the main cam shaft 633 of the punching unit PU. A common bearing 634 mounted on the right-hand side plate 635 of the punching unit serves to support the adjacent ends of the shafts 630 and 633, the other or right-hand end of the shaft 630 being supported in a frame member 636. The gear 628 constitutes the driving element of a single position, one-revolution clutch 638 that is governed by stop lever 639, and the stop lever 639 is adapted to be released by a solenoid 638M. This clutch is of the type and construction illustrated in the patent of Walter T. Gollwitzer, No. 2,265,134, patented December 9, 1941. The driven element 638B of the clutch 638 is pinned onto the stub shaft 630 which extends to the right as shown in Fig. 99 through a bracket 639 mounted on the outside of the frame plate 636. On its outer end, the shaft 630 has a bevel gear 640 fixed thereto so as to be driven when the clutch 638 is engaged, and this bevel gear engages a bevel gear 641 that is fixed on the transverse shaft 260, which is also shown in Fig. 9 of the drawings, and which is carried in the mounting bracket 639. The forward end of the shaft 260 which projects forwardly beyond the mounting bracket 639 has the arm 259 fixed thereto, as will be evident in Figs. 9 and 99, and this arm 259 is connected to the actuating link 257 of the shuttle feed mechanism as hereinbefore described. Thus, the shuttle feed mechanism will be operated through a cycle each time the clutch 638 is engaged.

The high speed shaft 620 extends to the left, as shown in Fig. 141, and serves as the source of power for driving the main cam shaft 645 of the variable printing unit VP–1, this shaft 645 being shown in Figs. 99 and 141. The variable printing unit VP–1 is in most of its aspects quite similar to the variable printing unit that includes the adding mechanism as shown in the Walter T. Gollwitzer Patent No. 2,501,444, such machine being shown in Fig. 37 and the following views in said aforesaid copending application. The shaft 645 has a gear 646 loosely mounted thereon, and this gear is driven by a pinion 647 fixed on the high speed drive shaft 620. The gear 646 constitutes the driving element of a single position, one-revolution clutch 650 that is of the same type as the clutch 638, hereinbefore described, and the driven element 650B of the clutch 650 is pinned to the shaft 645 so that this shaft will be driven when the clutch 650 is engaged. The clutch 650 is adapted to have its stop lever disengaged by a solenoid 650M. Just to the left of the outer frame element 653 of the variable printing unit VP–1, a bevel gear 654 is pinned on the shaft 645, and this bevel gear meshes with a bevel gear 655 that is fixed on a rearwardly extending connecting shaft 656. This connecting shaft 656 at its rear end has a bevel gear connection 657 with a shaft 658 that is shown in Figs. 99 and 141.

The shaft 658 is thus driven in each cycle of operation of the variable printing unit VP–1, including the total taking cycles thereof, and among other things, the shaft 658 is utilized to operate timing switches 659A, 659B and 659C, Fig. 143, that are actuated by cams 659A–1, 659B–1 and 659C–1, Figs. 141 and 143, fixed on the shaft 658. The shaft 658 extends to the right and to a point between the frames of the variable printing unit VP–1 and the punching unit PU. This shaft is associated with the driven element of a clutch 660 whereby the shaft 658 may be connected with a stub shaft 661 that is mounted in the frame of the punching unit PU in alignment with the shaft 658. The shaft 661 extends to the right and outwardly of the frame plate 635 of the punching unit, and has a bevel gear connection 662 with the lower end of the shaft 309 which drives the stop finger cam shaft 308.

It will be observed that the shaft 645 is driven from the clutch 650, and between the frames of the variable printing unit VP–1 and the punching unit PU, another clutch 665 is provided whereby the main cam shaft 633 of the punching unit PU may be operatively connected to the

cam shaft 645 of the variable printing unit thereby to drive these two units together when this is desired or to enable the punching unit PU to remain inactive in those cycles of machine operation when totals are being read out of the accumulators that are included in the variable printing unit VP–1.

The clutches 660 and 665 are of the type shown in Figs. 30 and 31, and the details of these clutches are shown in Fig. 100 of the drawings. These clutches are of the same one-revolution release type, and have stop levers 660S and 665S adapted to be latched in retracted positions by latches 660L and 665L. These latches are adapted to be released by solenoids 660M and 665M, thereby to allow the respective stop levers 660S and 665S to move to their effective positions, and return arms 660A and 665A associated with these stop levers are adapted to be engaged by pins 660P and 665P to return these stop levers to their latched positions. The pins 660P and 665P are carried on the driving elements of the respective clutches so that such clutches remain disengaged for but one revolution.

The totals that are thus read out of the accumulators of the variable printing unit VP–1 are not printed by the variable printer VP–1, but are set up and printed in the variable printer VP–2, as will hereinafter be described, and the variable printing unit VP–2 is operated in timed relation to the cam shaft 645 not only in such total cycles, but also in the normal printing cycles wherein money amounts, derived from the printing devices D, are printed on the proof sheets. This is effected by affording a driving connection from the shaft 658 to the main cam shaft 668 of the variable printer VP–2. This driving connection includes a separable connector 670 that comes into play when the unit 202 is separated from the main unit 201. The separable connector 670 has one element 670–1 fixed on the end of the shaft 658, while a second element 670–2 is fixed on the end of a connecting shaft 671 that is connected by a universal joint 672 to another shaft 673 which is in turn associated with the main cam shaft 668 by a universal joint 674.

The shaft 661 of the punching unit PU has an indexing means, including a disk 675, associated therewith so as to hold the shaft 661 in its home position when the clutch 660 is disengaged. Also, the shaft 661 has a cam 676 fixed thereon so as to operate a timing switch 677 in each revolution of the shaft 661, this timing switch being utilized in the control of the machine as will be described hereinafter.

The cam shaft 633 also has an indexing means including a disk 778, associated therewith, as well as certain driving or actuating members, as will be described hereinafter.

THE PRINTING DEVICE FEED

The printing devices D are customarily stored in suitable drawers or the like when not in use, and when these printing devices are to be fed through the machine, they are introduced into the magazine M in the manner disclosed, for example, in Gollwitzer Patent No. 2,002,773, patented May 28, 1935. The magazine M comprises four upright substantially L-shaped corner members as 700, such L-shaped figuration affording in each of the strips an arrangement adapted to embrace a corner of each of the printing members stacked in the magazine M. The lowermost printing device in the magazine is withdrawn from the magazine and advanced through the printing device guideway through the intermediary of reciprocable carrier bars, as will be described presently.

The guideway through which the printing devices are thus advanced comprises two rails 701 and 702 which are suitably secured to mounting bars 832 of the main frame of the machine and which extend from front to rear across the machine in parallel relation one with the other. As best shown in Fig. 46, the rail 701 has a rabbeted groove 703 formed in the inner face adjacent the upper edge thereof and a corresponding rabbeted groove 704 is provided in the inner face of the rail 702 adjacent the upper edge thereof. The carrier bars 705 and 706 are mounted in these rabbeted grooves and have a reciprocatory movement imparted thereto in a manner which will be explained presently. A retaining plate 707 is secured to the inner face of the rail 701 and extends past the open face of the rabbeted groove 703 so as to thereby retain the carrier bar 705 in the rabbeted groove 703. A similar plate 708 on the inner face of the rail 702 is effective to retain the carrier bar 706 in the rabbeted groove 704. As will be explained more fully, the plates 707 and 708 are discontinuous in that these plates extend between the anvils on which the printing and control devices come to rest in the course of the step-by-step advancing movement thereof through the printing device guideway and the plates 707 and 708 also extend beneath the magazine M so that the lowermost of the printing and control devices stacked in the magazine M rests on the upper edges of the rails 707 and 708.

In the course of advancing movement of the printing and control devices through the machine, and in the course of movement of these printing devices from the magazine M and onto and from the various anvils, to be described presently, on which the printing and control devices come to rest, the printing devices D ride on the upper edges of the plates 707 and 708. As best shown in Fig. 46, the upper edges of these plates are of rounded configuration and desirably these edges are chromium-plated so as to thereby present a wear-resistant surface to the printing and control devices that are adapted to travel therealong.

The carrier bars 705 and 706 have a reciprocatory movement imparted thereto through the intermediary of the arrangement illustrated, for example, in Fig. 38. Thus, by referring to Fig. 38, it will be seen that a rack 709 is formed in the lower edge of the carrier bar 706 adjacent to the rear end thereof and a similar rack is provided and is similarly located on the carrier bar 705. A shaft 710 is journaled in bearings provided in the rails 701 and 702 and pinions 711 and 712 are fastened thereto in position thereon to respectively mesh with the racks as 700 respectively provided on the carrier bars 706 and 705. Inasmuch as the pinions 711 and 712 are fastened to the shaft 710, and since these pinions are meshed with the racks on the carrier bars, movement imparted to the shaft 710 is simultaneously transmitted to the carrier bars 705 and 706.

Rotative movement is imparted to the shaft 710 and therefore reciprocatory movement is imparted to the carrier bars 705 and 706 through a segment 713, Figs. 33, 36, 37 and 38, that is mounted for pivotal movement about a stub shaft

714 that is journaled in bearings provided on the plates as 714A that are secured to and extend above the rails 701 and 702. The segment 713 includes an arm 715 to which one end of a link 716 is pivotally connected. A reciprocatory movement is imparted to the link 710 from rocker 471 that is included in the drive mechanism as hereinbefore explained, and, as shown in Fig. 33, the lower end of the link 716 is pivoted at 716P on the rocker 471. The teeth 717 provided on the segment 713 mesh with a pinion 718 that is secured to the shaft 710 outwardly of the rail 702. Desirably the pinion 718 is of smaller diameter than the pinions 711 and 712 so that when reciprocatory movement is imparted to the segment 713 from the link 717 and this in turn is transmitted through the teeth 717 through the pinion 718, the pinions 711 and 712 will be effective to transmit accelerated motion to the carrier bars 706 and 705.

The conjugated cams 470A and 470B included in the drive mechanism 390 act through the rocker 471 to impart the reciprocatory movement to the link 716, and the degree of movement of the link 717, and consequently the degree of movement imparted to the carrier bars 705 and 706, is determined by the configuration of the aforesaid conjugated cams and the amount of movement thus imparted to the carrier bars 705 and 706 is sufficient to move the carrier bars 705 and 706 toward the front of the machine in an amount sufficient to advance the printing and control devices from the magazine M and on to and from the anvils provided in the printing device guideway on which the printing devices are adapted to come to rest, such spacing of the magazine M from the first of such anvils and the spacing of these anvils one from the other being uniform along the extent of the printing and control device guideway.

Advancing movement is imparted to the printing and control devices from the carrier bars 705 and 706 through pawls that are provided at spaced intervals along the carrier bars 705 and 706, and these pawls have portions that may project above the top edges of the carrier bars and these projecting portions of the pawls engage the rearwardly disposed edges of printing and control devices when these are to be advanced through the guideway therefor. The pawls are arranged in pairs, one pawl of each pair being mounted in the carrier bar 705 and the other being mounted in the carrier bar 706 and the pawls of such a pair are aligned one with the other. Moreover, these pairs of pawls are provided at spaced intervals along the extent of the carrier bars, the spacing between the respective pairs of pawls corresponding to the spacing of the first anvil from the magazine and the spacing of the respective anvils one from the other.

By referring to Fig. 38, it will be seen that a pawl 719 is provided in the carrier bar 706 near the inner end of the rack 709. This pawl is mounted in a recess 720 formed in the upper edge of the carrier bar 706 and the pawl 719 includes a rounded end portion 721 which fits into a complementary shaped portion at the rear end of the recess 720 so as to thereby support the pawl for vertical movement relative to the upper edge of the carrier bar 706. At the forward end of the recess 720, a ledge 722 provided at the upper edge of the carrier bar 706 extends over a portion of the recess 720 and a tongue 723 on the pawl is normally disposed beneath this ledge. A leaf spring 724 is mounted in the lower part of the recess 720 and acts on the lower edge of the pawl 719 so as to force the pawl upwardly and thereby dispose the shoulder 725 on the pawl 719 at the inner end of the ledge 722 in a position to project above the top edge of the carrier bar 706. A pawl similar to the pawl 719 and mounted in the manner just described is provided in the carrier bar 705 in alignment with the pawl 719 and these pawls constitute the pair that advances the lowermost printing device from the magazine and to the anvil disposed immediately forward of the magazine.

During the course of forward movement of the carrier bars 705 and 706, the pawl 719 and the cooperating pawl in the carrier bar 705 project above the upper edges of the carrier bars in which they are mounted, and immediately after the start of forward movement of the carrier bars 705 and 706 the shoulders 725 on these pawls engage the rear edge of the lowermost printing and control device in the magazine, and in the course of subsequent forward movement of the carrier bars 705 and 706 these pawls remain in engagement with the rear edge of this device and move the same forward along with the carrier bars, this particular printing and control device riding on the upper edges of the plates 707 and 708 as described hereinabove. At the end of forward movement of the carrier bars, the printing and control devices advanced by the pawl 719 and its cooperating pawl will be disposed at station 212 in the printing and control device guideway. This station 212 is afforded by an anvil 726 that is composed of a block that is disposed between and which is secured to the rails 701 and 702, the portions of the plates 707 and 708 that extend beneath the magazine and terminating at the rear edge of the anvil 726. The upper surface of the anvil 726 lies in the plane of the rounded edges provided at the tops of the plates 707 and 708 so that when the printing and control devices advance from the magazine into station 212, it rests on the anvil 726.

Immediately after the forward movement of the carrier bars has been effective to dispose the printing and control devices withdrawn from the magazine M at station 212, the rearward movement of the carrier bars 705 and 706 is initiated and these carrier bars subsequenty return to the initial at-rest position thereof, in which position the pawl 719 and its cooperating pawl will be disposed behind the rear edge of the lowermost printing device in the magazine M.

In the course of returning movement of the carrier bars 705 and 706, the pawls as the pawl 719 and its cooperating pawl in the carrier bar 705, are free to be pressed downwardly against the action of spring 723 effective thereon. It has been found to be advantageous to positively lower the pawls as 719 during the course of rearward movement of the carrier bars 705 and 706 so as to dispose the upper edges of these pawls below the plane of the upper edges of the carrier bars so as to thereby keep the upper surfaces of the pawls out of engagement with the lowermost printing and control devices in the magazine during the course of returning movement of the carrier bars. To this end, as best shown in Figs. 39 and 39A, a pin 727 is secured to the pawl 719 to project inwardly to-

ward the opposite carrier bar. A flat spring 728 is mounted on the top of a block 728B on the inside face of the plate 708, and this spring 728 has an overhanging edge extending into a longitudinal clearance slot 728S formed in the plate 708. Within the slot 728S, the spring 728 has a projecting forward end 728F disposed immediately forwardly of the magazine M, and this forward end 728F is bent slightly upwardly as shown in Fig. 39A. The rear end 728R extends to substantially the rear portion of the magazine M and is bent downwardly as shown in Fig. 39A. In the course of return movement of the carrier bar 706, the pin 727 moves under the forward end of the spring 728, and by reason of the vertical position of the spring 728 this is effective to pivot the pawl 719 downwardly against the effect of the spring 723 so as to thereby dispose the upper surface of this pawl beneath the upper edge of the carrier bar 706. Prior to the time the rearward movement of the carrier bar 706 is completed, the pin 727 moves out from under the lower face of the rear end 728R of the spring 728, and thereupon the spring 723 is effective to dispose the shoulder 725 on the pawl 719 in position to engage the rear edge of the lowermost printing and control device in the magazine M. In the course of the next advancing movement of the carrier bar 706, the pin 727 rides along the upper surface of the spring 728 and this is effective to hold the pawl 719 in position to have the shoulder 725 thereon remain in engagement with the rear edge of the printing device being advanced from the bottom of the stack thereof in the magazine M. The spring 728 is, therefore, effective to prevent the weight of the stack of the printing and control devices in the magazine M from depressing the pawl 719 as the pawl passes beneath the printing and control devices disposed in the magazine M immediately above the one being advanced by the pawl 719 and its cooperating pawl. The pawl in the carrier bar 705 aligned with the pawl 719 includes a pin similar to the pin 727, and this pin cooperates with a spring plate similar to the spring plate 728 so that this particular pawl operates in the manner hereinabove described with reference to pawl 719.

In order to insure that the printing and control devices being advanced by the pairs of pawls in the carrier bars will remain in engagement with the pawls respectively effective thereon and in order to insure that the printing and control devices D will ride along the upper edges of the plates 707 and 708, retaining strips 730 and 731 are respectively secured to the upper edges of the rails 701 and 702, the inwardly disposed marginal portions of these retaining strips projecting above side marginal portions of the printing and control devices on the upper edges of the plates 707 and 708.

A pawl 732 is mounted in a recess 733 in the upper edge of the carrier bar 706 in the manner described hereinabove with reference to the pawl 719 and a pawl adapted to cooperate with the pawl 732 is mounted in the carrier bar 705 in alignment with the pawl 732. The pawl 732 is mounted on the carrier bar 706 in spaced relation with the pawl 719, the spacing between these pawls being equal to the amount of advancing movement imparted to the carrier bar 706 or stated otherwise, the pawl 732 is spaced from the pawl 719 in an amount equal to the spacing between the magazine M and station 212 above anvil 726.

Hence, during the time the pawl 719 and its cooperating pawl in the carrier bar 705 is effective to advance the lowermost printing and control device in the magazine M or to the anvil 726, the pawl 732 and its cooperating pawl in the carrier bar 705 is effective to advance a printing and control device that has been disposed in the anvil 726 to station 214 above the anvil 734 that is disposed between and secured to the rails 701 and 702 as best shown in Figs. 41 and 43.

Yet another pawl 735 is provided in the carrier bar 706 forwardly of the pawl 732 and this pawl 735 is mounted in the carrier bar 706 in the manner hereinabove described with reference to the pawl 719. Another pawl is provided in the carrier bar 705 in alignment with the pawl 735 and the pair of pawls thus afforded are effective to advance a printing and control device disposed at station 214 on the anvil 734 to station 216 on the anvil 736, which like the anvils 726 and 734 is disposed between and carried by the rails 701 and 702. The pawl 735 is spaced forwardly from the pawl 732 in an amount equal to the spacing of the pawl 732 forwardly of the pawl 719.

The pawls 732 and 735 and their cooperating pawls in the carrier bar 705 do not have a pin as 727 provided thereon and spring plates as 728 are not associated with the pawls 732 and 735. These two pawls and their cooperating pawls in the carrier bar 705 do not tend to be depressed during the advancing movement of the carrier bars and it is for this reason that these pawls are not equipped with a pin as 727 to correspond with a plate as 728.

By referring to Fig. 33, it will be seen that a plate 737 is secured to the inner face of the retaining plate 707 and this plate has a curved surface 738 provided on the upwardly and forwardly disposed edges thereof, the curved surface 738 being arranged to merge into the upper face of the anvil 736. Another plate 739 is fast to the inwardly disposed face of the plate 707 and has a rearwardly disposed formed surface 740 thereon. The space between the surfaces 738 and 740 affords a throat 741 into which the marginal edge of a printing and control device is advanced when the pawl 735 and its cooperating pawl in the carrier bar 705 engage the rear edge of a printing and control device that has been disposed on the anvil 736 so that during the course of the advancing movement of the carrier bars, the printing and control device that has been disposed on the anvil 736 passes through the throat 741 to be collected with other printing and control devices that have passed through the machine in a manner to be explained presently. It will be understood that plates similar to the plates 737 and 739 are provided on the inner face of the retaining plate 708 to afford a throat and similar to and aligned with the throat 741.

During the time the printing and control devices come to return on the anvils 726, 734 and 736, operations are performed thereon as will be explained more fully hereinafter. It has been found to be advantageous to accurately locate and positively retain the printing devices disposed on the anvils 726, 734 and 736 during the time operations are being performed thereon.

The mechanisms which are effective to bring about such accurate positioning and firm re-

tention of the printing and control devices D cooperate with the notch 234, Fig. 2, that is provided in a marginal edge of each of the printing and control devices. Briefly, the notch as 234 is of substantially V-shaped configuration for a purpose that will be explained presently.

By referring to Fig. 33, it will be seen that brackets 742, 743 and 744 are secured to the outer face of the rail 702 and a shaft 745 is journaled in bearings afforded in these brackets. As best shown in Fig. 48, an arm 746 is fastened to the shaft 745 and the upper end of a link 747 is pivotally connected to the free end of the arm 746. The desired reciprocatory movement is imparted to the link 747 by pivotally connecting the lower end of the link 747 to the rocking plate 475, Fig. 33, so as to thereby rock the shaft 745. A spring 747S acting upwardly on the link 747, as shown in Fig. 33, serves to hold the cam roller 475A in engagement with the cam 479.

As best shown in Figs. 33 and 36, a plate 748 is mounted on the shaft 745 adjacent to the bracket 742 and this plate extends across the outer face of the rail 702. The plate 748 is aligned with the anvil 726. Similar plates 749 and 750 are mounted on the shaft 745, respectively, in alignment with the anvils 734 and 736.

As best shown in Figs. 40, 41, 42 and 46, each plate as 748 is bent inwardly at the upper edge thereof to extend across the upper edge of the rail 702. By referring to Fig. 42, it will be seen that the intermediate portion of the inwardly bent part of the arm 748 is cut away to provide a finger 748F, and at the rearwardly disposed edge of the plate as 748 a finger 751 is provided, the inwardly disposed edge of this finger 751 being of substantially V-shaped configuration so as to be complementary to the notch as 234 provided in the printing and control devices.

As best shown in Figs. 33, 40, 41, 42 and 46, each plate as 749 has an opening formed therein through which an adjustable screw as 752 is freely extended, the adjusting screw being mounted in a tapered opening provided in the outer face of the rail 702. A spring as 753 is disposed about the screw as 752 and extends between the head of this screw and the adjacent face of the plate 749, this spring being effective to urge the plate 749 inwardly toward the printing and control device guideway. Moreover, this adjustable screw is effective to limit pivotal movement of a plate as 749 in a direction away from the adjacent face of the rail 702.

Immediately prior to the start of the advancing movement of the carrier bars 705 and 706, the link 747 acts on the arm 746, Fig. 48, to rock the shaft 745 clockwise as viewed in Fig. 46. A block as 754 is fast to the shaft 745 adjacent each of the plates 747, 749 and 750 and upon clockwise movement of the shaft 745, this block acts on the adjacent face of the plate as 749 and pivots this plate clockwise as viewed in Fig. 46 so as to thereby withdraw the fingers 750 and 751 on each plate as 749 away from the printing and control device guideway.

Shortly prior to the completion of the advancing movement of the carrier bars 745 and 746, the link 747 acts through the arm 746 to rotate the shaft 745 counterclockwise as viewed in Fig. 48 and in the course of this movement the block as 754 tend to move away from the adjacent face of the plate as 749 with which the block is associated. This frees the plate as 749 to the action of the spring 753 which thereupon pivot these plates counter-clockwise as viewed in Fig. 46 to thereby move these plates inwardly toward the printing and control device guideway.

By referring to Figs. 40 and 42, it will be seen that each finger as 750 on each plate as 749 projects inwardly for a greater distance than does the associated finger 751. Each plate as 749 is so related with reference to the anvil with which it is associated that the rearwardly disposed edge of the finger 749 is disposed in the position in which it is desired to dispose the leading edge of a printing and control device that is to come to rest on the anvil. Hence, since the plates as 749 move inwardly toward the printing and control device guideway just prior to the completion of an advancing movement of the carrier bars 705 and 706, each finger as 750 will be disposed in a position to arrest movement of a printing and control device moving on to the associated anvil.

The apex of the finger 751 is spaced from the rearwardly disposed face of its related finger 750 in an amount corresponding to the spacing of the apex of the notch 234 in the printing and control device D as shown in Fig. 2 from the lower edge of this device as it appears in Fig. 2. Therefore, as the leading edge of a printing and control device moves into engagement, the rearwardly disposed edge of the finger 720 and the related finger 751 is in position to have the substantially V-shaped end thereof move into the notch as 234 in the printing and control device disposed on the related anvil. By reason of the complementary and substantially V-shaped configuration of the notch as 234 and the finger as 751, the movement of the V-shaped finger into the V-shaped notch accurately positions the printing and control device on the anvil. Furthermore, the disposition of the finger as 751 in the notch as 234 under the effect of the spring as 753 is effective to retain the printing and control device on the related anvil in a predetermined position during the time an operation is being performed on this printing and control device in the course of operation of the machine.

The plate 748 that is disposed at sensing station 212 carries a microswitch 748S which is actuated in accordance with the extent of inward movement of the plate 748. Thus, when a printing device D is in sensing station, the plate 748 moves to one position and a normally open set of contacts in the switch 748S are closed to condition certain control circuits of the selector mechanism as will be described. When a printing device has not been moved into sensing station, the plate 748 moves farther inward, and a normally closed set of contacts in the switch 748S are opened to disable the control circuits for the variable printer VP-1, the shuttle feed 240 and related mechanism, as will be described.

The printing device is passed into the throat as 741, Fig. 33, and through the chutes 754 to which the throat as 741 leads. The chute 754 for directing the printing device to the printing and control device collecting tray 755 is supported from the frame of the machine beneath the printing and control device guideway. A conventional follower device is included in the tray 755 and as the printing devices move into this tray, a packer mechanism is effective on the printing devices to force the same through the tray 755 toward the right as viewed in Fig. 33. The packer mechanism which is operative to effect the foregoing includes the arm 756 supported from a stud shaft 757. The arm 756 has a finger

758 extending therefrom which is releasably attached to the arm 759 that is also pivotally mounted on the stud shaft 757, the releasable connection between the finger 758 and the arm 759 being effective intermediate the ends of the arm 759. A link 760 is pivotally connected to the free end of the arm 759 and this link extends rearwardly and downwardly and is pivoted on the rocker 471 so that reciprocatory movement is imparted to this link 760 so as to thereby rock the arm 756 to effect the packing operation. The releasable connection established between the finger 758 and the arm 759 permits the arm 756 to be swung upwardly when it is desired to gain access to the forward part of the collecting tray 755.

The usual means for withdrawing printing and control devices from the collecting tray 755 is provided. In the present instance, this consists of a rod 761 slidably mounted at one side of the collecting tray 755. A hand grip 762 is provided at the rear end of the rod 761 and when it is desired to withdraw printing and control devices from the collecting tray 755, the hand grip 762 is grasped so as to enable the rod 761 to be moved rearwardly. The usual means at the forward end of the rod 761 acts on printing and control devices in the tray 755 to move the same rearwardly through this tray when the rod 761 is moved rearwardly.

It is essential that the rod 761 and the parts associated therewith be returned to the normal at-rest position thereof shown in Fig. 37. In order to insure that this will be brought about, a finger 763 is associated with the device provided at the forward end of the rod 761. An adjustable screw 764 is mounted in this finger 763 in position to cooperate with the operating element of a microswitch 765. The adjusting screw 764 is so related to the operating element of the microswitch 765 that when the rod 761 is in its proper at-rest position, the microswitch 765 is closed. As will be described hereinafter, the microswitch 765 is included in the main control electrical circuit of the machine and is so arranged in this circuit that this switch must be closed before circuit can be established through this main control circuit.

It has been found to be advantageous to enable the follower mounted in the printing and control device collecting tray 755 to be removed therefrom as, for example, when a collection of printing and control devices is to be withdrawn from this tray. It is, however, essential that the printing and control devices in the tray 755 remain in upright position even though the follower device is removed from association therewith.

In order that this may be realized, the arrangement best illustrated in Figs. 34 and 35 is provided.

Near the rear end of the collecting tray 755, the side wall is bent to provide a horizontally disposed ledge 766. A block 767 is disposed on and secured to this ledge 766 and the inwardly disposed face of this block is aligned with the inwardly disposed face of the side wall of the tray 755 that is bent to afford the ledge 766, as best shown in Fig. 35. At spaced intervals along the extent of the block 767 openings 768 are provided by drilling into the block 767 from the left-hand face thereof as this block is viewed in Fig. 35. In so forming the openings as 768, the tapered point of the drill is prevented from breaking through the right hand face of the block 767 as it is viewed in Fig. 35 whereby an inturned shoulder 769 is afforded at this end of each opening 768. A jaw as 770 is mounted in each of the openings 768 and is disposed therein so as to engage the shoulder 769 whereby a portion of each jaw as 770 extends into the tray as 755 to be disposed in position to engage adjacent edges of printing and control devices in the tray 755. In order to maintain the jaw 770 in the aforesaid projected position, a spring as 771 is mounted in each of the openings as 768 and acts on the jaw 770 to force the same into the aforesaid projected position. The springs as 771 are retained in the openings as 768 by a plate 772 that is secured to the face of the block 767 from which the openings as 768 are drilled, said plate 772 being effective to close the adjacent ends of the openings as 768 and thereby maintain the springs as 771 in the openings as 768 under tension. By referring to Fig. 33, it will be seen that a plurality of openings as 768 are afforded so that a plurality of supports are provided near the rear end of the tray 755 that are to be effective to maintain the printing and control device in upright position in this tray.

The supply of printing devices D in the magazine M is checked in each operation of the carrier bars by a sensing pawl 773, Figs. 33, 33A, 36, 36D and 36E, that is pivoted at 773P beneath the rail 702. A spring 773S urges the upper end of the pawl toward the lower side portion of the magazine M so that a nose 773N may engage the edge of the lowermost printing device D. Such sensing movement is governed by a recess 706R, Fig. 36E, formed in the side of the carrier bar 706, such recess being engaged by a cam roller 773R carried on a pin 774 fixed on the pawl 773 and extended through an opening 702B formed in the rail 702, Figs. 36 and 36D. A microswitch 775 is carried on the pawl 773, and is so arranged that when the pawl 773 moves through its full counter-clockwise stroke, due to absence of a printing device in the magazine, the operating button of the switch 775 will engage an adjustable abutment afforded by a screw 775S, thereby to operate the switch 775 and cause the machine to stop, as will hereinafter be described. The recess 706R is so located that such sensing takes place when the carrier bars are in the forward portion of their stroke.

THE SENSING MEANS

A printing device advanced from the stack thereof in the magazine M onto the anvil 726 is disposed in sensing station 212 when the printing device comes to rest on this anvil 726. While the printing and control device is disposed in this position, the sensing head SH now to be described in detail cooperates with the printing device D disposed at station 212. The sensing means which is to cooperate with a printing and control device as D at the station 212 includes a plurality of groups of sensing pins that are adapted for cooperation with perforations as 231 that are formed in the card 232 and the underlying data field 230 on the frame 225 of the printing and control device as D. The sensing means also includes sets of pins that are adapted for cooperation with tabs as 236 that may be removably secured to the frame 225 of a printing and control device as D at selected of predetermined positions along one edge thereof as, for example, in the manner disclosed in Gollwitzer Patent No. 2,132,412, patented October 11, 1938.

As best shown in Figs. 80, 82 and 83, the sensing means includes the sensing head SH that is mounted between the rear ends of the arms 776 and 777. As best shown in Figs. 36, 36A and 36C, by pivotal mounting indicated at 778 on the plates as 714A respectively secured to the rails 701 and 702, the arms 776 and 777 are maintained in predetermined spaced apart relation by a spacer 778. Adjacent the pivotal mounting 778 of each of the arms as 776 and 777, a bracket 779 is provided which is pivotal about a screw 780, Fig. 36C. An opening 781, Fig. 36A, is formed in another arm of the bracket 779 and a screw 782 freely passes through this opening 781 and is tapped into the adjacent arm as 777 so that the screw 782 serves as an adjusting means for the arm 777. The arm as 777 may be shifted and adjusted relative to the bracket 779 and the pivot 778 to thereby impart slight longitudinal movement in one direction or the other to the arm 777 to thereby enable the position of the sensing head SH to be adjusted along the extent of the printing and control device guideway. In order that the sensing head SH may be adjusted transversely of the printing and control device guideway, the arrangement best shown in Fig. 36B is provided. The arrangement shown in Fig. 36B is that associated with the arm 777 but it will be understood that a similar but reversely directed arrangement is associated with the arm 776. A bracket 783 depends from the arm 777 and a screw 784 is passed through a tapped opening in the lower portion of this bracket to have the head thereof adjacent thereof with the face of the rail 702. The lock nut 784A is provided on the screw 784 and cooperates with the adjacent face of the bracket 783 to hold the screw 784 in adjusted position. By varying the position of the screw as 784 relative to the face of the rail as 702 and simultaneously adjusting the corresponding parts provided for the arm 776 to cooperate with the outer face of the rail 702, the arms 776 and 777 and, therefore, the sensing head SH may be adjusted transversely of the printing and control device guideway. The purpose of these longitudinal and transverse adjustments will be explained presently.

As best shown in Fig. 83, the sensing head SH includes an upper head as 785 which has lugs as 785A depending from the rear end thereof that are pivotally connected as indicated at 785B to brackets as 785C provided at the rear ends of arms as 776. In this way the head 785 is supported for pivotal movement relative to the arms as 776 to which other portions of the sensing head 785 are fixedly connected.

By referring to Fig. 2, it will be seen that the data field 230 of the frame 225 of the printing and control device D affords a field whereat perforations may be formed in selected positions, such potential positions being shown in broken lines in Fig. 2 and wherein also the perforations of such potential positions are indicated in full lines. It will be noted that transversely across the printing and control device as illustrated in Fig. 2 where the numerical amounts are to be represented by perforations formed in the card 232 and the underlying portion of the data field 230 of the frame 225 of a printing and control device, each set of five perforations longitudinally across the printing and control device may be devoted to an order of numerical amounts to be represented. In the present instance the two sets of potential positions whereat perforations may be formed along the right-hand edge of the printing and control device are not utilized but perforations may be selectively formed in any or all of the next succeeding five sets of perforations toward the left as viewed in Fig. 2. Also, when numerical amounts are to be represented, perforations are formed in the card 232 and through the underlying potential perforation position in the data field 230 in accordance with the code shown in Fig. 3. Thus, when the number "1" is to be represented, a perforation is formed in the lowermost of the potential positions as these are viewed in Fig. 2 and also in the uppermost of such positions. If the number "2" is to be represented, a perforation is only formed in the lower portion of the position. By referring to Fig. 3, it will be seen where the openings are thus formed in the various sets of perforations either singly or in pairs to effect representations of the other significant digits. In the event a space appears in the order of a number to be represented then no perforation is formed in the potential positions.

In the present instance where perforations may be formed in any one or all of the five sets of perforations in potential positions in the data field 230 of a printing and control device as D, the sensing head SH is equipped with sensing pins. These sensing pins are located in the sensing head in such position that one such pin will be aligned with and will be free to pass through an opening formed at a particular one of the potential positions in the data field 230 of the printing and control device as D. Hence, the sensing pins are arranged in sets of five and in Fig. 83 is shown one such set of pins, these pins being indicated by the reference character 786. The pins as 786 and the various sets thereof are mounted in plates as 787 and 788 that are secured to and extend between the arms 776 and 777, the plate 787 being arranged along the upper edges of the arms 776 and 777 while the plate 789 is disposed in recesses formed in the lower edges of the arms 776 and 777 as best shown in Fig. 83. Openings as 789 are formed in the plate 785 at each position whereat a pin as 786 is to be disposed and openings as 790 are formed in the plate 778 respectively in alignment with the openings as 789. Thus, each pin as 786 is mounted in and extends through an opening as 789 and another opening as 790. Collars as 791 are formed on each of the pins as 786 and springs as 792 are disposed about each pin as 786 to extend between the lower face of the plate 787 and the upper face of the collar 791. Thus the springs 792 are effective to force the pins 786 outwardly beyond the lowermost face of the plate 788.

When a printing and control device is disposed at station 212 and in a manner to be described presently, the sensing head 775 is moved downwardly toward the printing and control device disposed at station 212. As to those of the pins 786 which are aligned with a potential perforation position in the data field 230 on the printing and control device D whereat a perforation is not formed with a corresponding and aligned perforation in the card 232, it will be noted that the lower end of this particular sensing pin engages the upwardly disposed face of the card 232 and as shown in Fig. 83 further movement of such a pin with the sensing head SH is arrested so that each such pin is forced upwardly against the effect of the spring 792 disposed thereabout. However, as to those of the pins 786 which pass through a perforation in the card 232 and an underlying perforation at one of the potential positions in the data field 230 in the printing and control device at the station 212, it will be ob-

served that these pins advance on through the printing and control device at the station 212 for a purpose now to be described.

As best shown in Fig. 83 a bracket as 793 is detachably secured to the inner face of the rail 701 and a corresponding bracket is similarly secured to the inner face of the rail 702. A plate 794 is secured to the upper face of the horizontally disposed portion of the brackets as 793 to extend between the rails 701 and 702. Openings as 795 are formed in the plate 794 at each of the places whereat a sensing pin as 786 may pass through aligned perforations in the card 232 and the underlying portion of the data field 230. Thus, as shown in Fig. 83 where the sensing head SH is shown in its lowermost operative position, those pins as 786 which pass through perforations in the card 232 and the data field 230 move into the underlying opening 795. Pins as 796 have enlarged heads at the upper ends thereof respectively disposed in the opening 795. Collars as 797 are provided on each of the pins 796 below the plate 794 and also below a plate 798, Figs. 83 and 83A. As best shown in Fig. 83A, the plate 798 has a plurality of slots 798A formed therein which extend inwardly from one edge of this plate. Each set of pins as 796, one such set being shown in Fig. 83, is respectively adapted to be disposed in a slot as 798A. A plate 798 is suitably secured to the underface of the plate 794. The disposition of the pins as 796 in the slots as 798A limits the downward movement of the head of the pins as 796 in the openings as 795.

Studs as 799 depend from the underface of the plates 798 and 794 and support a plate 800. Openings as 801 are provided in the plate 800 in such position that one of the pins 796 extends through each such opening. Springs as 802 are respectively disposed about the pins 796 to extend between the upper face of the plate 800 and the lower end of the collar 797 on the particular pin 796. The springs 802 force the pin 796 upwardly, such upward movement of the pins being limited by engagement with the upper face of the collar 797 and with the lower face of the plate 798.

A plate of insulating material 803 is mounted at the lower ends of the studs as 799. Openings 804 are formed in the plate 803 in such a manner so that each opening 804 is aligned with a pin 796. Contact bars as 805 are respectively disposed in the openings as 804. Each contact bar 805 has a groove as 806 formed therein and pins as 807 extend through openings across the block 783 so that each pin 807 engages all the contact bars 805 in a set thereof, such a set of contact bars corresponding to a set of pins as 786 and 796. As best shown in Fig. 83B, the pins 807 either engage in grooves as 806 and adjacent pins 807 or in a groove as 806 and in a cooperating recess formed in an adjacent part of the block 803. By withdrawing the pins 807 from the block 803, the contact bars as 805 may be withdrawn from this block.

As best shown in Fig. 83B when the pins 796 are disposed in their normal at-rest position with the upper edge of the collar 797 thereon engaging the under face of the plate 798, each pin 796 is spaced from its cooperating contact bar 805. However, when a pin as 786 passes through aligned perforations in the card 232 and the underlying portion of the data field 230, such pin passes into the aligned opening 795 and presses the pin 796 therein downwardly. Such downward movement of a pin as 796 into engagement with a contact bar as 805 establishes an electrical circuit, the pins as 796 being mounted in metallic elements and, therefore, being grounded while the contact bars as 805 are mounted in the block of insulating material 803 so that in effect the engagement of a pin 796 with its cooperating contact bar as 805 grounds this particular contact bar, and such grounding of a contact bar as 805 closes an electrical circuit for a purpose described hereinafter.

As is well understood in the art, the heads of the tabs as 236 in the printing and control device D, Fig. 2, may either be what are known as whole tabs, half tabs or perforated tabs. Thus, as disclosed in Hueber Patent No. 2,359,851, patented October 10, 1944, each tab may take the form of a full tab, a notched tab, or may be formed with perforations in the head of each tab as 236 in any one of four different positions. Customarily, twelve sockets of the nature disclosed in Patent No. 2,132,412 are provided along the edge of the printing and control device whereat tabs as 236 are to be secured to thereby afford twelve different positions whereat tabs at 236 may be secured. Where resort is had to whole and half tabs, each of these twelve tab receiving positions affords twenty-four selecting positions as the operative portions of the faces of the heads of the tabs 236 are commonly called. When the arrangement is such that a perforation may be formed at any one of four different positions in the head of a tab, the positions are aligned with each other along the parallel edge of the printing and control device D and in such an arrangement twenty-four selecting positions are afforded by the perforations in one such row thereof and when two such rows are provided, forty-eight selecting positions are provided. In order that the selector head SH may be arranged to be responsive to forty-eight selecting positions, openings as 808 are formed in the plate 787 adjacent the forwardly disposed edge thereof, there being two rows of twenty-four openings as 808 provided in the plate 787. Openings as 809 are formed in the plate 788 and these openings 809 are respectively aligned with the openings as 808 in the plate 787. A pin as 810 is mounted to extend through each opening 808 and its aligned opening 809, these pins including headed upper ends which normally rest up against the upper face of the plate 787. Two grooves as 811 are formed in the upper face of the block 794 and when the sensing head SH is moved to its lower position shown in Fig. 83, the free lower ends of the pins as 810 may pass into one or the other of the grooves 811, one such groove being respectively aligned with each set of twenty-four pins.

When no tab as 236 is provided at a particular position or when half of a tab is cut away in alignment with a pin as 810 adapted to cooperate with the cut away portion of the tab or when an opening is formed in the head of a tab as 236 in alignment with a pin as 810 adapted to cooperate therewith when a printing and control device D is disposed at the station 212, the free ends of the pins as 810 may pass into the grooves as 811. When, however, the lower end of a pin as 810 engages the face of a tab downward movement of such pin with sensing head 785 is interrupted and consequently in the course of continued downward movement of the sensing head 785, the head of the pin engaged with the face of the tab acts on the flange 812 on the member 785 so that the member 785 pivots about the pivot

785B therefor in a counter-clockwise direction as viewed in Fig. 83.

While openings as 808 and 809 are respectively formed in the plates 787 and 788 to be respectively aligned with each of the potential selecting positions, it is often desirable to eliminate pins as 810 so that only predetermined of the various potential selecting positions will be effective. This is accomplished by mounting pins as 810 in aligned openings 808 and 809 in position to cooperate only those selecting positions that are to be effective. Moreover, while the arrangement shown in the accompanying drawings is one that enables utilization of forty-eight selecting positions, it will be understood that the arrangement is such that resort may be had to a fewer number of such selecting positions merely by omitting pins as 810. Furthermore, if desired, arrangement can be made to provide accommodation for a third row of pins as 810 so as to thereby increase the number of potential selecting positions to sixty.

By referring to Figs. 80 and 83, it will be seen that the member 785 consists of two sections 812 and 813, the brackets as 785A being secured to the section 813. The section 812 includes a part which extends beneath the part 813 and pins as 814 and 815 are fast in this portion of the member 812 near the inwardly disposed edge thereof. These pins respectively extend through slots as 814A and 815A formed in the section 813 to thereby support the part 812 for sliding movement relative to part 813. A slot 816 is formed in the part 812 between but forwardly of the slots 814A and 815A. A stud 816A extends through the slot 816 and has a pin 816B thereon at the lower edge thereof. A plate 817 is secured to the inner face of the part 812 and has a cam surface formed on the downwardly disposed face thereof. The stud 816A includes a head 818 that rests against the upper part of the face 813. A handle 819A is secured to the head 818 and when this handle is disposed in the position shown in Figs. 80 and 83, the pin 816B engages the high part of the cam surface on the plate 817 and this is effective to clamp the part 812 to the part 813. However, when the handle 819A is grasped and rotated through a 90° angle as viewed in Fig. 80, the part 812 is unclamped from the part 813, whereupon the part 812 may be moved toward the left as viewed in Figs. 80 and 83. In the course of such movement, the flange 812 is moved out of alignment with the openings 808 thus disclosing these openings. When the openings 808 are thus disclosed, a pin 810 may be inserted into an opening 808 and the aligned opening 809, or such a pin may be removed from such a set of openings by selectively disposing pins as 810 in openings 808 and cooperating openings 809, and the pins 810 may be disposed to be aligned with those of the potential selecting positions that are to be effective in the course of operation of the machine.

When the upper part 785 of the sensing head SH pivots about the pivotal mounting as 785B thereof as an incident to the engagement of a pin 810 with the face of a tab on a printing and control device D disposed at the station 212, this counter-clockwise movement as viewed in Fig. 83 of the part 785 is transmitted through the arm 819A, Figs. 36 and 80, to cause this arm to move in a counter-clockwise direction as viewed in Fig. 36. A link 819B is connected to the arm 819A at the free end thereof and the aforesaid movement of the arm 819A in a counter-clockwise direction as viewed in Fig. 36 is effective to move this link 819B upwardly for a purpose to be described hereinafter.

As has been explained hereinabove as an incident to operation of the printing and control device advancing means, a reciprocatory movement is imparted to the link 785 from the cam 780 against the effect of the spring 485A which is normally effective to hold the follower 482A against the periphery of the cam 480. The dwell of this cam is so arranged that it is normally effective on the links 485 to hold the sensing head SH in its lowered operative position shown in Fig. 83. The upper ends of the links 485 are respectively and pivotally connected to the arms 776 and 777 as indicated at 485B, Figs. 36 and 80. When in the course of operation of the printing and control device advancing means, a printing device disposed at station 212 is to be advanced from this station and the lowermost printing and control device in the magazine M is to be advanced into the station 212, the cam 480 is effective through the links as 785 to move the sensing head SH upwardly so as to thereby withdraw the pins as 786 and 810 from cooperation with a printing and control device at the station 212. This upward movement of the sensing head SH is initiated prior to the time advancing movement is imparted to the carrier bars 705 and 706 so that the pins 786 and 810 are free of the printing and control device at the station 212 prior to the time advancing movement is imparted to this printing and control device by the carrier bars 705 and 706. However, once a printing and control device has been withdrawn from the magazine M and advanced into the station 212 by the carrier bars 705 and 706, the sensing head SH may be lowered into the operative position thereof shown in Fig. 83 so as to thereby bring the pins 786 and 810 into cooperation with related parts on the printing and control device at station 212 with which these pins are respectively adapted to cooperate.

Inasmuch as it is important that a face-to-face relation be maintained between the arms 777 and 778 and the link 785 connected thereto, an arrangement like that shown in Fig. 36B is provided in each of the arms 785. This arrangement consists of an adjusting screw as 784B, Fig. 36, which cooperates with the adjacent face of a rail as 702 in the manner and for the purpose described hereinabove with reference to the adjusting screw 784. Thus, when the transverse position of the sensing head 785 is adjusted through the intermediary of the adjusting screws as 784B and in this way a flat face-to-face relation is maintained between the links as 785 and the adjacent faces of the arms 777 and 778.

It will be understood that the hereinabove described longitudinal and transverse adjustments that may be effective to the sensing head SH are for the purpose of insuring alignment of the pins as 786 and 810 with the parts of a printing and control device disposed at station 212 with which these pins are adapted to cooperate.

THE PLATES AND RELATED MECHANISMS

The platens P–2, P–3 and P–4 are carried on the rigid printing frame 216 as hereinbefore pointed out, and the particular way in which these platen mechanisms are mounted is illustrated in Figs. 49 to 60. Thus, the printing frame

216 is afforded by a pair of rigid and generally C-shaped side plates 825 and 826 that are mounted in position on the machine frame of the unit 201 so that the upper arms of the plates 825 ad 826 are disposed above the sheet guideway SG–2 while the lower arms of these plates are disposed beneath the table top T–1 of the machine.

In attaining this mounting arrangement of the platens 825 and 826, it should be pointed out that the machine frame comprises a plurality of uprights 827 extended upwardly from a lower base frame 828 of rectangular form, this base frame in turn being supported on bottom rails 829 that are arranged to engage the floor. The uprights 827 are connected along the rear side of the machine by a plurality of horizontal mounting bars 830, 831 and 832, while at the front of the machine the uprights are connected by a pair of horizontal bars 833 and 834.

At the rear or closed end of the C-shaped plates 825 and 826, these plates are arranged to be connected to the upper mounting bar 832, while at the forward end of the lower arm of each such C-shaped plate, a connection is effected with a longitudinal mounting bar 835 which extends parallel to the bar 834 and somewhat rearwardly thereof.

Between the upper arms of the plates 825 and 826, provision is made for supporting the various plates P–2, P–3 and P–4. Thus, near the forward ends of the upper arms of the plates 825 and 826, a pair of transverse rails 840 and 841 are secured by means including fastening bolts 842. It is between the mounting rails 840 and 841 that the platen P–3 is mounted, as will hereinafter be described. Spaced rearwardly from the mounting rail 841, a pair of parallel mounting rails 843 and 844 are extended between the upper arms of the C-shaped plates 825 and 826, and these mounting rails are similarly secured in position to afford mounting space within which the roller platen P–2 and the supplemental stamper type platen P–4 may be mounted as hereinafter described.

The roller platen P–2

The roller platen P–2 is illustrated in detail in Figs. 50 to 60, inclusive, and it will be evident in these views that the roller platen P–2 embodies a carriage C that is disposed between the rails 843 and 844, and is mounted for longitudinal reciprocation along a path that is transverse with respect to the printing device guideway and which is located so that the carriage passes over the position occupied by the anvil 734. In affording the desired support for the carriage C on the rails 843 and 844, these rails have horizontally projecting tracks afforded thereon by means of plates 846, that are secured to the bottoms of the rails by screws 847. The arrangement is such that these plates extent toward each other so as to project beyond the adjacent surfaces of the supporting rails 843 and 844, and the projecting tracks that are thus afforded are arranged to be engaged by supporting and guiding roller means. Thus, near the center of the carriage C, front and rear rollers 849 are mounted so as to ride along the upper faces of the respective rails or tracks 846. The carriage C also has a pair of front rollers 849 and a pair of rear rollers 850 mounted thereon and arranged to engage the lower faces of the respective tracks 846, and the rear rollers 850 each have a somewhat larger guide disk 850G associated therewith so as to extend into a downwardly facing guide groove 846A formed longitudinally in the lower face of the rear guide rail 846. Thus, the carriage is guided along an accurately defined path over the printing station defined by the anvil 734.

The carriage C as herein shown is arranged to afford two positions at which platen rollers PR may be supported, but in most of the views from Figs. 50 to 60, only one such platen roller has been illustrated in the left-hand operating position in the machine, the other or right-hand mounting position having been provided for use in connection with two-column listing work when this is required. Thus, the carriage has a pair of downwardly projecting mounting plates 851 disposed near the front and rear edges thereof, and these mounting plates serve to support certain of the elements of the mechanism. These mounting plates are formed as elements of a bottom casting 852 that is secured to the lower face of the main carriage casting by means such as bolts 853, Fig. 53. In affording a mounting for a platen roller PR, adjustment in a vertical direction is provided in order that the printing pressure may be accurately determined, and in accomplishing this result, a pair of links 854 are extended generally horizontally to the left, Fig. 52, from aligned pivot points 855 and 856 afforded, respectively, in the lower corners of the mounting plates 851. These links 854 are extended to the left and are pivotally connected at their left-hand ends to upwardly extending links 857, the links 857 being supported at their upper ends on a vertically adjustable cross shaft 860. Adjustment of the cross shaft 860 is attained by means including a pair of adjusting nuts 861 that are of round form and extend downwardly through the upper parts of the carriage C. A retaining plate 861P engages reduced neck portions on the nuts 861, and screws extend downwardly through the plate 861P and into studs 861S that extend upwardly through the carriage casting so that this structure holds the nuts 861 in fixed longitudinal positions while permitting rotative adjustment by engagement of the kerfed upper ends of the nuts 861. The nuts 861 are internally screw threaded, and engage upwardly extended threaded studs formed on members 862 that have a pinned connection with the cross sheet 860 as shown at 862A. Thus, by operation of the adjusting nuts 861, the cross shaft 860 may be raised or lowered, and since the adjusting nuts 861 are disposed near the front and rear ends, respectively, of the cross shaft 860, these nuts may also be used for the purpose of leveling the platen structure. The nuts 861 are arranged for normal adjusting operation in unison by a knurled head 863 that is mounted for limited vertical movement in a non-rotative relation on a stub shaft 863M that extends downwardly through the main carriage casting, Fig. 60. This is accomplished by a pin and slot arrangement 863Y, and a spring 863Z beneath the head 863 urges the head toward an upper relation with respect to the shaft 863M. A spring plunger 863P in the shaft 863M, Fig. 60, acts against a stud 863X to urge the shaft 863M upwardly so that a gear 864M fixed thereon is in the plane of and meshed with a pair of idler gears 864G that are carried on the lower ends of the studs 861S. The gear 864M also engages stationary pin 864P when the gear is in its upper position, thereby to be locked against rotation. These idler gears 864G mesh with gears 864H fixed on the nuts 861, and when the head 863 is moved downwardly from its normal position to the end of the lost motion afforded by the pin and slot 863Y, the gear 864M is disengaged from the locking pin 864P while still remaining engaged with

the idler pinions. When this is done, the head 863 will actuate the nuts 861 in unison to cause ordinary adjustment of the printing pressure. When a leveling operation is to be performed, the shaft 863M is depressed to disengage the gear 864M from the idlers, and the nuts 861 may then be adjusted independently.

The platen roller PR is of the positive gear driven type so that the platen roller rolls along the lines of embossed characters on the printing device D in timed relation to the movement of the platen carriage C, and in such rolling action the desired cutoff action is attained by affording a resilient platen facing 865 which is segmentally formed to afford cutoff edges 865–1 and 865–2 as shown in Fig. 53 of the drawings. In accordance with the present invention, the platen carriage C is moved through a stroke in one direction to accomplish a particular printing operation, and at the end of the stroke, comes to rest in the position shown in Fig. 52, wherein the edges 865–1 and 865–2 are both spaced away from the table top of the machine. Then, after advancing movements of the sheets and related elements, the next printing operation is performed by moving the carriage C in the opposite direction to a position wherein the platen roller PR occupies the position shown in dotted outline in Fig. 52, in which position the edges of the resilient platen facing are similarly spaced from the paper so that the desired sheet feeding operations may take place.

The gearing arrangement through which such positive rotative movements may be applied to the platen roller PR in the course of the aforesaid reciprocating movements of the carriage C are illustrated in Figs. 52 to 55 and 57 and 59. Thus, the rear link 857 carries a platen mounting bearing structure which includes a pinion 867, and this pinion 867 is meshed with a pinion 868 that is carried by the link 854. The pivot pin 856, Fig. 59, carries a pinion 869 that meshes with the pinion 868, and this pinion 869 meshes with a pinion 870 that is mounted on a shaft 871 that extends from front to rear through the mounting plates 851. The pinion 870 is fixed on the forward end of a sleeve 872, and at its rear end this sleeve carries a gear 873. The gear 873 is disposed so as to underlie and be meshed with a rack 875 that extends substantially parallel to the path of movement of the carriage C. The left-hand end of the rack 875 is pivoted at 876 on a bracket 877 that extends downwardly from the rear face of the mounting rail 844, it being observed that in Fig. 55 this structure is shown in a reverse relationship. The sleeve 872 has a guiding bracket 877 rotatably associated therewith, and this bracket is extended upwardly and bent around the upper edge of the rack 875 as indicated at 877G. Thus, when the carriage C is moved longitudinally, the guide 877 moves with the carriage C and along the rack 875 and assures that the rack 875 is maintained in meshed relationship with respect to the gear 873. With the arrangement that is thus afforded, the free end of the rack 875 that is meshed with the gear 873 is able to follow the up and down adjusting movements of this gear 875 when the platen pressure is being adjusted and, hence, the pressure adjustments are attained without changing the cutoff relationship of the platen face 685. The mounting, adjusting and driving arrangements just described are in effect duplicated at the right-hand end of the carriage C to afford another platen roller position.

The carriage C is actuated through the desired reciprocating stroke by a pair of links 880 that are pivoted on pivots 881 near the front and rear edges of the carriage C, and these links 880 are extended to the left and are respectively pivoted at 882 to a pair of similar arms 883 that are extended in parallel relation from opposite ends of a mounting sleeve 884. The mounting sleeve 884 is fixed on a counting shaft 885 that is extended horizontally through the mounting rails 843 and 844, and on the projecting rear end of the shaft 885, a bevel gear segment 886 is fixed. This bevel gear segment is meshed with a bevel gear segment 887 that is fixed on a horizontal shaft 888 that is supported by a bearing bracket 889 and by a bearing in the left-hand plate 825. Just to the left of the plate 825, an arm 890 is fixed on the shaft 888, and the upper end of the actuating link 575 is pivotally associated with the arm 890. Thus, when the link 575 is moved in a downward direction, the carriage C is moved to the left to the position shown in Fig. 51, while movement of the link 575 in an upward direction actuates the carriage C to the right and into the position shown in Figs. 52 and 53.

The stamper platen P–3

The main stamper platen P–3 is mounted and supported over the main printing station in and below the space between the mounting rails 840 and 841, as will be evident in Figs. 49 and 51, 65, 70, 72 and 73, and the stamper platen P–3 is driven by an operating connection from the vertical shaft 407. Thus, as shown in Fig. 49, the shaft 407 extends upwardly to a point adjacent the outside surface of the C-shaped member 826 and by means of bevel gearing 892 is connected to a forwardly extended shaft 893. The forward end of the shaft 893 is supported in a bearing bracket 894 carried on the side of the member 826, and by bevel gearing 895, the shaft 893 is connected to a horizontal shaft 896 that extends to the left substantially midway between the mounting rails 840 and 841, and at its left-hand end, the shaft 896 is associated by means of a coupling 897 with the operating mechanism of the plate P–3.

Thus, as best shown in Figs. 65, 70 and 72, the platen P–3 is adjustably supported by means of adjusting screws 900 beneath a lower plate 901 that is formed as a part of a supporting yoke 902. This supporting yoke 902 is arranged to extend upwardly from the forward edge of the plate 901, thereby to enable this yoke 902 to be disposed adjacent to the forward mounting rail 840, and near its upper end, the yoke 902 extends inwardly as at 903 so as to substantially overlie an operating shaft 905 that is connected by the coupling 897 to the shaft 896. The shaft 905 is journaled adjacent its opposite ends in a pair of cross bars 906 and 907, Figs. 70 and 72, thereby to enable the shaft 905 to exert downward force on the yoke 902 by means of a pair of spaced cams 908 fixed on the shaft 905 and acting downwardly against cam rollers 909 that are mounted in upstanding bearing lugs 910 formed on the plate 901. Spring means such as springs 911 and 912 act to urge the yoke 902 in an upward or retracting direction.

The yoke 902 is supported and guided for movement so as to maintain the lower face of the platen P–3 in desired plane for printing engagement with a sheet S, and, as herein shown, this is accomplished by a parallelogram mounting. Thus, the mounting rail 841 has a pair of mount-

ing lugs 913 fixed thereto and a shaft 914 is mounted therein. A pair of links 915 are pivoted at the rear ends on the shaft 914 and extend forwardly and are pivoted on a shaft 916 in the overhanging portion 903 of the yoke 902. Thus, the upper end of the yoke 902 is guided and the lower end is guided by a pair of links 918 that are pivoted near the lower end of the bracket 913 by a pivot shaft 919. These links 918 extend forwardly and are pivoted on the axis of the cam rollers 909. Hence, in the rotation of the shaft 905, the platen P–3 will be moved downwardly through a printing stroke and will then be retracted to the raised position in Fig. 49.

Serial numbering machine N–2

It will be observed that the left-hand link 918 is pinned to the shaft 919 so that this pivot shaft is operated through a rocking movement each time the platen P–3 is actuated through a printing cycle, and this rocking movement is utilized to advance the serial numbering machine N–2. Thus, as will be evident in Figs. 65 and 72, the shaft 919 extends a short distance to the left beyond the cross bar 907, and at the end of the shaft 919, a rearwardly extending operating arm 920 is fixed to the shaft 919. The numbering machine N–2 has an operating or advancing shaft 921 that is urged in a counter-clockwise direction as viewed in Fig. 65 by a spring 922, and when the numbering machine is to be advanced one unit, the shaft 921 is rocked first in a clockwise direction through a conditioning movement and is then released for a return or advancing movement under the action of the spring 922. The spring 922 acts on one arm of a bell crank lever 923, and the other arm of this bell crank extends in a rearward direction and is disposed substantially beneath the arm 920. An operating connection is afforded between the arm 920 and the bell crank lever 923 by a vertically extending link 925 that has a pivoted connection at its lower end with the arm 923 and which has a hook 925H at its upper end which is arranged to fit over a laterally projecting pin 926 that is afforded on the arm 920. Hence, in the downward movement of the platen P–3, the arm 920 will act to rock the shaft 921 of the numbering machine N–2 through a conditioning stroke, and after the printing operation has been completed and in the course of the retracting movement of the platen P–3, the shaft 921 will be allowed to move under the action of its spring 922 through an advancing movement.

The numbering machine N–2 is mounted in the machine so as to be removable therefrom, thereby to facilitate resetting of the numbering machine as well as the mounting of embossed printing plates 930 thereon for printing certain fixed data on the sheets S, and to enable this to be accomplished without disturbing the connection that includes the link 925, the numbering machine N–2 has its operating shaft arranged to be detachably related to the rock shaft 921. Thus, the rock shaft 921 is mounted in a bracket 931 that is stationarily located in the machine, and a tongue and groove coupling 932 is afforded, one element of this coupling being located on the shaft 921 while the other is located on the operating shaft of the numbering machine. The numbering machine N–2 has a forwardly extending rod 933 fixed thereto so that the numbering machine may be slid in a forward direction along a guide plate 934 so as to thereby remove the numbering machine from its normal position of use, and in such forward movement, the tongue and groove connector 932 would normally be disengaged simply by such forward movement, the tongue and groove of this coupling being normally disposed in a horizontal position. However, in the present instance, an extremely close spacing of the numbering machine with respect to the location of the printing device D has been necessary, and this has required that a clearance recess 935 be afforded in the adjacent side edge of the track 702, as will be evident in Fig. 74 of the drawings. Because of this, the guideway or track 934 is supported on a mounting plate 936 and is pivoted thereto at its rear end on a pivot 937, this pivot having a spring tension arrangement 938 so that the structure may be lifted to disengage a locating pin 939 that engages a suitable recess in the mounting block 936. Adjacent to the forward end of the mounting block 936, a spring tension guide pin 940 is extended downwardly from the guide 934 through a slot 941 formed in the mounting plate 936, and it will be observed that a spring 942 acts to urge the guide bar 934 to its normal position that is shown in full lines in Fig. 74. When the numbering machine is to be removed, the guide strip 934 is raised at its forward end to disengage the locating pin 939, and the bar 934 is then moved to the dotted line position shown in Fig. 74, thereby to move the numbering machine out of the recess 935 in the side of the rail 702, and the numbering machine may then be withdrawn in a forward direction along the guide bar 934.

The numbering machine N–3

The numbering machine N–3 is located at the right-hand end of the printing position 210, and is thus disposed just outside of the rail 701 of the printing device guideway. This numbering machine N–3 is manually set up and remains in such setting throughout any particular run of the machine. This numbering machine is arranged on a guide bar 945 that is in turn carried on a support plate 946, this mounting being attained by means including spring retaining pins 947 so that by depression of the forward end of the guide 945, a latch element 948 on the rear end of the numbering machine may be disengaged from a slot in an adjustable retaining rod 949. The numbering machine N–3 may then be engaged by a handle 950 and withdrawn along the guide 945, thereby to remove the same from the machine. When the numbering machine is thus removed, the setting of the numbering machine N–3 may be changed and an embossed printing plate 952 carried on the block of the numbering machine may be replaced if this is required.

The stop finger and safety sensing means at station 210

When a sheet S is brought into the printing station 210, it is brought to rest and its presence at the printing station is verified by means that are operated under control of the multi-print shaft 425. Thus, as shown in Fig. 49 of the drawings, the shaft 434 extends upwardly to a position adjacent the outer side surface of the C-shaped frame member 226, and at its upper end this shaft is associated by bevel gearing 955 and a bracket 956 with a forwardly extending horizontal shaft 957. At its forward end the shaft 957 is associated by gearing 958 with a stop finger cam shaft 960 that is extended across beneath the upper arm of the frames 225 and 226 and substantially beneath the mounting rail 941. The

stop finger cam shaft 960 is supported by a bracket 961 at its right-hand end and by bracket 962 carried by the plate 825 at its left end. The bracket 962 also serves as a support for the left-hand end of a pivot shaft 963, the right-hand end of which is supported at 961A in the bracket 961. The pivot shaft 963 serves to pivotally secure a block 965 that constitutes the supporting member of a stop finger 966. The stop finger 966 takes the form of a plate that extends downwardly from the forward end of a rod 967 that is fixed at its rear end in the lower portion of the block 965. The block 965 has an upwardly extending arm 968 which has a laterally projecting pin 969 thereon that serves as a cam follower that engages a stop finger operating cam 970 fixed on the stop finger control shaft 960. A return spring 972 acts between a pin 973 extended rearwardly from the block 965 and a pin 974 that is fixed on the non-rotative pivot shaft 963. This urges the stop finger 966 toward its effective position and tends to maintain the follower 969 in engagement with the cam 970.

The stop finger cam shaft 960 also serves to operate safety sensing means that are effective to sense the presence of the sheet S at printing station 210 and in subsequent positions along the sheet guideway SG–2. Thus, as will be evident in Figs. 70 and 76 to 78, a sensing lever 975 is supported on the pivot shaft 963 and has an upwardly extending arm 976 with a follower 977 arranged to engage an operating cam 978 fixed on the stop finger cam shaft 960. A spring 979 acts on the sensing arm 975 to maintain the follower in engagement with the cam 978 and thereby urge the sensing arm downwardly toward the effective sensing position of Fig. 77. At its forward end, the sensing lever 975 has a pair of laterally projecting arms 975A and 975B, the arm 975B extending to the right as viewed in Fig. 70 and beneath the rod 967 of the stop lever. At its right-hand end, the arm 975 extends downwardly so that in a downward sensing movement of the sensing lever 975, the arm 975B may move downwardly through an opening 980 in the table top in the event that a sheet S is not in position in abutment with the stop finger 966. In the event that the arm 975B does thus move downwardly through the opening 980, the arm 975A will concurrently move downwardly through an opening 981, Fig. 73, so as to operate a stop switch 985, Figs. 70 and 78, such stop switch being included in the safety stop circuit of the machine, as will hereinafter be described.

The operative association of the arm 975A of the sensing lever 975 with the switch 985 is so arranged that the major portion of the operative connection may also be actuated by another sensing means which is utilized to sense the proper discharge of the sheet S from the printing position 210, and this operative connection will, therefore, be described after such additional sensing means have been described. Thus, as will be evident in Figs. 70 and 78, a sensing roller 987 is rotatably mounted on the forward end of a mounting shaft 988 that is carried by a rocking block 989 that is supported on the pivot shaft 963. The rocking block has an upwardly projecting arm 989A upon which a laterally projecting follower 990 is afforded for engagement with a control cam 991 that is fixed on the stop finger cam shaft 960. A return spring 992 is afforded for urging the sensing roller 987 in a downward or sensing direction. The cam 991 is so formed that at the time when a sheet S in normal operation will have moved from the printing position 210 and into position beneath the roller 987, the roller 987 will move downwardly, and in normal operation of the machine the roller 987 will strike the sheet and its downward movement will be terminated. However, if a sheet has not been properly discharged from the printing position, the roller 987 will move downwardly through an opening 993, Figs. 73 and 78, and into engagement with the operating mechanism of the switch 985. Such operating mechanism 985 comprises a rocker 995 pivoted at 996 on a bracket 997, such bracket 997 being fixed on the mounting rail 832A of the frame. The bracket 997 serves also as a mounting for the switch 985 which is in the form of a microswitch having an operating plunger 985P. The rocker 995 has an arm 995A that is formed to afford clearance around the pivot 996, and which at its lower end is disposed substantially in a vertical plane passing through the pivot 996. This lower end of the arm 995A is disposed opposite the operating plunger 985P so that when the rocker 995 is actuated in a counter-clockwise direction, Fig. 78, the plunger of the switch 985 will be engaged and actuated. The rocker 995 has a forwardly projecting arm 995B and this forwardly projecting arm carries a bar 995C that extends parallel to the sheet guideway and into position beneath the two openings 981 and 993. Beneath the opening 981 the bar 995 has an adjustable abutment 999A for engagement by the arm 975A, while beneath the opening 993, the bar 995C has an adjustable abutment 999B for engagement by the roller 987.

It will be observed that most of the work performed by the shaft 960 is performed adjacent the left-hand end of the platen P–3, as well as the shaft 963, a supporting bracket 960B is extended downwardly from the rail 841 and is operatively associated with these two shafts so as to afford proper support therefor.

The stop finger cam shaft 960 is also utilized to impart the desired downward lowering movement to the collecting platform of the collecting mechanism K, and for this purpose, a cam 1001, Figs. 70 and 79, is fixed on the left-hand end of the stop finger cam shaft 960 just beyond the supporting plate 962. This cam is engaged by a roller 1002 carried on the forward end of a rectifying lever 1003 that is pivoted at 1004 on the mounting plate 862. The projecting rear end of the lever 1003 is urged upwardly by a spring 1005 so as to be more in contact with the cam 1001, and an operating cable 1006 extends downwardly from the rear end of the lever 1003 and is associated with the platform lowering mechanism of the collector K in a conventional manner.

The platen P–4

As shown in Figs. 50, 65, 66 and 79, the platen P–4 is carried on the lower end of a U-shaped supporting bracket 1009, and this bracket extends upwardly into a position between the supporting rails 843 and 844 where a mounting of generally parallelogram character is afforded. Thus, a pair of links 1010 extend forwardly from pivotal connections afforded on brackets 1011 fixed on the forward face of the mounting rail 1044 and the forward ends of the links 1010 are pivoted at 1012 to the upper ends of the arms of the U-shaped bracket 1009. Spaced downwardly somewhat from the links 1010, an operating shaft 1013 is extended parallel to the rail 1043 and is rotatably supported by bearings in the plate 825, and in a cross bar 1015 that extends

between the two rails 843 and 844. This shaft 1013 has a pair of arms 1016 extending forwardly therefrom and pivoted at 1017 to the respective arms of the U-shaped bracket 1009 so that by rocking movement of the shaft 1013, the bracket 1009 and the platen P–4 may be moved up and down between an upper retracted position and a lower effective or backing position for cooperation with the variable printer VP–2 and the numbering machine N–1. The movement thus afforded is not strictly a straight line or parallelogram movement, but when the lower or effective position is reached, the platen P–4 is in the desired level position with respect to the printing elements.

The shaft 1013 is operated through the requisite rocking movements by means including an arm 1020 fixed on the left-hand end of the shaft 1013 just outside of the frame member 825, and the arm 1020 has the upper end of a toggle link 1021 pivoted thereat at 1022. A lower toggle link 1023 is pivoted at 1024 to the lower end of the toggle link 1021, and the toggle link 1023 is pivoted on a fixed stud 1025 that is mounted in the frame member 825. Thus, by rocking the toggle link 1023 in a clockwise direction from the position shown in Fig. 65 to the dotted line position shown in this figure, the desired rocking movement may be imparted to the shaft 1013 to move the platen P–4 downwardly to its effective position. Such operation moves the toggle links to a fully extended position that is determined by engagement of a tooth 1021T on the link 1021 with a pin 1023P that is afforded on the toggle link 1023. When this extended relationship is reached, the platen P–4 is firmly held in its desired backing relationship with respect to the printing elements.

The toggle mechanism just described is actuated by means including an arm 1028 fixed to the toggle link 1023 by a sleeve connection, and from the rear end of the arm 1028, a downwardly extending operating link 1030 projects into an operative association with cam mechanism on the cam shaft 668 of the variable printer VP–2. Thus, as shown in Figs. 65, 66 and 68, the cam shaft 668 has a pair of conjugated cams 1031A and 1031B fixed thereon and a bell crank lever 1032 pivoted at 1033 has a pair of rollers 1034A and 1034B fixed thereon and engaged, respectively, with the edges of the cams 1031A and 1031B. The arm of the bell crank lever 1032 upon which the cam roller 1034 is mounted extends in a rearward and generally horizontal direction, and at its rear end, the lower end of the link 1030 is pivoted as at 1035 so that the rocking movements imparted to the bell crank 1032 are transmitted to the toggle mechanism 1021—1023 for operating the platen P–4.

THE DATA SET-UP MECHANISM CONTROLLED BY THE SENSING HEAD SH

The sensing head SH in sensing the numerical data represented by the perforations 231 in the printing and control devices D is arranged to control the closure of a plurality of switch mechanisms that include the pins 797 and 805, Fig. 83, as hereinbefore described, and these switches that are thus afforded are arranged in groups of five with each group allocated to a particular order of the numerical data as represented by a particular vertical column in the data representing field 230. The conductors from such switches are arranged in corresponding groups and these conductors are extended into the unit 202 of the machine so that these conductors may serve as energizing circuits for electrically operated set-up means which is arranged to control the set-up mechanism of the variable printer VP–1. As hereinbefore stated, this variable printer VP–1 is similar in its basic aspects to the variable printing and adding unit disclosed in Figs. 37 to 90 of the aforesaid Gollwitzer patent No. 2,501,444, and in the present application only those aspects of the variable printing mechanism which differ from the aforesaid Gollwitzer patent will be disclosed in detail.

Thus, as shown in Figs. 92 to 97 of the drawings, the variable printer VP–1 has a plurality of set-up slides 1050 that are associated along their upper edges with individually settable type segments 1051, and along their lower edges the set-up slides 1050 are operatively related to three accumulator mechanisms AC–1, AC–2 and AC–3 in the manner described in the aforesaid Gollwitzer patent. These accumulator mechanisms are arranged to be governed insofar as their normal adding action may be concerned and their total taking operation may be concerned by a total control shaft 1053, Fig. 93, which is arranged to be set in the same manner as in the aforesaid Gollwitzer patent No. 2,501,444. The total control shaft 1053 also attains its controlling action in the same manner as in the Gollwitzer patent.

The slides 1050 are normally biased in a rearward or left-hand direction by springs 1054, and a restoring bail 1055 operatively associated with a cam 1056 on the main cam shaft 645 of the unit VP–1 is arranged to restore the slides 1050 to their normal forward position and to release the same to the control of a set-up mechanism 1058 of the same general character as that shown in the aforesaid Gollwitzer Patent No. 2,501,444. It will be observed that this set-up mechanism 1058 includes five vertically movable stop pins 1059 adapted for cooperation with a positioning edge 1060 on the slides 1050, it being noted that five such pins are afforded in respect to each such slide 1050. The pins are arranged to disengage a control pawl 1061 on the related slide 1050 so as to free the pawl 1061 from a main stop plate 1062, thereby to allow the related slide 1050 to move to the left, Fig. 97, through the desired set-up movement that is permitted by the setting of the pins 1059. It will be observed that the five pins 1059 that are afforded in each order of the machine are mounted on a slidable mounting plate 1063 so that a translating action may be attained as described in the aforesaid Gollwitzer Patent No. 2,501,444. This translating action translates the five element code utilized in the printing and control devices into nine different positions that are representative of the nine significant digits, and reference may be had to the aforesaid Gollwitzer Patent No. 2,501,444 for details of this translating action.

The pins 1059 in the several orders of the variable printer VP–1 are selectably actuated in cooperation with the sensing head by a group of five solenoids 1065, one such group of solenoids 1065 being afforded for each order that is to be set up in the variable printer VP–1. These solenoids 1065 of each group are carried in a mounting frame 1066, Fig. 94, and each such assembly is mounted on supporting rails 1067 that are provided between a pair of spaced mounting frames 1068 that are afforded in the base of the unit 202 as shown in Fig. 101 of the drawings. In providing an operative association between the sole-

noids and the set-up pins 1059 of the related order of the machine, each pin 1059 is provided with a downwardly extending operating rod 1070 so that five such rods 1070 extend down for each order of the machine. In the base of the unit 202, as shown in Fig. 94 of the drawings, a bell crank 1071 is provided for each rod 1070, and a horizontally projecting arm of the bell crank 1071, Fig. 96, to the rod 1070. The other arm of the bell crank 1071 extends downwardly and is pivoted at 1073 to a head 1074 that is provided on a rod 1075. The rod 1075 extends through the adjacent mounting plate 1066 of the solenoid group, and a spring 1077 acts to urge the rod 1075 in such a direction as to move the rod 1070 downwardly. The armature 1079 of the solenoid is connected to the rod 1075, and when a solenoid 1065 is energized, it acts through the bell crank 1071 and the rod 1070 to move the related pin 1059 in an upward or setting direction. In this regard it will be noted that the set-up pins 1059 and the related mechanism are restored in the manner disclosed in the aforesaid Gollwitzer Patent No. 2,501,444.

The various groups of solenoids 1065 that are allocated to the several orders of the variable printer VP–1, that are to be set up, are electrically associated with the switches at the sensing head SH by means including a plurality of terminal plugs 1080, Fig. 101, these plugs being connected to the solenoids by cables indicated diagrammatically at 1081 in Fig. 101.

It will be observed in Figs. 94 and 95 that the rods 1070 are sectional in character, so that upper sections 1070A are included permanently in the variable printing unit VP–1 and at their lower ends are arranged to engage the upper ends of the lower sections as viewed in Fig. 95 of the drawings.

When the various sensing or set-up pins 1059 have been set through the cooperative action of the sensing head SH and the solenoids 1065, the main cam shaft 645 of the variable printer unit is set into operation, as will hereinafter be described, so that the slides 1050 will be set up in accordance with the setting of the pins 1059, and in the ensuing cycle of operation of the variable printer VP–1, the numerical data set-up on the type segments 1051 will be printed, as described in the aforesaid Gollwitzer Patent No. 2,501,444, and the amount that has thus been printed will be entered into the accumulator AC–1.

The amount that has been set up on the slides 1050 of the variable printer VP–1 is concurrently set up in the punching means of the variable printer VP–2 of the main unit 201 of the machine. The operative association of the slides 1050 of the variable printing unit VP–1 with the punching unit PU will first be described.

As pointed out hereinabove, the punching unit PU is of the general character disclosed in the copending application of Walter T. Gollwitzer, Serial No. 587,579, filed April 10, 1945, and reference may be had to such copending application for details of the structure in operation. For present purposes, however, only such portions of the punching apparatus will be described as may differ from the structure shown in such copending application. It may be noted in a general way, however, that the punching unit PU does not in the present instance include accumulating mechanism, and hence, these portions of the structure, as well as the control elements associated therewith, are eliminated.

The punching unit PU, as shown in Figs. 92 and 98, has the punching head 280 mounted for vertical reciprocating movement on a guide frame 1090 of the kind shown in the aforesaid Gollwitzer application, and this guide head is moved up and down by means including a transmitting plate 1091 and rollers 1091A and 1091B that cooperate with cam means carried on the main cam shaft 633 of the punching unit. The punching head 1080 constitutes the operating means for a plurality of vertically movable punches 1094 that are arranged in rows of twelve punches each in an upper punch-guiding block 1095, such punch-guiding block being mounted over a die block 1096 with a clearance throat 1097 formed therebetween so that the sheets S may move into position beneath the punches 1094. Each row of twelve punches is allocated to a particular order in which numerical data is to be represented, and on the upper plate 1099 of the punch head 280, a plurality of longitudinally adjustable interposers 1100 are provided so that by longitudinal setting movement, the interposer 1100 in any order may be disposed opposite the punch 1094 that is to be actuated. These interposers are arranged so that some of them are set manually by manually operable set-up devices 1101 of the character illustrated in the aforesaid Gollwitzer application, Serial No. 587,579, while other interposers 1099 are arranged to be automatically set up by means of set-up slides 1104. The set-up slides 1104 are arranged in substantially the same manner as in the aforesaid Gollwitzer application, and each set-up slide is connected by means of a gear segment 1105, an arm 1106 and a link 1107 to the related interposer 1100.

The slides 1104 are extended rearwardly as shown in Figs. 92 and 98, and near their rear ends, these slides have racks 1104R formed in their upper edges. The racks 1104R serve as a part of an operative connection between the slides 1104 of the punching unit and the set-up slides 1050 of the variable printing unit VP–1. Thus, a plurality of transverse shafts 1109 are extended through the frames of the variable printing unit and the punching unit PU, and these shafts 1109 are supported in bearing plates 1110 and 1112 mounted, respectively, on the outside or remote side frame elements of the punching unit PU and the variable printer VP–1. The shafts 1104 are allocated, respectively, to the several set-up slides 1104, and pinions 1113 are fixed on the several shafts 1109 so as to be meshed with the racks 1104R of the slides 1104 to which their shafts 1109 are allocated. Similarly, the shafts 1109 each have a gear 1114 fixed thereon as shown in Fig. 92 so that each such gear 1114 engages a rack 1115 formed on an extension 1050E of the related set-up slide 1050 of the variable printing unit VP–1. It will be observed in Figs. 94 and 97 that each such extension 1050E is afforded rearwardly of the set-up mechanism 1058, and an operative connection is afforded between each slide 1050 and its extension 1050E by a U-shaped connecting plate 1116 which is arranged to extend upwardly and over the various mechanisms that are disposed above the set-up pins 1059. The extensions 1050E are supported on bars 1117 and guide combs 1118 in a manner generally similar to the support afforded for the slides 1050, as disclosed in the aforesaid Gollwitzer Patent No. 2,501,444.

By virtue of the operative connection that is afforded by cross shafts 1109 and the related gearing, the punching unit PU is set up in certain of its orders so as to correspond precisely

with the setting of the variable printing unit VP–1, and in this connection it will be observed that the interposers 1100 normally occupy their zero position so that in those orders to the left of the highest significant digit, zeros will be punched in accordance with usual accounting practice.

When the variable printer VP–1 and the punching unit PU are thus set up in accordance with the sensing operation of the sensing head SH, the variable printer VP–2 is similarly set up, and to enable this to be accomplished, an operative connection is afforded between the extensions 1050E of the slides of the variable printing unit VP–1 to the set-up slides of the variable printer VP–2. As will be pointed out hereinafter, this operative connection is afforded by means of a mechanical character which is adapted to be disconnected readily and easily as an incident to the separation of the two units 201 and 202 of the machine. In affording such an operative connection, the extensions 1050E have racks 1020 formed in their lower surfaces so as to engage related gear segments 1121, such segments being mounted on a common mounting shaft 1122 as indicated in Fig. 97 of the drawings. The segments 1121 have arcuate guide slots 1123 formed therein, and a guide comb 1124 is extended therethrough so that these segments may be accurately guided in relation to the racks 1120 with which they are engaged and also with respect to each other. Each gear segment 1121 has a connecting pin 1125 extended therefrom, as will be evident in Fig. 97, and a keyhole slot connecting element 1126 is adapted to be slid over the connecting stub 1125. The connecting element 1126 is permanently secured to the end of a Bowden wire 1130 so that when the extension 1050E moves through a setting movement to the left in Figs. 94 and 97, the rocking movement of the related gear segments 1121 in a counter-clockwise direction will permit movement of the Bowden wires 1130 in a corresponding amount and in a downward direction as viewed in Figs. 94 and 97. When the extensions 1050E are restored to their normal positions by the action of the restoring bail 1055, the Bowden wires 1130 are pulled in an upward direction, thereby to attain a controlling action, as will hereinafter be described, after the pertinent elements of structure of the variable printer VP–2 have been described.

The variable printer VP–2 is also of the general construction illustrated in the aforesaid Gollwitzer Patent No. 2,501,444, it being observed, however, that in the variable printer VP–2, the adding elements and the set-up elemets have been eliminated and a different set-up arrangement has been afforded.

Thus, in the variable printer VP–2, a plurality of slides 1135 are mounted for horizontal movement on guide bars 1136, and springs 1137 urge these slides 1135 individually toward the left as viewed in Fig. 104 and into abutment with a restoring bail 1138. The restoring bail 1138 is operated by means including a cam 1139 fixed on the main cam shaft 668 of the variable printer VP–2. The slides 1135 are associated with type segments 1140, and this is accomplished by means including a rack 1141 afforded on the upper edge of each of the slides 1135. The type segments 1140 are arranged to have impressions made therefrom by means including hammers 1142, and these hammers are operated and controlled in the manner described in the last mentioned Gollwitzer patent. The slides 1135 are arranged with racks 1135R along their lower edges, and these racks are engaged by individual gear segments 1143 which are mounted on a common mounting shaft 1144. A guide comb 1145 is associated with guide slots 1146 formed in the respective segments 1143 so that these segments are accurately guided in their movements. Each segment 1143 has a connecting stud 1147 extending laterally therefrom, and this connecting stud is engaged by a keyhole slot afforded in a relatively small connecting plate 1148. This connecting plate 1148 has the upper end of a Bowden wire 1150 fixed thereto, and this Bowden wire extends downwardly and into its sheath 1150S which is anchored in an anchoring block 1151 that is afforded in the base of the printing unit VP–2. It will be evident that when the restoring bail 1138 is moved to the left in Fig. 104 in the course of an operation of the variable printer VP–2, the springs 1137 will urge the slides 1135 to the left in a following direction in respect to the restoring bail 1138, and such movements are differentially controlled by extent of upward endwise movement that is permitted in the associated Bowden wires 1150. This upward movement of the Bowden wires 1150 is governed by operatively associating the Bowden wires 1150 with the related Bowden wires 1130 that are operatively associated with the extensions 1050E of the variable printer VP–1.

THE DETACHABLE MOTION-TRANSMITTING CONNECTIONS BETWEEN THE UNITS 201 AND 202

As pointed out hereinbefore, the Bowden wires 1130 and 1150 are under the present invention arranged for detachable association in the course of connection of the unit 202 to the unit 201 of the machine, and the details of such connection are illustrated in Figs. 84 to 91 and 101 of the drawings. Thus, as will be evident in Figs. 84 and 89, the Bowden cables 1150 in the unit 201 are extended downwardly and then horizontally toward the right, and the sheaths thereof are anchored at 1155 on a mounting bracket 1156 which is disposed in a vertical plane at right angles to the right-hand end wall of the unit 201. On the mounting plate 1156 and in horizontal alignment with the adjacent ends of the sheaths 1150S, a plurality of horizontal guides 1157 are provided, and within these guides, a plurality of horizontally movable plungers 1158 are mounted. These plungers 1158 are operatively connected to the Bowden wire 1150 that is extended into the left-hand end of the related guide 1157 so that each Bowden wire 1150 moves with the related plunger 1158. It will be recalled that the springs 1137 that are connected to the slides 1135 tend to pull the Bowden wires 1150 when the bail 1138 is moved to the left in Fig. 104, and to prevent this at certain times when it would be undesirable, each of the plungers 1158 has a shoulder 1158S formed thereon and facing to the left as viewed in Fig. 89 of the drawings. The various plungers 1158 are arranged to pass through keyhole slots 1160 formed in a locking plate 1161, Figs. 86 and 87, these keyhole slots being arranged with the small end extended upwardly. Hence, upon downward movement of the plate 1160 from the position shown in Fig. 86, the neck of the keyhole slot will be disposed in position to the left of the shoulder 1158S, thereby to hold the respective plungers 1158 against movement to the left. The locking plate

1161 is urged in a downward direction by means of a spring 1162, Fig. 89, so as to normally tend to assume its locking relationship, and such movements of the plate 1161 are controlled, as will hereinafter be described, in the course of the association and disassociation of the two units of the machine.

Each of the plungers 1158 has a downwardly facing hook 1158H formed thereon, and these hooks 1158H are arranged so that they may be engaged by a similar hook structure that is afforded on the adjacent ends of the related Bowden cables 1130, as will now be described.

The Bowden cables 1130 are shown in Figs. 89 and 90 with their sheaths 1130S anchored at 1164 on a mounting plate 1165 that is disposed just inside of the left-hand end wall of the unit 202. The mounting plate 1165 has a plurality of guides 1166 arranged thereon in a horizontal position, and within these guides, horizontally movable plungers 1168 are provided, these plungers being connected within their guides to the ends of the Bowden wires 1130. The left-hand ends of the plungers 1168 are arranged to have upwardly facing hooks 1168H formed thereon, and these hooks are adapted for engagement by upward movement with the downwardly facing hooks 1158H of the other unit of the machine.

In attaining such association of the hooks 1168H with the hooks 1158H, the hooks 1168H are so arranged on the left-hand side of the unit 202 as to be normally disposed slightly below the level of the plungers 1158 of the other unit. Thus, the unit 202 may be moved toward the unit 201 by rolling the unit 202 on its supporting casters 1170 toward the right-hand end of the unit 201. As the units approach each other, a plurality of projecting guide rods 1171 that project from the left-hand end of the unit 202 are entered into guide openings 1172 in the unit 201. The guide plungers 1171 thus serve to properly align the two units, and when the approaching movement has been completed, annular grooves 1171G in the aligning pins are disposed in the guide openings 1172, and this enables the unit 202 to be slightly lifted at its left-hand edge as will now be described, so as to engage the hooks 1168H with the hooks 1158H. Spaced guide fingers 1156G, Figs. 89 and 90, embrace opposite sides of the plate 1165 in such approaching movement. In attaining the lifting movement of the left-hand edge of the unit 202, it will be observed that stationary upwardly facing hooks 1175 are arranged to project to the right from the right-hand end of the unit 201, and as the two units are brought together as hereinbefore described, a pair of vertically mounted hooks 1176 on the unit 202 are brought into position over the hooks 1175. The hooks 1176 face in a downward direction, as will be evident in Figs. 84 and 101, and these hooks are disposed, respectively, near the front and rear corners of the machine. Each hook 1176 is formed at the upper end of a vertically extended slide bar 1177, Fig. 101, and each such slide bar is mounted by a pin and slot mounting 1178 so that the slide bar 1177 may be moved in an up and down direction. To enable such up and down movement of the slide bar 1177 to be effected, an operating shaft 1180 is extended through the frame of the unit 202 so as to pass through vertical slots in the two slide rods 1177. The operating shaft 1180 has a pair of cams 1182 fixed thereon, and these cams are located adjacent the respective slide bars 1177. Each slide bar has a pair of cam rollers 1183 fixed thereon and engaging the top and bottom edges, respectively, of the adjacent cam 1182, and hence, by rotation of the shaft 1180, the slide bar 1177 may be moved up and down. When the shaft 1180 is so actuated as to draw the slide bar 1177 in a downward direction, this serves to engage the hooks 1176 with the hooks 1175, and thereafter the adjacent or left end of the unit 202 will be lifted, thereby to engage the hooks 1168H with the hooks 1158H.

After the lifting movement has been completed so as to engage the aforesaid hooks, it is desirable that the latch plate 1161 be lifted to its disengaged position, and this is effected by an operating lever 1185 that is pivoted at 1186 on the mounting plate 1165. The left-hand end of the lever 1185 underlies a flange on the lower end of the latch plate 1161, and a cam follower 1187 on the right-hand end of the lever 1185 engages the periphery of a cam 1188 which serves to impart rocking movement to the lever 1185. The cam 1188 is so positioned that when the elevating movement of the unit 202 has been completed, a lobe on the cam 1188 engages the follower 1177 to release the latch plate 1161. When the two units of the machine are being disconnected, the shaft 1180 is operated in the reverse direction so that the latch plate 1161 is first allowed to move to its effective position, thereby to latch the Bowden cables 1150 against undesired displacement and, thereafter, the left-hand end of the unit 202 is lowered so as to disengage the hooks 1168H from the hooks 1158H. The operation of the shaft 1180 is attained by a removable handle 1189 that extends into the forward wall of the unit 202, as shown in Fig. 84.

When the unit 202 is moved into association with the unit 201 as above described, the rotation transmitting couplings 382 and 670 are also moved into the desired coupled relation. Thus, in each of these couplings, one unit is of the construction shown in Figs. 141A and 141B, in which the coupling element 670–2 is shown. Thus, this coupling element has a disk 1190 fixed on its right-hand end, such end being hollow as indicated at 1191 to receive a guide pin 670P extended axially from the other coupling element 670–1, Fig. 141. The disk 1190 has a pair of guide pins 1192 extended to the left therefrom on opposite sides of the shaft, and a mounting ring 1193 surrounding the shaft is carried on these guide pins 1192 and is urged to the right and into contact with the left-hand face of the disk 1190 by springs 1194 surrounding the pins 1192. The ring 1193 carries three drive pins 1195 spaced in different angular relations about the axis of the shaft, and these drive pins 1195 slidably project through complemental openings in the disk 1190. These pins 1195 are adapted to extend into similarly spaced openings in the opposed coupling unit 670–1, and in the coupling operation, these pins may be engaged by the disk 670–1, so as to be shifted to the retracted and ineffective positions of Fig. 141B, against the action of the springs 1194. Hence, when this shaft 658 is thereafter rotated, the pins 1195 will be held in such ineffective positions till the matching openings in the opposed disk 670–1 are brought into registry with the pins 1195, and at this time the pins will move into such openings so as to couple the shafts in a predetermined rotative relation. The coupling 382 is of substantially the same construction as the coupling 670 just described.

It will be recalled that in the coupling of the Bowden wires 1130 and 1150, the left-hand end

of the unit 202 was raised, and in order to enable this to be accomplished insofar as the coupled drive shafts are concerned, the shaft elements 383E and 671 are supported in horizontal bearings 1197 and 1198, respectively, which are guided in vertical guides 1197G and 1198G, as shown in Fig. 141. The universal joints 384 and 384–2 enable this to be accomplished in one instance, while the joints 672 and 674 accomplish this in the other instance.

THE IMPRESSION COUNTER FOR TOTALS

In order that totals may automatically be taken at appropriate intervals, means are afforded for counting the number of sheets S produced. Thus, in the punching unit PU an operating eccentric 1199 is mounted on the shaft 633, Fig. 99, for operating a counter 1200 that is mounted on the upper forward position of the frame of the punching unit PU. The counter 1200 is a three-order decimal system counter, the units order ratchet wheel 1200U of which is advanced one unit for each revolution of the cam shaft 633, and this is accomplished by a link 1201 associated with the eccentric 1199 and extended upwardly and forwardly as shown in Fig. 98 for connection with an operating rocker 1202 mounted on the counter shaft 1203. The rocker 1202 has an actuating pawl 1204 thereon which engages the units order ratchet wheel 1200U. A retaining pawl 1205 holds the ratchet wheel 1200U against retrograde movement. The operating connections to the higher orders of the counter are conventional. The ratchet wheels 1200U, 1200T and 1200H have cam disks 1206U, 1206T and 1206H fixed thereto, and these disks have dwell surfaces with recesses arranged therein so as to face forwardly when the disks are in their zero positions. Three rockers 1207U, 1207T and 1207H are mounted at their lower ends on a shaft 1208, and are urged in a clockwise direction, Figs. 8A and 98, by springs 1209 so that follower noses 1208N bear against the edges of the respective cam disks. The three rockers serve to support three microswitches 1210U, 1210T and 1210H, and when the follower nose 1208N of the associated rocker enters the recess in the related cam, the plunger of the releated switch is engaged with an opposed stationary abutment 1211. This closes the switch, and it should be observed that each switch is closed when its related counting ratchet moves into its zero position.

The counter controlled switches 1210U, 1210T and 1210H are connected and associated with other elements of the machine, as will hereinafter be described so as to automatically cause the pager and proofer to advance through a blank spacing movement at the end of each proof sheet PS–1, each such proof sheet containing ten printed impressions, to print a page total T–1 at the end of every tenth proof sheet, or in other words, after one hundred main impressions have been made, and after one thousand impressions, to print a T–1 total and lock up the machine as will hereinafter be described so that the operator must then determine whether a T–2 total is to be printed, or whether the listing is to be continued without such a total.

THE ACTUATION OF THE PLATEN P–1

As will be evident in Figs. 92 and 93, the platen P–1 is carried on the forward end of a supporting arm 1215 that is pivoted at 1216 on the frame of the variable printer VP–1, and a rearwardly extending arm 1217 has a spring 1218 acting thereon to yieldingly urge the platen P–1 to its raised position. An arm 1219 rigid with the platen arm 1215 projects forwardly from the pivot 1216, and a link 1220 is pivoted thereto as at 1221. The link 1220 extends downwardly and a fork 1220F at its lower end slidably embraces a stud 1222 that extends laterally from the rear end of a centrally pivoted bell crank lever 1223. The forward end of the lever 1223 has a cam roller thereon that engages the edge of a cam 1225 fixed on the cam shaft 645. A hook-like guide lug 1220H on the link 1220 is arranged to hold the pawl 1226 against the side of the link 1220. The stud 1222 also serves as a pivotal mounting for the lower end of a relatively long connecting pawl 1226 that extends upwardly along the side face of the link 1220. Near its upper end, the pawl 1226 has a forwardly facing notch 1226N that is adapted to embrace a square lug 1220L fixed on the link 1220. A spring 1228 is anchored at 1229 on the machine frame, and extends downwardly and rearwardly to a projecting pin 1226P on the pawl 1226, thereby to serve to urge the pawl 1226 into driving engagement with the lug 1220 and at the same time urge the pawl 1226 upwardly so as to hold the cam roller against the cam 1225.

The connection thus afforded tends to bring the platen P–1 into its printing position each time the cam shaft 645 of the unit VP–1 is operated. However, when totals are taken, such totals are not printed at the variable printer VP–1, but are utilized only in setting up the variable printer VP–2 so that the totals are printed at the proof station. Hence, in order to cause the platen P–1 to stay in its upper position in such total cycles, means are afforded for shifting the pawl 1226 to its ineffective position shown in part in dotted outline in Fig. 93. Thus, an arm 1230 is fixed on the pawl-releasing arm 1231 that is included in the total control means of the variable printer VP–2, as described in the aforesaid Gollwitzer Patent No. 2,501,444. This arm 1231 corresponds to the arm 535 of such Gollwitzer patent, and it functions as there explained in the setting of either the total control shaft 1053, or the sub-total control shaft 1053A, to release all of the pawls 1061 so as to free all of the slides of the machine for total-taking movement. Thus, when the machine is set for a total, the arm 1231 is pivoted in a counterclockwise direction, Fig. 93, thus to cause the arm 1230 to strike the spring anchoring pin 1226P. This shifts the pawl 1226 to its retracted position, and hence the platen P–1 is not lowered. At the end of the total cycle, the release of the arm 1231 as described in the aforesaid Gollwitzer patent causes the pawl 1226 to resume its engaged or effective relation.

THE ACTUATION AND MOUNTING OF THE NUMBERING MACHINE N–1

The numbering machine N–1 is normally disposed in the operative position beside the type segments 1140, as shown in Fig. 107, and in this location may be moved from a normal lower position shown in full lines in Fig. 110 to a raised operative position shown in dotted outline. In this normal position beside the type segments 1140, the numbering machine N–1 is disposed on the top of a vertically movable platform 1250, and this platform is carried on the upper end of a guide rod 1251 supported in vertical position on the adjacent side frame of the variable printer VP–2 by bearings 1252. A spring 1253 acts be-

tween the upper bearing 1252 and the platform 1250 so as to urge the platform toward its lower position. For driving the platform 1250 to its upper position, a cam 1255 is provided on the cam shaft 668 of the variable printer, and a lever 1256, pivoted at 1257, Fig. 69, extends adjacent the upper edge of the cam 1255 and has a roller 1256R bearing on the cam 1255. At its other end the lever 1256 has an upwardly extending drive pawl 1260 pivoted thereto at 1261. The projecting lower end 1260E of the pawl 1260 has a spring 1262 acting thereon as shown in Fig. 103 so as to urge the upper end of the pawl 1260 to the left, Fig. 103, toward a lug 1263 fixed on the rod 1251, and in this movement a transmitting notch 1260N tends to engage the block or lug 1263 for driving the platform 1250 to its upper position.

When it is desired to prevent elevation of the platform, as in total cycles where no serial number is to be printed, the pawl 1260 is withdrawn to the right, Fig. 103, so as to disengage the pawl 1260 from the lug 1263. This is accomplished by a solenoid 1265 that is connected through a rocker 1266 and a link 1267 to the pawl 1263. When the pawl 1260 is thus withdrawn, a latch 1268 engages the rocker 1266 to latch the rocker in its pawl-disengaging position. Hence the pawl 1260 may move up in a total cycle without raising the numbering machine and, of course, without advancing the numbering machine N–I; and in such upward idle movement of the pawl 1260, a pin 1269 on the pawl 1260 engages a tail on the latch 1268 so as to release the same and return the mechanism to its normal condition.

In order that the numbering machine N–I may be firmly supported when a printing operation takes place, a supporting slide 1270 is mounted on the bars 1136, Figs. 107 to 109, and this slide has a recess 1271 in its upper edge, and when the slide 1270 is in its right-hand or restored position of Fig. 109, this recess 1271 is disposed beneath a heavy tooth 1272 carried on the lower end of a column 1273 that is secured to and extends downwardly from the platform 1250. The column 1273 has a vertical guide slot 1274 therein that embraces a stationary transverse guide pin 1275. The slide 1270 is restored by the bail 1138, against the spring 1177, so that when the bail 1138 frees the slides 1135 and 1270 for setting movement, the slide 1270 moves to the left, Fig. 108, to its supporting position. Added strength is afforded by a rigid support plate 1278 disposed in the frame of the variable printer and having rollers 1279 thereon disposed beneath the lower edges of the slide 1270. The slide 1270 thus acts as an interposer between the rollers 1279 and the supporting column 1273 of the platform 1250.

It will be recognized that the counter N–I must be reset at times, and to enable this to be readily accomplished, the counter N–I is mounted on a transverse guideway 1281 on the platform 1250, and means are afforded whereby the numbering machine N–I may be withdrawn along this guideway 1281 to the left from the position of Fig. 106 to the position of Fig. 105. In such movement the numbering machine N–I moves off of the guide 1281 and onto an aligned guide 1283 formed on a carriage 1285. The carriage 1285 is mounted on a pair of rearwardly extending guide rods 1286 supported in front and rear plates 1287 and 1288. An operating shaft 1290 rotatably mounted in the carriage 1285 and held against axial movement therein, may be rotated to withdraw the numbering machine N–I onto the carriage 1285, and to withdraw the carriage 1285 in a rearward direction. A spring 1291 acts to urge the shaft 1290 in a clockwise direction, Fig. 106, and a link 1292 fixed on the upper end of a lever 1293 extends to a bracket 1293B associated with the numbering machine so that rotative movement of the shaft 1290 moves the numbering machine along the guides 1281 and 1283.

A rearward extension 1290E of the shaft 1290 has a handle 1294, Fig. 103, thereon at the rear side of the machine so that the numbering machine may be moved laterally and rearwardly to a convenient clearance opening 1295 in the table top for resetting. When the counter N–I is returned to its position of Figs. 106 and 107, the lateral movement of an arm 1296 on the bracket 1293B engages the operating element of a safety switch 1299. This safety switch prevents starting of the machine until the numbering machine N–I is returned to its operating position.

THE PAGER AND PROOFER 218

The pager and proofer 218 is mounted on the upper forward ends of the plates 825 and 826 that afford the rigid printing frame 216, and as will be evident in Figs. 111 and 112, the rear edge of the pager and proofer mechanism 218 is disposed substantially in alignment with the cross rail 843, while the forward end of the pager and proofer mechanism extends forwardly beyond the forward edge of the main unit 201 so as to be disposed directly over the diablo mechanism 219.

In affording the pager and proofer mechanism 218, a pair of relatively rigid frame plates 1301 and 1302 are provided in spaced relation and are held in this relationship by transverse bracing members 1303 that are of the general character illustrated in Fig. 116 in the drawings. At its forward end the rigid frame 216 has forwardly projecting rigid brackets 216B, and these brackets are arranged to underlie the lower edges of the frame plates 1301 and 1302 so that cap screws 1304 may be extended up through the brackets and into the frame plates to support the pager and proofer rigidly in position. Near its upper forward end, the pager and proofer mechanism has a tray 1305 removably disposed between the frame plates 1301 and 1302 and in position to receive the proof sheets, as PS–I, after these proof sheets have been severed from the web W as will hereinafter be described.

The present machine contemplates the production of one or more carbons of the proof sheets PS–I, and as illustrated in Fig. 1 of the drawings, four rolls R of paper are provided rearwardly of the machine on the paper supply stand 203 so that four webs may be fed concurrently to the machine. Such webs are withdrawn from the rolls R and are guided into a face-to-face relationship and in a forward direction through a projecting tube or guideway 1306, Fig. 112, that extends through the base of the unit 201 and toward the lower end of the diablo mechanism 219. The webs W enter the lower end of the diablo mechanism 219 and are extended around an arcuate guide member 1307 so as to extend upwardly and as will be evident in Fig. 111, the webs at their upper end extend over a lower feed roll 1309 which has an upper feed roll 1310 cooperating therewith so that these feed rolls 1309 and 1310 may be driven as will hereinafter be described to withdraw paper from the rolls R and supply the same to the operating mechanism of the diablo unit 219. As shown in

Figs. 112 to 114, the diablo mechanism has a diablo roller 1312 mounted on a horizontal shaft 1314 that extends through guide slots 1315 afforded so as to extend vertically in side plates 219L and 219R of the diablo unit. The end of the shaft 1314 that extends through the side plate 219L has a switch operating element 1316 fixed thereon, and in the course of vertical movements of the diablo roll 1312 this switch operating element is arranged to close a series of switches. As will be evident in Fig. 112 of the drawings, a lower switch 1317 is arranged to be engaged and closed when the diablo roller 1312 reaches its lower position and this is effective as will hereinafter be described to stop the paper feeding movements of the feed rolls 1309 and 1310. When the diablo roller has been withdrawn in an upward direction through the desired degree, the switch operating mechanism is effective to close a switch 1318 and this is effective as will hereinafter be described to start the driving movement of the feed rolls 1309 and 1310. An additional switch 1319 is afforded above the switch 1318 and this constitutes a safety switch and when it is closed due to excessive upward movement of the diablo roller 1312, this switch 1319 is effective in a safety stop circuit of the machine so as to stop the entire machine as will hereinafter be described.

The web W that has been led downwardly from the feed rolls 1309 and 1310 and about the diablo roller 1312 is extended upwardly as will be evident in Figs. 111 and 112 and is extended over a guide roller 1320 that is extended between the frame plates 1301 and 1302 of the pager and proofer unit near the lower edges of these frame plates. The web extends rearwardly from the guide roller 1320 and over another guide roller 1321 that is loosely mounted on a transverse shaft 1325 that is supported in the frame plates 1301 and 1302. This transverse shaft 1325 and the roller 1321 that is carried thereby are disposed substantially over the space between the mounting rails 841 and 843, and the web is extended downwardly from the guide rolls 1321 in a plate substantially parallel to and spaced just forwardly of the forward face of the mounting rail 843. The web W at this point extends into position between a pair of guide plates 1327 and 1328, and as will be evident in Figs. 33 and 111 of the drawings, the guide plate 1328 is rounded rearwardly at its lower edge so that the web may then be extended rearwardly and beneath the platen P–2 at the proofing station of the machine. The web then passes around a guide roll 1330 that is carried in a frame 1331 and is positioned between the frame plates 825 and 826 and is carried by and on the rear face of the mounting rail 844. At its upper end the mounting frame 1331 has another guide roll 1333 and the web is extended over this mounting roll and forwardly so as to pass beneath a guide roll 1334 that is extended between the frame plates 1301 and 1302 at substantially the rear edge of the pager and proofer mechanism. The web then extends upwardly and about a guide roll 1335 and then extends downwardly and about a guide roll 1336.

The web then extends forwardly and between a lower feed roll 1338 and an upper feed roll 1339, and it is by controlled operation of the feed rolls 1338 and 1339 that the line spacing movements in respect to the proof printing station 214 are accomplished. The web is extended forwardly from the feed rolls 1338 and 1339 across the top of an angularly positioned stationary shear blade 1340 that is adapted to cooperate with an adjustable cutoff knife 1341 that is mounted on a transverse mounting bar 1342 that extends between the frame plates 1301 and 1302. A spring 1341S urges the knife 1341 laterally into contact with the stationary shear blade 1314, as shown in Fig. 117. When the proper length of web has been advanced beneath the knife 1341, this web is cut off by operation of the knife 1341 thereby to afford a proof sheet such as the proof sheet PS–1.

The drive and control mechanisms of the pager and proofer

Within the pager and proofer mechanism 218, suitable controls are afforded for utilizing a power that is constantly available within the pager and proofer mechanism and in affording this constant source of power, the constantly operated vertical extending shaft 441 is utilized. This shaft extends upwardly along the right-hand side of the printing frame 216, and at its upper end is connected by bevel gearing 1345 to the right-hand end of a horizontal stub shaft 1346, Figs. 111, 115 and 119A. The shaft 1346 is journaled in the right-hand plate 826 of the printing frame 216, and it extends into a position beneath the pager and proofer 218 and carries a drive pinion 1348 on its left-hand end, as will be evident in Figs. 111, 115 and 119A. When the pager and proofer 218 is put in place, the pinion 1348 is engaged by an idler pinion 1350 that is carried on the shaft 1325, and this idler pinion is in turn meshed between a gear 1351 that is fixed on a transverse drive shaft 1352 that constitutes one of the main sources of power in the pager and proofer 218. It will be noted in this regard that the shaft 1352 extends outwardly beyond both of the frame plates 1301 and 1302 and the power connections from the shaft 1352 are made on these outwardly extending ends of the shaft. One such connection is afforded by a sprocket 1354 that is fixed on the right-hand end of the shaft 1352 as shown in Fig. 119A, and a chain 1355 extends from this sprocket to a sprocket 1356 that is mounted on the axis of the feed roller 1309 as shown in Fig. 116, the feed roll 1309 is fixed on a shaft 1358 that is supported in bearings 1359 in the frame plates 1301 and 1302, and the sprocket 1356 is mounted loosely on the right-hand end of the shaft 1358 by means including a sleeve 1360 which constitutes the driving member of a clutch 1361. The clutch 1361 is arranged to be controlled by a stop lever 1361S and when this stop lever is disengaged the clutch is effective to extend the drive from the sprocket 1356 to the feed roll 1309.

It will be observed that the stop lever 1361S is urged toward an engaged or stopping position by means of a spring 1365, and when the clutch is to be engaged this stop lever is rocked in a counterclockwise direction to a released position by means of a solenoid 1370. When the stop lever 1361S reaches this disengaged or released relationship, it is held in this relation by a latch 1371 that is urged to a latching position by the spring 1372. Thus, the clutch 1361 remains engaged until the latch 1371 is released, and this may be accomplished by energization of a release solenoid 1373 that is operatively connected to the latch 1371.

The feed rolls 1309 and 1310 are driven in unison and for this purpose a gear 1375 is fixed on the shaft 1358 so as to mesh with a gear 1376 that is fixed on a shaft 1377 that supports the

upper feed roll 1310. It will be observed in Figs. 116 and 119A that the feed roll 1310 has a flat side 1310F so that at a particular point in the rotating movement of the roll 1310, the paper will be momentarily released and this enables the paper to become re-aligned and thereby assures proper tracking of the paper in the feeding movements thereof. When this flat face 1310F of the feed roll 1310 comes into position opposite the rear feed roll 1309, such rolls are maintained in the desired spaced relationship by engagement of an annular concentric flange 1378 formed on the gear 1376 with an annular surface 1379 formed on the gear 1375.

The mounting of the feed roll 1310 is arranged so that it may be moved upwardly to a released position, and this is accomplished by supporting the shaft 1377 eccentrically in rocking bearings 1380 that are connected by a release bail 1381 for rocking movement in unison. A spring 1382 acts on this bail to urge the same toward a relationship in which the annular surfaces 1378 and 1379 are in engagement.

The shaft 1352 also serves as a power source for driving the knife 1341 through its operating cycle, and for this purpose a one-revolution clutch 1385 is mounted on the shaft 1352 and its driven element is operatively connected to an actuating cam 1386 which is driven through a single revolution each time the clutch 1385 is engaged. In such movement, the cam 1386 operates on one arm of a rocker 1387 that is connected by means of a vertical link 1388 to the adjacent or right-hand end of the knife carrier 1341C. A spring 1389 urges the cam follower into engagement with the cam thereby to normally dispose the knife 1341 in its upper or inactive position. The clutch 1385 is controlled by a stop lever 1385S which is urged toward its effective relationship by a spring 1390 that is connected to a downwardly extending arm 1391 formed on the stop lever 1385S. When the clutch 1385 is to be engaged, this may be accomplished by energization of a solenoid 1393 that is operatively connected to the stop lever 1385S, and in order to insure that this solenoid 1393 will not stick in any instance and thereby cause inoperation of the mechanism, the downwardly extending arm 1391 is arranged in the rotating movement of the driven element of the clutch to be engaged by a pin 1394, Fig. 117, thereby to impart positive releasing movement to the stop lever.

As hereinabove pointed out, the shaft 1352 extends to the left and beyond the frame plate 1301 and this projecting end of the frame 1352 is operatively associated with means for imparting controlled advancing movement to the feed rolls 1338 and 1339. For this purpose, a clutch 1395 is provided on the shaft 1352, and the driven element of this clutch is connected by means of a sleeve 1396 to a cam 1397 which is utilized in imparting the desired rotating movement to the feed rolls 1338 and 1339. This cam 1397 is disposed adjacent to a movable slide 1398 which has cam rollers 1398U and 1398L fixed thereon so as to engage the upper and lower edges respectively of the cam. Hence, in a single cycle rotating movement of the driven element of the clutch 1395, the slide 1397 is moved upwardly and then downwardly through a reciprocating stroke of a fixed length. This reciprocating movement of the slide is utilized through a ratchet mechanism 1400 to impart different amounts of movement to the feed rolls as will now be described. Thus, the feed roll 1306 is mounted on a shaft 1401 that extends between and is supported by the frame plates 1301

and 1302, and at its right-hand end, this shaft has a gear 1402 fixed thereon and engaged with a gear 1403 fixed on a shaft 1404 which carries the upper feed roll 1339. Thus, the feed rolls 1338 and 1339 are driven with the same surface speed and the feed rolls may be separated by operation of a projecting handle 1405, Fig. 1. This projecting handle is arranged to be connected to a bail 1406 which is operatively connected to eccentric bearings 1407 that are arranged to support the shaft 1404. A spring 1408 acts on the bail so as to urge the bail in such a direction that the feed roll 1339 holds to its engaged position. The handle 1405, however, may be operated to rock the bail 1406 thereby to separate these feed rolls.

The shaft 1401 has a ratchet wheel 1410 fixed thereon, and a rocker 1411 that is loosely mounted on the shaft 1401 has a pawl 1412 that is adapted to engage the ratchet wheel 1410 to impart advancing movement to the ratchet wheel 1410, and thus to the associated feed rolls. This rocker has a gear segment 1413 formed thereon that is engaged by ratchet teeth 1414 formed on an upstanding portion of the slide 1398, and hence when the slide 1398 is moved in an upward direction, the rocker 1411 is moved in a clockwise direction, Fig. 119, thereby to act through its pawl to impart advancing movement to the ratchet wheel 1410. As such advancing movement is completed, the pawl 1412 moves into engagement with an adjustable abutment surface 1415 that is formed on a vertical bar 1416. This vertical bar 1416 is pivoted on its lower end on a shaft 1417 and its upper end is bifurcated to receive an adjustable eccentric 1418 whereby the effective relationship to which the pawl 1412 engages the surface 1415 may be adjusted. In the downward or return movement of the slide 1398, the rocker 1411 and its pawl 1412 return to the position shown in Fig. 119 of the drawings. A conventional spring biased friction brake 1419 is associated with the shaft 1401 to prevent overthrow or other undesired movements of the feed rolls 1338 and 1339, as shown in Figs. 117 and 118.

As will hereinafter become apparent, the feed rolls 1338 and 1339 are in most instances operated to impart a full line spacing movement to the web W, and such full line spacing movement is attained when the pawl 1412 is in engagement with the ratchet wheel 1410 throughout substantially the entire stroke above described. In another instance, however, it is desired to advance the web W through what may be termed a "half-space," and to enable this to be accomplished, a shroud member 1420 is pivoted at 1421 adjacent to the ratchet wheel 1410 and the shroud is urged by a spring 1422 to a normal position that is determined by a stop pin 1423. In this normal position the shroud is not effective upon the pawl 1412 but when the shroud 1412 is rocked slightly in a counter-clockwise direction, Fig. 119, a lower arm portion 1420S is moved outwardly in a radial direction with respect to the ratchet wheel 1410 and is effective to maintain the pawl 1412 disengaged through substantially one-half of the stroke described hereinabove. Hence, when the mechanism is operated under such conditions, the web W will be advanced through but a half space. When such a half space is desired, the shroud is to be rendered effective by energization of a solenoid 1425 that is operatively connected with the shroud 1420 so as to operate the same.

The clutch 1395 is arranged to be controlled

by a stop lever 1425S that is pivoted on the shaft 1417 and at its opposite end, the stop lever has a downwardly projecting arm 1426 that is connected to a spring 1427 that serves to urge the stop lever toward its effective position. At its other end, the stop lever is operatively connected to a releasing solenoid 1428 whereby the stop lever 1425S may be released and in order to insure that this solenoid will not stack at any time, a roller 1430 is provided on the driven element of the clutch 1395 so as to engage the arm 1426 in the course of a rotating movement of the driven member of the clutch 1395. This positively supplements the action of the spring 1427 and initiates the movement of the stop lever toward its effective or stopping position.

When the shroud 1429 is to be moved to its effective position, this may be done by a momentary actuation of the solenoid 1425, and to insure that the shroud will remain effective throughout the proper length of time, a latch 1431 is pivoted at 1432 so that a tooth 1431T may engage a lug 1433 formed on the rearwardly projecting arm of the shroud 1429. A spring 1434 urges the latch 1431 towards its engaged position and when the latch 1431 has become engaged it remains in this engaged relationship and holds the shroud in its effective position until the slide 1398 has been moved to substantially the uppermost point on its stroke. When this occurs, the upper end of the slide 1398 engages the end of an arm 1435 formed on the latch 1431, and this serves to disengage the latch 1431 and thereby permits the shroud 1429 to assume its normal relationship.

The pager and proofer 218 also includes means for counting the spacing movements of the web W, thereby to enable the operation of the knife 1341 to be controlled in such a manner as to produce proof sheets of uniform length. For this purpose, a countershaft 1440 is mounted so as to extend transversely of the two frames 1301 and 1302 and this countershaft has a ratchet wheel 1441 fixed thereon so that by actuation of this ratchet wheel the countershaft 1440 may be rocked through indexing movements. For this purpose, a rocker 1442 is mounted on the shaft 1440 and this rocker has one arm 1442A that extends downwardly and has a spring biased pawl 1443 mounted thereon for engagement with the teeth of the ratchet wheel 1441. A spring 1444 urges the rocker 1442 in a counter-clockwise direction, and the movements of the rocker 1442 are controlled from the clutch 1395. Thus, a cam 1446 is fixed to the driven element of the clutch 1395, and a rocking lever 1447 has a roller at one end thereof engaging the upper edge of the cam 1446. The rocking lever 1447 is pivotally mounted on the shaft 1417 and extends to the right as shown in Fig. 119 so that a downwardly extending link 1448 may connect this end of the lever 1447 to an arm 1442B of the rocker 1442. Thus, in each rotating movement of the driven element of the clutch 1395, the rocking lever 1447 is operated through a stroke which serves to index the ratchet wheel 1441 through an angular distance equal to two teeth of this ratchet wheel. In this connection it will be noted that the ratchet wheel 1441 has twenty-two teeth so that for normal line spacing operation of the web W, the ratchet wheel may be actuated to a distance equal to a two-tooth space, but when a half-space movement is to be imparted to the web W, this ratchet wheel 1441 must be operated through a shorter distance equal to one-tooth space. To enable this to be done, a shroud 1450 is pivoted on the shaft 1440 and is urged in a clockwise direction by a spring 1451 to a position that is shown in dotted outline in Fig. 119 and which is determined by a stop pin 1452. When the shroud 1450 is in the total line position of Fig. 119, the apparatus will be effective to index the countershaft 1440 through two-tooth spaces, and when a half-space feeding operation is to take place, the shroud 1450 may be moved in a counter-clockwise direction to its position shown in full lines in Fig. 119 by a solenoid 1454. When the shroud is thus moved to its effective position, it is latched in this position by a latch 1455 that is urged toward its latched position by a spring 1456. It will be noted that the latch 1455 has a cam surface 1455A at its upper end so that in the downward movement of the right-hand end of the lever 1447, this cam surface may be engaged by a control pin 1458 that is carried by the lever 1447 near its right-hand end. Hence, when the shroud 1450 has served its purpose in a feeding operation, the latch 1455 is released and the shroud returns to its normal position shown in total lines in Fig. 119.

The lever 1447 also serves as an operating means for a pair of switches 1460 and 1461 which have operating spring levers 1460S and 1461S associated therewith. When the lever 1447 is in its upper position, the pin 1458 engages the operating lever of the switch 1460, while in the lower position of the lever 1447, the pin 1458 engages the operating lever of the switch 1461 and the functions of these switches will be discussed hereinafter.

The counter-shaft 1440 extends across the machine and at the end which is remote from the ratchet wheel 1441, the shaft 1440 carries means for operating a pair of switches 1465 and 1466. These switches are mounted on similar levers 1467 and these levers have teeth 1467T thereon adapted to engage control cam means as will be described, springs 1468 being afforded for pivoting such levers into engagement with the control cam means. Thus, a control cam 1469 is fixed on the shaft 1440 and this cam 1469 has a dwell surface throughout substantially its entire periphery and at one point of the periphery has a cam recess 1469R so that the switch 1466 is maintained in its open relationship throughout the entire rotating movement of the shaft 1440 and is then closed when a complete revolution of such shaft has taken place.

The other switch 1465 is arranged to cooperate with a toothed wheel 1470 that has twenty-two teeth, one of which is relatively deep, and with this arrangement the switch 1465 is opened and closed twice in each normal paper feeding movement and once in each half space movement, and when the cam follower of the switch 1465 cooperates with the aforesaid deep tooth, the switch 1465 is maintained closed in such a way as to obtain a control action that is utilized to be described presently.

We recall that the impressions on the proof sheet PS are arranged to have serial numbers included therein, and it is desirable that these serial numbers in many instances be disposed at particular locations in the proof sheets. To enable this to be accomplished, means are afforded for setting the counter-shaft 1440 at any desired rotative position, particularly so as to correspond with the serial numbering mechanism. For this purpose, an index disk 1475 is fixed on the shaft

1440 on the end that is adjacent to the disk 1441, as will be evident in Fig. 120, and a knurled handle 1415H is secured to this index disk 1415 as shown in Fig. 120. This index disk 1415 is diagrammatically indicated in Fig. 119A of the drawings and it has an indication of a zero position and positions from one to ten and a further "T" position which is the total position in the machine. This enables the mechanism to be conveniently adjusted, as will be described hereinafter.

THE CARBON RIBBON FEED

In order that a plurality of carbon copies may be made of the proof sheets, as PS-1, means are provided at the proof printing station 214 for feeding a plurality of carbon paper ribbons between the webs W that are moved past this printing station, and such carbon ribbon feed mechanism is illustrated in Figs. 1, 17 and 121 to 125 of the drawings. Thus, a supply cabinet 1480 is mounted on the right-hand side of the printing frame 216 on a supporting bracket 1481, and within this cabinet 1480 a plurality of supply rolls 1482 of carbon paper ribbon are supported one above the other on parallel horizontal axes that extend in substantially a front to rear direction, as will be evident in Figs. 121 and 124. A door 1480D that is held closed by a spring latch 1480L, enables such rolls to be readily replaced. These carbon paper ribbons or webs 1482W are withdrawn in a downward direction and in a parallel relationship about a lower guide roll 1483 that is supported by downwardly extending arms 1484 on the cabinet 1480. These ribbons or webs 1482W are then led to the left as shown in Figs. 17, 121 and 124 and are extended between the various webs W and on to the left to a feed mechanism 1485 that will be described presently. It will be observed in Figs. 17, 121 and 124 that the carbon ribbon extends in an angular direction, thereby to attain efficiency of operation in accordance with known principles, and in attaining this path of movement of the carbon ribbons, which are identified as 1482W, a pair of guide rollers 1487 are supported on the frames 825 and 826 by means including brackets 1487B.

Just rearwardly of the printing station 214, means are afforded for separating the various webs W, and such means include a plurality of separator bars 1490 that are relatively thin and which are extended between the various webs W and are guided by vertical guide pins 1491 that extend upwardly from the machine frame and through openings in opposite ends of separating bars 1490.

The carbon paper ribbons or webs 1482W are withdrawn or advanced with a step by step action by the advancing means 1485, which is actuated periodically in timed relation to the operation of the printing mechanism at printing station 214. The withdrawing mechanism 1485 comprises a generally U-shaped bracket 1495 supported on a base bracket 1496, and in the U-shaped bracket 1495, a lower feed roll 1498 is rotatably mounted. The feed roll 1498 is disposed on a horizontal shaft 1499 that is in a stationary position within the bracket 1495, and above the feed roll 1498, an upper feed roll 1500 is mounted in a bail 1501 that is pivoted at 1502 in the bracket 1495. The bail 1501 has a spring 1501S acting thereon so as to urge the upper feed roll 1500 yieldingly in a downward direction and into effective contact with the lower feed roll 1498, and to insure proper gripping of the webs 1482R, both of the rolls are serrated so as to have a gripping and interlocking action on the webs.

The lower feed roll 1498 may be manually actuated by a knurled knob 1499K fixed on the end of the shaft 1499. In normal operation the shaft 1499 is arranged to be operated by a ratchet mechanism which includes a rocker 1505 mounted on the shaft 1499 and having a spring urged pawl 1506 arranged to engage a ratchet wheel 1507 fixed on the shaft 1499. A spring 1508 urges the rocker 1505 in a counter-clockwise direction as shown in Fig. 122 of the drawings, and when the feed rolls are to be actuated, this is accomplished by a Bowden wire 1510 that is connected to the right-hand end of the rocker 1505 as shown in Fig. 122 of the drawings. This Bowden wire 1510 extends downwardly and is operatively associated with an operating cam mechanism fixed on the shaft 668 of the variable printer VP-2. Thus, the carbon ribbon feed will be advanced each time a printing operation is performed at the proof printing station 214.

In order to effectually separate the carbon ribbons 1482W from the upper feed roll 1500, this feed roll has a groove 1500G formed therein adjacent the mid point of its length, this groove being annular in character so as to extend entirely about the roll 1500. This groove 1500G is engaged by a horizontally extended stripper arm 1513 that is mounted on the cross arm of the bail 1501 as will be evident in Figs. 121, 124A and 125. As the carbon ribbon is fed to the left, any tendency of this ribbon to follow the feed roll 1500 is overcome by the stripping arm 1513, and thus proper operation of the mechanism is assured.

SELECTOR MECHANISM AND RELATED TIMING ELEMENTS

As pointed out hereinabove, the gear 440 in the main gear box 390 is driven in timed relation to the operation of the printing device feed mechanisms, this gear 440 being driven from the sleeve 411 which is in turn controlled by the printing device feed clutch 410. As shown in Figs. 36, 126 and 129 of the drawings, a selector unit 1519 is afforded that includes a timing shaft 1520 supported rearwardly of the main gear box 390 at substantially the level of the shaft 420 upon which the gear 440 is mounted, and a gear 1521 fixed on the timing shaft 1520 and of the same diameter as the gear 440 is meshed with the gear 440 so that the timing shaft 1520 will be rotated through a single revolution each time the printing device feed mechanism is operated. This timing shaft 1520 is utilized not only in the main timing functions of the machine, but also is utilized for timing the operation of switches that form part of the selector mechanism 1519 of the machine. Thus, it will be observed that the shaft 1520 is supported by means including a bracket 1522 that extends rearwardly from the machine frame, and outwardly or rearwardly of the shaft 1520, a stationary pivot shaft 1523 is supported by means including the bracket 1522. This pivot shaft 1523 serves as a mounting for a plurality of rocker arms 1524 that extend forwardly and have cam rollers 1525 at their forward ends arranged to bear on related timing cams that are carried on the timing shaft 1520, and springs 1524S urge the levers downwardly so that the rollers 1525 cooperate with such cams. In Figs. 36, 126 and 129, three such switches 1526, 1527 and 1528 are mounted on three adjacent arms

1524, and these three switches are utilized in the selector mechanism 1519 of the machine, as will hereinafter be described in detail.

In addition to the switches 1526, 1527 and 1528 which form part of the selector mechanism, switches 1529, 1530, 1531, 1532 and 1533, that are shown only in Fig. 142 of the drawings, are mounted on similar arms 1524 and cooperate with cams on the main cam shaft 1520. Thus, each cam on the cam shaft 1520 is identified by the same reference character as the related switch with the letter C added in each case. The additional timing switches are shown in the wiring diagram, and the controlling actions thereof will be described in detail hereinafter in connection with the description of the operation and control of the machine.

In respect to the three switches that form part of the selector mechanism 1519, it will be observed that each lever 1524 has an upward extension that is identified by the same reference character as the related switch, but with the letter A added, and such upward extensions are shown in Figs. 36 and 126. At the upper end of each such arm, a lateral finger 1534 is provided as shown in Figs. 126 and 128A, and this lateral finger 1534 has a forwardly projecting tooth 1535 thereon as shown in Fig. 128A. Such tooth 1535 is in each instance quite narrow, and this tooth is adapted for cooperation selectively with the edge of any one of three control disks, such as the three control disks included in the group identified as 1538 in Fig. 128A of the drawings. Three such groups 1536, 1537 and 1538 of control disks are afforded, and these groups are allocated, respectively, to the arms 1526A, 1527A and 1528A, as will be evident in Fig. 126. The three groups of disks that are thus afforded are mounted on a selector shaft 1540 that is mounted in a horizontal position and for rocking as well as longitudinal setting movement in an inverted U-shaped bracket 1541. The shaft 1540 is adapted to be set in any one of three longitudinal positions as determined by a latch member 1542 that is loosely pivoted on the right-hand end of the selector shaft 1540 as shown in Figs. 126 and 128. The latch 1542 is urged toward its engaged position by a spring 1543, and this tends to engage the latch 1542 with one of three positioning notches 1544 that are formed in a stationary latch plate 1545, Fig. 127. When the latch 1542 is in its right-hand position of Fig. 126, the machine is set for what is termed print-tab operation, and the left-hand control disk of each of the groups is aligned with the tooth 1535 of the related extension, as 1526A. The central one of the two positions on the latch plate 1545 is what is termed the skip-tab position, and this aligns the central disks of the several groups with the related teeth 1535. When the latch 1542 is engaged with the left-hand one of the notches 1544 of the latch plate, the shaft 1540 is set in such a position that a selector mechanism is turned off, and the right-hand disks of the several groups are aligned with the respective teeth 1535. When the selector is set in its "off" position, the left-hand end of the shaft 1540 engages an operating arm 1548 of a control switch 1549 that is included in the control circuits of the machine in a manner that will hereinafter be described.

The several control disks that are mounted on the shaft 1540 take different forms, as illustrated in Figs. 130 to 132 of the drawings, and the basic purpose of such disks is to serve as a dominating control governed by the sensing head SH and regulating the response of the switches 1526, 1527 and 1528 to the action of their related cams. Thus, it will be observed that these cams, which are shown in detail in Fig. 133, have cam recesses at different positions along their periphery so that when these recesses come into alignment with the related cam roller 1525, the related switch will tend to rock downwardly so as to bring the operating plunger thereof into engagement with an opposed adjustable abutment 1551 that is afforded in a stationary horizontal mounting bar 1552 that is disposed beneath the several switches and between the shafts 1520 and 1523 as shown in Fig. 36 of the drawings.

In attaining the desired dominating controlling action in respect to the three switches of the selector mechanism 1519, the right-hand disk of each group of control disks has an annular outer edge surface which at any point in its periphery serves as an abutment for the opposed tooth 1535 so that the switches of the selector mechanism can not be closed, even though the cams 1526C, 1527C and 1528C continue their operation. When the selector is in its "off" setting and the right-hand disks are in position opposite the respective teeth 1535, this action prevents closure of any one of the switches of the selector mechanism. As shown in Figs. 130, 131 and 132, the aforesaid right-hand disks of the several groups are identified as 1536N, 1537N and 1538N.

The central disks of the three groups are identified as 1536S, 1537S and 1538S, while the left-hand disks are identified as 1536P, 1537P and 1538P, and these disks are provided with notches and dwell surfaces at appropriate angular points around their edges so that a desired selecting action may be attained, as will now be described. The selecting action is attained by rocking or indexing movement of the selector shaft 1540, and this is attained through the action of the supplemental sensing head 785, and in the sensing action of the supplemental sensing head 785, the movement of the sensing head is transmitted to the selector shaft 1540 by the arm 819A and the link 819B, the link 819B extending downwardly and having a rack 1556 formed on its rear edge so as to engage the forward edge of a pinion 1557 that is fixed on the selector shaft 1540. A spring 1558 acts on the link 819B to urge the same in a downward direction, and when one of the sensing pins 810 engages a tab on the printing device at sensing station, the action of the sensing means is such that the link 819B is withdrawn in an upward direction, and this imparts clockwise rotating or indexing movement to the selector shaft 1540.

The extent of this clockwise movement of the selector shaft 1540 may vary in accordance with the length of the sensing pin 810 that is effective in the sensing operation, and in this regard, attention is directed to the aforesaid Hueber Patent No. 2,359,851, wherein the use of sensing pins of varying lengths is described in detail. Thus, when the sensing head 785 does not sense a tab, the several control disks will be moved in a clockwise direction for approximately 8½° to what may be termed position I, wherein the line marked with the reference character I in Fig. 130 will be in the horizontal plane of the dot-dash line 1560. When a tab is sensed by a normal length sensing pin, the control or selector shaft

1540 will be rotated to what may be termed position II, wherein the line marked by the reference character II in Fig. 130 will be in the horizontal plane of the dot-dash line 1560. Similarly, when a tab is sensed by a long sensing pin, the selector shaft 1540 will be moved to what may be termed position III wherein the line marked with the reference character III in Fig. 130 will be in the horizontal plane of the dot-dash line 1560.

In order that such rotative settings of the selector shaft 1540 may attain the desired selecting control, the control disk 1536P has a dwell surface at position II and has recesses 1561 at positions I and III, respectively. Similarly, the control disks 1537P and 1538P have dwell surfaces in positions I and III and recesses 1561 in position II. The control disk 1536S has a dwell surface in position I and has an elongated recess 1561 that extends throughout positions II and III thereof. Control disks 1537S and 1538S are of the same form and have a recess at position I and dwell surfaces at positions II and III.

It will be evident that with the control disks formed in the manner disclosed in Figs. 130, 131 and 132, the different settings of the selector shaft 1540 will attain different selecting actions, as will be described in connection with the operation of the machine.

THE MANUAL CONTROL MECHANISMS AND RELATED ELECTRICAL CONTROLS

When the motor 375 is operating, the printing operations of the machine may be instituted by forward withdrawal of a control handle 1600 that is disposed in the lower right-hand portion of the forward end of the printing frame 216. This handle 1600 is mounted in a horizontal bearing 1601, Figs. 49, 84 and 134, and has a rearwardly extending link 1602 extending rearwardly for connection at 1603 with one arm of a bell crank 1604 that is pivoted on the side of the frame 216. The other arm of the bell crank is connected to the upper end of a link 1605 that extends downwardly near the back of the machine and is connected to the end of an arm 1606. The arm 1606 is fixed on a horizontal cross shaft 1609 that is mounted for rocking movement along and near the lower rear portion of the machine. When the machine is to be started or turned on, forward withdrawal of the handle 1600 rocks the shaft 1609 in the "on" direction indicated by arrows in Figs. 49 and 134 to 138.

Such rocking of the shaft 1609 serves to impart downward actuating movement to the clutch control rods 516, 520 and 531, and the operative connections afforded are of such a character that certain of these control rods may be released in a different timed relation. Thus, in affording a motion-transmitting connection between the rock shaft 1609 and the rods 520 and 531, a slide plate 1611 is mounted for vertical sliding movement on a vertical bracket plate 1612 disposed above the shaft 1609. At its upper end the slide plate 1611 has a flange 1611F extending to the left, Fig. 134. The rods 520 and 531 extend slidably through the flange 1611F, and collars 520C are fixed on the lower ends of the rods 520 and 531 so that upon downward movement of the slide plate 1611, these rods will be pulled downwardly.

Downward movement is imparted to the slide 1611 from an arm 1613 fixed on the shaft 1609 and projecting forwardly therefrom. A pull rod 1614 extends upwardly from the end of the arm 1613 through a flange 1611B and through an upstanding guide sleeve 1615 fixed on the flange 1611B. At its upper end the rod 1614 has a head 1616 which may be pulled downwardly against the top of the sleeve 1615 so as to pull the slide 1611 downwardly. When the slide 1611 is thus pulled down, it is latched in such position by a latch 1617 that engages a flange 1611C and is urged toward such latching engagement by a spring 1618. A solenoid 1620 is connected to the latch 1617 to enable the solenoid to disengage the latch. The latch 1617 may also be disengaged by the operation of the shaft 1609, it being noted that the head 1616 is of considerable vertical length so that when the shaft 1609 is rocked clockwise, the upper end of the head 1616 engages a pin 1617P on the latch 1617 so as to disengage the latch.

The slide 1611 also is arranged to operate a pair of microswitches 1623 and 1624 that are mounted in fixed positions on the opposite face of the bracket 1612, Fig. 134. The switches 1623 and 1624 are disposed opposite a vertically shiftable cam block 1625 that is carried on the slide 1611 by studs that extend through the bracket 1612, and when the slide 1611 is moved downwardly to the position shown in Fig. 134, the two switches are closed.

The pull rod 216 is associated with the rock shaft 1609 by a generally similar slide 1631 mounted for sliding movement vertically along a mounting bracket 1632. The upper flange 1631F is connected to the lower end of the rod 516 for imparting downward movement thereto, and a latch 1637 is arranged to engage a flange 1631C to latch the slide in its lower position. The latch 1637 is adapted to be released by a solenoid 1640. The slide 1631 is pulled downwardly by an arm 1633 fixed on the shaft 1609, and a link 1834 extends upwardly through an upstanding guide sleeve 1635 fixed on a lower flange 1631B of the slide. A head 1636 on the rod 1634 engages the upper end of the sleeve 1635 when the shaft 1609 is rocked in and "on" direction, thereby to pull the slide 1631 to its lower latched position. It will be noted that the head 1636 is relatively short in a vertical direction, and thus this head can not act to disengage the latch 1637.

The slide 1631 also carries a cam plate 1645 on the opposite side of the bracket 1632, and this cam plate 1645 is arranged, when the slide 1631 is in its lower position, to close a microswitch 1643.

CONTROL LOCKING AND UNLOCKING MEANS

While it is usually desirable to have the handle 1600 or other starting means available for starting the machine, it is desirable in some instances to prevent starting of the machine until after certain conditioning operations have been performed. For this purpose, a mounting plate 1650, Figs. 134 and 138, is arranged to carry a locking latch 1651 pivoted at 1652 and urged by a spring 1651S toward a locking engagement with an arm 1653 fixed on the shaft 1609. A solenoid 1654 is connected to the latch 1651 for releasing the same, and when the latch 1651 is thus released, it is engaged by a retaining latch 1655 that is pivoted at 1656 on the plate 1650. The latch 1655 is urged toward its effective position by a spring 1657, and a solenoid 1658 connected to the latch 1655 may be energized to release the latch 1655 and thus permit the locking latch 1651 to become effective to disable the starting shaft 1609.

ELECTRICAL CIRCUIT CONNECTIONS

Electrical power for the machine is supplied from an alternating current source through an attachment cord 1660 to a positive terminal 1661 and a negative terminal 1662, and from these terminals a starting and running circuit for the motor 375 is afforded by means including a relay 1663. In this relation a motor control panel 1665 is afforded having a normally open push button start switch 1666 and a normally closed push button stop switch 1667. The relay 1663 has one terminal thereof connected to the negative terminal 1662 by a wire 1668 while the positive terminal 1661 is connected by means including a wire 1670 to one contact of the start switch 1666. A wire 1671 connects one contact of the stop switch 1667 to the other contact of the start switch 1666, while a wire 1672 extends circuit from the other contact of the stop switch to one contact of the switch 1299. Circuit is then extended from the other contact of switch 1299 to one contact of the switch 765 by a wire 1673, a wire 1674 extending from the other contact of the switch 765 to safety switch 1319 of the diablo unit 219, Fig. 144. A wire 1675 extends from the other contact of the switch 1319 to one contact of a safety switch 1676 that is associated with the overload release 381 of the main drive of the machine. A wire 1677 extends from the other contact of the switch 1676 to one contact of a safety switch 1678 that is associated with an overload release mechanism 1679 that is included in the drive of the unit 202. A wire 1680 extends from the other contact of the switch 1678 to the other terminal of the relay 1663.

Thus, when the start switch 1666 is depressed, the relay 1663 is energized, and this closes several circuits, as follows:

A. A holding circuit for the relay 1663 from the positive terminal 1661 through normally open but now closed relay contacts 1663–1, a wire 1682, a fuse 1683, wires 1684 and 1685, a fuse 1686 and a wire 1687 to the wire 1671. This holding circuit, of course, includes the safety switches 1299, 765, 1319, 1676 and 1678 that were included in the starting circuit, and hence opening of any of these safety switches will cause the relay 1663 to be deenergized so as to stop the machine.

B. A motor energizing circuit for the motor 375 from the positive terminal through the relay contacts 1663–1, the wire 1682, the fuse 1683, the wire 1684, a wire 1688 to one terminal of the motor 375, and wires 1689 and 1690 in series from the other terminal of the motor 375 through the now closed relay contacts 1663–2 to the negative terminal 1662.

C. A main safety stop circuit that may serve, as will hereinafter be described, to energize the main stop solenoid 1620 of the auto-stop mechanism of the machine, is effectually conditioned. This safety or auto-stop circuit includes wires 1691 and 1692, the wire 1691 being connected by a wire 1693 to the wire 1687 so as to constitute the positive side of the safety stop circuit, while the wire 1692 is connected by a wire 1694 to the wire 1690, thereby to constitute the negative side of such safety stop circuit.

The stop solenoid 1620 is energized when the machine is to be stopped, thereby to release the control slide 1611. Thus, one terminal of the stop solenoid 1620 is connected by wires 1701 and 1702 in series to the wire 1692, while a wire 1703 extends from the other terminal of the solenoid 1620 to a terminal 1705 from which two control circuit branches are extended. One such circuit branch comprises a wire 1706 that is extended from the terminal 1705 to different locations in the machine. A wire 1707 extends to the same locations in the machine, and by a wire 1708 is connected to one terminal of the switch 1643, the other terminal of which is connected to the wire 1691. When the machine is operating, the switch 1643 is closed by the action of the latched control slide 1631, Figs. 134 and 135, so that under such circumstances the solenoid 1620 may be energized by effecting a connection between the wires 1706 and 1707.

Thus, the circuit to the stop solenoid 1620 may be closed by a normally open push button stop switch 1710 located on the back of the unit 201 as indicated in Fig. 142, this switch being connected across the wires 1706 and 1707. Similarly, two push button stop switches 1711 and 1712 are located on the front of the unit 201, and a wire 1713 and a branch lead 1714 connect on contact of each of these switches to the wire 1706. Wires 1715 and 1715A serve respectively to connect the other terminals of the switches 1711 and 1712 to the wire 1707, so that either of these switches may serve to energize the solenoid 1620. It will also be noted that the wire 1706 extends into the unit 202, Fig. 143, while the wire 1707 extends into the proofing unit 218, Fig. 144, to one contact of an off-on switch 1716. An extension 1707E extends from the other terminal of the switch 1716 back into the unit 201, Fig. 142, and then into the unit 202. In the unit 202, the wires 1706 and 1707E are connected respectively to the opposite terminals of a push button stop switch 1718 that is located under the card magazine CM, as shown in Fig. 1, and this switch 1718 serves a stopping function similar to the switches 1711 and 1712.

In addition to the manual stop switches just described, several safety switches are also connected across the wires 1706 and 1707E for energizing the solenoid 1620 when any one of these switches is closed. Thus, the switch 985 which is operated by the safety card sensing means in the sheet guideway SG–2 is connected by wires 1719 and 1720 across the wires 1706 and 1707E, as shown in Fig. 142. Similarly in the unit 202, as shown in Fig. 143, the card safety switch 340 is connected across the wires 1706 and 1707E by wires 1721 and 1722, while the card safety switch 334 is connected across the wires 1706 and 1707E by wires 1723 and 1724. Hence, the operation or closure of any one of the card safety switches 334, 340 or 985 may serve to energize the stop solenoid 1620.

The off-on switch 1716 is normally disposed in its "on" position, but when it is desired to operate the lister mechanism 216 when no sheets S are being fed along the sheet guideway SG, the switch 1716 is opened so as to disable the sheet safety switches in the units 202 and 201.

Further control of the stop solenoid 1620 is afforded by other control switches disposed across branches of the wire 1706 and 1707. Thus, as shown in Fig. 142, a branch from the wire 1706 is extended by wires 1706A and 1706B in series to one contact of the last plate switch 775, while a branch from the wire 1707 is afforded by wires 1707A and 1707B in series to the other contact of the switch 775. Hence, when the supply of printing devices D in the magazine M is exhausted, closure of the switch 775 serves to energize the stop solenoid 1620. Similarly, a switch 1725, that is disposed at the rear end of the printing device collecting tray 755 so as to be

closed by the printing devices D when the tray is filled, is connected across the wires 1706A and 1707A so as to attain a similar stopping action.

The machine must also be stopped when the "thousand impression" T–I total is taken under control of the impression counter 1200, and for this purpose a relay 1728, Fig. 142, is provided which is energized under the control of the counter 1200 and which is effective to energize the stop solenoid 1620 and also the locking solenoid 1658. Thus, the relay 1728 has normally open contacts 1728–1 connected across the wires 1706A and 1707A so as to energize the solenoid 1620 when the relay is operated. A second set of normally open relay contacts 1728–2 is connected between the wire 1707A and a wire 1731 that extends to one terminal of the locking solenoid 1658, and wires 1732 and 1733 extend in series from the other terminal of the solenoid 1658 to the wire 1692 so that operation of the relay 1728 serves to energize the locking solenoid 1658.

The relay 1728 has one terminal thereof connected to the wire 1692, while a wire 1734 extends from the other terminal of the relay 1728 to one terminal of the switch 1623 which is closed so long as the slide 1611 is in its lower or latched position. A wire 1735 extends from the other terminal of the switch 1623 to one terminal of the timing switch 658C that is included in the variable printer VP–I, Fig. 143, while a wire 1736 extends from the other terminal of the switch 658C to one terminal of the counter switch 1210H. The other terminal of the counter switch 1210H is connected by a wire 1737 to one terminal of the counter switch 1210T, while the other terminal of the counter switch 1210T is connected by a wire 1738 to one terminal of the counter switch 1210U. A wire 1739 extends from the other terminal of the switch 1210U to a wire 1740 that is extended to the other side of the circuit as represented by the wire 1601. Thus, when the thousandth impression is registered by the counter 1200 so as to close all three of the counter switches, the energizing circuit for the relay 1728 will be conditioned, and upon closure of the timing switch 658C, the relay 1728 will be energized so as to cause energization of the stop solenoid 1620 and the locking solenoid 1658.

The drive for roller platen P–2 is arranged so that when the machine is stopped, for example, by the manual or automatic switch means just described, the stopping of the roller platen P–2 is delayed until its cycle has been completed. Thus, the stop solenoid 1640 has one of its terminals connected by the wire 1701 to the negative power lead 1692, and a wire 1745 is extended from the other terminal of the solenoid 1640 to one contact of the normally open timing switch 1533. The other contact of the normally open timing switch 1533 is connected by a wire 1746 to one contact of the normally closed switch 1624, it being noted that the switch 1624 is held open by the slide 1611 when the slide is latched down, and is closed when the solenoid 1620 releases or unlatches the slide 1611. Thus, the unlatching of the slide 1611 acts by closing the switch 1624 to condition the circuit to the stop solenoid 1640, and this circuit is timed by the switch 1533. Circuit is extended from the other contact of the switch 1624 by a wire 1647 to the wire 1707 and thence through the wire 1708 and the then closed switch 1643 to the positive power lead 1691.

In the operation of the machine it is sometimes desirable to run the machine so as to skip all of the printing devices, and for attaining this result a double throw, double pole toggle switch 1750 is mounted adjacent the stop switch 1712, and this switch 1750 is connected in the selector circuits as shown in Fig. 142. Now in respect to the selector mechanisms, it will be recognized that by shifting the axial position of the selector shaft 1540, the action may be reversed, but for present purposes, the circuits will be described as they function when the selector is set for print-tab operation. In such print-tab operation the action of the selector, when a tab is sensed, is to rock the selector shaft 1540 to its position II so that the switch 1526 will be held open, the switch 1527 will be allowed to close, and the switch 1528 will be allowed to close. The switch 1526 is included in the circuit of the suppressing solenoid 580, which, when energized, releases the stop lever 570S–2, and this is done early in the machine cycle as shown in the timing chart, Fig. 145, and hence the stop lever opens the clutch 570 and suppresses operation of the platen P–2 in this machine cycle. The switch 1526 is also included in the circuit of the suppressing solenoid 448 which, when energized, unlatches the stop lever 415S–2 and allows this stop lever and the coordinated stop lever 403S–2 to assume their effective positions, thereby to act at the end of such cycle to disengage the clutches 415 and 403 for one-cycle, and this prevents or suppresses operation of the stop finger and the tape feed as well as the main platen P–3 in the next cycle.

Thus, circuit is extended from the positive wire 1707 by a wire 1753 and a branch 1754 to one terminal of the selector switch 1526, and a wire 1755 extends from the other terminal of switch 1526 to one terminal of the solenoid 580 and from the other terminal of this solenoid, wires 1756 and 1757 extend in series to the negative wire 1692. In affording an energizing circuit for the solenoid 448, a wire 1758 extends from the wire 1755 to one terminal of the switch 1549, and a wire extends from the common terminal of this switch to one terminal of the solenoid 448, the other terminal of which is connected by a wire 1759 to the wire 1757. Hence, when the switch 1526 of the selector is closed, as when no tab is sensed in print-tab operation, the solenoids 580 and 448 will be energized, and the platens P–2 and P–3 will be held against operation in respect to the particular sensed printing device D when such printing device reaches stations 214 and 210, respectively. In this connection, it should be noted that the action of the solenoid 580 renders the stop lever 570S–2 effective to suppress operation of the platen P–2 in the same machine cycle as the sensing, while the solenoid 448 releases its stop levers 415S–2 and 403S–2 after the start of the cycle in which the sensing takes place so that the suppressing action is effective on the platen P–3 in the next machine cycle when the printing device reaches station 210.

For operation in duplicate work, the timing switch 1529 is utilized, and this switch is normally closed and is opened in response to a recess in its control cam 1529C. The timing is such that the switch 1529 opens before the switch 1526 closes, and closes after switch 1526 opens, and in this connection it should be noted that the timing switch 600 opens and closes at the same time as the switch 1526. Thus, a wire 1765 extends from the wire 1753 to one contact of the switch 1529, and wires 1766 and 1767 in

series extend from the other contact of the switch 1529 to one terminal of the switch 609, the other terminal of which is connected by a wire 1763 to the wire 1755. Thus, when there is no movement of the printing device advancing means, and consequently no rotation of the timing cam 1529C, the switch 1529 will remain closed and the subsequent closure of the timing switch 609 will serve to energize the solenoids 590 and 448 so as to tend to suppress printing at both of the stations, but it will be observed that with respect to the printing station 210, the multi-print shaft 425 and the means including the control rocker 452 will serve as a dominating control so that the requisite multi-print impressions will be made at the printing station 210.

The circuits just described for energizing the suppressing solenoids 448 and 590 also come into play under control of the switch 748S or the switch 1750. In this connection, it will be observed that the switch 1750 is normally set to its lower or print position. One common contact of this switch is connected to the wire 1767 by a wire 1770, while the corresponding lower contact is connected by a wire 1771 to the selective contact of the switch 748S which is engaged when no printing device is sensed at sensing position. The common contact of this switch 748S is connected by a wire 1772 to the wire 1793, so that when a printing device does not move into sensing position, the switch 748S cooperates with the timing switch 609 to suppress printing at both printing stations.

Similarly, when the skip switch 1750 is in its upper or skip setting, the wire 1770 is connected to a wire 1774 that extends to the wire 1753, thereby to render the timing switch 609 effective in each cycle to energize both of the suppressing solenoids 448 and 590. In the event that the selector shaft 1540 is in its "off" position, the common contact thereof is connected by a wire 1774A to one contact of the timing switch 1530, the other contact of which is connected by a wire 1767A to the wire 1767. Hence, the switch 1530 times the solenoids 448 and 590 when the skip switch 1750 is set to its skip position.

The switch 1527 of the selector 1519 serves to control the energization of a rectifier 1775, Fig. 143, which constitutes the power source for the translator solenoids 1065, and the relation between the rectifier and these solenoids is such that the set-up means of the variable printer VP–1 are not set up except in those cycles when the rectifier is energized. Such energization, while controlled by the switch 1527, is dominated by the switches 1750 and 748S. Thus, the other selective contact of the switch 748S is connected by a wire 1776 to the other lower contact of the switch 1750, which lower contact is engaged by the other common contact of the switch 1750 when the switch is in its lower or print position. This other common contact is connected by wires 1777 and 1778 in series to one contact of the normally open switch 1527, and a wire 1779 from the other contact of the switch 1527 extends into the unit 202, Fig. 143, and to one input terminal of the rectifier 1775. The other terminal of the rectifier 1775 is connected by a wire 1780 to the wire 1733, Figs. 142 and 143, which is extended to the negative side of the circuit as represented by the wire 1692.

The selector switch 1528 serves to control the starting of the variable printer VP–1 and the shuttle feed, and is dominated by the switches 1750 and 748S in the same manner as the selector switch 1527. Thus, a wire 1782 extends from the wire 1777 to one contact of the normally open switch 1528, and wires 1783 and 1784 in series extend from the other contact of the switch 1528 to one contact of the timing switch 1531. A wire 1785 extends from the other contact of the switch 1531 into the unit 202, Fig. 143, and is connected by a wire 1786 to one terminal of the clutch solenoid 650M which serves to engage the clutch 650 of the variable printer VP–1. The other terminal of the solenoid 650M is connected by a wire 1787 to the negative lead 1733, so that closure of the switch 1528, when the circuit is properly conditioned through switch 748S by the presence of a printing device at sensing station 212, serves to initiate a cycle of the variable printer VP–1.

Such switch closure of the switch 1528 also serves to energize the shuttle feed clutch solenoid 638M, one terminal of which is connected to the wire 1707E by a wire 1790. The other side of the circuit for the solenoid 638M is afforded by a wire 1791 extended from the wire 1783 to one terminal of the timing switch 1532, a wire 1792 being extended from the other terminal of the switch 1532 to the other terminal of the solenoid 638M. When, however, a printing device D is not in position at the sensing station 212, the switch 748S is so operated as to open circuit to the wire 1771, thus to prevent operation of the rectifier 1775, the shuttle feed, and the variable printer VP–1. Also, the switch 748S is in such an instance engaged with the other selective contact, which contact is connected by a wire 1779A to the lower contact of the switch 1750 that is connected to the wire 1770. Hence, a circuit is established which prevents printing in that cycle at station 210 and in the next cycle at station 210.

A manually controlled circuit for energizing the shuttle feed solenoid 638M is afforded by a push button switch 1795 located near the switch 1718, and connected at one of its terminals to the positive lead 1740, and at the other of its terminals to a wire 1796 which extends to the wire 1792 and thence through the solenoid 638M and the wire 1796 back to the negative lead 1733.

A similar manual control for energizing both of the solenoids 650 and 638M is afforded by a multiple contact push button switch 1800 having two sets of contacts. One contact of each set is connected by means including a wire 1801 to the positive lead 1740; and the other contact of one set is connected by a wire 1802 to the wire 1786, while the other contact of the other set is connected by a wire 1803 to the wire 1792. Thus, upon actuation of the switch 1800, a card will be fed from the card magazine CM, and the variable printer VP–1 will be operated through a cycle. The switch 1800 constitutes a test switch.

A switch 1805 of the same structure as the switch 1800 has one contact of each set connected by a wire 1806 to the positive lead 1740 and the other contact of one set is connected by a wire 1807 to the wire 1802, so closure of this one contact set energizes the solenoid 650M and starts the variable printer. The other contact of the other set is connected by a wire 1808 to one terminal of each of the suppressing solenoids 660M and 665M, the other terminals of which are connected by a wire 1809 to the negative lead 1733. Thus, when the variable printer VP–1 is started by depression of the switch 1805, the stop finger mechanism in the unit 202 and the punching unit PU will not be operated.

The pager and proofer 218 is associated with

the variable printer VP–2 so as to obtain coordinated web feed in the unit 218, and in attaining this result, a wire 1810 extends from the positive lead 1740 to one contact of the normally open timing switch 612, the other contact of which is connected by a wire 1811 to one contact of an off-on switch 1816. Wires 1817 and 1818 in series connect the other contact of the switch 1816 to one terminal of the line space solenoid 1428, the other terminal of which is connected to the negative lead 1692 by a wire 1819. Thus, the switch 1816 is used to obtain continuous paper feed and in its closed position conditions the circuit which is then closed by the timing switch 612 each time the cam thereof operates. Normally the switch 1816 is maintained open, and the solenoid 1428 is operated under control of the variable printer VP–1 or the counter mechanism or manual controls, as will hereinafter be described.

Energization of the solenoid 1428 by means including a part of the circuit just described serves to produce a normal full line space feeding movement of the web W, and such action normally takes place each time the variable printer VP–2 is operated, as will be described. It will be observed that at the bottom of each proof sheet an additional or eleventh space is afforded to receive the total impressions, and for accomplishing this the counter switch 1466 is rendered effective or closed at the end of each revolution of the counter shaft, or, in other words, in the course of the tenth impression feeding movement. Thus, the switch 1466 has one contact connected by a wire 1821 to the wire 1811, while wires 1822 and 1823 extend in series from the other contact of the switch 1466 to the wire 1818. Hence, after the switch 1466 has been closed, the next rotation of the timing shaft of the unit 600, the timing switch 612 completes the circuit and causes the desired idle or eleventh space feeding of the web W.

The line feed solenoid 1428 may also be energized by a multiple contact push button switch 1825, Fig. 144, having three sets of normally open contacts. One contact of each set is connected by a wire 1826 to the positive lead 1691. The other contact of the first set is connected by a wire 1827 to one contact of the switch 1460, which switch is normally open, and is closed when the feeding means are in their home position. The other contact of the switch 1460 is connected by a wire 1828 to the wire 1817, thereby to afford an energizing circuit for the solenoid 1428. The other contact of the second set included in the switch 1460 is connected by wires 1829 and 1830 to one terminal of the shroud solenoid 1425, and a branch 1831 from the wire 1829 is connected to one terminal of the shroud solenoid 1454. The other terminals of the solenoids 1425 and 1454 are connected respectively by wires 1832 and 1833 to the negative lead 1692.

The other contact of the third set of contacts included in the switch 1825 is connected by a wire 1834 to the other terminal of the unlatching solenoid 1654, Fig. 142, thereby to establish circuit back through the wire 1732 to the negative lead 1733. The switch 1825 may thus be operated to produce a half-space paper feed, and to unlock the auto-stop latch when it is desired to continue operation of the machine after an automatic T–I total has been taken and printed in the half-space position after one thousand checks have been produced. Such use of the switch 1825 merely re-establishes the full-space and properly timed relation of the web W, and conditions the machine for manual restarting by means of the control handle 1600, but it may be observed that the cutoff knife will automatically operate as will be hereinafter described.

Another push button switch 1835 located adjacent the switch 1825 has its single pair of contacts connected respectively by wires 1836 and 1837 to the wires 1601 and 1827 to enable a single full line spacing operation to be attained by energization of the solenoid 1428.

The diablo paper feed is started by energization of the solenoid 1370 which has one terminal connected to the negative lead 1692, and the other terminal thereof is connected by a wire 1838 to one contact of the switch 1318. The other contact of the switch 1318 is connected by a wire 1839 to the lead 1691. Similarly, one terminal of the stop solenoid 1373 is connected by a wire 1840 to the lead 1692, and its other terminal is connected by a wire 1841 to one terminal of a switch 1842. This switch 1842 is normally open, and is closed by a cam 1843 on the shaft 1358 at all times except when the feed rolls 1309 and 1310 are in their home positions. The other contact of the switch 1842 is connected by a wire 1845 to one contact of the switch 1317, the other contact of which is connected by a wire 1846 to the wire 1839. Thus, when the diablo loop becomes unduly short and the switch 1318 is closed, the trip or start solenoid 1370 causes the feed clutch 1361 to engage, and the stop lever 1351 is latched in its released position by the latch 1371. When the diablo loop has been increased so as to cause the switch 1317 to be closed, the release solenoid 1373 will be energized to release the latch 1371. This causes the feed clutch 1361 to be disengaged, and when the shaft 1358 comes to rest in its home position, the circuit to the solenoid 1373 is opened by the protective switch 1842.

When the pager and proofer 218 operates through the full eleventh line space, as contrasted with the first half-space movement, the deep tooth on the control cam 1470 of the switch 1465 causes this switch to be closed, and this is effective to condition a circuit for energizing the solenoid 1393 which causes operation of the cutoff knife. Thus, one contact of the switch 1465 is connected by a wire 1850 to the positive lead 1691, while the other contact is connected by a wire 1851 to one contact of the timing switch 1461, the other contact of the switch 1461 being connected by a wire 1852 to one terminal of the solenoid 1393. The other terminal of the solenoid 1393 is connected by a wire 1853 to the negative lead 1692. Thus, after closure of the conditioning switch 1465, the paper is severed as soon as the full feeding stroke of the paper feed means has caused closure of the timing switch 1461.

When the aforesaid eleventh line spacing feed of the web W is to take place, the machine is shut down for one cycle by energization of the one-cycle suppressing solenoid 504. This is accomplished under control of the counter 1200 and the timing switch 658B. Thus, a wire 1855 is extended from the wire 1738 in the counter 1200 to one contact of the switch 658B, and a wire 1856 from the other contact of the switch 658B extends to one terminal of the solenoid 504, the other terminal of which is connected by a wire 1857 to the negative lead 1733. Thus, it will be evident that each time the units order counting switch 1210U is closed by reason of the units

order of the counter reaching zero, the main clutch 501 of the machine will be disengaged for one cycle so as to thereby prevent advance of printing devices and prevent printing at either printing station while the web is being advanced through the eleventh space.

The switch 658A has one contact connected by a wire 1360 to the positive lead 1740, and from its other contact a wire 1361 extends to the wire 1323, and this causes the paper feed of the pager and proofer to be started in each operation of the variable printers VP–1 and VP–2. This constitutes the normal control for the web feed in the lister 218.

THE AUTOMATIC TOTAL TAKING CONTROLS

The control of the total taking operations of the unit VP–1 is attained by a mechanism which in its primary structure is substantially like that shown in Figs. 37 to 90 of the aforesaid Gollwitzer Patent No. 2,501,444, and reference may be had to such co-pending application for details not specifically described herein. In this connection it will be noted that corresponding basic elements of such total control mechanism are in most instances identified herein by the same reference characters with the suffix "2" added. Thus, in Figs. 142 and 143A the present machine is shown as having a T–1 total control unit including a shaft 2600 and a T–2 total control unit including a shaft 2601, both of these units being included in the total unit 625 shown in Fig. 101.

The shaft 2600 is adapted to be frictionally driven from the chain drive source 624 under control of a solenoid 2609–1 which acts to release a stop lever 2605–1. The stop lever 2605–1 acts to release a disk 2604–1 which constitutes the driven member of the friction drive and which is connected to the shaft 2600. A lever 2611–1 that is acted on by the disk 2604–1 then acts through a Bowden wire 2526–1 to set the total control shaft 1053 of the adding unit for taking a T–1 total.

The rotation of the shaft 2600 also serves to rotate a plurality of cams 1969C, 1970C, 1971C, 1972C and 1973C. The cam 1969C acts on a normally closed switch 1969 to open and then close the same just prior to the completion of a rotative cycle of the shaft 2600. The cam 1970C acts on a normally open switch 1970 to close and then open the same just prior to completion of such cycle. The cam 1971C acts on a normally open switch 1971 to close the same just as such cycle starts and to open such switch at about 180° in such cycle. The cam 1972C acts on a normally open switch 1972 to close the same at the end of the cycle, and to open the same as soon as the next cycle starts. The cam 1973C acts on a normally open switch 1973 to close and then open the same at the very beginning of such a cycle of the shaft 2600.

The T–2 total control shaft 2601 is adapted to be frictionally driven through a one-revolution cycle under control of a similar solenoid 2609–*a* and stop lever 2605–2, and a similar disk 2604–2 in this assembly acts through a lever 2611–2 and a Bowden wire 2526–2 to set the total control shaft 1053 for a T–2 total operation. The shaft 2601 carries cams 1974C, 1975C, 1976C and 1977C which act respectively on switches 1974, 1975, 1976 and 1977. The switch 1976 is normally open and is closed by its cam and immediately opened at the start of a rotative cycle of the shaft 2601. The switches 1975 and 1976 are normally open and are closed at the start of such cycle and opened at about 180° in such cycle. The switch 1977 is normally closed and is opened and immediately closed just prior to the end of such cycle.

The total control means also includes a T–1 total relay 2643 and a T–2 total relay 2664. The relay 2643 includes contacts 5 to 11 arranged so that upon operation of the relay contact 5 is engaged with contact 7, contact 7 is disengaged from contact 6, contact 8 is engaged with contact 9, and contact 10 is engaged with contact 11. Similarly, the relay 2664 includes contacts 1, 2, 5, 6, and 7 arranged so that upon operation of the relay, contact 1 is engaged with contact 2, contact 5 is engaged with contact 7, and contact 7 is disengaged from contact 6.

When a T–1 total is to be printed in the eleventh or bottom position on the tenth proof sheet under control of the counter 1200, or in other words after one hundred impressions, the T–1 total control relay 2643 is energized under control of the counter. Thus, under such a situation, the counter switches 1210U and 1210T are closed, but the switch 1210H is open, so that circuit is extended from the positive lead 1740 through the wire 1739, switch 1210U, wire 1738 and switch 1215T to the wire 1737, and from this wire a wire 1989 extends to one contact of the timing switch 677. The switch 677 is normally open in cycles where the punching unit PU operates, the switch 677 is closed just after at about 180° of the cycle and is opened at about 360° of the cycle. Wires 1981 and 1982 in series extend from the other contact of the switch 677 to the No. 6 contact of the relay 2643, which through its engagement with the No. 7 contact extends circuit to wire 1983 that is connected to the No. 7 contact. The wire 1983 is connected to one terminal of the relay 2643, and a wire 1984 connects the other terminal of the relay 2643 to the negative lead 1733. Thus, in the cycle when the one hundredth impression is made, the relay 2643 will be energized, and upon operation of the relay, a holding circuit is established from the No. 7 contact to the No. 5 contact and through a wire 1985 to one contact of the switch 1969, the other contact of which is connected by a wire 1986 to the positive lead 1740. At this same time an energizing circuit for the solenoid 2609–1 is conditioned so that it may be completed in the next cycle of the timing means. Thus, one terminal of the solenoid 2609–1 is connected by a wire 1988 to the negative lead 1733, while the other terminal is connected by a wire 1989 to the No. 9 contact of the relay 2643. This contact is at this time engaged with the No. 8 contact from which a wire 1990 extends to the wire 1611, thus to be connected through the timing switch 612 to positive lead 1740.

Hence, in the next cycle of the timing unit, the closure of switch 612 will start the shaft 2600 on its cycle so as to act through the Bowden wire 2526–1 to set the total control shaft 1053, and to operate the switches 1969, 1970, 1971, 1972 and 1973. Of these switches, the switch 1969 serves as a holding circuit for the relay 2643; the switch 1970 functions in the taking of a T–2 total and will be described in connection with such total taking operations; the switch 1971 serves to disable the advancing means of the numbering machine N–1 and to disable or shut off the punching unit PU, the card feed and stop finger mechanism of the unit 202, and the card shuttle feed; the switch 1972 functions in causing operation

of the shrouds in the pager and proofer 218 in the automatic T–1 total taken after one thousand impressions, and will be described hereinafter in connection with such one thousand total; and the switch 1973 serves to energize the clutch solenoid 650M to start the total cycle of the adding unit.

Thus, the switch 1971 has one contact connected by a wire 1991 to the positive lead 1740, and wires 1992 and 1993 in series extend from the other contact to one terminal of the solenoid 1265, the other terminal of which is connected by a wire 1994 to the negative lead 1962. The wire 1993 is also connected to the wire 1811 so that the suppressing solenoids 660M and 665M will be energized simultaneously with the solenoid 1265.

The switch 1973 has one contact connected by a wire 1995 to the positive lead 1740, while its other contact has wires 1996 and 1997 in series extended therefrom to the wire 1786, thus to afford an energizing circuit for starting the total taking operation of the unit VP–1.

When a T–1 total is thus taken automatically after one hundred impressions, the main machine functions are merely suppressed for a single cycle by the action of the solenoid 504, so that the automatic operation of the machine in producing sheets S and proof sheets PS is immediately and automatically resumed after the printing of such total on the proof sheet.

With respect to the automatic T–1 total that is taken after one thousand impressions, a different situation is presented in that the total is printed on the half space, as shown in the proof sheet PS–3 in Fig. 7 of the drawings, and the auto-stop mechanism is operated and locked in stop position so as to require special attention on the part of the operator in order to again start the machine. Thus, circuit is extended through all three switches of the counter 1200, and then through wire 1736, timing switch 658C, wire 1735, switch 1623 and wire 1734 to the relay 1728, which is thus energized so as to cause operation of the auto-stop solenoid 1626 so as to cause stopping of the machine, and also to energize the locking solenoid 1658 so as to lock the machine against starting by the handle 1600.

In addition to the foregoing, the shrouds in the pager and proofer 218 are rendered effective, and for this purpose a wire 2000 is extended from the wire 1736 to one contact of the switch 1972 which is then closed, the other contact of this switch being connected by a wire 2001 to the No. 10 contact of the relay 2643. A wire 2002 extends from No. 11 contact of this relay and is connected to the wire 1830, Fig. 144, so that when the relay 2643 is energized, as hereinabove described by the circuit extended from the switch 1210T, the two shrouds in the pager and proofer 218 will be operated so as to produce half-space operations of both the web feed and the counter shaft. The T–1 total will thus be printed in the half space position as shown in the proof sheet PS–3, and the machine will be stopped and locked in stop position.

When the machine is thus locked in its stopped condition after automatic printing of the T–1 total in the half-space position, the operator may determine that the machine is to be started without printing a T–2 total, or that a T–2 total is to be taken. When operation is to be continued without taking a T–2 total, the switch 1825 is actuated, thereby to effect another half-space web feed, and energize the latch release solenoid 1654, as hereinbefore described, and the machine may then be started by actuating the handle 1600.

When a T–2 total is desired after the automatic printing of a T–1 total in the half-space position, the operator actuates a multiple contact push button switch 2025, Fig. 143, which contains four sets of contacts, one contact of each set being connected by means including a wire 2026 to the positive lead 1740. The other contact of the first set is connected by a wire 2027 to the wire 1834 so as to energize the unlatching solenoid 1654; the other contact of the second set is connected by wires 2028 and 2029 to the No. 6 contact of the T–2 relay 2664, Fig. 143A, and a wire 2030 from the No. 7 contact extends to one terminal of the relay 2664, the other terminal of which is connected to the negative lead 1733; the other contact of the third set is connected by a wire 2031 to the No. 1 contact of the relay 2664, a wire 2032 continuing the circuit from the No. 2 contact to one terminal of the T–2 solenoid 2609–2, the other terminal of which is connected by a wire 2033 to the wire 1733; and the other contact of the fourth set is connected by a wire 2035 to the wire 2002 so as to energize the shroud solenoids in the pager and proofer for causing half-space operations in respect to the web feed and the counter shaft. The T–2 total control unit by operating shaft 2601, acts by closing switch 1974 to close circuit to the start solenoid 650M, thus to initiate a cycle of the variable printer VP–1, and the paper feed solenoid 1428 is, of course, energized in the usual way through the timing switch 658A.

The machine also has a push button switch 2045 for causing a T–1 total and a T–2 total in automatic sequence. This switch has three sets of contacts, and one contact of each set is connected to the positive lead 1740 by means including a wire 2046. The other contact of the first set is connected by a wire 2047 to the wire 2028; the other contact of the second set is connected by a wire 2048 to the wire 1982; while the other contact of the third set is connected by a wire 2049 to the wire 2035.

In addition to the foregoing, it is important to note that the wire 2031 is connected by a wire 2051 to one contact of the switch 1970, the other contact of which is connected by a wire 2052 to the negative lead 1733. Also the switch 1974 has a contact connected to the wire 1733 by a wire 2054, and the other contact is connected to the wire 1997. A wire 2058 connects the wire 1993 to one contact of the switch 1976, the other contact of which is connected by a wire 2059 to the wire 1995. The switch 1977 is connected to a wire 2061 to the wire 1740, and from its other contact by a wire 2062 to the No. 5 contact of relay 2664. A wire 2065 extends from the lead 1740 to one contact of switch 1975, while a wire 2066 extends from the other contact of this switch to the wire 2002.

Thus, in a T–2 total that is initiated by the manual switch 2025, and as the unit VP–1 is started by action of the switch 1974, the switch 1975 closes circuit to the shroud solenoids 1425 and 1454, thereby to cause half-space operation of the web feed and the counter shaft of the pager and proofer 218. In the operation of the shaft 2601, the switch 1976 serves to energize the suppressing solenoids 660M and 665M, thereby to disconnect the stop finger and the punch PU of the unit 202. Finally, at the end of the cycle, the switch 1977 is opened, thereby to break the stick circuit for the T–2 relay 2664, and this

terminates the machine cycle and all operation of the machine is thus stopped.

When the switch 2045 is operated to cause taking of a T–1 total and a T–2 total in sequence, the switch 2045 closes energizing circuits to the T–2 relay 2664, to the T–1 relay 2643, and to the shroud solenoids 1425 and 1454. These relays, of course, are held operated by their stick circuits as hereinbefore described. The concurrent operation of the T–2 relay 2664 serves, through its contacts 1 and 2, to condition a circuit for the T–2 solenoid 2699–2 so that this solenoid 2699–2 will be operated at the end of the T–1 total cycle which will now be described.

The operation of the shaft 2600 of the T–1 total unit is, of course, initiated by the timing switch 612 after the relay 2643 is thus operated, and the half-spaced web feed and counter operation, the suppression of the numbering machine operation at the unit VP–2, operation of the punching unit PU suppressed and the operation of the units VP–1 and VP–2 to take and print a T–1 total on the half-space, all take place in the sequence hereinbefore described. At the end of the cycle of the shaft 2600, the stick circuit for the relay 2643 is broken by the switch 1969, and the switch 1970 is closed, thereby to start operation of the shaft 2601 so as to cause further half-space paper feed and counter operation, suppression of the numbering, punching and stop finger operation, and printing of the T–2 total in the eleventh space on the proof sheet. The stick circuit for the relay 2664 is then broken by the switch 1977 so as to terminate the machine operation.

THE TIMING CHARTS

In Figs. 145 to 148 of the drawings, timing diagrams are afforded which show all of the different sequences in which the print-skip controlling operations may take place in the present machine. Fig. 145 is a timing chart that shows the sequence and timing in a cycle in which a print operation is sensed in a cycle following a cycle where a print operation has been sensed. In such a cycle, it will be observed that the carrier bars and the sensing head operate and the timing switches and selector switches that are operatively associated with the timing shaft 1520 are active. Moreover, it will be observed in such a cycle that the punch and both of the variable printing units are operated, and all of the platen mechanisms are operated and that, in addition, the full space lister feed takes place as well as the normal card movements in the sheet guideway SG.

In Fig. 146, a timing diagram is afforded illustrating the way in which the machine functions when a skip operation is sensed in a cycle following a cycle in which a print operation has been sensed. In such a machine cycle, the carrier bars and the sensing head operate as do the timing and selector switches associated with the timing shaft 1520, but the punching means and the translator are rendered ineffective and the variable printing units and the platens P–1, P–2 and P–4 are also ineffective.

Moreover, the lister feed of the pager and proofer unit 218 remains inactive in such a cycle and the card feed and stop finger mechanism in the unit 202 remain inactive. Thus, in such a cycle the only active elements are related to the main stamper platen and the card feed in the main unit of the machine.

In Fig. 147 of the drawings, a timing diagram is afforded which illustrates the operations that take place in the machine when a skip operation is sensed in a cycle following the cycle when a skip operation has been sensed. In such a cycle all of the principal machine elements are maintained inactive and the carrier bars and the interconnecting sensing head constitute the only primary elements which are effective. It will be noted, of course, that the timing and selector switches associated with the timing shaft 1520 operate in such a cycle, for it is by the action of certain of these switches that operation of certain of the elements of the machine are suppressed in this cycle.

In Fig. 148 of the drawings, the timing diagram is afforded which illustrates the operation of the machine in a cycle where a print operation is sensed after a cycle in which a skip operation has been sensed. In this cycle it will be observed that operation of the platen P–3 and the associated card feed and the numbering machine are suppressed, but in other respects the elements operate in the same manner and sequence as in the cycle shown in Fig. 145.

In Fig. 149 of the drawings, a timing diagram is afforded which illustrates the way in which the idle or eleventh space movement of the web W in the pager and proofer 218 is attained, and it will be observed that this timing diagram illustrates two cycles of machine operation thereby to illustrate the manner in which the controls for the idle cycle are set up in the preceding cycle in which the last or tenth normal impression is made on the proof sheet.

Fig. 150 is a timing diagram similar to Fig. 149 by illustrating the way in which an automatic T–1 total is taken and printed in the eleventh space of the proof sheet on which the one hundredth impression has been made. In this respect it will be observed that certain controls are set up in the cycle when the last or tenth normal impression is made on this sheet, and that thereafter in the next cycle of operation of the timing shafts of the machine, the web W in the pager and proofer is advanced to its full eleventh space position and the variable printers are operated so as to take a T–1 total, print the same on the proof sheet PS–3, and thereafter continue automatic operation of the machine in producing further sheets S.

In Fig. 151 of the drawings, a timing diagram is afforded that illustrates the operation in the machine when an automatic T–1 total is to be printed on the proof sheet in the half-space position after one thousand normal impressions have been made. This timing diagram is similar in many respects to Figs. 149 and 150, but it will be noted that in the last or one thousandth cycle which precedes the cycle in which the total is to be taken and printed, controls are set up whereby the next spacing movement of the web W in the pager and proofer 218 will be through but one-half space, and the machine will be stopped and will be locked in its stopped position. The controls that are thus set up in the one thousandth cycle are effective after the machine has been stopped to initiate the total taking and printing operation of the variable printers VP–1 and VP–2 and after such total taking operation has taken place, the machine stops, and in order to again start the machine the operator must manually actuate a control mechanism which will determine what type of operation is to be performed. If the operator determines that the printing of sheets or checks S is to be continued without printing of a T–2 total on the

proof sheet, the operator may then press the control switch 1825, thereby to cause unlocking of the control shaft and a half-space advancing movement of the web W, thereby to bring the web W back into the proper relationship with the other elements of the machine. In such an instance, after the normal relationship has been established by operation of the control switch 1825, the operator may initiate further operation of the machine by withdrawing the control handle 1800.

In the event that the operator wishes to print a T–2 total in the last or eleventh position of the machine, this is done by actuation of the control switch 2025 which causes release of the locking means, a half-space advancing movement of the web W in the pager and proofer unit 213, operation of the T–2 total control unit, and operation of the variable printer VP–1, and when this is done, the T–2 total is printed by the variable printer VP–2 in the last or eleventh position, and the machine is stopped after the printing of such total has been completed.

In other instances, of course, the operator may wish to cause a T–1 total and a T–2 total to be taken and printed in sequence on a proof sheet and when this is to be accomplished, the operator actuates the control switch 2045 so as to cause a T–1 total to be printed in a half space position and thereafter automatically to cause a T–2 total to be printed in the next full space position, after which the machine comes to rest.

SUMMARY

From the foregoing description it will be evident that the present invention facilitates the use of printing and control devices in the production of business instruments, and that this invention enables this to be accomplished in such a way that proof sheets may be concurrently produced showing the changeable data and the money amounts included in such individual business instruments. Moreover, it will be apparent that the present invention enables data representations on individual printing and control devices to concurrently govern and set up all of the printing and other means which are to produce numerical data on the individual sheets as well as on the proof sheets.

The present invention also enables punching means and printing means to be concurrently set up, and enables this to be readily accomplished from and under control of data representations carried by individual printing devices. Furthermore, the present invention affords a simple and positive interconnection between the set-up means of a variable printing mechanism and a punching mechanism so that these mechanisms will be concurrently set up to produce representations of identical numerical amounts, and it utilizes such a variable printer, including accumulating means, with an interconnection between the driving mechanisms of the variable printer and punching mechanism so that the variable printer may, upon occasion, be utilized to take and control the printing of totals while the punching mechanism remains inactive. As another feature it will be observed that the invention enables the feeding of individual business instruments through the machine to be controlled by the punching mechanism while the set-up of the total control means are controlled by the variable printer and its related adding mechanism.

It will also be evident that the present invention affords an improved and simplified means in the collecting tray for acting upon the printing and control devices to retain the same in upright positions, even though the most advanced of these printing and control devices may be manually removed from the tray, thus to eliminate the necessity for the presence of a follower in a collecting tray in certain portions of the tray filling operations.

It will also be apparent that the present invention affords an improved and simplified roller platen structure, and under the present invention a roller platen structure is provided that attains its printing cooperation with the printing means of the printing and control devices simply through movement of the platen in a horizontal plane, thereby to attain the desired printing cooperation without the necessity for imparting upward or withdrawing movements to the platen roller at the end of its printing operation.

The present invention also enables such printing machines to be constructed in major units that may readily be moved into assembled relationship, and enables major units of such a printing machine to be connected together in such a way that drive or power connections between the individual units are established as an incident to the physical association of such units. Moreover, the present invention enables selective set-up arrangements involving physical motion transmitting means to be similarly associated in the course of the connection of such machine units.

The present invention also simplifies the attainment of print-skip operation in printing machines and affords a control clutch arrangement in such printing machines whereby the clutch normally tends to remain in its engaged and driving relationship and wherein means are afforded for disengaging such clutch for but a single cycle in response to a simple control operation that is rendered effective upon the clutch control mechanism. Furthermore, the invention affords a clutch mechanism which may be readily disconnected by a simple control operation that may be performed by electrical means, and affords means in association with the clutch whereby in response to mechanical movements of the other elements of the machine the clutch may be quickly restored to its connected relationship in proper timed relationship with respect to movements of other elements of the machine.

It will also be apparent that the present invention improves the mounting of skid rollers in the sheet feed of such printing machines, and this is accomplished in such a way that the skid rollers of the printing machine are readily shiftable as a unit from their normal operating positions to out-of-the-way positions so as to enable the sheet guideway to be readily cleared when the need to do this arises.

Under the present invention, the transmission of the results of a data-sensing operation are rendered dependent upon the presence or absence of a printing and control device at the sensing station, and the machine is operative to sense the presence or absence of a printing device at the sensing station in each operation of the sensing means, so as to govern the controlling action of the numerical sensing means in accordance with the sensed presence or absence of a printing and control device at the sensing station.

It will also be apparent that under the present invention, the print-skip operation of the machine as two different printing stations may be

governed without the necessity for the use of storage mechanism. Moreover, the present invention enables the sensing operations in respect to each printing device to be accomplished in the same cycle in which the first printing operation is to take place with respect to such printing device, thereby to simplify the operation and control of printing machines of the kind to which the present invention relates. In addition, the present invention enables printing and control devices to be sensed insofar as the identifying means thereof may be concerned in a first portion of a particular machine cycle, and to be thereafter moved to a first printing station where the printing operation is controlled in accordance with such sensing operation, and at the same time to set up the controls that are to be effective in the next machine cycle wherein the printing device will be advanced to another printing station. Finally, the present invention enables the sensing of the identifying means for selecting purposes to be accomplished in such a way as to materially simplify the setting up of related variable printers, punches and the like, and this is accomplished in such a way that the selector-control action on successive printing operations in respect to each printing and control device are materially simplified.

Thus, while I have illustrated and described the preferred embodiment of my invention, it is to be understood that this is capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. In a printing machine through which printing and control devices, each bearing identifying means, control means, and printing means, are adapted to be passed sequentially, a guideway along which such printing and control devices may be advanced, means for advancing such printing and control devices along said guideway in a step-by-step manner such that each printing and control device comes to rest at a sensing station, then at a first printing station, and subsequently at a second printing station, sheet feeding means for feeding individual sheets to said second printing station, sensing means located at said sensing station operable to sense the control means and the identifying means on a printing and control device located at sensing station, a sheet guideway, a sheet supply magazine from which sheets may be fed into one end of said sheet guideway, a settable punching means, and a first variable printer disposed along said sheet guideway between said sheet supply magazine and said second printing station, said first variable printer including accumulator means for accumulating numerical amounts set up on said first variable printer, a second variable printer located at said second printing station, means operable under the control of said sensing means in accordance with the control means sensed thereby to concurrently set up said variable printers and said punching means, first, second and third impression means located respectively at said first and second printing stations and said first variable printer and operable independently through printing strokes, means controlled in part by said sensing means in accordance with the identifying means sensed thereby to render said impression means at said first printing station effective to produce printing impressions from said second variable printer and from the printing means of a printing and control device at said first printing station, said second impression means being adapted in a printing stroke to print an impression from the printing means of a printing and control device located at said second printing station, clutch means normally operable to cause printing strokes of said first, second and third impression means and said punching means in each machine cycle, and means operable on said clutch means under control of said sensing means when a skip control is sensed in a particular cycle to suppress operation of said first and third impression means and said punching means in such particular cycle and to suppress operation of said second impression means in the succeeding cycle.

2. In a printing machine through which printing and control devices, each bearing identifying means, control means, and printing means, are adapted to be passed sequentially, a guideway along which such printing and control devices may be advanced, means along said guideway affording a sensing station, then a first printing station, and then a second printing station, locating means at said stations for accurately positioning printing devices at such stations, a sheet guideway and associated sheet feeding means for feeding individual sheets to said second printing station, means for feeding a proof web past said second printing station, sensing means located at said sensing station operable to sense the control means and the identifying means on a printing and control device located at sensing station, printing device advancing means, actuating means operable in a first portion of a machine cycle to actuate said sensing means through a sensing cycle, and in an intermediate portion of such cycle to actuate said advancing means to advance the printing devices to the next station, and to actuate said locating means in a final portion of such cycle to accurately position the printing devices, a sheet guideway extended through said second printing station, a sheet supply magazine from which sheets may be fed into one end of said sheet guideway, a settable punching means, and a first variable printer disposed along said sheet guideway between said sheet supply magazine and said second printing station, said first variable printer including accumulator means for accumulating numerical amounts set up on said first variable printer, a second variable printer located at said second printing station, means operable in said first portion of a cycle under the control of said sensing means and in accordance with the control means sensed thereby to concurrently set up said variable printers and said punching means, first, second and third impression means located respectively at said first and second printing stations and said first variable printer and operable independently through printing strokes, means controlled by said sensing means in accordance with the identifying means sensed thereby to render said impression means at said first printing station effective in said final portion of a cycle to produce printing impressions from said second variable printer and from the printing means of a printing and control device at said first printing station, said second impression means being adapted in said final portion of a cycle to print an impression from the printing means of a printing and control device located at said second printing station, clutch means normally operable to cause print-

ing strokes of said first, second and third impression means and said punching means in each machine cycle, and means operable on said clutch means under control of said sensing means when a skip control is sensed in a particular cycle to suppress operation of said first and third impression means and said punching means in such particular cycle and to suppress operation of said second impression means in the succeeding cycle.

3. In a printing machine through which printing and control devices, each bearing identifying means, control means, and printing means, are adapted to be passed sequentially, a guideway along which such printing and control devices may be advanced to a sensing station, then a first printing station, and subsequently at a second printing station, a sheet guideway along which individual sheets may be fed to said second printing station, sensing means located at said sensing station operable to sense the control means and the identifying means on a printing and control device located at sensing station, printing device advancing means for advancing printing devices from station to station along said printing device guideway, locating means operable to accurately locate printing devices at said stations, actuating means for operating said sensing means, said advancing means and said locating means to render the same effective successively in first intermediate and final portions of a machine cycle, a sheet supply magazine from which sheets may be fed into one end of said sheet guideway, a settable punching means and a first variable printer disposed along said sheet guideway between said sheet supply magazine and said second printing station, said first variable printer including accumulator means for accumulating numerical amounts set up on said first variable printer, a second variable printer located at said second printing station, means operable under the control of said sensing means in accordance with the control means sensed thereby to concurrently set up said variable printers and said punching means, first, second and third impression means located respectively at said first and second printing stations and said first variable printer and operable independently through printing strokes, means for rendering said first impression means effective in said final portion of a cycle to produce printing impressions from said second variable printer and from the printing means of a printing and control device at said first printing station, means for rendering said second impression means effective in said final portion of such a cycle to print an impression from the printing means of a printing and control device located at said second printing station, clutch means normally operable to cause printing strokes of said first, second and third impression means and said punching means in each machine cycle, and means governed by sensing operation of said sensing means and operable on said clutch means when a skip control is sensed in a particular cycle to suppress operation of said first and third impression means and said punching means in such particular cycle and to suppress operation of said second impression means in the succeeding cycle.

4. In a printing machine through which printing and control devices, each bearing identifying means, control means, and printing means, are adapted to be passed sequentially, a guideway along which such printing and control devices may be advanced to a sensing station, then a first printing station, and subsequently at a second printing station, a sheet guideway along which individual sheets may be fed to said second printing station, sensing means located at said sensing station operable to sense the control means and the identifying means on a printing and control device located at sensing station, printing device advancing means for advancing printing devices from station to station along said printing device guideway, locating means at the respective stations operable to accurately locate printing devices at said stations, actuating means for operating said sensing means, said advancing means and said locating means to render the same effective successively in first intermediate and final portions of a machine cycle, a sheet supply magazine from which sheets may be fed into one end of said sheet guideway, a settable punching means and a first variable printer disposed along said sheet guideway between said sheet supply magazine and said second printing station, said first variable printer including accumulator means for accumulating numercial amounts set up on said first variable printer, a second variable printer located at said second printing station, means normally operable under the control of said sensing means in accordance with the control means sensed thereby to concurrently set up said variable printers and said punching means, first, second and third impression means located respectively at said first and second printing stations and said first variable printer and operable independently through printing strokes, means for rendering said first impression means effective in said final portion of a cycle to produce printing impressions from said second variable printer and from the printing means of a printing and control device at said first printing station, means for rendering said second impression means effective in said final portion of such a cycle to print an impression from the printing means of a printing and control device located at said second printing station, clutch means normally operable to cause printing strokes of said first, second and third impression means and said punching means and said variable printers in each machine cycle, means governed by sensing operation of said sensing means and operable on said clutch means when a skip control is sensed in a particular cycle to suppress operation of said first and third impression means and said punching means in such particular cycle and to suppress operation of said second impression means in the succeeding cycle, and means operated by said locating means at said sensing station when a printing device is not moved into such station and operable on said clutch means to suppress operation of said variable printers and said first impression means in that cycle and to suppress operation of said second impression means in the next cycle.

5. In a printing machine through which printing and control devices, each bearing identifying means, control means and printing means, are adapted to be passed sequentially, a guideway along which such printing and control devices may be advanced to a sensing station, then a first printing station, and subsequently at a second printing station, a sheet guideway along which individual sheets may be fed to said second printing station, sensing means located at said sensing station operable to sense the control means and the identifying means on a printing

and control device located at sensing station, printing device advancing means for advancing printing devices from station to station along said guideway, locating means operable to accurately locate printing devices at said stations, actuating means for operating said sensing means, said advancing means and said locating means to render the same effective successively in first intermediate and final portions of a machine cycle, a sheet supply magazine from which sheets may be fed into one end of said sheet guideway, a settable punching means and a first variable printer disposed along said sheet guideway between said sheet supply magazine and said second printing station, said first variable printer including accumulator means for accumulating numercial amounts set up on said first variable printer, total control means for said accumulator means, a second variable printer located at said second printing station, means operable under the control of said sensing means in accordance with the control means sensed thereby to concurrently set up said variable printers and said punching means, first, second and third impression means located respectively at said first and second printing stations and said first variable printer and operable independently through printing strokes, means for rendering said first impression means effective in said final portion of a cycle to produce printing impressions from said second variable printer and from the printing means of a printing and control device at said first printing station, means for rendering said second impression means effective in said final portion of such a cycle to print an impression from the printing means of a printing and control device located at said second printing station, clutch means normally operable to cause printing strokes of said first, second and third impression means and said punching means in each machine cycle, means governed by sensing operation of said sensing means and operable on said clutch means when a skip control is sensed in a particular cycle to suppress operation of said first and third impression means and said punching means in such particular cycle and to suppress operation of said second impression means in the succeeding cycle, an impression counter, governing means operated under control of said counter for rendering total control means effective, and means under control of said governing means to disable said sheet feeding means and said punching means.

6. In a printing machine through which printing and control devices, each bearing identifying means, control means, and printing means, are adapted to be passed sequentially, a guideway along which such printing and control devices may be advanced to a sensing station, then a first printing station, and subsequently at a second printing station, a sheet guideway along which individual sheets may be fed to said second printing station, sensing means located at said sensing station operable to sense the control device located at sensing station, printing device advancing means for advancing printing devices from station to station along said guideway, locating means operable to accurately locate printing devices at said stations, actuating means for operating said sensing means, said advancing means and said locating means to render the same effective successively in first intermediate and final portions of a machine cycle, a sheet supply magazine from which sheets may be fed into one end of said sheet guideway, a settable punching means and a first variable printer disposed along said sheet guideway between said sheet supply magazine and said second printing station, said first variable printer including accumulator means for accumulating numerical amounts set up on said first variable printer, a second variable printer located at said second printing station, means operable under the control of said sensing means in accordance with the control means sensed thereby to set up said first variable printer, means operatively connecting said first variable printer to said second variable printer and said punching means to concurrently effect corresponding set up thereof, first, second and third impression means located respectively at said first and second printing stations and said first variable printer and operable independently through printing strokes, means for rendering said first impression means effective in said final portion of a cycle to produce printing impressions from said second variable printer and from the printing means of a printing and control device at said first printing station, means for rendering said second impression means effective in said final portion of such a cycle to print an impression from the printing means of a printing and control device located at said second printing station, clutch means normally operable to cause printing strokes of said first, second and third impression means and said punching means in each machine cycle, other clutch means normally operable to drive said punching means with said first variable printer, sheet feed means and an impression counter driven from said punching means, means governed by sensing operation of said sensing means and operable on said clutch means when a skip control is sensed in a particular cycle to suppress operation of said first and third impression means and said punching means in such particular cycle and to suppress operation of said second impression means in the succeeding cycle, total control means for said accumulator means, governing means controlled by said counter for rendering said total control means effective, and for concurrently controlling said other clutch means to disable said punching means and said sheet feed means during the total taking cycle.

7. In a printing machine through which printing and control devices, each bearing identifying means, control means, and printing means, are adapted to be passed sequentially, the combination of a printing device guideway along which such printing and control devices may be advanced, means for advancing such printing and control devices along said guideway in a step-by-step manner such that each printing and control device comes to rest at a sensing station and then at a proof-printing station and a sheet-printing station in succession, sensing means located at said sensing station and comprising a first sensing head having means thereon operable to sense the control means on a printing and control device located at sensing station and said sensing means including a second sensing head having means thereon for sensing the identifying means of such a printing and control device, a sheet guideway disposed transversely with respect to said printing device guideway and intersecting said printing device guideway at said sheet printing station, means for feeding sheets into one end of said sheet guideway, means associated with said means between said one end of said sheet guideway and said sheet printing station and affording a punching and printing station, means for bringing each

sheet to rest at said punching and printing station and then at said sheet printing station, independent impression means located at said proof-printing station at said sheet printing station and operable through printing strokes to print impressions from the printing means of printing and control devices located at such stations, a first variable printer and a punch located at said punching and printing station and set up in unison under cntrol of said second sensing head in accordance with a control means sensed thereby and operable to print and punch the set-up data on such a sheet at said punching and printing station, a second variable printer located at said proof-printing station and set-up by said first variable printer to correspond with the setting of said first variable printer and operated by said first variable printer, and means operable under the control of said sensing means in accordance with the identifying means sensed thereby to control the operation of said variable printers, said impression means and said punch.

8. In a printing machine through which printing and control devices, each bearing identifying means, control means, and printing means, are adapted to be passed sequentially, the combination of a printing device guideway along which such printing and control devices may be advanced, means for advancing such printing and control devices along said guideway in a step-by-step manner such that each printing and control device comes to rest at a sensing station and then at a proof-printing station and a sheet-printing station, sensing means located at said sensing station and comprising a first sensing head having means thereon operable to sense the control means on a printing and control device located at sensing station and said sensing means including a second sensing head having means thereon for sensing the identifying means of such a printing and control device, a sheet guideway disposed transversely with respect to said printing device guideway and intersecting said printing device guideway at said sheet printing station, sheet supply means for feeding sheets into one of said sheet guideways, means associated with said means between said one end of said sheet guideway and said sheet printing station and affording a punching and printing station, sheet advancing means for advancing sheets along a sheet guideway, a first stop finger means for bringing each sheet to rest at punching and printing station and a second stop finger means for bringing each sheet to rest at said sheet printing station, independent impression means located at said proof-printing station at said sheet printing station and operable through printing strokes to print impressions from the printing means of printing and control devices located at such stations, a first variable printer and a punch located at said punching and printing station and set up in unison under control of said second sensing head in accordance with a control means sensed thereby and operable to print and punch the set-up data on such a sheet at said punching and printing station, accumulator means included in said first variable printer, means for disabling said punch during total cycles of the accumulator means, means operable in timed relation to said punch for operating said sheet supply means and said first stop finger means, a second variable printer located at said proof-printing station and set-up by said first variable printer to correspond with the setting of said first variable printer and operated by said first variable printer, and means operable under the control of said sensing means in accordance with the identifying means sensed thereby to control the operation of said variable printers, said impression means and said punch.

9. In a machine of the character described for producing sheets having corresponding numerical data recorded thereon by printing and by data representing perforations, a settable variable printer including a plurality of settable slides each allocated to a different numerical order and movable along parallel paths through setting and restoring movements, printing elements settable by the respective slides, set up means for governing set-up movements of said slides, accumulator means associated with said slides for accumulating totals of amounts set up thereon, total control means for causing total taking operations wherein said slides are set up in accordance with such totals, an operating drive shaft for operating said variable printer, a variably settable punching unit including selective punching elements allocated to different numerical orders, means including a plurality of settable punch-selecting slides for selecting the punching elements to be effective in the respective orders of said punching unit, a punch operating shaft, a normally engaged single position clutch connecting said drive shaft of the variable printer to said punch operating shaft for driving said punch operating shaft in unison with said drive shaft, said punch-selecting slides being mounted for movement parallel to said settable slides of said variable printer, gearing means operatively connecting each slide of said variable printer with the punch-selecting slide of the same numerical order in said punching unit for imparting corresponding setting movements thereto, sheet feeding and stopping means for feeding sheets to said variable printing unit and said punching unit, means including a second normally engaged single position clutch operatively connecting said sheet feeding and stopping means to said drive shaft for operation thereby, and means operable under control of said total control means for disconnecting said clutches for a single cycle during a total taking operation.

10. In a machine of the character described for producing sheets having corresponding numerical data recorded thereon by printing and by data representing perforations, a first variable printer including set up means for governing set-up movements of said slides, a variably settable punching unit including selective punching elements allocated to different numerical orders, means including a plurality of settable punch-selecting slides for selecting the punching elements to be effective in the respective orders of said punching unit, said punch-selecting slides being mounted for movement parallel to said settable slides of said variable printer, gearing means operatively connecting each slide of said variable printer with the punch-selecting slide of the same numerical order in said punching unit for imparting corresponding setting movements thereto, a second variable printer having a plurality of settable slides each allocated to a different numerical order and movable along parallel paths through setting and restoring movements, printing elements settable by the respective slides, racks formed on the slides of both variable printers, rockable gear segments meshed one with each of said racks, and Bowden cables operatively connecting the segments of corre-

sponding orders of the two variable printers to effect concurrent and corresponding set-up of the two printers.

11. In a machine of the character described for producing sheets having corresponding numerical data recorded thereon by printing and by data representing perforations, a first variable printer including set up means for governing set-up movements of said slides, a variably settable punching unit including selective punching elements allocated to different numerical orders, means including a plurality of settable punch-selecting slides for selecting the punching elements to be effective in the respective orders of said punching unit, said punch-selecting slides being mounted for movement parallel to said settable slides of said variable printer, gearing means operatively connecting each slide of said variable printer with the punch-selecting slide of the same numerical order in said punching unit for imparting corresponding setting movements thereto, a second variable printer having a plurality of settable slides each allocated to a different numerical order and movable along parallel paths through setting and restoring movements, printing elements settable by the respective slides, racks formed on the slides of both variable printers, rockable gear segments meshed one with each of said racks, Bowden cables operatively connecting the segments of corresponding orders of the two variable printers to effect concurrent and corresponding set-up of the two printers, and spring means acting on each segment of one of said variable printers to take up lost motion and insure uniformity of setting operation.

12. In a machine of the character described for producing sheets having corresponding numerical data recorded thereon by printing and by data representing perforations, a first variable printer including set up means for governing set-up movements of said slides, a variably settable punching unit including selective punching elements allocated to different numerical orders, means including a plurality of settable punch-selecting slides for selecting the punching elements to be effective in the respective orders of said punching unit, said punch-selecting slides being mounted for movement parallel to said settable slides of said variable printer, gearing means operatively connecting each slide of said variable printer with the punch-selecting slide of the same numerical order in said punching unit for imparting corresponding setting movements thereto, a second variable printer having a plurality of settable slides each allocated to a different numerical order and movable along parallel paths through setting and restoring movements, printing elements settable by the respective slides, racks formed on the slides of both variable printers, gear members meshed one with each of said racks, and means operatively connecting the gear members of corresponding orders of the two variable printers to effect concurrent and corresponding set-up of the two printers.

13. In a machine of the character described for producing sheets having corresponding numerical data recorded thereon by printing and by data representing perforations, first and second variable printers one of which includes set up means for governing set-up movements of said slides of such printer, a variable settable punching unit including selective punching elements allocated to different numerical orders, means including a plurality of settable punch-selecting slides for selecting the punching elements to be effective in the respective orders of said punching unit, said punch-selecting slides being mounted for movement parallel to said settable slides of said one variable printer, means operatively connecting each slide of said one variable printer with the punch-selecting slide of the same numerical order in said punching unit for imparting corresponding setting movements thereto, racks formed on the slides of both variable printers, gear means meshed one with each of said racks, and means operatively connecting the gear means of corresponding orders of the two variable printers to effect concurrent and corresponding set-up of the two printers.

14. In a machine of the character described for producing sheets having corresponding numerical data recorded thereon by printing and by data representing perforations, a first variable printer including set up means for governing set-up movements of said slides, a second variable printer having a plurality of settable slides each allocated to a different numerical order and movable along parallel paths through setting and restoring movements, printing elements settable by the respective slides, racks formed on the slides of both variable printers, rockable gear segments meshed one with each of said racks, Bowden cables operatively connecting the segments of corresponding orders of the two variable printers to effect concurrent and corresponding set-up of the two printers, and spring means acting on the segments of said second variable printer to take up lost motion and insure uniformity of setting operation.

15. In a printing machine of the character described, a main unit and a separably related supplemental unit adapted to be moved into an operative relation wherein said units are disposed in an end to end relation, said main unit embodying printing device advancing means and a related printing device guideway along which individual printing devices each adapted to bear identifying means, printing means, and numerical data representing means, are adapted to be passed one by one to a printing position, impression means in said main unit for effecting impressions from the printing means of such printing and control devices, sensing means in said main unit for sensing the identifying means and data representing means of such printing and control devices, means in said main unit for operating and controlling said sensing means, said printing devices advancing means and said impression means and including a constantly operating first drive shaft, a first settable variable printer in said supplemental unit, drive means for said first variable printer, said last mentioned drive means including a second drive shaft, a third drive shaft connected to said second variable printer and driven in timed relation thereto, a second variable printer in said main unit, a fourth drive shaft included in said main unit and serving to drive said variable printing of said main unit, means controlled by said sensing means for setting up said first variable printer, Bowden wire connections extended from the set-up means of the two variable printers, means for detachably connecting corresponding Bowden wires of the two units together as an incident to movement of said units into said operative relation, and means for rotating the several drive shafts in predetermined timed relation.

16. In a printing machine of the character described, a main unit embodying printing device advancing means and a printing device guideway along which individual printing and control devices each adapted to bear identifying means, printing means, and numerical data representing means, are adapted to be passed one by one to sensing and printing positions, impression means in said main unit for effecting impressions at said printing station from the printing means of such printing and control devices, sensing means in said main unit for sensing the identifying means and data representing means of such printing and control devices, means in said main unit for operating and controlling said sensing means, said printing devices advancing means and said impression means and including a first constantly operating driving shaft, said main unit including a variable printer, a second unit separably related to said main unit and including a settable variable printer, drive means for said variable printer of said second unit, said last mentioned drive means including a second drive shaft, a third drive shaft connected to said last mentioned variable printer and driven in timed relation thereto, a fourth drive shaft included in said main unit and serving to drive said variable printer of said main unit, means controlled by said sensing means for setting up said variable printer of said sensing means for setting up said variable printer of said second unit, Bowden wire connections extended from the set-up means of the two variable printers, means for detachably connecting corresponding Bowden wires of the two units together for operatively coordinating the set-up means of the two printers as an incident to movement of said units into adjacent and coordinated relationship, and means mounted on the several drive shafts and operable to effectively connect said first drive shaft with said second drive shaft and said third drive shaft with said fourth drive shaft as an incident to such movement of the two units into assembled relation.

17. In a printing machine of the character described, a main unit and a separably related supplemental unit adapted to be moved into an operative relation wherein said units are disposed in an end to end relation, said main unit embodying printing device advancing means and a related printing device guideway along which individual printing devices each adapted to bear identifying means, printing means, and numerical data representing means, are adapted to be passed one by one to a printing position, impression means in said main unit for effecting impressions from the printing means of such printing and control devices, sensing means in said main unit for sensing the identifying means and data representing means of such printing and control devices, means in said main unit for operating and controlling said sensing means, said printing devices advancing means and said impression means and including a constantly operating first drive shaft, a first settable variable printer in said supplemental unit, drive means for said first variable printer, said last mentioned drive means including a second drive shaft, a third drive shaft connected to said second variable printer and driven in timed relation thereto, a second variable printer in said main unit, a fourth drive shaft included in said main unit, means controlled by said sensing means for setting up said first variable printer, Bowden wire connections extended from the set-up means of the two variable printers, means for detachably connecting corresponding Bowden wires of the two units together as an incident to movement of said units into said operative relation, and means mounted on the several drive shafts and operable to effectively connect said first drive shaft with said second drive shaft and said third drive shaft with said fourth drive shaft as an incident to such movement of the two units into operative relation.

18. In a printing machine of the character described, a main unit and a separably related supplemental unit adapted to be moved into an operative relation wherein said units are disposed in an end to end relation, said main unit embodying printing device advancing means and a related printing device guideway along which individual printing devices each adapted to bear identifying means, printing means, and numerical data representing means, are adapted to be passed one by one to a printing position, impression means in said main unit for effecting impressions from the printing means of such printing and control devices, sensing means in said main unit for sensing the identifying means and data representing means of such printing and control devices, means in said main unit for operating and controlling said sensing means, said printing devices advancing means and said impression means and including a constantly operating first drive shaft, a first settable variable printer in said supplemental unit, drive means for said first variable printer, said last mentioned drive means including a second drive shaft, a third drive shaft connected to said second variable printer and driven in timed relation thereto, a second variable printer in said main unit, a fourth drive shaft included in said main unit and serving to drive said variable printing device of said main unit, means controlled by said sensing means for setting up said first variable printer, Bowden wire connections extended from the set-up means of the two variable printers, hook-shaped connectors on the ends of said Bowden wires for detachably connecting corresponding Bowden wires of the two units together, means for engaging the related hook-shaped connectors as an incident to movement of said units into said operative relation, and means mounted on the several drive shafts and operable to effectively connect said first drive shaft with said second drive shaft and said third drive shaft with said fourth drive shaft as an incident to such movement of the two units into operative relation.

19. In a printing machine of the character described, a main unit and a separably related supplemental unit adapted to be moved into an operative relation wherein said units are disposed in an end to end relation, said main unit embodying printing device advancing means and a related printing device guideway along which individual printing devices each adapted to bear identifying means, printing means, and numerical data representing means, are adapted to be passed one by one to a printing position, impression means in said main unit for effecting impressions from the printing means of such printing and control devices, sensing means in said main unit for sensing the identifying means and data representing means of such printing and control devices, means in said main unit for operating and controlling said sensing means, said printing devices advancing means and said impression means and including a constantly operating first drive shaft, a first settable variable

printer in said supplemental unit, drive means for said first variable printer, said last mentioned drive means including a second drive shaft, a third drive shaft connected to said second variable printer and driven in timed relation thereto, a second variable printer in said main unit, a fourth drive shaft included in said main unit and serving to drive said variable printer of said main unit, means controlled by said sensing means for setting up said first variable printer, motion transmitting connecting elements extended from the set-up means of the two variable printers, means for detachably connecting corresponding connecting elements of the two units together as an incident to movement of said units into said operative relation, and means mounted on the several drive shafts and operable to effectively connect said first drive shaft with said second drive shaft and said third drive shaft with said fourth drive shaft as an incident to such movement of the two units into operative relation.

20. In a printing machine of the character described, a main unit and a separably related supplemental unit adapted to be moved into an operative relation wherein said units are disposed in an end to end relation, slidably related guide elements on the two units for guiding the same into such operative relation, means for elevating said supplemental unit after engagement of said guiding elements, said main unit embodying printing device advancing means and a related printing device guideway along which individual printing devices each adapted to bear identifying means, printing means, and numerical data representing means, are adapted to be passed one by one to a printing position, impression means in said main unit for effecting impressions from the printing means of such printing and control devices, sensing means in said main unit for sensing the identifying means and data representing means of such printing and control devices, means in said main unit for operating and controlling said sensing means, said printing devices advancing means and said impression means and including a constantly operating first drive shaft, a first settable variable printer in said supplemental unit drive means for said first variable printer, said last mentioned drive means including a second drive shaft, a third drive shaft connected to said second variable printer and driven in timed relation thereto, a second variable printer in said main unit, a fourth drive shaft included in said main unit and serving to drive said variable printer of said main unit, means controlled by said sensing means for setting up said first variable printer, Bowden wire connections extended from the set-up means of the two variable printers, means for detachably connecting corresponding Bowden wires of the two units together as an incident to movement of said units into said operative relation and elevation of said supplemental unit, and connector means mounted on the several drive shafts and operably engageable by endwise approaching movement of said units to effectively connect said first drive shaft with said second drive shaft and said third drive shaft with said fourth drive shaft as an incident to such movement of the two units into operative relation, certain of said drive shafts having universal joint connections to enable such elevation of the supplemental unit to be accomplished after engagement of said connector means.

21. In a printing machine wherein individual sheets having changeable data and numerical data are to be produced in coordinated relation with proof sheets bearing identical data and totals of the numerical data at selected intervals, means including a proofing station and a numerical data printing station for effecting the requisite printing operations, variable printers at said stations, one of said printers including an accumulator, a lister for guiding a web past said proofing station and including web feed means operable through line feed movements, a multiple order counter operable to advance one unit for each sheet produced, a first switch means governed by one order of said counter to suppress printing at said stations and cause idle line feed movement of said web whenever said one order of said counter has moved through a full notation, other switch means in series with said first switch means and closed by a higher order of said counter when such higher order has moved through a full notation so as to be closed in such an instance concurrently with said first switch means, and means energized when said other switch means is closed to cause total taking operation of said accumulator.

22. In a printing machine wherein individual sheets having changeable data and numerical data are to be produced in coordinated relation with proof sheets bearing identical data and totals of the numerical data at selected intervals, means including a proofing station and a numerical data printing station for effecting the requisite printing operations, variable printers at said station, one of said printers including an accumulator, a lister for guiding a web past said proofing station and including web feed means operable selectively through full-space or half-space line feed movements, a multiple order counter operable to advance one unit for each sheet produced, a first switch governed by a lower order of said counter to suppress printing at said stations and cause idle full-space line feed movement of said web whenever said lower order of said counter has moved through a full notation, a second switch in series with said first switch and closed by an intermediate order of said counter when such intermediate order has moved through a full notation so as to be closed concurrently with said first switch, means energized when said second switch is closed to cause total taking operation of said accumulator, a third switch means in series with said second and first switch means and closed by a higher order of said counter when said higher order has moved through a full notation so that said third switch is in such an instance closed concurrently with said first and second switches, and means energized through said third switch and said second and first switches in series to cause half-space line feed movement of said web.

23. In a printing machine wherein individual sheets having changeable data and numerical data are to be produced in coordinated relation with proof sheets bearing identical data and totals of the numerical data at selected intervals, means including a proofing station and a numerical data printing station for effecting the requisite printing operations, variable printers at said station, one of said printers including an accumulator, a lister for guiding a web past said proofing station and including web feed means normally operable through full-space line feed movements, normally inactive limiting means operable to limit operation of said web feed means to less than a full-space line feed movement, a multiple order counter operable to ad-

vance one unit for each sheet produced, a first switch governed by a lower order of said counter to suppress printing at said stations and cause idle full-space line feed movement of said web whenever said lower order of said counter has moved through a full notation, a second switch in series with said first switch and closed by an intermediate order of said counter when such intermediate order has moved through a full notation so as to be closed concurrently with said first switch, means energized when said second switch is closed to cause total taking operation of said accumulator, a third switch means in series with said second and first switch means and closed by a higher order of said counter when said higher order has moved through a full notation so that said third switch is in such an instance closed concurrently with said first and second switches, and means energized through said third switch and said second and first switches in series to render said limiting means effective so as to thereby cause half-space line feed movement of said web.

24. In a printing machine wherein individual sheets having changeable data and numerical data are to be produced in coordinated relation with proof sheets bearing identical data and totals of the numerical data at selected intervals, means including a proofing station and a numerical data printing station for effecting the requisite printing operations, variable printers at said station, one of said printers including an accumulator, a lister for guiding a web past said proofing station and including web feed means operable selectively through full-space or half-space line feed movements, space counting means in said lister operated by said web feed means, a cut-off knife in said lister controlled by said line counting means for severing said web into sheets, a multiple order counter operable to advance one unit for each sheet produced, a first switch governed by a lower order of said counter to suppress printing at said stations and cause idle full-space line feed movement of said web whenever said lower order of said counter has moved through a full notation, a second switch in series with said first switch and closed by an intermediate order of said counter when such intermediate order has moved through a full notation so as to be closed concurrently with said first switch, means energized when said second switch is closed to cause total taking operation of said accumulator, a third switch means in series with said second and first switch means and closed by a higher order of said counter when said higher order has moved through a full notation so that said third switch is in such an instance closed concurrently with said first and second switches, means energized through said third switch and said second and first switches in series to cause half-space line feed movement of said web, and adjusting means for said space counting means for coordinating the same with the controlling operations of said counter.

25. In a printing machine wherein individual sheets having changeable data and numerical data are to be produced in coordinated relation with proof sheets bearing identical data and totals of the numerical data at selected intervals, means including a proofing station and a numerical data printing station for effecting the requisite printing operations, variable printers at said station, one of said printers including an accumulator, a lister for guiding a web past said proofing station and including web feed means operable selectively through full-space or half-space line feed movements, a multiple order counter operable to advance one unit for each sheet produced, a first switch governed by a lower order of said counter to suppress printing at said stations and cause idle full-space line feed movement of said web whenever said lower order of said counter has moved through a full notation, a second switch in series with said first switch and closed by an intermediate order of said counter when such intermediate order has moved through a full notation so as to be closed concurrently with said first switch, means energized when said second switch is closed to cause total taking operation of said accumulator, a third switch means in series with said second and first switch means and closed by a higher order of said counter when said higher order has moved through a full notation so that said third switch is in such an instance closed concurrently with said first and second switches, means energized through said third switch and said second and first switches in series to cause half-space line feed movement of said web, locking means for locking said machine against further operation, and means operated under control of said third switch for rendering said locking means effective.

26. In a printing machine wherein individual sheets having changeable data and numerical data are to be produced in coordinated relation with proof sheets bearing identical data and totals of the numerical data at selected intervals, means including a proofing station and a numerical data printing station for effecting the requisite printing operations, variable printers at said station, one of said printers including an accumulator, a lister for guiding a web past said proofing station and including web feed means operable selectively through full-space or half-space line feed movements, a multiple order counter operable to advance one unit for each sheet produced, a first switch governed by a lower order of said counter to suppress printing at said stations and cause idle full-space line feed movement of said web whenever said lower order of said counter has moved through a full notation, a second switch in series with said first switch and closed by an intermediate order of said counter when such intermediate order has moved through a full notation so as to be closed concurrently with said first switch, means energized when said second switch is closed to cause total taking operation of said accumulator, a third switch means in series with said second and first switch means and closed by a higher order of said counter when said higher order has moved through a full notation so that said third switch is in such an instance closed concurrently with said first and second switches, and means energized through said third switch and said second and first switches in series to cause half-space line feed movement of said web, locking means rendered effective when said third switch is thus closed to stop further operation of said machine, releasing means for releasing said locking means, and manually actuated means operable concurrently on said web feed means and said releasing means to cause a half-space feeding movement of said web and to release said locking means.

27. In a printing machine of the character described, a printing device guideway along which printing devices may be advanced one by one to sensing and printing stations, a plurality of operative mechanisms including printing device ad-

vancing means, sensing means at said sensing station and impression means at said printing station, actuating means for said operative mechanisms including at least one single-cycle clutch means, stop means normally tending to disengage said clutch means, a control shaft adapted to be rocked between start and stop positions, a control slide shiftable between start and stop positions by said control shaft and operatively connected to said stop means to shift said stop means to ineffective position when said slide is in its start position, a latch for holding said slide in said start position thereof to cause continuous operation of the machine, and electrically operable stop means for releasing said latch so as to stop the machine.

28. In a printing machine of the character described, a printing device guideway along which printing devices may be advanced one by one to sensing and first and second printing stations, a plurality of operative mechanisms including printing device advancing means, sensing means at said sensing station and first and second independently operable impression means at the respective printing stations, independently operable actuating means for the respective operative mechanisms each including a single-cycle clutch, independent stop means for each clutch normally tending to disengage the related clutch, a control shaft adapted to be rocked between start and stop positions, first and second control slides shiftable between start and stop positions by said control shaft and operatively connected to the respective stop means of said first and second impression means to shift said stop means to ineffective position when the related slide is in its start position, independent latches for holding said slides in said start positions thereof to cause continuous operation of the machine, and electrically operable stop means for independently releasing said latches so as to stop the related operative mechanisms of the machine.

29. In a printing machine of the character described, a printing device guideway along which printing devices may be advanced one by one to sensing and first and second printing stations, a plurality of operative mechanisms including printing device advancing means, sensing means at said sensing station and first and second independently operable impression means at the respective printing stations, independently operable actuating means for the respective operative mechanisms each including a single-cycle clutch, independent stop means for each clutch normally tending to disengage the related clutch, a control shaft adapted to be rocked between start and stop positions, first and second control slides shiftable between start and stop positions by said control shaft, means operatively connecting said second slide to the respective stop means of said second impression means and printing device advancing means to shift said stop means to ineffective positions when the related slide is in its start position, means operatively connecting said first slide to the stop means of said first impression means to release such stop means for movement to ineffective position when said first slide is moved to its start position, independent latches for holding said slides in said start positions thereof to cause continuous operation of the machine, and means for independently releasing said latches so as to stop the related operative mechanisms of the machine.

30. In a printing machine of the character described, a printing device guideway along which printing devices may be advanced one by one to sensing and first and second printing stations, a plurality of operative mechanisms including printing device advancing means, sensing means at said sensing station and first and second independently operable impression means at the respective printing stations, independently operable actuating means for the respective operative mechanisms each including a single-cycle clutch, independent stop means for each clutch normally tending to disengage the related clutch, a control shaft adapted to be rocked between start and stop positions, first and second control slides shiftable between start and stop positions by said control shaft, means operatively connecting said second slide to the respective stop means of said second impression means and of said printing device advancing means to shift said stop means to ineffective positions when the related slide is in its start position, means operatively connecting said first slide to the stop means of said first impression means to release such stop means for movement to ineffective position when said first slide is moved to its start position, independent latches for holding said slides in said start positions thereof to cause continuous operation of the machine, means for independently releasing said latches so as to stop the related operative mechanisms of the machine, multiprint control means, and a latch dominating said stop means of said second impression means and controlled by said multiprint control means to delay stopping of said second impression means.

31. In a machine of the character described for producing business instruments from and under control of individual printing and control devices each adapted to bear printing means and data representing control means, means for feeding such devices one by one through said machine to sensing and printing machines in succession, sheet feeding means for feeding sheets one by one to a recording station and then to said printing position, variably settable recording means at said recording station for recording variable data on such sheets, set up means for said recording means, driving means for said recording means, impression means at said printing station for making impressions from the printing means of such devices onto such sheets, normally effective actuating means for said impression means, starting means for said driving means to initiate an operative cycle of said recording means, sensing means at said sensing station effective to sense the data representing means of a device at said sensing station, a positioning pawl at said sensing station for engaging and accurately locating such a device at said sensing station, operative means controlled by said sensing means to operate said starting means and to operate said set up means to selectively set up said recording means, and safety means operated by said positioning pawl when a printing device is not fed into said sensing station to disable said operative means and disable the actuating means of said impression means.

32. In a machine of the character described for producing business instruments from and under control of individual printing and control devices each adapted to bear printing means and data representing control means, advancing means for feeding such devices one by one through said ma-

chine to sensing and printing machines in succession, sheet feeding means for feeding sheets one by one to a recording station and then to said printing position, variably settable recording means at said recording station for recording variable data on such sheets, set up means for said recording means, driving means for said recording means, impression means at said printing station for making impressions from the printing means of such devices onto such sheets, normally effective actuating means for said impression means, starting means for said driving means to initiate an operative cycle of said recording means, sensing means at said sensing station effective to sense the data representing means of a device at said sensing station, a positioning pawl at said sensing station operated in timed relation to said advancing means for engaging and accurately locating such a device at said sensing station, operative means controlled by said sensing means to operate said starting means and to operate said set up means to selectively set up said recording means, and safety means operated by said positioning pawl when a printing device is not fed into said sensing station to disable said operative means and disable the actuating means of said impression means.

33. In a printing machine having a printing device guideway along which printing devices, each adapted to bear identifying means at one or more identifying positions thereon, may be advanced one by one to sensing and printing stations, printing device advancing means including a single-cycle feed clutch for advancing printing devices in a step by step manner along said guideway, sensing means at said sensing station for sensing the identifying means of such devices, impression means including a single-cycle impression clutch, a drive shaft from which said clutches are driven, a multiprint control shaft, means including a single-cycle multiprint control clutch for driving said multiprint control shaft in different selected ratios from said drive shaft, sheet feeding and stopping means operated by said control shaft and effective to feed sheets to said printing station, normally effective stop levers for disengaging said impression clutch, said control clutch and said feed clutch, machine starting means for moving all of said stop levers to ineffective positions to start operation of the machine, a first latch means for latching said machine starting means in its start position, a first stop means for unlatching said first latch means for stopping the machine, a second latch means for latching all of said stop levers in their ineffective positions, and means operated by said control shaft to maintain second latch means effective through a cycle of said control shaft and to release the same at the end of the cycle.

34. In a printing machine having a printing device guideway along which printing devices, each adapted to bear identifying means at one or more identifying positions thereon, may be advanced one by one to sensing and printing stations, printing device advancing means including a single-cycle feed clutch for advancing printing devices in a step by step manner along said guideway, sensing means at said sensing station for sensing the identifying means of such devices, impression means at said printing station, means for actuating said impression means including a single-cycle impression clutch, a drive shaft from which said clutches are driven, a multiprint control shaft, means including a single-cycle multiprint control clutch for driving said multiprint control shaft in different selected ratios from said drive shaft, sheet feeding and stopping means operated by said control shaft and effective to feed sheets to said printing station, normally effective stop levers for disengaging said impression clutch, said control clutch and said feed clutch, machine starting means for moving all of said stop levers to ineffective positions to start operation of the machine, a first latch means for latching said machine starting means in its start position, a first stop means for unlatching said first latch means for stopping the machine, a second latch means for latching all of said stop levers in their ineffective positions, means operated by said control shaft to maintain second latch means effective through a cycle of said control shaft and to release the same at the end of the cycle, a pair of other stop levers associated with said control clutch and said impression clutch, means connecting said other stop levers together for operation in unison, a third latch means for holding said other stop levers in ineffective positions, means controlled by said sensing means for releasing said third latch means, and means operable under control of said feed clutch for restoring said other stop levers to ineffective positions whenever said feed clutch is engaged, and means operated by said control shaft to hold said other stop levers disengaged during and until the end of a cycle of rotation of said control shaft.

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