May 1, 1956 V. W. SPARROW 2,743,669

MACHINES FOR PRINTING AND ISSUING POSTAL ORDERS AND LIKE FORMS

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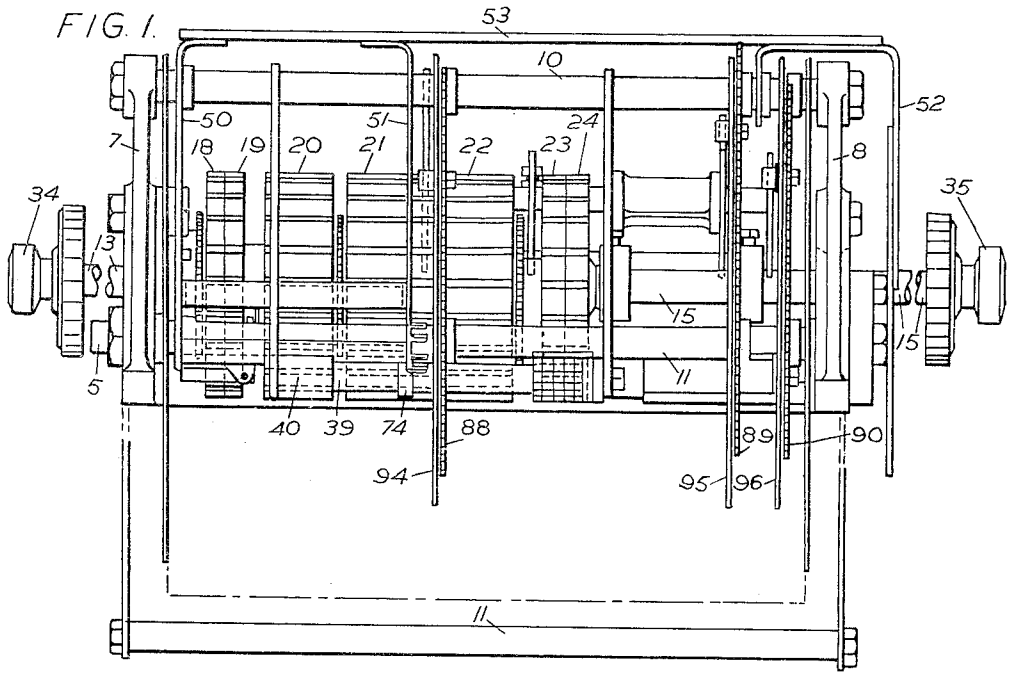
FIG. 1.



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MACHINES FOR PRINTING AND ISSUING POSTAL ORDERS AND LIKE FORMS

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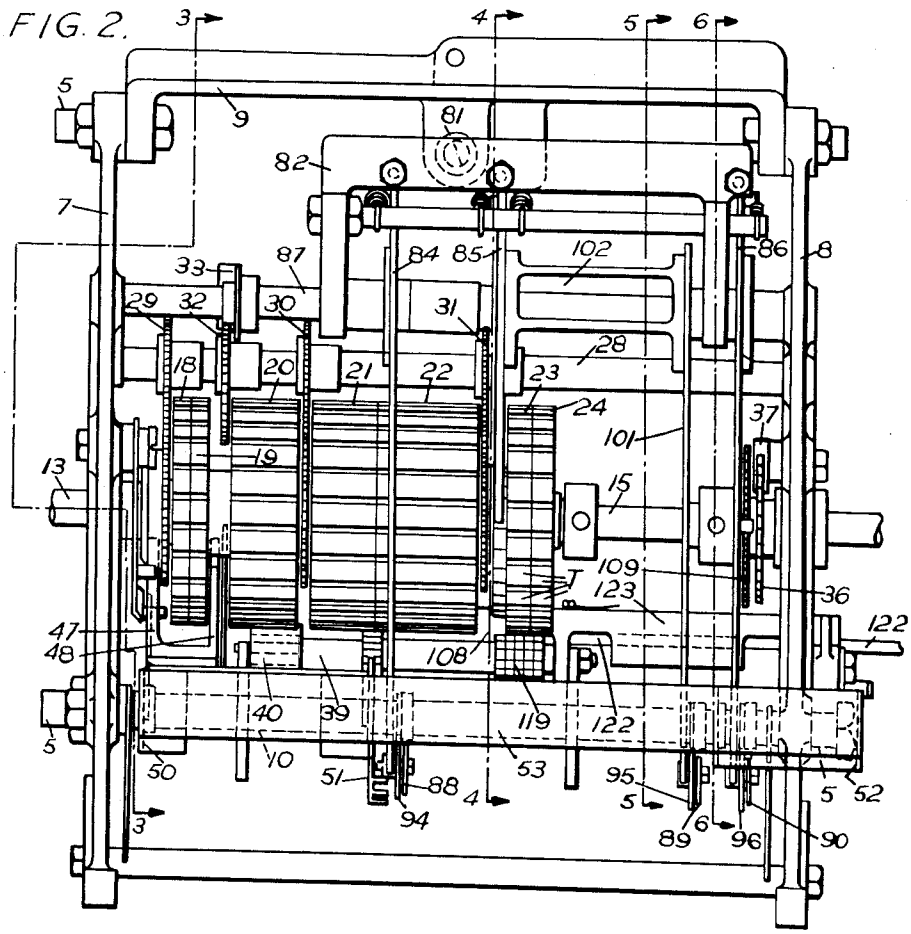
FIG. 2.



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MACHINES FOR PRINTING AND ISSUING POSTAL ORDERS AND LIKE FORMS

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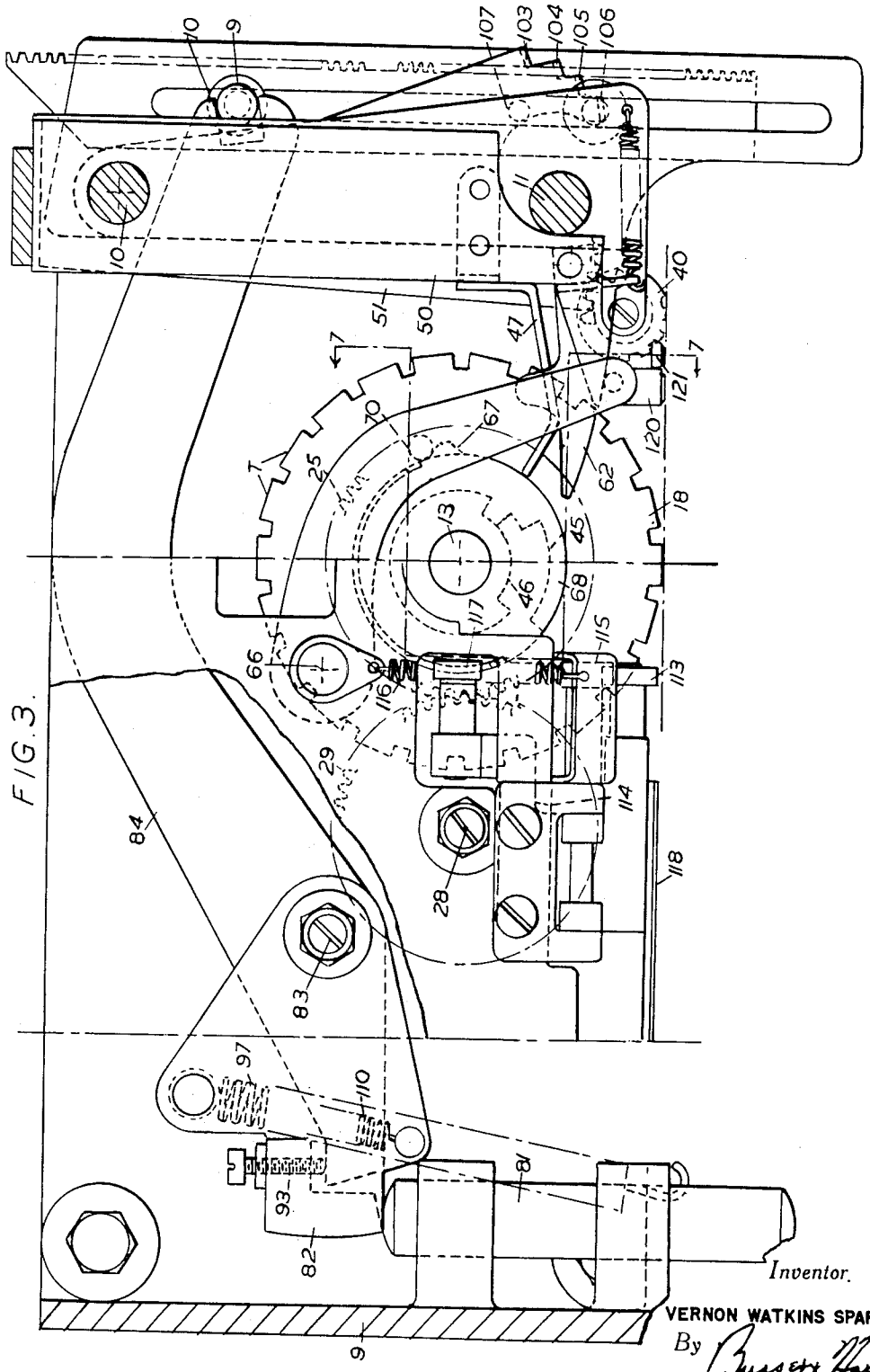

FIG. 3.

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MACHINES FOR PRINTING AND ISSUING POSTAL ORDERS AND LIKE FORMS

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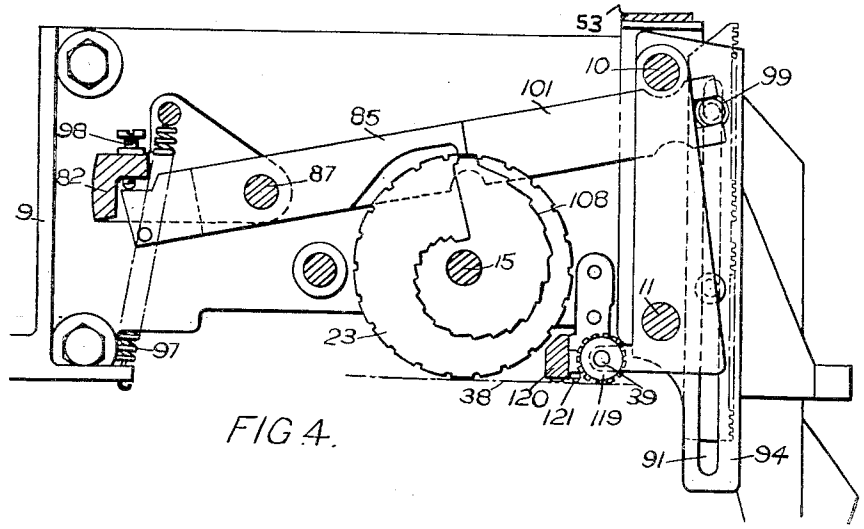


FIG 4.

FIG. 6.

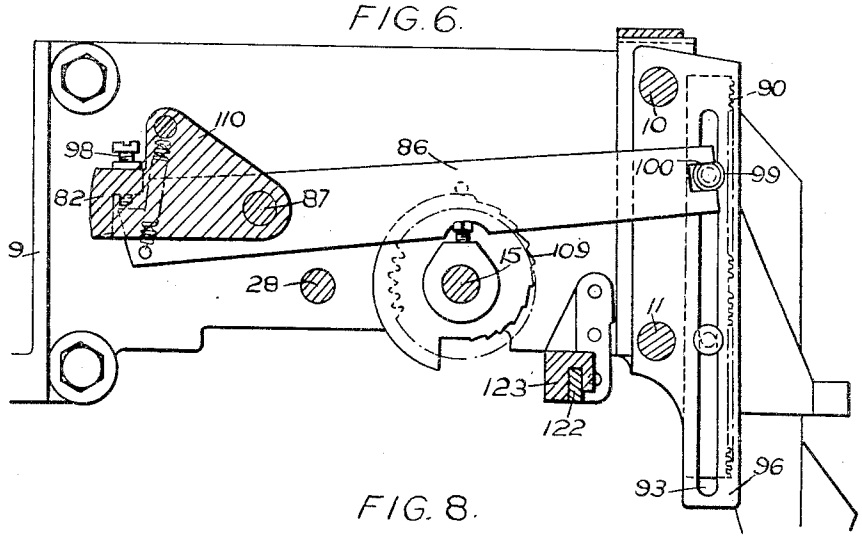
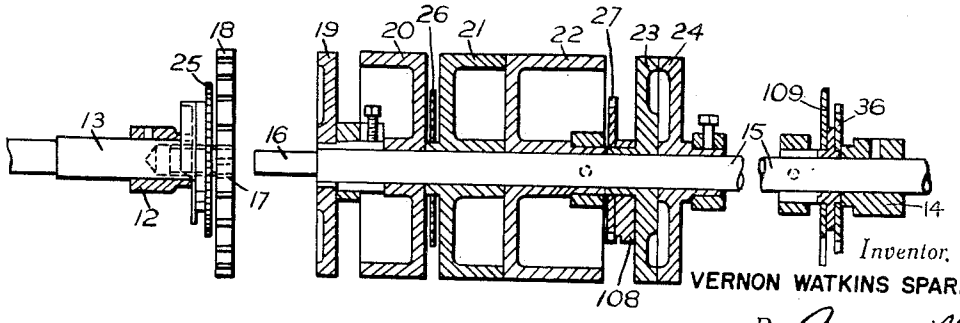


FIG. 8.



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MACHINES FOR PRINTING AND ISSUING POSTAL ORDERS AND LIKE FORMS

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FIG. 5.

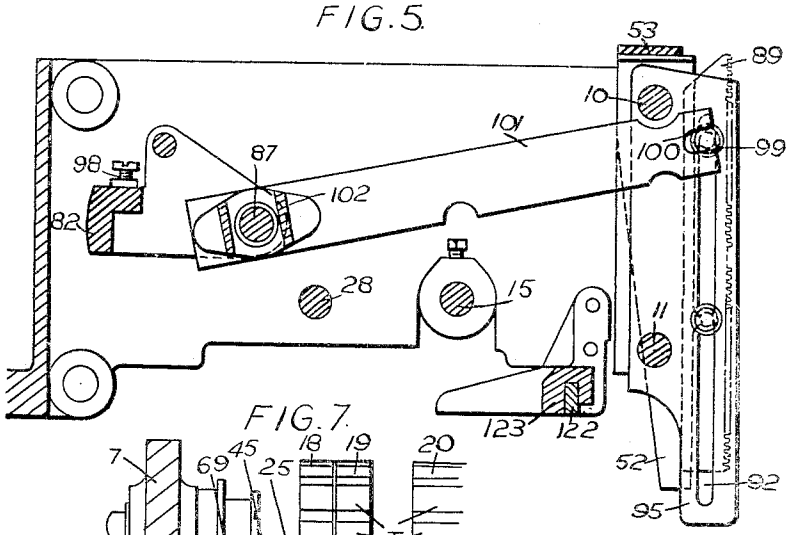


FIG. 7.

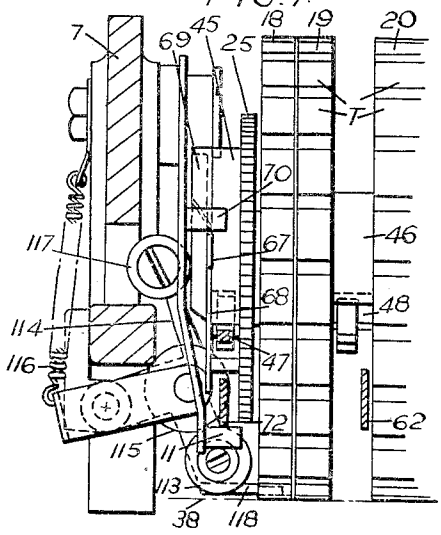
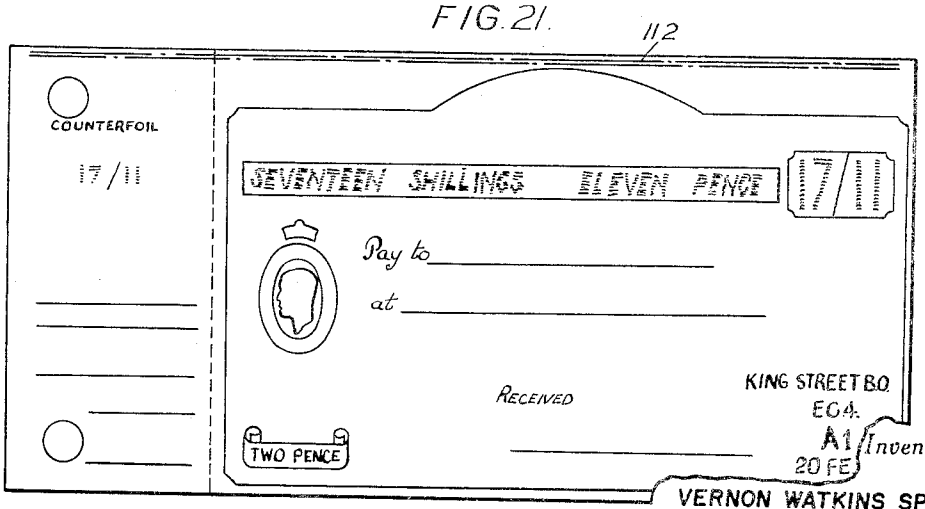


FIG. 21.



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MACHINES FOR PRINTING AND ISSUING POSTAL ORDERS AND LIKE FORMS

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FIG. 9.

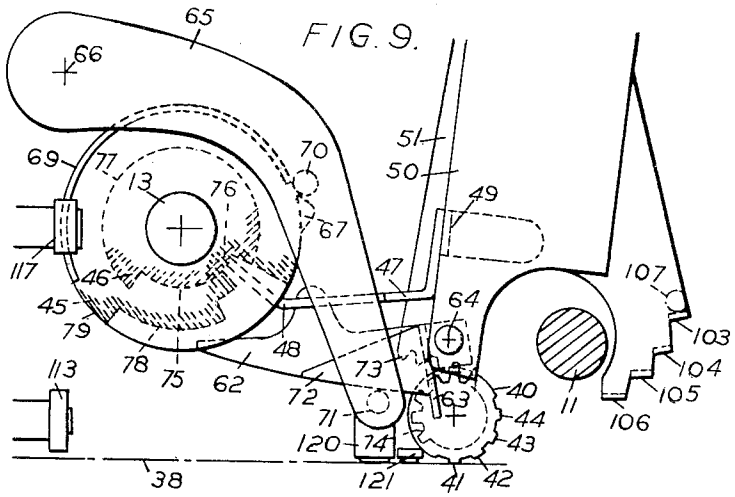


FIG. 10.

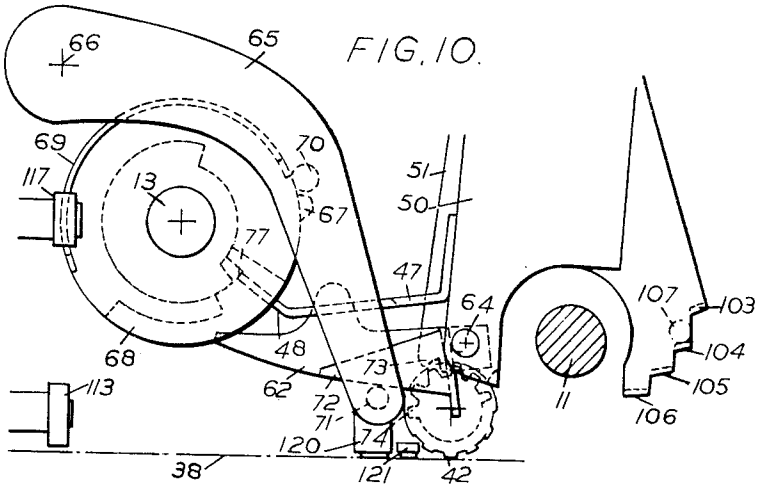
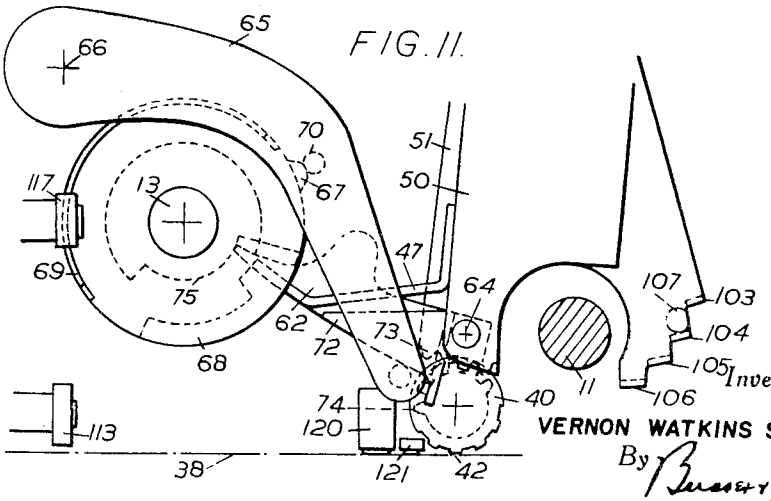


FIG. 11.



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May 1, 1956 V. W. SPARROW 2,743,669

MACHINES FOR PRINTING AND ISSUING POSTAL ORDERS AND LIKE FORMS

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FIG. 12.

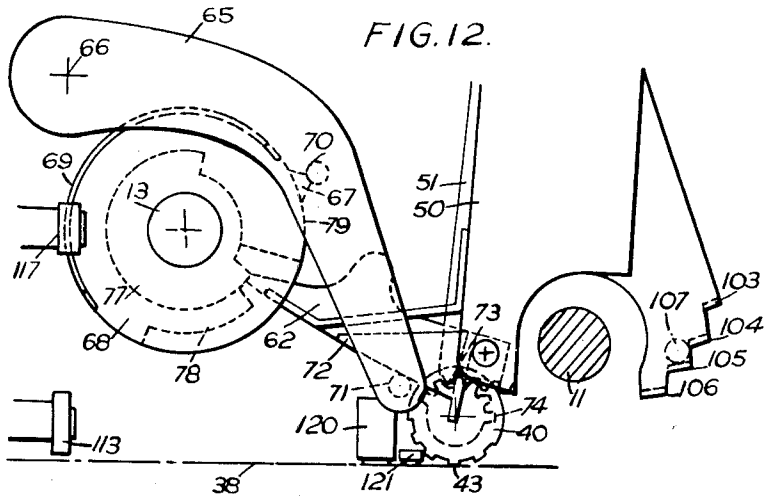


FIG. 13.

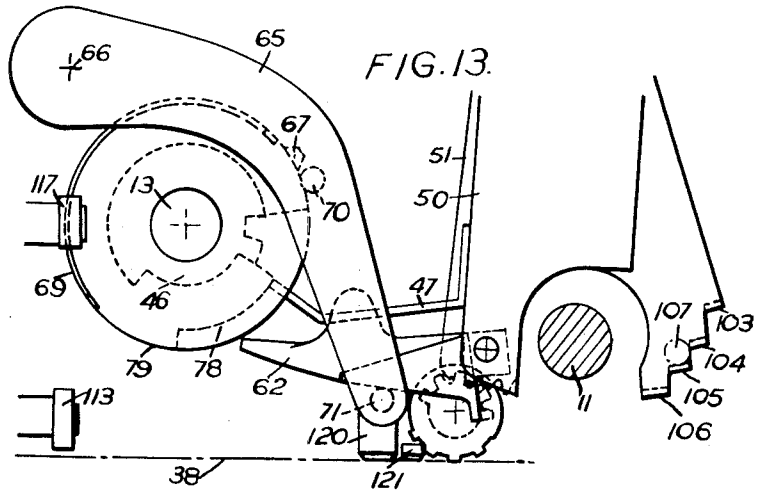
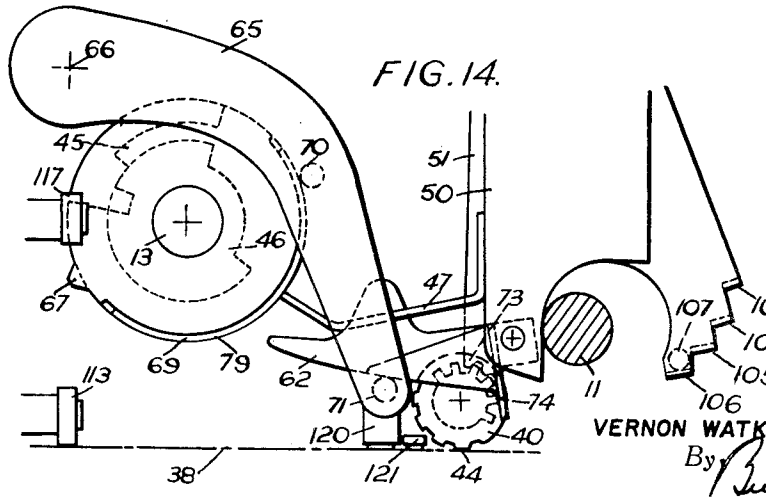


FIG. 14.



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May 1, 1956 V. W. SPARROW 2,743,669

MACHINES FOR PRINTING AND ISSUING POSTAL ORDERS AND LIKE FORMS

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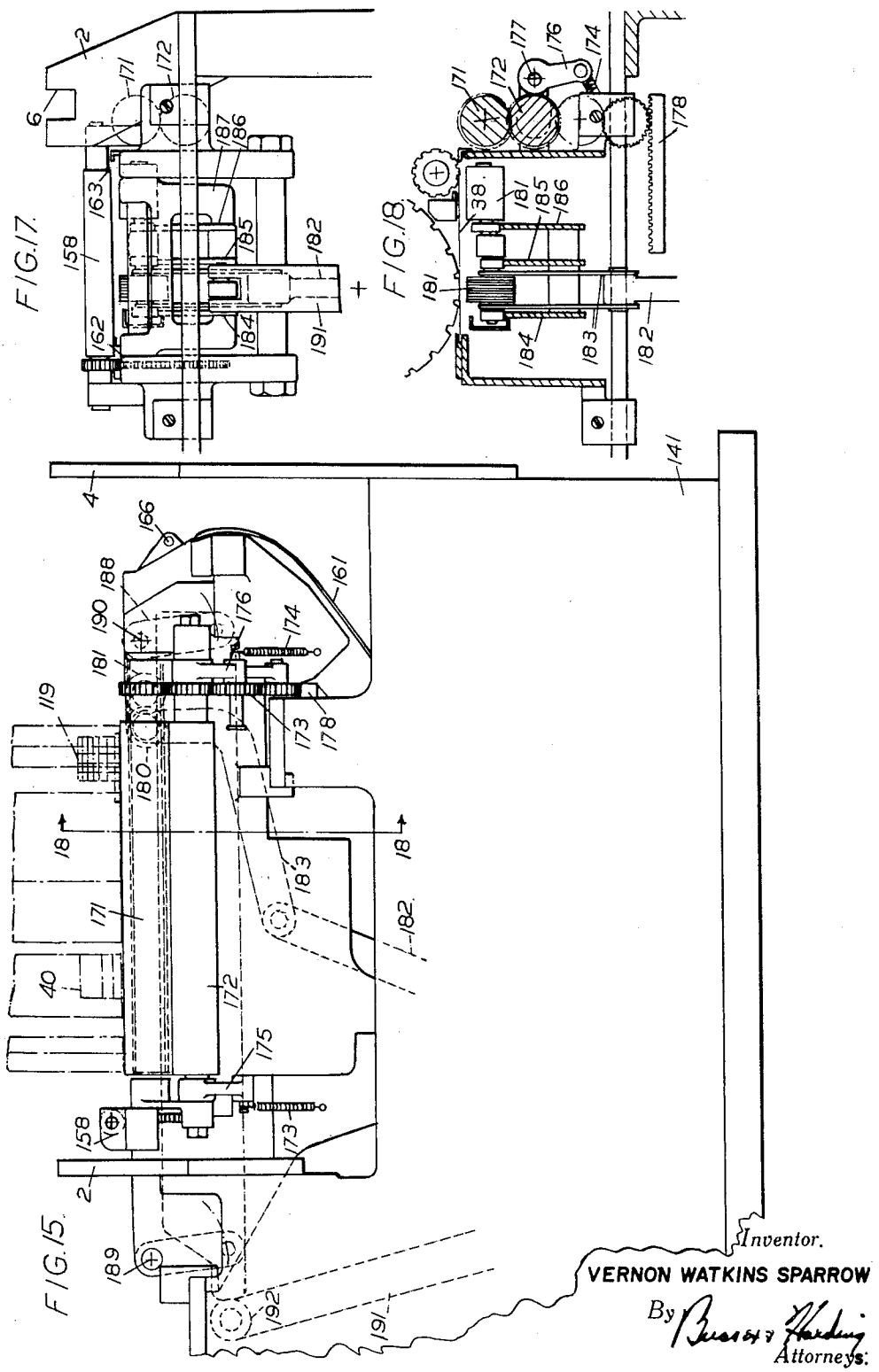

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May 1, 1956 V. W. SPARROW 2,743,669

MACHINES FOR PRINTING AND ISSUING POSTAL ORDERS AND LIKE FORMS

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FIG. 16.

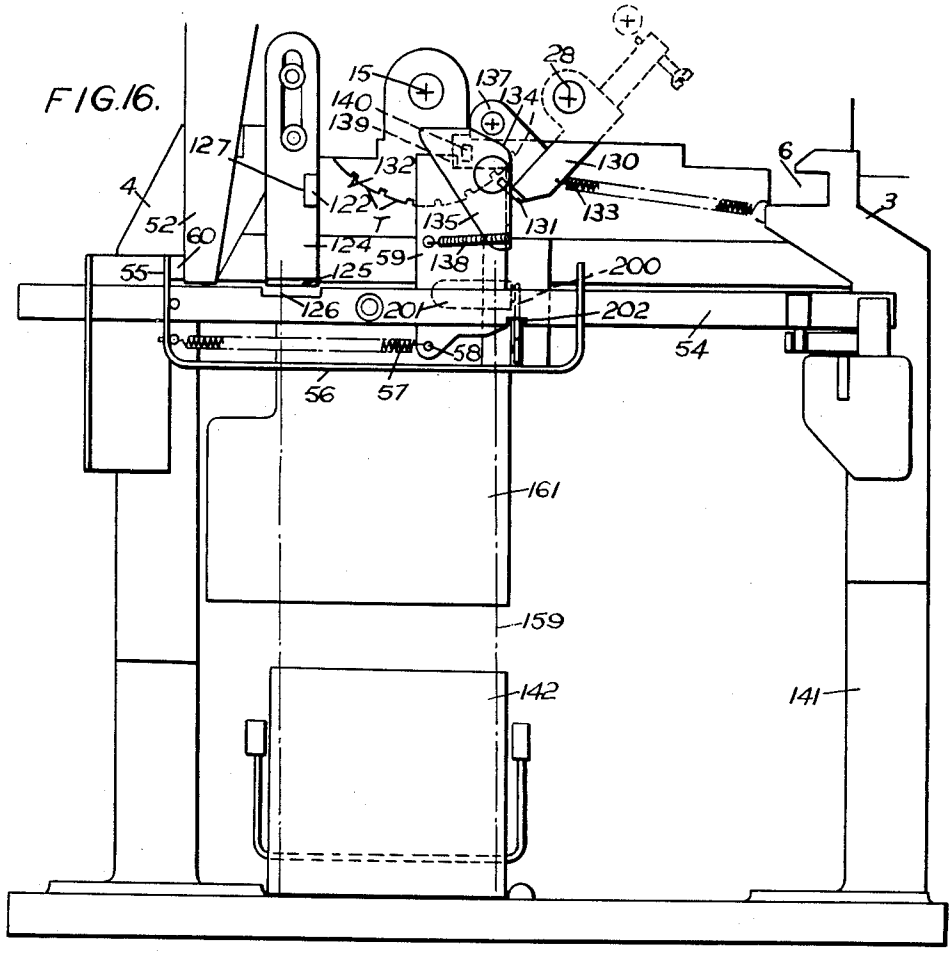
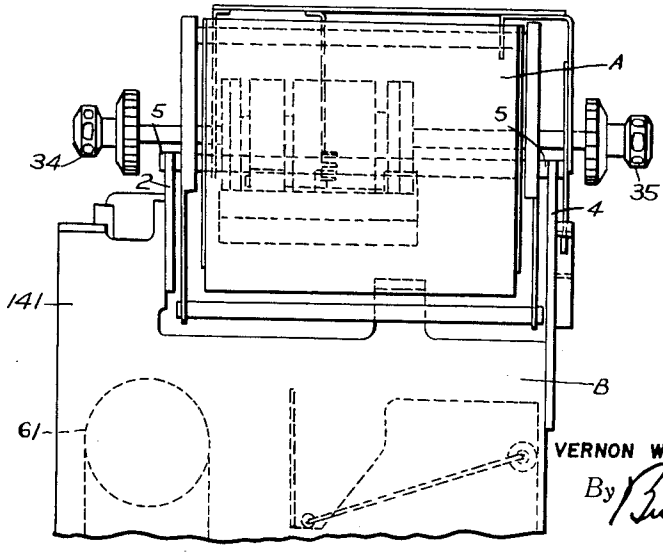


FIG. 20.



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MACHINES FOR PRINTING AND ISSUING POSTAL ORDERS AND LIKE FORMS

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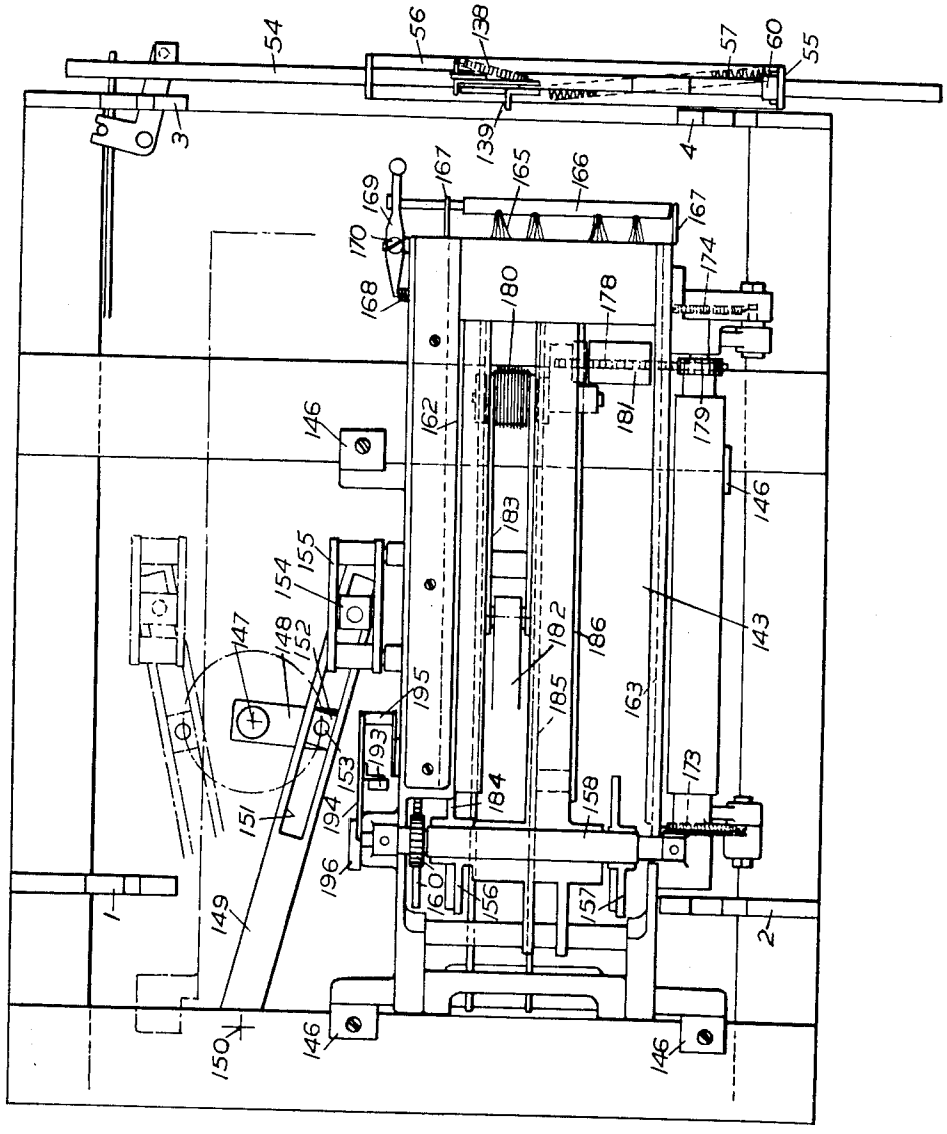
FIG. 19.



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United States Patent Office 2,743,669 Patented May 1, 1956

2,743,669

MACHINES FOR PRINTING AND ISSUING POSTAL ORDERS AND LIKE FORMS

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Application February 7, 1951, Serial No. 209,732

Claims priority, application Great Britain February 14, 1950

6 Claims. (Cl. 101—93)

This invention concerns machines for printing and issuing forms (hereinafter referred to as forms of the character described) relating to money transactions wherein there are two separate money values to be taken into account the magnitude of one of which varies in dependence upon the magnitude of the other, but in a non-proportionate manner.

The invention more especially concerns a machine for printing and issuing postal orders. As is known, a postal order carries two money value markings upon it, one representing the exchange value of the order and the other the poundage value. The magnitude of the poundage value increases with that of the exchange value. The increases is, however, in steps each embracing a range of successive increases in the exchange value. The result is that although the poundage value increases in dependence upon the exchange value it does so in a non-proportionate manner.

Heretofore postal orders have had the exchange and poundage values pre-printed upon them, although where the exchange value is a value between 6d. and 1/– or between an odd-number multiple of 6d. and 1/– or a multiple thereof, or in the case of a higher-value order, between two successive multiples of 1/–, a form is used the exchange value of which is that of the nearest 6d., or in the case of a higher-value order, the nearest 1/– below the required value, and the latter value is made up on the form by the application of postage stamps thereto. The date of issue of the order, also the postal district of the office of issue, are usually stamped on the form by the clerk issuing it.

As applied to machines for printing and issuing postal orders, the object of the invention is to provide a machine in which at least the exchange and poundage values and preferably also the other data mentioned, are printed on the form at the time of issue thereof, blank forms being used in the machine, drawn from a supply thereof accommodated in the machine.

While as stated the invention is more especially concerned with a machine for printing and issuing postal orders, it is applicable generally to machines for printing and issuing forms of the character described. For example it would be applicable to a machine for printing and issuing payment receipts in respect of sales transactions involving the payment of a dividend or bonus to the customer.

According to the invention, a machine for printing and issuing forms of the character described comprises two separate series of type elements allocated respectively to the printing of the two money values to be printed upon the form (which values will hereinafter be referred to for convenience as the "primary" value and the "secondary" value) and subject to a single control as regards setting of the elements for the printing operation, by a hand operated mechanism common to them both.

According to one general form of the invention, which is the form employed in a preferred embodiment of the

invention hereinafter described, the series of type elements allocated to the printing of the primary value are set by the hand operated mechanism and the other series of type elements, allocated to the printing of the secondary value, are set by a separate mechanism whose functioning is dependent upon the setting of a movable part or parts by the first mentioned mechanism in consequence of actuation of the latter to set the first mentioned series of type elements.

Further according to the invention, the movable part or parts referred to in the preceding paragraph which are set by the hand operated mechanism referred to therein may consist of a cam or cams arranged to cooperate with a feeler or feelers in operative connection with the separate mechanism. It is to be understood, however, that the form of this part or of these parts will vary widely, according for example to the general constructional design of the machine.

Further according to the invention, the separate mechanism referred to may be actuated through the intermediary of a manual control member for the machine and where, as in the aforesaid particular embodiment of the invention, the machine is electrically driven by a motor controlled by a switch incorporated in the machine, the manual control member may operate the switch in the direction to initiate a cycle of operation of the machine and in the course of doing so actuate or permit the actuation of the separate mechanism, the arrangement being such that that mechanism is actuated, with consequent setting of the type elements associated therewith, before the cycle of operation commences.

The form of the type elements of the machine may also vary widely, according for example to the general design and operational requirements of the machine. According to a generally preferred form of the invention, however, the type elements of one of the series thereof are constituted by type carried upon the respective peripheries of a series of drums or drum segments independently adjustable for the purposes of the setting operation about an axis of rotation common to them all, the arrangement being one in which when the elements are in their set positions for the printing operation the type thereon which are thus composed for the operation are disposed along a line crossing the peripheries of the elements and parallel to said axis of rotation thereof, while the type elements of the other series thereof are constituted by successive portions of the periphery of a single drum or drum segment common to the whole series of elements, the drum or drum segment being angularly adjustable about its axis for the purposes of the setting operation. In the case of a machine for printing and issuing postal orders, the first mentioned series of type elements would be allocated to the printing of the exchange value of the order and the other series to the printing of the poundage value.

Further according to the invention, the latter comprises certain additional features of novelty which will be severally described in what follows herein and specifically claimed in the accompanying claims. The said additional features include features relating to the constructional details of the setting means for the various type elements of the machine; of the means for inking the type elements; of the means for feeding the forms to be printed to printing position in the machine and then delivering them after the printing operation to a position at which they may be removed from the machine for use as required, and of certain mechanisms embodied in the machine for ensuring that the machine shall be automatically locked against operation in certain events hereinafter described.

As will be appreciated, a machine in accordance with this invention has inherently the important advantage that it only requires manipulation of one hand-operated control means for setting the various type elements of the

machine, and in consequence the operation of the machine is both easy and speedy. For example in the case of a machine for printing and issuing postal orders, the control means may conveniently consist (as regards the manipulating members of the means) simply of a pair of turning knobs disposed say one at either side of the machine and allocated one to the "shillings" portion of the exchange value of the form and the other to the "pence" portion thereof, the arrangement being such that the only operations necessary in the issuance of an order are (1) the manipulation as necessary of the knobs, and (2) the initiation of a cycle of operation of the machine by actuation of the control member aforesaid thereof.

Conveniently, as in the case of the aforesaid embodiment of the invention hereinafter described, the machine may be constructed in the form of two complementary units, an upper unit comprising inter alia the printing elements and the setting means therefor and a lower unit comprising inter alia the means for inking the type elements, the means for feeding the forms from a supply thereof accommodated in the machine to printing position in the machine and thence following the printing operation to a delivery position located exteriorly of the machine, the means for effecting a printing operation following upon the feeding of the form to be printed to printing position in the machine, the driving motor of the machine and the various operative connections provided between the driving motor and the parts of the machine which are driven thereby.

In the case, for example, of a machine for printing and issuing postal orders, the upper unit in such a two-part construction will generally be readily removable from operative position over the lower unit to enable it at the end of a period of use of the machine, for example at the end of the day, to be removed and placed under lock and key to prevent tampering with the totalising mechanisms of the machine by some unauthorized person, it being understood that a machine in accordance with the invention would generally incorporate a mechanism or mechanisms for automatically totalising the "primary" and "secondary" values printed on the form as issued by the machine. In such a case it is highly important, of course, that provision shall be made against tampering with these mechanisms, and a two-part construction as visualized above has this desideratum especially in mind. In addition, it enables a machine to be designed which is more readily portable by reason of the fact that it is constructed in two parts which can be transported separately.

The invention will now be further described with reference to the accompanying drawings, which illustrate the aforesaid particular embodiment purely by way of example, the machine illustrated being a two-part machine as above referred to for the printing and issuing of postal orders.

In the drawings:

Figure 1 is a front elevation of the upper unit of the machine;

Figure 2 is a plan view of the upper unit of the machine;

Figure 3 is a vertical section through the upper unit, taken on the section line 3—3 of Figure 2 and drawn on a larger scale than Figures 1 and 2;

Figures 4, 5 and 6 are similar sections on the lines 4—4, 5—5 and 6—6 respectively;

Figure 7 is a fragmentary vertical section through Figure 3 taken on the section line 7—7 thereof, with certain parts omitted for the sake of clearness;

Figure 8 is an axial section through the type elements of the machine that are allocated to the printing of the exchange value of the order, the view showing certain additional parts hereinafter described in addition to the type elements referred to;

Figures 9, 10, 11, 12, 13 and 14 are fragmentary views illustrating different settings of the type elements of the machine corresponding respectively to different exchange values of the order and correspondingly different poundage values thereof;

Figure 15 is a front elevation of the lower unit of the machine, with certain parts omitted;

Figure 16 is a side elevation of the lower unit, looking in the direction of the arrow 16 in Figure 15;

Figure 17 is a fragmentary side elevation of the lower unit, looking in the direction of the arrow 17 in Figure 15;

Figure 18 is a fragmentary vertical section through Figure 15 taken on the section line 18—18 thereof;

Figure 19 is a plan view of the lower unit with certain parts omitted;

Figure 20 is a front elevation of the complete machine drawn on a smaller scale than the preceding figures, and

Figure 21 shows a postal order as printed and issued by the machine.

Like reference numerals are applied to like parts in the various figures of the drawings.

The machine shown comprises an upper unit, generally marked A in Figure 20, and a lower unit, generally marked B. The upper unit is removably mounted upon the lower unit in the manner hereinbefore described. It is so mounted thereon through the intermediary of upstanding bearers 1, 2, 3, 4 on the lower unit and laterally extending spigot members 5 on the upper unit, the members 5 being received within notches 6 in the bearer members.

The two units A, B will now be described separately, as follows:

Upper unit

This unit comprises a rigid framework consisting of side members 7, 8 rigidly secured together at the back of the machine by a rear member 9, and at the front of the machine by a pair of cross rods 10, 11.

Rotatably mounted in a journal bearing 12 in the side member 7 of the framework is a horizontal shaft 13, and rotatably mounted in a second journal bearing 14 in the side member 8 of the framework is a second horizontal shaft 15. The two shafts 13, 15 are coaxial with one another and their adjacent ends are mutually supporting with respect to one another, a spigot 16 on the shaft 15 being rotationally received within a journal bearing 17 provided to receive it in the end of the shaft 13. Figure 8 shows the construction in this respect.

Mounted on the shafts 13, 15 are the type elements of the machine that are allocated to the printing of the exchange value of the order.

These type elements, which as shown take the form of drums as hereinbefore referred to, carrying the type on the periphery thereof, comprise a counterfoil shillings drum 18 for printing on the counterfoil of the order the shillings figure of the exchange value in numerals ("1," "2," "3" etc.); a counterfoil pence drum 19 for printing on the counterfoil of the order the pence figure of the exchange value in numerals ("1," "2," "3" etc.); a shillings drum 20 for printing on the order itself the shillings figure of the exchange value in letters ("One," "Two," "Three" etc.); a drum 21 associated with the shillings drum 20 and adapted to print on the order the word "shilling" or "shillings" against the shillings figure of the exchange value as printed in letters by the drum 20; a pence drum 22 for printing on the order the pence figure of the exchange value in letters ("One Penny," "Twopence," "Threepence" etc.); a shillings drum 23 for printing on the order the shillings figure of the exchange value in numerals ("1," "2," "3" etc.), and a pence drum 24 for printing on the order the pence figure of the exchange value in numerals ("1," "2," "3" etc.).

Drum 18 is fast with shaft 13, drums 19, 22 and 24 are fast with shaft 13 and drums 20, 21 and 23 are revoluble on shaft 15.

Fast with drum 18 is a toothed wheel 25. Fast with drums 20, 21 is a second toothed wheel 26. Fast with drum 23 is a third toothed wheel 27.

Disposed parallel to the shafts **13**, **15** and revolubly mounted in bearings in the side member **7** of the framework of the unit is a countershaft **28**. Fast on this shaft are three toothed wheels **29**, **30**, **31** respectively meshing with the wheels **25**, **26**, **27**. (Figure 8.)

Also fast on countershaft **28** is a toothed wheel **32** (Figure 2) whose function is co-operation with a spring controlled pawl **33** is accurately to locate the drums **18**, **20**, **21** and **23** in true printing position upon being adjusted thereto (possibly only approximately) by the hand-operated setting mechanism of the machine, later described.

From the foregoing it will be understood that drums **18**, **20**, **21** and **23** all rotate as one whenever shaft **13** is rotated, and drums **19**, **22** and **24** similarly all rotate as one whenever shaft **15** is rotated.

Shaft **13** is rotated by manipulation of a turning knob **34** at the left of the unit (Figure 1). Shaft **15** is rotated by manipulation of a turning knob **35** at the right of the unit. These knobs form, as will be appreciated, part of the hand-operated setting mechanism for the type elements of the machine which are allocated to the printing of the exchange value of the order.

Fast with shaft **15** is a toothed wheel **36** (Figure 2) associated with a spring controlled pawl **37**. The function of this wheel and pawl is accurately to locate the assembly of drums **19**, **22** and **24** in true printing position upon being adjusted thereto by rotation of the knob **35**.

The drums are all of the same peripheral diameter and as shown the portions (marked T) of their respective peripheries whereat the printing type are carried thereon are all in line with one another axially of the drums, the printing line (shown in chain line at **38** in several of the figures) being vertically beneath the axis of the shafts **13**, **15**.

Disposed parallel to the shafts **13**, **15** and forward thereof is a shaft **39** carried in bearings on a part in stationary relation to the framework of the unit.

Fast with this shaft is a drum **40** carrying on four successive portions of the periphery thereof four flats **41**, **42**, **43**, **44** (see Figures 9 to 14). These four flats carry printing type. The type on flat **41** prints a "blank" marking, while the type on the flats **42**, **43** and **44** print respectively the words "Penny," "Three Halfpence" and "Two Pence," which represent the poundage values of the orders to be issued in the machine, corresponding respectively to the following ranges of exchange values: 6d. to 1/5d.; 1/6d. to 5/11d., and 6/– to 21/11d.

The successive printing elements constituted respectively by the successive portions of the periphery of the drum **40** and the type carried thereon, are brought into printing position under the control of the mechanism for setting the drums **18**, **19**, **20**, **21**, **22**, **23**, **24**, which mechanism includes the turning knobs **34**, **35**, the shafts **13**, **15** associated therewith and the toothed wheels **25**, **26**, **27**, **29**, **30**, **31**.

To this end the following construction is employed:

Shaft **13** carries, fast with it, and therefore fast with drum **18**, a "shillings" cam **45** the shape of which is clearly shown in Figures 9 to 14, and fast with drum **19** is a "Pence" cam **46** whose shape is also clearly shown in said Figures 9 to 14, the two cams being hatched in Figure 9 with lines which in the case of cam **45** slope to the left and in the case of cam **46** slope to the right.

Associated with the cams **45**, **46** are two "feelers" as hereinbefore referred to.

One of these "feelers" consists of a U-shaped member formed with two limbs **47**, **48** (see Figure 2) one of which (**47**) cooperates with cam **45** and the other (**48**) with cam **46**.

This feeler is mounted on the rearwardly presented face of a plate **49** secured at the two ends thereof to a pair of downwardly directed arms **50**, **51** forming part of a swinging structure comprising these arms, a third downwardly directed arm **52** and, in rigid connection

with the arms **50**, **51**, **52**, a horizontal bar **53**, the said structure being swingably mounted on the cross rod **10** of the framework of the unit and being swung rearwardly of the machine at each operation thereof, to bring the free end of one or other of the limbs **47**, **48** of the U-shaped feeler into engagement with the periphery of the corresponding cam **45** or **46**, in consequence of rearward manipulation of a reciprocatable bar **54** slidingly mounted on the framework of the lower unit of the machine and constituting the "control member" of the machine as hereinbefore referred to.

The operative connection between the bar **54** and the swinging structure comprises the forward end portion **55** of a U-shaped stirrup **56** (see Figure 16) normally urged rearwardly of the machine by a spring **57** anchored at **58** to a part **59** in stationary relation to the bar **54**, and an abutment block **60** on said portion **55** of the stirrup, the block **60** normally bearing against the forward edge of the arm **52** of the swinging structure. The arrangement is such that inward movement of the control bar **54** (i. e. in the direction towards the rear of the machine) which inward movement, by operating a switch (not shown) in the lower unit controlling an electric motor **61** therein (see Figure 20), initiates a cycle of operation of the machine, is accompanied by a corresponding rearward movement of the stirrup **56** (under the pull of the spring **57**), which in turn, through the intermediary of the block **60**, produces a swinging movement in the direction towards the rear of the machine of the swinging structure. The control bar **54** is returned, with consequent return of the swinging structure to normal position (Figures 1, 2, 3, 4, 5, 6, 16, 17, 20), by a returning spring (not shown) provided in the upper unit.

The other "feeler" is constituted by an arm **62** projecting rearwardly of the machine in the general plane of pence cam **46**, from a bar **63** pivoted at **64** to the arms **50**, **51** of the swinging structure, so as to have a freedom for swinging movement in a vertical plane relatively to said structure, from a raised (operative) position in which it appears in Figures 11 and 12 and which it occupies when the drums **18**, **20**, **21** and **23** are set at the shilling position around the axis of the shafts **13**, **15**, to a lowered (inoperative) position in which it appears in Figures 3, 9, 10, 13 and 14 and which it occupies in all other settings of the said drums **18**, **20**, **21** and **23**.

The feeler **62** is moved from the lowered position to the raised position by a lever **65** pivoted at **66** to the side member **7** of the framework of the upper unit, said lever being itself moved to the raised position (to raise the feeler) by a pip **67** on the periphery of a rotary cam **68** fast with the shaft **13** and therefore with the drum **18** and carrying also an axially directed cam **69** whose function will be described later, when the drums **18**, **20**, **21** and **23** are in said shilling position, said pip **67** co-operating to this end with a follower pin **70** on the lever and the lever communicating its motion to the feeler through a pin **71** on the free end of the lever and an arm **72** on the bar **63**.

As will be seen from Figures 11 and 12, feeler **62** reaches to a position beyond the free extremities of the limbs of the U-shaped feeler **47**, **48** when it is in the raised position. Consequently, when it is in this position it operates to limit the rearward (operative) movement of the swinging structure, relatively to any given portion of the cam **46**, to an extent which exceeds that to which the movement would be limited by the feeler **47**, **48**.

In any given setting of the drums **18**, **19**, **20**, **21**, **22**, **23**, **24** of the machine, except when the drums **18**, **20**, **21** and **23** are in the shilling setting as above described, the U-shaped feeler will engage, by the corresponding limb (**47**) or (**48**) (and of course upon the swinging structure being moved through its operative stroke in consequence of actuation of the control bar **54** in the manner above described) one or other of the cams **45**, **46**—ac-

cording to which of these cams, with the drums in the given setting thereof, is carrying the cam surface most remote from the axis of rotation of the shafts **13**, **15** at a position therearound opposite the free ends of the limbs of the feeler. In certain settings of the drums the U-shaped feeler will engage both of the cams, as for instance in the setting illustrated in Figure 9.

The necessity for providing in the machine two feelers (**47**, **48** and **62**) will be indicated later.

As shown, most clearly in Figures 9 to 14, the downwardly directed arm **51** of the swinging structure carries along the lower edge thereof an arcuate rack **73**.

This rack meshes constantly with a second arcuate rack **74** on the shaft **39**, said rack **74** being concentric with said shaft **39** and being located along a portion of the periphery of the shaft which is on the diametrically opposite side of the axis of the shaft to the side at which the flats **41**, **42**, **43** and **44** of the type element drum **40** are located (see Figures 9 to 14).

The arrangement is such that rearward movement of the swinging structure produces rotation of the drum **40** to an extent which is proportional to the angular stroke of the swinging structure, which stroke is limited and determined by the action of the cam **45** or **46** and one or other of the associated feelers, in the manner above described.

The action in this respect is illustrated in Figures 9 to 14, which show the relative position of the parts in the following series of settings of the type elements of the machine:

"Rest" setting (no shillings, no pence)—Figure 9.

6d. setting—Figure 10
1/– setting—Figure 11
1/6d. setting—Figure 12
2/– setting—Figure 13
12/6 setting—Figure 14

The reason why it is necessary to provide two feelers in the machine, associated with the cams **45**, **46**, will now be described.

If the successive ranges of exchange values corresponding to the successive ranges of poundage values terminated in all cases with a whole shilling, the one cam **45** fast with the shilling cam **45** would suffice to provide the necessary action in setting the poundage type drum **40**. In the ranges however at present in use in postal order transactions, the lowest range of exchange values terminates at a value between 1/– and 2/–, namely at the value 1/5d., the next succeeding range commencing at 1/6d. It is necessary, therefore, to provide an additional feeler (feeler **62**) to accommodate this particular change point in the poundage values. This will be apparent from a perusal of Figures 9 to 14.

Thus between the "Rest" setting (Figure 9) and the 5d. setting limb **48** of the U-shaped feeler engages inset portion **75** of pence cam **46**, limb **47** continuing to engage inset portion **76** of shillings cam **45**, since this cam has not yet been displaced from its "Rest" position.

At the 6d. setting (Figure 10), limb **48** engages portion **77** of pence cam **46**, limb **47** being now free from engagement with cam **45**.

Between the 6d. setting and the 11d. setting, limb **48** continues to engage portion **77** of cam **46** and limb **47** continues to be free from engagement with cam **45**, since shillings cam **45** has still not yet been displaced from its "Rest" position.

At the 1/– setting (Figure 11), feeler **62** is in the raised position and takes over the action from the U-shaped feeler (**47**, **48**). As shown, it is in engagement with inset portion **75** of pence cam **46**. It remains in engagement with said portion **75** throughout the following successive settings up to and including the 1/5d. setting.

At the 1/6d. setting (Figure 12), feeler **62** engages portion **77** of pence cam **46** and it remains in engagement therewith through the succeeding settings up to and including the 1/11d. setting.

At the 2/– setting (Figure 13), feeler **62** is again in the lowered (inoperative) position and the action is again taken over by the U-shaped feeler **47**, **48**, limb **47** engaging step **78** of shillings cam **45**, with which it then remains in engagement throughout the succeeding settings up to and including the 5/11d. setting.

At the 6/– setting, limb **47** of the U-shaped feeler engages the radially outermost portion **79** of shillings cam **45** and it continues to engage this portion throughout the succeeding settings up to and including the 21/11*d*. setting.

In this way an arrangement is provided in which, in accordance with the broadest aspect of the invention as hereinbefore indicated, the two separate series of type elements (viz. the exchange value type drums **18**, **19**, **20**, **21**, **22**, **23** and **24** and the poundage value type drum **40**) are subject to a single control as regards setting of the elements for the printing operation, by a hand-operated mechanism (viz. knobs **34**, **35** and the associated shafts **13**, **15**, countershaft **28** and toothed wheels **25**, **26**, **27**, **29**, **30**, **31**) common to them both, the arrangement described being one in which, more specifically, the type elements allocated to the printing of the "primary" value (viz. the exchange value) are set by a hand-operated mechanism as referred to and the other series allocated to the printing of the "secondary" value (viz. the poundage value) are set by a separate mechanism (viz. the control bar **54**, portion **55** of stirrup **56**, abutment block **60**, swinging structure **50**, **51**, **52**, **53**) whose functioning is dependent upon the setting of a movable part or parts (cams **45**, **46**) by the first mentioned mechanism (knobs **34**, **35** etc.) in consequence of actuation of the latter to set the first mentioned type elements (drums **18**, **19**, **20**, **21**, **22**, **23**, **24**).

Mounted on the front of the upper unit of the machine are two totalising mechanisms allocated one to the summation of exchange values and the other to the summation of poundage values.

These mechanisms, which are not shown on the drawings, as in themselves they form no part of the present invention, are mounted on a bearer plate (or the equivalent) **80** (see Figure 20) and are actuated by drive from the motor **61** through the intermediary of a vertically reciprocatable plunger **81** on the lower unit, a stirrup **82** on the upper unit oscillatable with the reciprocations of plunger **81** about a horizontal axis **83**, a series of levers **84**, **85**, **86** fulcrumed on a shaft **87** extending across the interior space of the framework of the upper unit, and a corresponding series of vertically reciprocatable racks **88**, **89**, **90** guided in their operative movement by guide slots **91**, **92**, **93** in three guide plates **94**, **95**, **96** carried in stationary relation to the framework of the upper unit, upon the cross rods **10**, **11** thereof.

Stirrup **82** is raised (by plunger **81**) against the pull of a tension spring **97** and levers **84**, **85**, **86** are engaged at the rear (tail) end thereof by stirrup **82** through the intermediary of adjustable screw stops **98**.

At the forward end the levers **84**, **86** are operatively connected to the respective racks **88**, **90** through the intermediary of rollers **99** on the racks engaging in notches **100** on the levers. In the case of lever **85**, the operative connection between this lever and the corresponding rack **89** is through a second lever **101** fulcrumed on the shaft **87** and in rigid connection with lever **85** through a connecting bracket **102**, and a roller **99** on the rack engaging in a notch **100** on the free end of lever **101**.

Plunger **81** is raised and lowered once per cycle of operation of the machine, in time with the movements of the various other motor-driven parts of the machine.

The operative stroke of the plunger is constant, being the same for all settings of the type elements of the machine. The strokes of the levers **84**, **85**, **86** vary however with these settings.

Thus, associated with each lever is a cam which is set simultaneously with the type elements and which functions to limit and so determine the operative movement of the corresponding lever. The arrangement in this respect is as follows:

Lever **84**, which is associated with the poundage totalising mechanism, is associated with a cam constituted by a series of stop ledges **103**, **104**, **105**, **106** carried on the downwardly directed arm **51** of the swinging structure hereinbefore referred to, said cam co-operating with a pin **107** on rack **88**.

Lever **85**, which is associated with the shillings portion of the exchange value totalising mechanism, is associated with a stepped-snail cam **108** (see Figure 4) fast with shillings type drum **23**.

Lever **86**, which is associated with the pence portion of the exchange value totalising mechanism, is associated with a second stepped-snail cam **109** (Figure 6) fast with shaft **15** and therefore with pence type drum **24**.

According to the setting of the shillings series of type drums (**18**, **20**, **21** and **23**) so is determined the angular setting of the shillings cam **108** and therewith the throw of the shillings lever unit **85**, **101**, **102**. According to the setting of the pence series of type drums (**19**, **22** and **24**) so is determined the angular setting of the pence cam **109** and therewith the throw of the pence lever **86**.

According to the setting of the poundage type drum **40**, so is determined the angular setting of the arm **51** of the swinging structure and therefore the stop position of the pin **107** on rack **88**, since this pin is designed to engage selectively one or other of the ledges **103**, **104**, **105**, **106** on arm **51**, as ilustrated in Figures 9 to 14.

In order to accommodate the varying operative strokes of movement of the levers **84**, **85**, **86** relative to the constant stroke of plunger **81**, freedom for lost motion is provided, through the intermediary of the stirrup **82**, as between the levers on the one hand and the plunger on the other, thereby enabling the plunger to continue in its upward stroke after any one of the levers has become arrested in its downward stroke by the associated cam. This lost motion takes place against the pull of a tension spring **110** (Figure 3).

It will be understood of course that the effective stroke of the racks **88**, **89**, **90** is the upward and further, that the increment of operative advance of the totalising mechanisms is proportional in each case to the movement of the corresponding rack.

It will also be appreciated that the successive steps in the periphery of the cams **108**, **109** are allocated respectively to successive steps in the corresponding portion (shillings or pence) of the exchange value.

The swinging structure aforesaid is automatically returned to normal position on release of the control bar **54**, by a returning spring (not shown).

The upper unit of the machine further comprises a device for marking a line **112** (Figure 21) e. g. in red or some other distinguishing color, on the postal order as it is being delivered tothe tear-off position, following the printing operation.

This device comprises an inked marker in the form of a roller **113** (see Figures 3 and 7) carried on a swinging bracket **114** pivoted to the side member **7** of the framework of the unit, so as to have two positions—a raised (inoperative) position which it occupies when the exchange value of the order is any value below 10/– and a lowered (operative) position which it occupies when the exchange value is 10/– or any value thereabove.

The roller **113** is inked by an inking roller **115** also carried on the bracket and the unit comprising the bracket and the two rollers thereon is moved from the position in which the marking roller **113** is in the lowered (operative) position to the position in which said roller is in the raised (inoperative) positon, by the axially directed cam **69** aforesaid on the cam **68**, operating, against a returning spring **116**, through a cam follower roller **117** on the bracket.

As later described more particularly, the order form to be printed is fed to printing position in the machine upon a carriage translatable rearwardly and then forwardly of the machine at each cycle of operation thereof. It is necessary, therefore, to provide some means for temporarily lifting inking roller **113** clear of the path of the form in position on said carriage during the reciprocation of the latter—i. e. at all exchange values of 10/– and over.

For this purpose an upwardly directed projection (not shown) is provided on the lower unit of the machine, adapted by engaging the underside of a cam plate **118** on the bracket **114** in all positions of the carriage in the course of its reciprocation from and to normal (printing) position, to turn the bracket about its pivot to the position in which the inking roller **113** is in the raised (inoperative) position.

It is also desirable to provide that the roller **113** shall drop to the lowered (operative) position only after commencement of movement of the printed order to the tear-off position. The means provided for this purpose will be described later.

The upper unit further comprises a device for printing on the order the date of issue thereof; a type block for printing on the order the office of issue; and a second type block for printing on the order the code letter (or number) of the clerk operating the machine.

The dating device consists of an assembly of manually settable type drums **119** rotationally mounted on a part coaxial with the shaft **39** which carries the poundage value type drum **40**.

The type block for printing the office of issue is marked **120** and is a fixture in the unit.

The other type block, for printing the code letter of the operator, is marked **121** and is carried on a bar **122**, slidably mounted in guide members therefor **123** in stationary relation to the framework of the unit. The arrangement is such that there is a bar **122** for each clerk that will operate the machine, and that clerk inserts his bar into operative position in the machine when he (or she) takes over the machine for the current period of use thereof.

The arrangement is further such that the machine can only be operated when the bar **122** is in operative position in the machine. For this purpose, an interlocking device is provided, consisting of a vertically movable locking plate **124** (see Figure 16) on the lower unit of the machine, which is yieldingly controlled in the downward direction towards an effective (locking) position in which a flange **125** on the lower end of the plate engages a notch **126** in the upper edge of the control bar **54** so as to prevent any movement of that bar, the plate **124** having in it an opening (or notch) **127** through which the code bar **122** extends when in position in the machine. When the code bar is not in the machine the plate is in its lowered (effective) position and the control bar is locked against actuation.

The upper unit further comprises means for ensuring that the machine shall only be operable (in consequence of actuation of the control bar **54**) when the exchange value type drums **18**, **19**, **20**, **21**, **22**, **23**, **24** are in correct alignment with one another as regards the portions T of their peripheries.

For this purpose, an alignment stirrup **130** is provided in the unit, mounted upon and swingable about the axis of the shaft **28** (see Figure 16). This stirrup carries along the free edge thereof a nose bar **131** adapted to enter the spaces **132** between successive portions T of the peripheries of the type drums, only when these are in correct alignment with one another in the sense indicated, the entry of the nose bar into said spaces being consequent on swinging movement of the stirrup **130** in the clockwise direction (in Figure 16), against the pull

of a returning spring 133, produced by the rearward movement of the control bar (i. e. when this is actuated to initiate a cycle of operation of the machine), through the cam action of a surface 134 on the upper edge of a swinging abutment plate 135 pivotally mounted at 136 upon the part 59 aforesaid upstanding from the control bar 54. Thus, on the stirrup is a cam follower roller 137 which is so positioned on the stirrup as to lie in the path of the surface 134 as the control bar 54 is moved rearwardly, the arrangement being such that immediately the bar 54 is moved the cam action as between surface 134 and roller 137 occurs, with resulting entry of the nose bar on the stirrup into the spaces between the portions T. In the event of non-alignment of the type drums, entry of the nose bar into said spaces is prevented with consequent prevention of at least completion of the operative swinging movement of the stirrup. Further movement of the control bar is, however, still possible, for a short distance, against the pull of a tension spring 138 operating through the abutment plate 135, since this plate is yieldingly (pivotally) mounted on the part 59. After a small amount of such further movement, an abutment 139 on the part 59 reaches a position of engagement with a co-operating abutment 140 on the stirrup, with resulting arrest of said further movement. This occurs before the control bar has reached the position in which, by operating the switch aforesaid, it initiates a cycle of operation of the machine.

A further interlock is provided in the machine, for ensuring that the control bar shall similarly be locked against actuation with consequent initiation of a cycle of operation of the machine, when the form supply in the machine fails or has become exhausted. The means to this end will also be described later.

Lower unit

This unit comprises a rigid framework 141 carrying the bearers 1, 2, 3, 4 hereinbefore referred to.

Mounted upon this framework are, inter alia, the driving motor 61; the reciprocatable carriage upon which the order forms are supported when in printing position (which carriage will hereinafter be referred to simply as the "carriage"); a supply receptacle 142 (see Figures 16 and 20) for the order forms, which latter are loaded in the receptacle in continuous-strip zig-zag pack form and are therefore fed in continuous strip form to the printing position on the carriage; and various parts (some of which will be hereinafter mentioned) constituting the driving connection between the motor 61 on the one hand and the carriage and other motor driven parts of the machine on the other.

The carriage, which may take any desired or necessary constructional form and is generally marked 143, is slidable in the reciprocatable movement hereinbefore described, upon a pair of rails 144, 145 on the framework 141, its mounting upon these rails being through the intermediary of slide blocks 146 on the carriage.

The carriage is reciprocated by drive from the motor 61 through an operative connection including toward the end thereof adjacent the carriage, a vertical shaft 147; a crank 148 fast therewith; an arm 149 swingable about a fixed vertical axis 150 and having in it a slot 151 in which works a cross-head 152 in pivotal connection with the pin 153 of the crank 148; and a cross-head 154 on the free end of arm 149 working in a slide 155 on the carriage. The arrangement is such that each revolution of shaft 147 produces one complete reciprocation of the carriage, from the normal (printing) position in which it appears in full lines in Figure 19, to the rearward position in which it appears in chain line in that figure and back to the normal position.

Revolubly mounted in the carriage are a pair of feed wheels 156, 157 (Figure 19) which at each cycle of operation of the machine co-operate with a feed roller 158, also revolubly mounted on the carriage, to feed the form strip 159 (Figure 16) from the supply reservoir 142 to the printing position on the carriage. Feed wheels 156, 157 and feed roller 158 are geared to one another by gearing 160.

The form strip is fed forward by a distance which is exactly equal to the combined length of an order form and its counterfoil, which latter is issued with the form and afterwards detached therefrom in the usual way.

The form strip is guided in its movement to the printing position by a curved guide plate 161 (Figures 15, 16) and also between guides 162, 163 (Figure 19) for the two edges of the strip. It also receives support when in the printing position from a plate 164 extending lengthwise of the carriage.

The form strip is maintained in proper contact with the various guide surfaces guiding it to the printing position, by a series of flexible wipers 165 carried on a spindle 166 revolubly mounted in bearings 167, 167 on the carriage and normally maintained in operative position by a tension spring 168 operating through a lever 169 on the spindle whose position is adjustable as necessary by a set screw 170.

Also mounted on the carriage is an inking roller 171 whose function is to ink the type on the various type elements of the machine. This roller is absorbent at the periphery and is normally charged with ink.

Beneath roller 171 is a second ink charged roller 172. This roller is maintained in pressure contact with roller 171 by springs 173, 174 pulling inwardly upon the free extremities of the downwardly directed limbs of a pair of bell cranks 175, 176 pivoted at 177 to a part in stationary relation to the framework of the carriage, roller 172 being carried in bearings on the free extremities of the other (horizontally directed) limbs of said bell cranks.

Inking roller 171 is driven, at a peripheral speed which is equal to the speed of traverse of the carriage, and in a direction which is such that the roller rolls on the face of the type as it inks the same, by drive from a stationary rack 178, transmitted through gearing 179. The arrangement is such that the roller 171 inks all of the type elements of the machine, including those of the dating device, also the two type blocks which print respectively the office of issue and the code letter of the issuing clerk.

The actual printing operation is performed by a pair of pressure rollers 180, 181.

These rollers are reciprocated along the carriage, to the left (in Figure 19), in a raised (operative) position in which they bear upwardly at the periphery against the rear face of the form strip in printing position on the carriage, the pressure of the rollers being exercised against the reaction of the type elements, and to the right, in a lowered (inoperative) position in which they are clear of said rear face, once per cycle of operation of the machine.

Rollers 180, 181 are reciprocated by drive from the motor 61 transmitted through an operative connection therewith including at the end adjacent the rollers, an angularly reciprocatable lever 182 linked to the rollers through a link 183, and they are raised and lowered by upward and downward movement of a guide structure for the rollers, rising and falling in time with the oscillations of the lever 182.

The guide structure referred to consists of three rails 184, 185, 186 (Figure 18) rigidly connected together and pivotally connected at the two ends of the structure to a pair of downwardly directed levers 187, 188 (Figures 15, 17) pivoted at 189, 190 to the general framework of the carriage so as to be swingable in a vertical plane with resulting raising and lowering of the guide structure.

The levers 187, 188 are moved to the right (in Figure 15) by thrust from the upper end of a lever 191 oscillatable through one complete reciprocation once per cycle of operation of the machine under drive from the motor 61 transmitted through an operative connection therewith (not shown), said thrust being transmitted through

a pressure roller **192** on the lever, and to the left by a returning spring (not shown).

In a cycle of operation of the machine the first motion to be performed is the inking of the type elements, which of course have previously been set by manipulation to the required positions of the turning knobs **34, 35**. In this first operation, during which the form to be printed is in printing position on the carriage (having been brought thereto during the last preceding cycle of operation of the machine), the carriage performs one complete reciprocation, from and then back to normal (printing) position in the machine.

The next motion is that of the pressure rollers **180, 181**, which perform their leftward (operative) stroke and at least commence their rightward (inoperative) stroke, before any feed movement of the form strip takes place.

The printing operation has now been effected and the final motion is the feeding of the form strip forward one step, by the action of the feed wheels **156, 157** and feed roller **158**.

This results in (*a*) delivery of the printed form to the tear-off position and (*b*), in the case of an order whose exchange value is 10/– or over, the marking on the form as it is delivered to this position of a distinguishing line **112** in, say, red ink by the marking roller **113**.

Referring again to the marking roller **113**, the cam plate **118** on the swinging bracket **114** upon which this roller is mounted has associated therewith an abutment roller **193** at the mid-point of a lever **194** pivoted at **195** to the general framework of the carriage and located in the path of a rotary cam **196** on the spindle of the feed wheels **156, 157**, the arrangement being such that through the intermediary of the cam **196**, lever **194**, roller **193** and cam plate **118**, (A) the controlling spring **111** of the bracket is prevented from bringing the marking roller **113** to the lowered (marking) position until shortly after the feed rollers have commenced to feed the form strip forwardly, and (B) towards the end of a cycle of operation of the feed rollers, the bracket is moved against the control of spring **111** to the position in which the marking roller is clear of the path of the strip. In this way it is positively ensured that the distinguishing line which is marked on the order shall be confined to the order in course of being issued.

The device hereinbefore alluded to, by which in the event of the supply of forms to be printed failing for any reason, it will be impossible to start the machine, comprises a bell crank **200** pivoted to the general framework of the carriage to swing in a vertical plane. On one arm of this bell crank is a feeler **201** normally bearing, under thrust derived from a yielding control acting on the bell crank, against the face of the form strip **159**, the arrangement being such that the feeler is held in this way in a position to maintain the other arm of the bell crank out of engaging position relatively to a notch **202** in the underside of the control bar **54**. If the supply of forms should fail, feeler **201** will move into the path of the strip and interlocking will occur as between the latter mentioned arm of the bell crank and the control bar **54**. It will now be impossible to start the machine, since it is impossible to actuate the control rod.

It will be seen that the pressure roller (**180**) which prints the exchange value on the order is peripherally grooved with fine closely spaced grooves. By this means the exchange value is printed on the order in letters and numerals which are made up of a series of closely spaced lines extending parallel to the direction of length of the order. Characters in this form are more difficult to tamper with and alter than ordinary solid line characters.

If desired, the machine may embody means for operating it by hand. Such means (which are not shown) may conveniently comprise a turning handle, say at the right hand side of the machine, suitably connected to the driving connection between the motor **61** and the various motor driven parts of the machine, at a point therein convenient for the integration thus of the two drives—the power drive and the manual drive. Any desired arrangement may be employed in this respect.

Various modifications are obviously possible, as regards constructional details. For example, the form and arrangement of the various type elements may vary widely according to the requirements of the machine, as also may the form of the manual setting mechanism therefor, the form of the means employed for feeding the strip of forms to and from printing position and the form of the means used in the actual printing operation. The type elements may, as already indicated, be of drum segment form instead of complete drum form and it may be remarked here that the term "drum" is used herein and in the accompanying claims without respect to the axial length of the drum which can be of any desired or necessary magnitude, according, for example, to the operational requirements of the machine.

What is claimed is:

1. A machine for printing and issuing forms or the like comprising means for feeding a portion of a supply strip to a printing position, two sets of value printing devices, means for adjusting one set of said printing devices, means controlled by the adjustment of the first set of said printing devices to adjust correspondingly the second set of said printing devices but to non-linearly related values, the last named means comprising cams adjusted simultaneously with the first set of printing devices in response to operation of the means for adjusting said one set of said devices and means including feelers controlled by said cams for adjusting said second set of said printing devices, and means for actuating said two sets of value printing devices to print upon said positioned portion of said supply strip.

2. A machine for printing and issuing forms or the like comprising means for feeding a portion of a supply strip to a printing position, two sets of value printing devices, means for adjusting one set of said printing devices, means controlled by the adjustment of the first set of said printing devices to adjust correspondingly the second set of said printing devices but to non-linearly related values, the last named means comprising cams adjusted simultaneously with the first set of printing devices in response to operation of the means for adjusting said one set of said devices, feelers engaging said cams and means displaced by movement of said feelers in response to adjustment of said cams for adjusting said second set of printing means and means for actuating said two sets of value printing devices to print upon said positioned portion of said supply strip.

3. A machine for printing and issuing forms or the like comprising means for feeding a portion of a supply strip to a printing position, value printing devices, means for adjusting said value printing devices, means for printing selected additional matter when said value printing devices are adjusted to a value on one numerical side of any of a plurality of disproportionate non-linearly related predetermined values, and means for actuating said value printing devices to print upon said positioned portion of said supply strip.

4. A machine for printing and issuing forms or the like comprising means for feeding a portion of a supply strip to a printing position, value printing devices, means for adjusting said value printing devices, means for printing a selected one of a plurality of specific additional matters, means responsive to non-linear increments of value adjustment of said value printing device by said value printing adjusting means for selecting successive specific ones of said plurality of specific additional matters to be printed, and means for actuating said value printing devices to print upon said positioned portion of said supply strip.

5. A machine for printing and issuing forms or the like comprising means for feeding a portion of a supply strip to a printing position, value printing means including two

independently adjustable printing devices, a pair of cams, each of said cams being in fixed relation with one of said two printing devices, a third printing device, means including a plurality of fingers adapted to variously engage said cams and means variously positioned in response to various engagements of said fingers with said cams to position said third printing device in corresponding but non-linear relation to the position of said two printing devices, and means for actuating said three printing devices to print upon said positioned portion of said supply strip.

6. A machine for printing and issuing forms or the like comprising means for feeding a portion of a supply strip to a printing position, two sets of value printing devices, setting means for moving one set of said printing devices, means including a manually operated member for initiating operation of the machine, means actuated by the movement of the first set of said printing devices and by said member to move the second set of said printing devices a disproportionate and non-linearly related extent in response to a single setting operation, and means for

actuating said two sets of value printing devices to print upon said positioned portion of said supply strip.

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