Dec. 25, 1934. H. P. ELLIOTT 1,985,247

BILL PRINTING AND ADDRESSING MACHINE

Filed Nov. 12, 1931 7 Sheets-Sheet 1

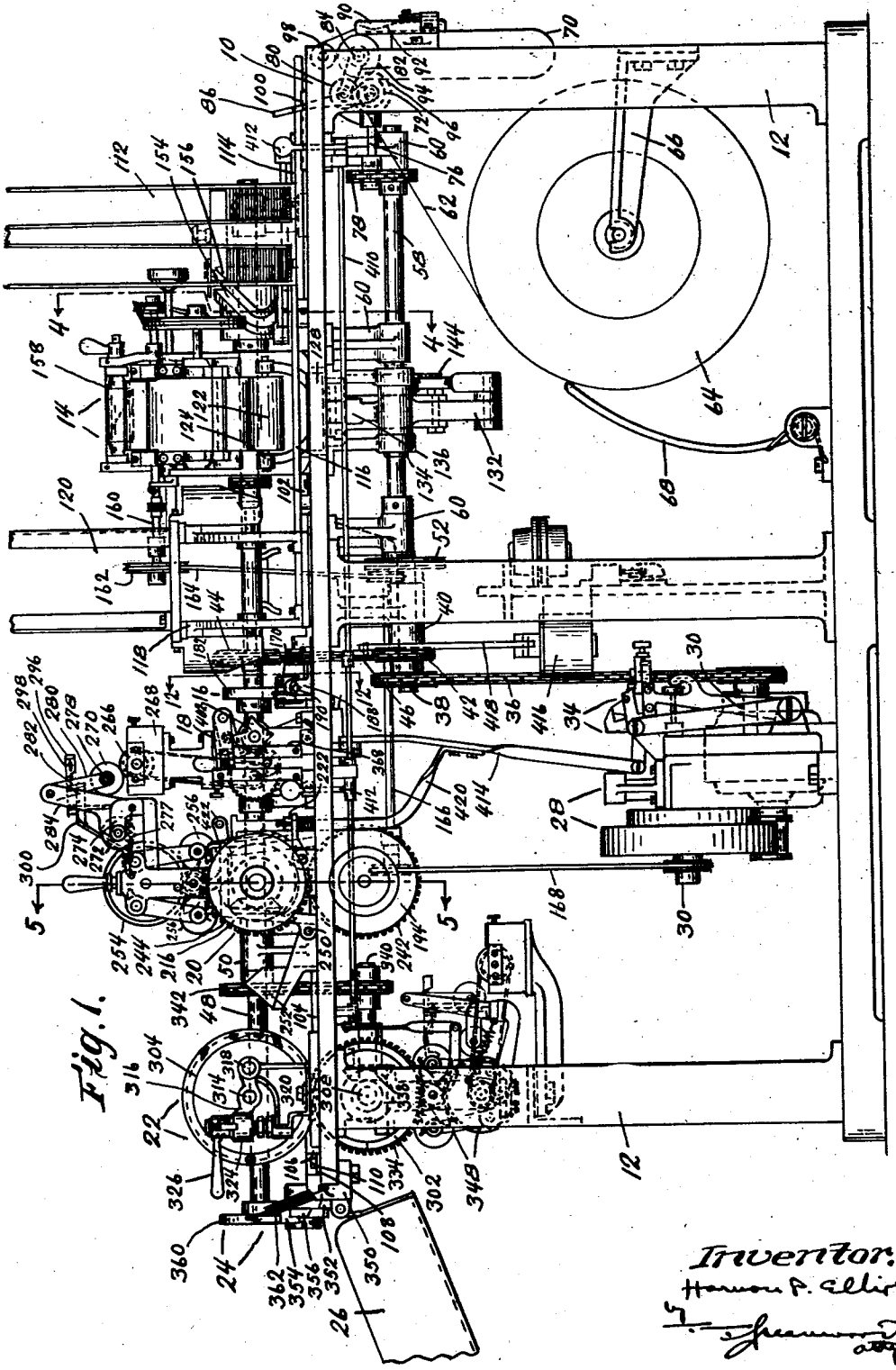


Fig. 1.

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BILL PRINTING AND ADDRESSING MACHINE

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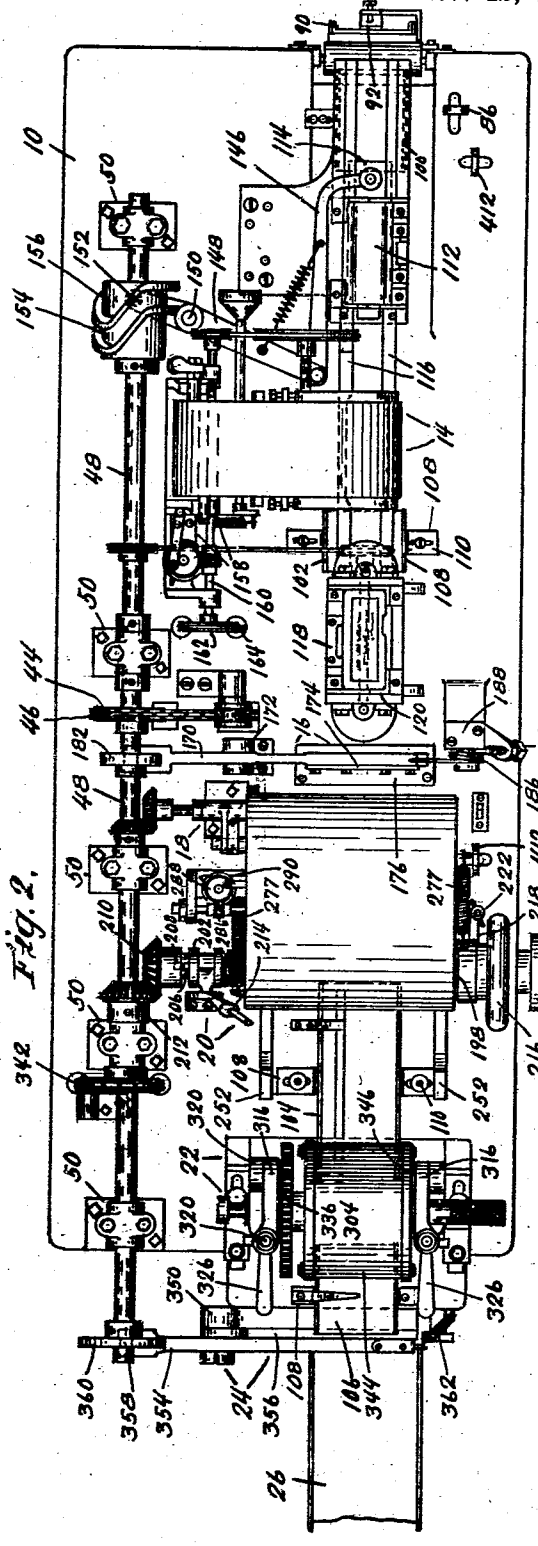


Fig. 2.

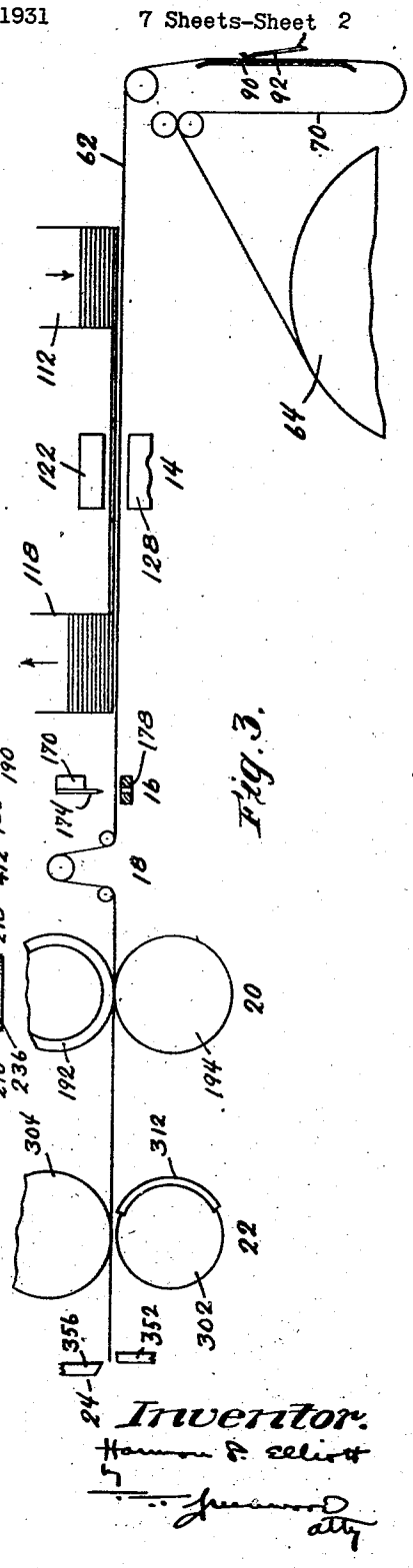


Fig. 3.

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BILL PRINTING AND ADDRESSING MACHINE

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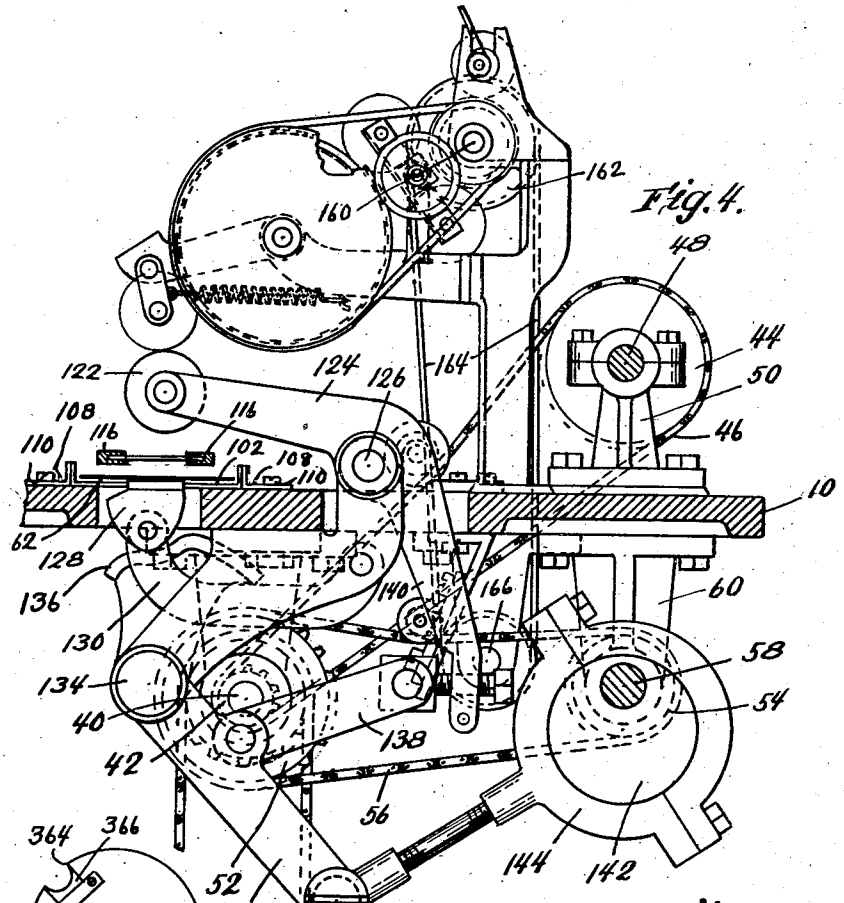


Fig. 4.

Fig. 17.

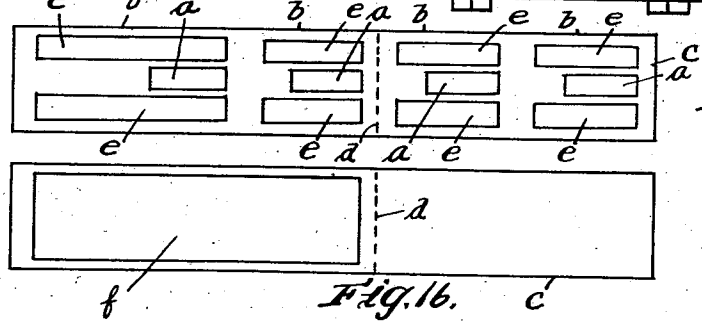


Fig. 15.

Fig. 16.

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BILL PRINTING AND ADDRESSING MACHINE

Filed Nov. 12, 1931 7 Sheets-Sheet 4

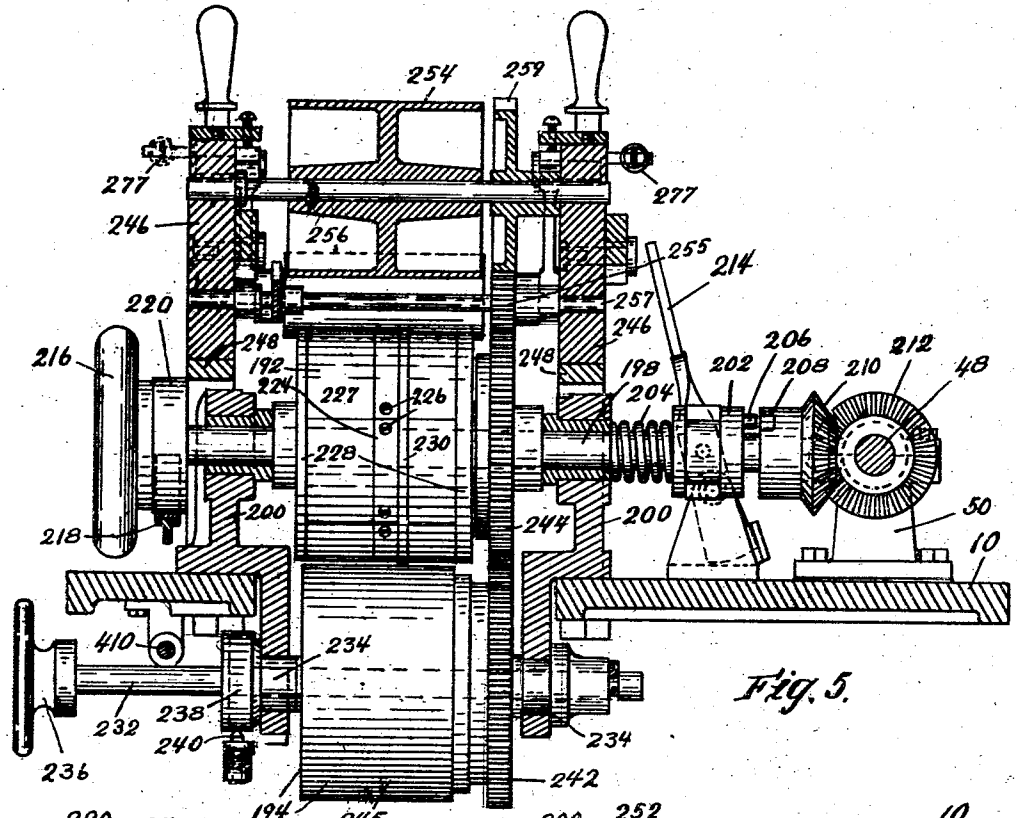


Fig. 5.

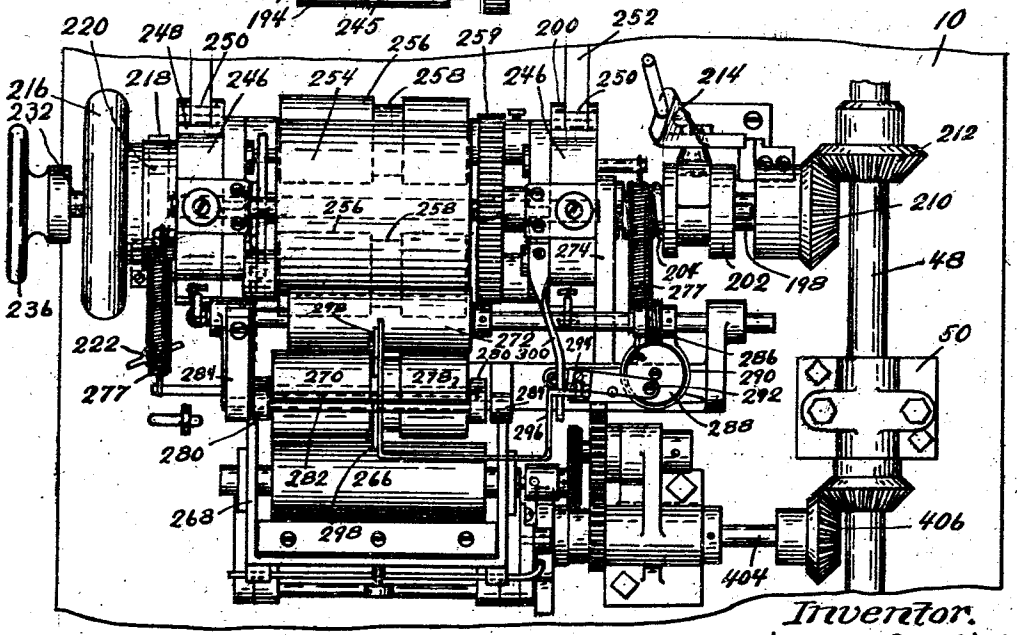


Fig. 6.

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BILL PRINTING AND ADDRESSING MACHINE

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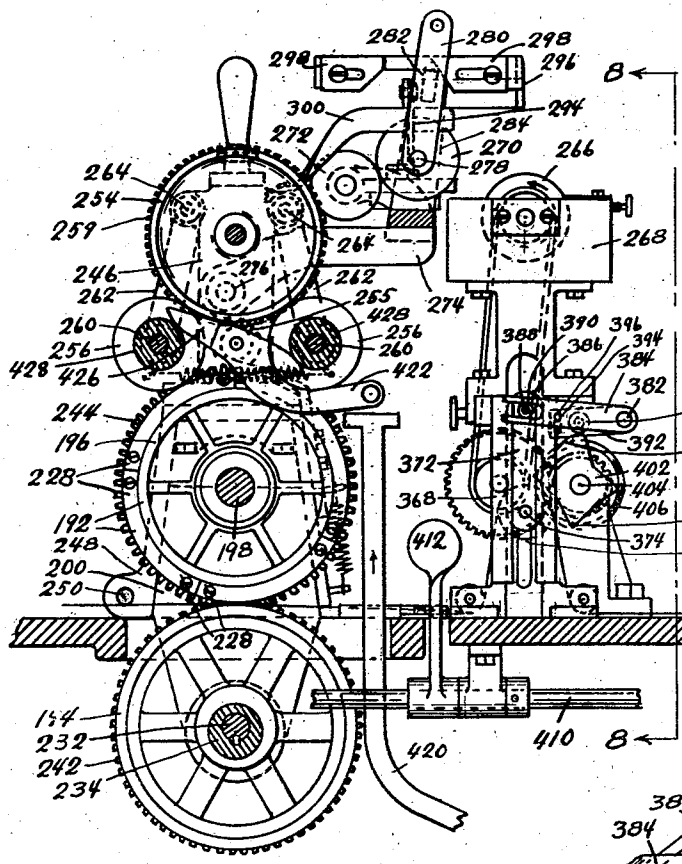


Fig. 7.

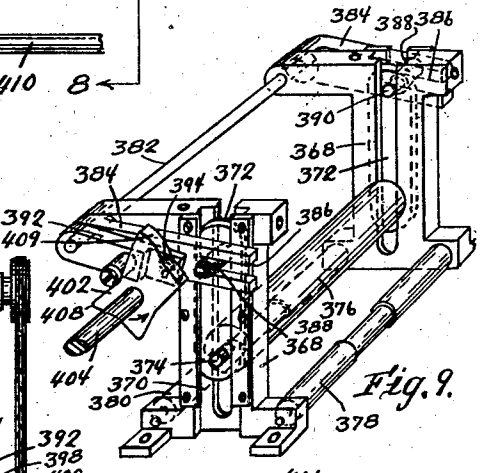


Fig. 9.

Fig. 8.

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by Freemont Atty

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BILL PRINTING AND ADDRESSING MACHINE

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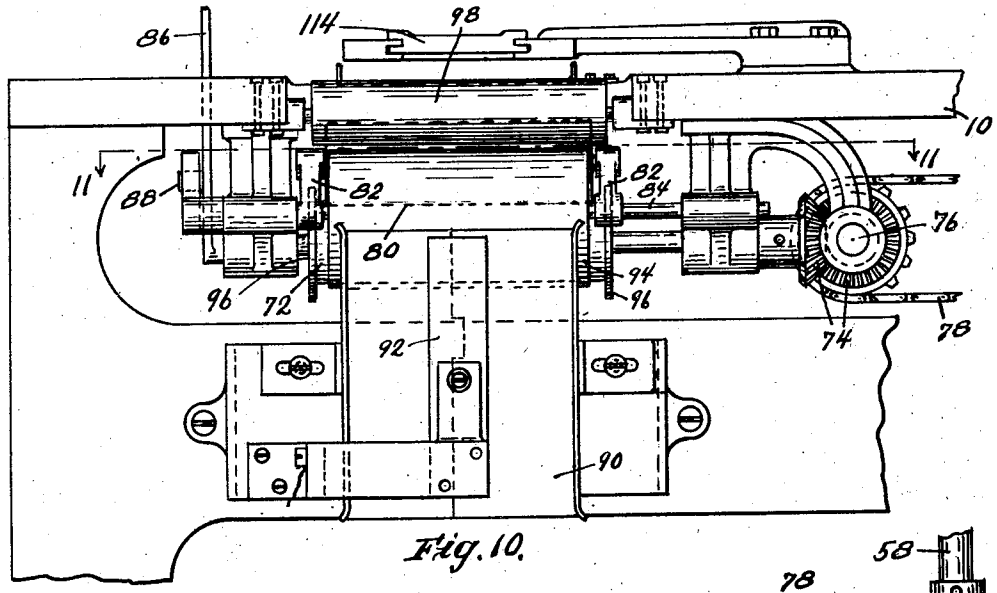


Fig. 10.

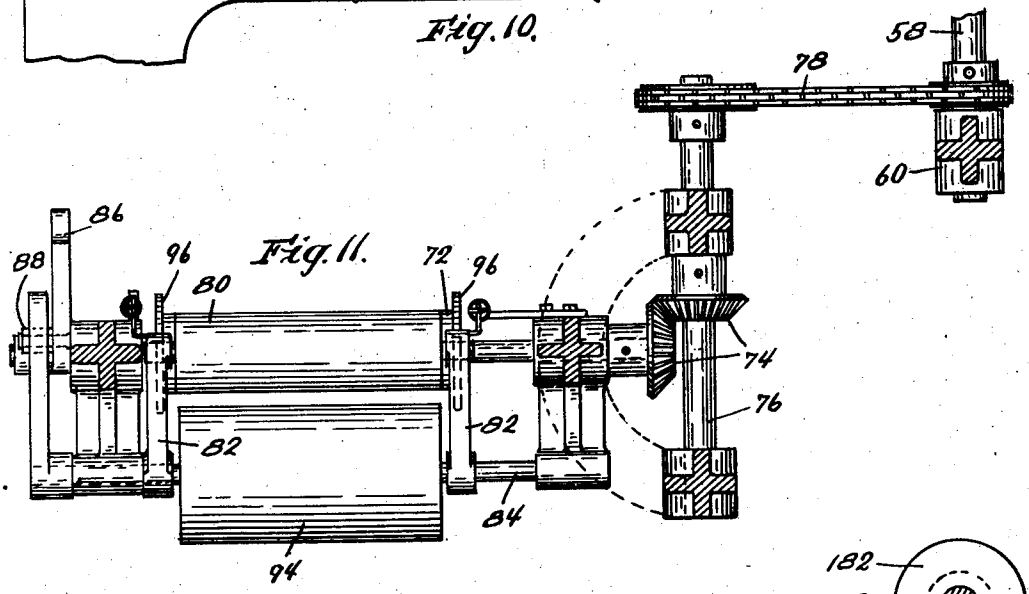


Fig. 11.

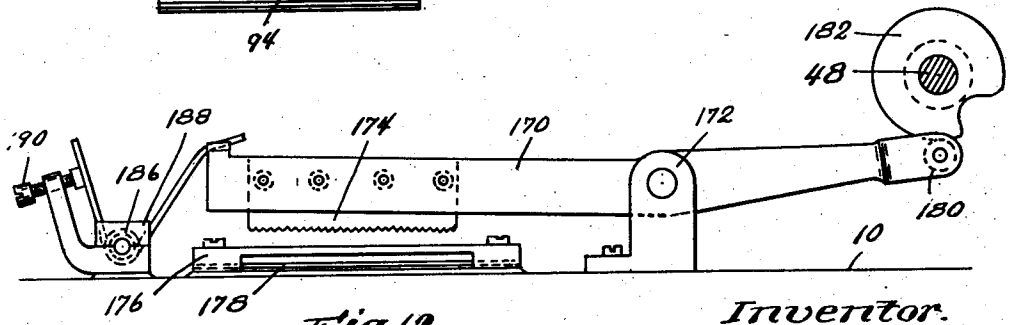


Fig. 12.

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BILL PRINTING AND ADDRESSING MACHINE

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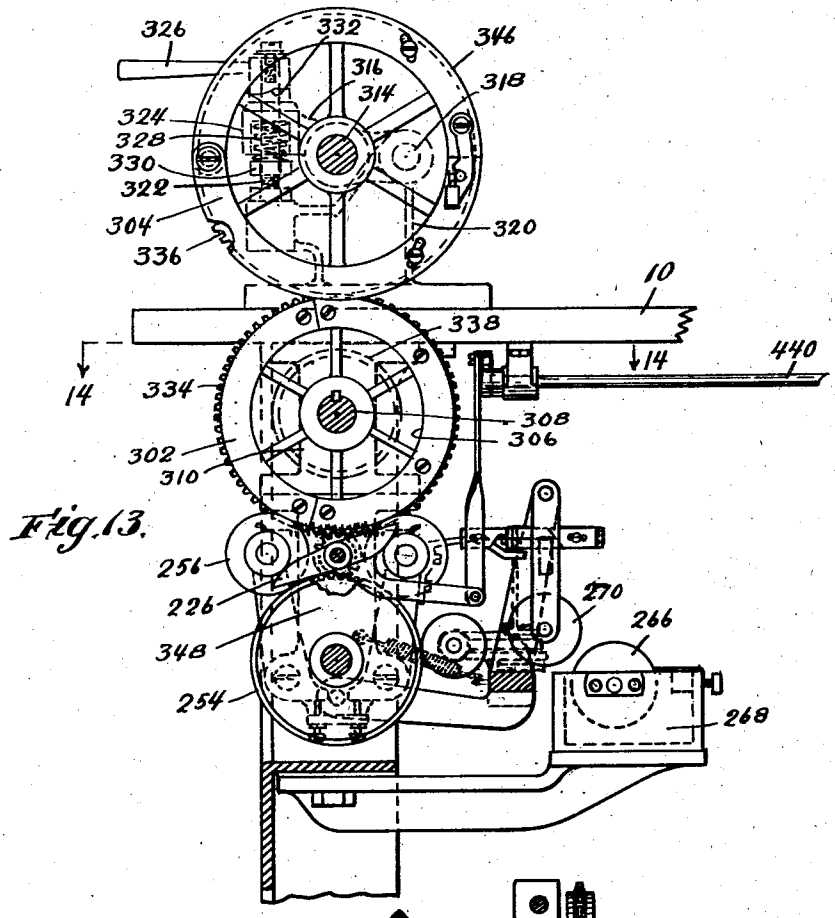


Fig. 13.

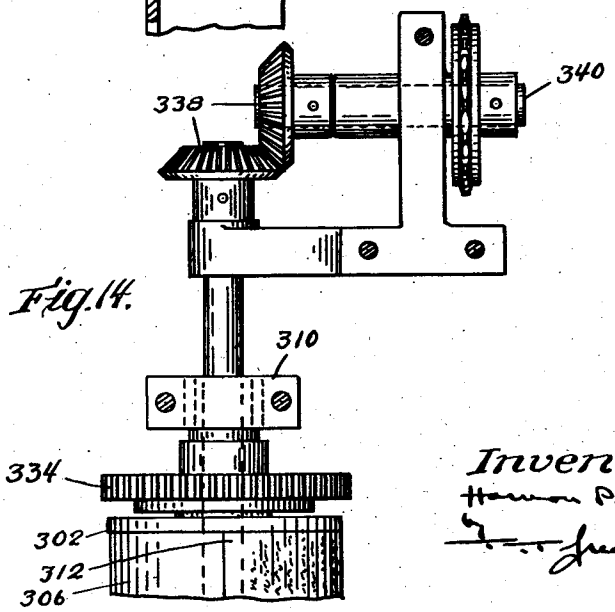


Fig. 14.

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Patented Dec. 25, 1934 1,985,247

UNITED STATES PATENT OFFICE

1,985,247

BILL PRINTING AND ADDRESSING MACHINE

Harmon P. Elliott, Watertown, Mass.

Application November 12, 1931, Serial No. 574,483

36 Claims. (Cl. 101—47)

This invention relates to a machine for printing and addressing public service and the like bills and is of the general type disclosed in my co-pending applications Serial No. 273,364, filed April 27, 1928, and Serial No. 574,482, filed November 12, 1931.

A public service bill, as a telephone bill, frequently consists of several connected sections. The bills have different addresses and the same printed matter; and the sections of the bill all have the same address. Certain of the sections are adapted to be detached from the remainder of the bill for business purposes. One of the sections of the bill may be longer than the other sections of the bill.

One of the objects of the present invention is an improved machine for printing and addressing such bills more rapidly than heretofore.

A further object of the invention is the provision of a bill printing and addressing machine having reciprocating addressing mechanism and rotary printing mechanism, wherein means is provided that acts to advance a bill sheet or web from which completed bills are subsequently severed in a continuous manner through both mechanisms, and wherein mechanism is provided that modifies or converts the continuous movement of the sheet into an intermittent advance of the sheet by steps of different lengths at the addressing mechanism, so that the reciprocating addressing mechanism can apply repetitions of the same address on the different sections of a bill, which sections may be of different lengths, so that the addresses are in registration with the printed common data.

Another object of the invention is the provision of rotary printing mechanism and reciprocating addressing mechanism wherein a continuously and uniformly rotating feed roll advances the paper sheet through both mechanisms and in a continuous and uniform manner through the printing mechanism and wherein the continuous movement of the paper web is converted, at the addressing mechanism, to an intermittent advance by steps that may be of different lengths.

The common printed data and addresses are on one face only a public service bill, as a telephone bill. It is frequently desirable to apply on the other or back face of the bill printed matter such as an explanation of the rates for service, or an advertisement or message of some form or another. Hence a further object of the invention is the provision of an improved form of bill printing and addressing machine wherein the back of each bill also contains printed data which is applied prior to the delivery of the completed bill from the machine and preferably prior to the severance of the bill from the long sheet or web.

In my prior application Serial No. 425,779, filed February 4, 1930. I have disclosed a bill printing and addressing mechanism also adapted to apply printed data to the back of each bill. The present invention includes an improved form of back-printing mechanism wherein the back-printing is accomplished by cooperating impression and platen rolls and wherein the platen roll also constitutes a blotting roll for the freshly inked front face of the bill.

It is a further object to have the platen and impression rolls rotating at slightly unequal angular speeds so that successively different surfaces of the blotting roll will be presented to the successive impressions of the printed data of successive bills, thereby to prevent the smudging of the front faces of the bills.

A still further object of the invention is generally to improve the construction and operation of bill printing and addressing machines.

Fig. 1 is a front elevation of a bill printing and addressing machine embodying the present invention.

Fig. 2 is a plan view of the machine of Fig. 1.

Fig. 3 is a diagrammatic sectional elevation of the machine of Fig. 1, taken along the length of the bill sheet and illustrating diagrammatically the several essential mechanisms of the machine.

Fig. 4 is a sectional view taken along line 4—4 of Fig. 1.

Fig. 5 is a sectional elevation of the front-printing mechanism taken along line 5—5 of Fig. 1.

Fig. 6 is a plan detail of the mechanism of Fig. 5.

Fig. 7 is an enlarged side elevation of the printing mechanism of Figs. 5 and 6, and also of the feed-converting mechanism.

Fig. 8 is a sectional elevation showing the feed-converting mechanism, taken along line 8—8 of Fig. 7.

Fig. 9 is a perspective detail of the feed-converting mechanism.

Fig. 10 is an elevation of the right hand end of the machine of Fig. 1, and illustrating particularly the sheet-guide and the take-off mechanism.

Fig. 11 is a plan detail of the take-off mechanism taken along line 11—11 of Fig. 10.

Fig. 12 is a sectional detail taken along line 12—12 of Fig. 1, and illustrating particularly the perforating or scoring mechanism.

Fig. 13 is an enlarged side elevation of the back-printing mechanism of Fig. 1.

Fig. 14 is a plan detail of the driving mechanism for the back-printing mechanism, taken along line 14—14 of Fig. 13.

Fig. 15 is a plan view of the front face of a bill that is a product of the machine.

Fig. 16 is a plan view of the back face of the bill of Fig. 15.

Fig. 17 is a side elevation of the severing knife.

The bill printing and addressing machine embodying the present invention comprises a flat horizontal table 10 which supports the major parts of the operative units of the machine and is, in itself, supported by a frame 12. The machine includes reciprocating addressing mechanism 14 for applying the same address *a* on each section *b* of a bill *c* (Fig. 15) and different addresses on different bills; perforating mechanism 16 for perforating or scoring the bill transversely of its length along a line or lines *d* between selected sections so that the sections can be detached; feed-converting means 18 which converts the continuous movement of the web into intermittent movement in such manner that the web stays stationary at times in the addressing mechanism and in such position that the addresses are printed on the different sections in accurate registration with the subsequently-applied printed data thereon; front-printing mechanism 20 which prints the common data *e* on the front face of the bills in register with the addresses thereon and also advances the web in a continuous manner; back-printing mechanism 22 which prints the same data *f* on the back face of each bill; severing mechanism 24 which severs the successive completed bills from the web; and a tray 26 in which the successive bills accumulate in superimposed order.

The various operative elements of the machine are driven by a power mechanism 28 that is of a well known type and is located on the base of the machine. Said mechanism includes a continuously rotatable motor-driven shaft 30 and a slower speed shaft 32 the rotation of which is controlled through suitable control mechanism 34. Said shaft 32 is positively connected through sprockets and a chain 36 with a short shaft 38 that is journalled beneath the table in a bracket 40. Said shaft 38 through sprockets 42 and 44 and a driving chain 46, see Figs. 1, 2 and 4, is in positive driving relation with an operating and timing shaft 48 which is located at the rear of the table and is journalled in lengthwise relation thereof in upstanding pedestals 50. Said shaft 48 makes one complete rotation for each complete bill and operates all of the essential elements of the machine, except the printing roll and platen of the addressing mechanism, in timed relation with each other as will presently appear.

The shaft 38 through sprockets 52 and 54 and a driving chain 56 is in positive driving connection with a shaft 58. Said shaft is journalled in pedestals 60 carried by the table and is disposed beneath and parallel with the shaft 48. Said shaft 58 makes as many complete revolutions per bill as there are sections in the bill. The particular machine herein described is designed to make a bill having four sections. Hence the shaft 58 makes four complete revolutions per bill.

The paper from which the bills are made is in the form of a web 62 contained in a roll 64 located beneath and at one end of the table and supported in brackets 66. A spring-urged brake shoe 68 is in continuous frictional engagement with the periphery of the roll to prevent the roll from unrolling at a greater rate than paper is withdrawn therefrom. The paper web is withdrawn from the roll in a continuous, although uninterrupted, manner and at a rate which is slightly, although definitely, greater than the rate of advance of the web through the printing mechanism so that the web forms into a loop 70, from which loop the web is drawn by the web-advancing mechanism without effort. The web withdrawing or take-off mechanism, see Figs. 1, 10 and 11, comprises a driving roll 72 which is connected through gears 74 with a shaft 76, which shaft is positively driven from the shaft 58 by sprockets and a chain 78. The paper web is pressed onto the periphery of the driving roll 72 by an idler roll 80 which is carried at the ends of arms 82 pivoted on a shaft 84. A lever 86 is pivoted concentrically with the roll 72 and has a pin 88 which, when the lever 86 is moved to the right, Fig. 1, can raise said arms 82 and thereby raise the roll 80 and arrest the driving of the web. The free end of the lever 86 is located above the table within convenient access of the operative who is intended to operate the lever and thus momentarily to arrest the feeding of the web when the loop becomes too long. The web 62 passes upwardly from the loop and over the vertical wall of a web guide 90. An electrical contact member 92 rides upon the web and upon exhaustion or breakage of the web makes contact with the wall of the guide and thereby completes an electric circuit that not only sounds an alarm but stops the machine. An idler roll 94 is supported on the shaft 84 between the flanges 96 of the feed roll 72 to keep the web in position on the driving roll. The web passes upwardly from the guide 90 and over a horizontal idler roll 98 and thence horizontally from one end to the other of the machine and in succession to the various mechanisms. The position of the web with respect to the mechanisms is determined by a plurality of web guides 100, 102, 104 and 106, see Figs. 1 and 2. Said web guides are in general similarly constructed and are provided with flat bottom walls and upstanding side walls and have laterally extending ears 108 which are provided with elongated slots through which screws 110 pass, by which the guides can be secured in suitably adjusted and aligned positions transversely of the table.

The addressing mechanism 14 comprises a stencil holder 112 adapted to contain a superimposed pile of stencils the successive lowermost ones of which are moved in successive order by a pusher 114, see Figs. 1 and 2, out of the holder and into and along a pair of parallel stencil tracks or guide ways 116 and into and out of an addressing position. The stencils from the track are delivered from the printing position into an elevating mechanism 118 of the general type described in the Sterling Elliott Patent No. 1,210,440. Said elevating mechanism delivers stencils in successive order in a pile in the stencil receiver 120. The addressing mechanism includes an inked printing roll 122, see especially Fig. 4, which is located above the stencil track and journalled to arms 124 of a frame pivoted to the shaft 126. A platen 128 is located beneath the web 62 and the stencil track is carried by pivoted arms 130. The platen is reciprocated toward and away from the stencil track by means including a lever 132 that is pivoted on a shaft 134 and has an upwardly directed extension provided with

a cam face 136 that raises and lowers the platen. The lever 132 is connected by a pivoted link 138 with an arm 140 of the printing roll supporting frame so that the reciprocation of said lever 132 causes the platen and the printing roll to move toward and away from each other. The lever 132 is reciprocated by an eccentric 142 which is fixed to the shaft 58 and engages an eccentric strap 144 that is pivotally connected with the lower end of said lever 132. Thus the printing roll and platen make one complete operation for each complete rotation of the shaft 52 and thus print the address of a stencil contained in the stencil track upon the front face of the web. The web is advanced following each addressing operation. The same stencil, however, remains in position until as many addressing operations have been made thereon as there are sections in the bill. For a four section bill, as here shown, there will be four addressing operations. The stencil is then advanced out of printing position and replaced by a different stencil.

The mechanism for reciprocating the pusher 114 includes a link 146, see especially Fig. 2, which link is pivotally connected to the forward end of a reciprocating lever 148 which is pivoted intermediate its end on a vertical pin 150 carried by the table. The rear end of the pin is provided with an upstanding roll 152 which operates in the groove 154 of a cylindrical cam 156 fixed to the shaft 48. Since the shaft 48 makes one complete revolution per bill the pusher is reciprocated but once per bill. The shape of the cam groove 154 is such that the pusher is reciprocated to deliver a new stencil into addressing position between addressing movements of the printing roll and platen.

The printing roll 122 is supplied with ink through suitable inking mechanism 158 which can be of any suitable type and need not be further described except to state that it includes an axially reciprocable shaft 160 which carries an axially reciprocable ink distributing roll 162. Said shaft 160 is driven through a belt 164 and a shaft 166, see Figs. 1 and 4, located beneath the table and operated by a belt 168 from the continuously rotating shaft 30.

The addressed web advances in an intermittent or step by step manner from the addressing mechanism to the scoring mechanism 16. Said mechanism includes an arm 170, see Figs. 1, 2 and 12, which is pivoted intermediate its ends to a bracket 172 and at its forward end carries a perforating or scoring knife 174 which extends transversely of the web and is provided with a series of teeth at its lower face. The web passes through a block 176 and over a slotted plate 178 at the bottom thereof, the slot of which receives the teeth of the scoring blade that passes through the web. The rear end of the arm 170 is provided with a roll 180 which cooperates with a circular cam disc 182 fixed to the shaft 48. The cam disc has a notch 148 into which the roll falls to permit the lever to be depressed to score the paper. The particular bill that is a product of the present machine is scored only between two of the four sections and hence the scoring mechanism operates but once for each bill. It is apparent, however, that there will be as many notches in the cam disc 182 as there are lines of scoring in each bill and that the notches will be peripherally spaced in proportion to the lengths of the sections between the score lines. The roll 180 is maintained in engagement with the cam disc by means of a coil spring 186 that is carried by a block 188. One end of the spring bears against the front or free end of the lever 170 and the other end bears against a bolt 190 that is screw-threaded in said block and by which the tension of the spring can be adjusted.

The web advances from the scoring mechanism 16 through the feed-converting or web stopping and positioning means 18, which will be hereinafter described, and thence to the front-printing mechanism 20 which prints data *e*, Fig. 15, common to all of the bills on the front faces thereof in registration with the addresses. Said printing mechanism 20 is illustrated more particularly in Figs. 1, 5, 6 and 7, and includes an upper electrotype or impression roll 192 and a lower cooperating platen roll 194. Said impression roll 192 comprises a cylindrical drum 196 which is fixed to a shaft 198 journalled in and between brackets 200. Said shaft 198 has a clutch sleeve 202 fixed for conjoint rotation with but slidable on said shaft and is constantly urged by a spring 204 in a direction to locate a driving pin 206 of said sleeve in a recess 208 of a gear 210. Said gear 210 is carried by and is rotatably loose on said shaft 198 and is driven by a gear 212 of the same pitch diameter fixed to the shaft 48. The clutch sleeve 202 can be disengaged from the gear by movement of a control lever 214. The clutch sleeve is normally held engaged with the gear 210 by the aforesaid spring but is adapted to be disengaged therefrom during the setting up of the printing mechanism. There is but one pin 206 and one recess 208 so that the impression roll, when in driving engagement with the shaft 48, is always in a predetermined relation with the other elements of the machine. When the clutch is disengaged the shaft and the impression roll can be rotated manually by a hand wheel 216. Irregular rotation of the impression roll, due to the back-lash of the gears and the like, is prevented by a small amount of frictional restraint on the roll applied by a brake shoe 218, see Figs. 1 and 5, which engages a brake drum 220 formed integrally with the hand wheel. The brake shoe is pivoted intermediate its ends and the pressure of the shoe can be adjusted by a thumb screw 222.

The periphery of the drum 196 of the impression roll is provided with a plurality of segments 224 which completely surround the drum, the number of segments corresponding to the number of sections of a bill and the lengths of the segments each corresponding with the length of a different section of a bill. The segments are secured removably to the drum by suitable means as screws 226 and each section carries electrotype plates 227 for printing, on the bill sections, the data common to all of the bills. The electrotype plates are retained removably in position on the segments by means including the detachable segmental end plates 228. The segments intermediate the ends have outstanding flanges which cooperate to provide a peripherally continuous flange 230 which is in continuous uninterrupted driving engagement with the web and presses the web between it and the platen roll.

The platen roll comprises a drum having a smooth periphery and is rotatable on a shaft 232 fixed to eccentric bushings 234 which are rotatable in depending extensions of the brackets 200. The bushing can be rotated into any desired position in the brackets by a hand wheel 236 on the shaft so that the platen can be raised and lowered into and out of pressure engagement with the impression roll. The front eccentric bushing is provided with a flange 238 angularly-adjustably

secured thereto and having a notch therein in which a spring pressed pin 240 can enter to determine and hold the platen roll in proper elevated and pressure engagement with the impression roll. The impression and platen rolls are in positive driving engagement through gears 242 and 244 by which both rolls are rotated at the same peripheral speed. The periphery of the platen roll is provided with an apron 245 of relatively hard but resilient material as rubber so that it can yield sufficiently to permit all the type characters of the impression roll to make good printing contact with the bill-sheet. The use of this apron has been found to eliminate the tedious work of leveling the surface of the platen roll formerly necessary to obtain a uniform impression of the type characters of the impression roll. The use of the resilient apron also permits the platen roll to have a different diameter than that of the impression roll so that the same area of the apron does not come opposite the same type characters of the impression roll during successive rotations of said latter roll, thereby ensuring a long life to the apron. As herein constructed, the platen roll has a slightly greater diameter than the impression roll and the gear 244 of the platen roll has one tooth more than the number of teeth of the gear 242 of the impression roll so that, while the surface speeds of the two rolls are the same, the angular velocities are different, and the same corresponding surface areas do not come into registration for successive bills. The ratios of gear teeth of the two gears are adapted to be odd so that the same corresponding surface areas will come into registration infrequently.

The inking mechanism for the impression roll 192 includes a pair of upstanding brackets 246 which are disposed above the brackets 200 that support the impression roll and are carried on a frame 248. Said frame is pivoted at 250 to the forward ends of the aforesaid brackets 200 and is adapted to be swung in a counterclockwise direction about said pivotal connection and to reset upon posts 252, see especially Fig. 1, in such position that the impression roll is accessible for the purpose of changing the type characters and especially the date characters without the necessity of taking the roll out of place. An ink roll 254 is carried by and is journalled between said brackets and supplies ink to a pair of rolls 256 which are located between the ink and the impression rolls and are adapted to be in continuous rolling engagement with both while the machine is in operation, whereby to transfer ink to the type characters of the impression roll. The rolls 256 are provided with peripheral grooves 258, see especially Fig. 6, in which the web driving flange 230 is located so as to preserve the face of said flange free from ink. The rolls 256 are journalled on shafts 260 which are fixed to the lower ends of arms 262 which are pivoted at 264 on opposite sides of the brackets 246 so that said rolls 256 can be swung outwardly and into positions where they are free from engagement from both the ink and the impression rolls when the machine is stationary. The ink roll 254 receives ink from a continuously-rotating fountain roll 266 that rotates in an ink reservoir 268 and is rotated from the shaft 48. A swinging roll 270 swings between the fountain roll and a reciprocating distributing roll 272 which is mounted on a bracket 274 that is pivoted at 276 to the brackets 246. Said frame is urged by springs 277 in such direction that the roll 272 is maintained in constant engagement with the ink roll 254. The swinging roll 270 is journalled on a shaft 278 which is fixed to upstanding arms 280 that are connected by a transverse bar 282 and are pivoted, above said bar, to upstanding arms 284 of the brackets 274. Said roll 272 is reciprocated by mechanism that includes the reciprocating means for the roll 272. Said latter roll is reciprocated by means of a worm gear 286, see Fig. 6, that is fixed to the shaft of said roll and rotated therewith and also rotates a worm 288 that is journalled to a sliding frame 290 and is pivoted at one end to a connecting rod 292, the other end of which is pivoted to the frame 274. This is a well known construction for reciprocating the roll 272. As said roll reciprocates, the connecting rod 292 is oscillated; and the oscillations of said connecting rod are utilized to swing the transfer roll 270 back and forth. To this end the connecting rod is provided with an upstanding arm 294 that is pivoted to one end of a bar 296, the free end of which is disposed above the cross bar 282 of the transfer roll frame and has cam blocks 298 adjustably fixed thereto on opposite sides of said transverse bar. The oscillatory movement of the connecting rod causes the bar 296 to reciprocate and thereby moves the cam blocks alternately into engagement with the frame of the transfer roll and thereby moves the roll alternately into engagement with the fountain roll 266 and the distributing roll 272. When the transfer roll is in engagement with one or the other of the aforesaid rolls, the bar 296, upon further movement thereof in the same direction, rises upwardly due to the inclined cam face of one or the other of the cam blocks riding upon the transverse bar 282. The bar 296 is supported in the aforesaid position upon a rod 300 which is fixed to and is carried by one of the arms 262 that supports an ink roll 256. The arrangement is such that as said ink rolls are swung outwardly away from operative relation the roll 300 is rotated counterclockwise sufficiently to raise the bar 296 away from cooperative relation with the frame of the transfer roll so that said roll hangs vertically between and free from engagement with its cooperating rolls.

The ink roll 254 is driven at the peripheral speed of the impression roll by an idler gear 255 that is journalled on a shaft 257 and meshes with the gear 244 of the impression roll and also with a gear 259 fixed to said ink roll.

The paper web is advanced in a continuous and uniform manner from the cooperating impression and platen rolls and is completely printed and addressed on its front face. It then advances, under the urge of said rolls, along the guide 104 to the back-printing mechanism 22 where data *f*, Fig. 16, that is common to all of the bills is printed on the back face thereof and preferably on the back face of the first one or two sections of the bill, or that portion of the bill that is sent to the customer. The back-printing mechanism, see especially Figs. 1, 2, 13 and 14, comprises an electrotype-carrying or impression roll 302 which is disposed below the path of movement of the paper web, and a cooperating upper platen roll 304. The impression roll comprises a cylindrical drum 306 that is fixed to a shaft 308 journalled in depending brackets 310 carried by the table 10. The impression roll is constructed in general like the previously-described impression roll 192 and has one or more sectors 312 fixed to the periphery of the drum 306, which sectors carry suitable type characters contained preferably on electro-

type plates. The type characters, however, do not extend completely around the periphery of the impression roll but have a combined peripheral length that ordinarily will not be greater than the length of one or two sections of the bill. Hence the impression and platen rolls will only be in pressure engagement for the length of the type matter on the impression roll and at other times will be free from engagement. The paper web is introduced between the impression and platen rolls preferably at the time there is a space between the rolls so that the paper can advance independently of said rolls. When the type comes into engagement with the web, the web is driven by the impression roll until the type again leaves the web, whereupon the web advances under the urge of the front-printing impression roll. The overall diameter of the type face of the impression roll 302 is slightly, although definitely, smaller than the diameter of the web driving flange 230 of the impression roll 192 so that the rate of advance of the web by the impression roll 302 is slightly less than the rate of advance of the web by the impression roll 192. Hence there is no tendency for the web to break at times when both impression rolls are in engagement with the web. At such times a small loop forms between the rolls, which loop flattens out when the back-printing roll moves out of driving engagement with the web. The platen roll 304 consists of a drum fixed to a shaft 314 journalled in arms 316 pivoted at 318 to upstanding brackets 320 carried by the table above the brackets for the cooperating impression roll. The platen roll is adapted to be moved upwardly and out of pressure relation with the electrotype roll when the machine is idle. To this end upstanding rods 322 are fixed to the brackets 320 and pass through bosses 324 of said arms 316 and have handles 326 journalled thereon. Springs 328 are located in recesses of said bosses and bear against nuts 330 threaded on said rods and act to urge said platen roll upwardly and against the handles 326. The handles and the upper ends of said bosses are provided with cooperating cam faces 332 which, in the position shown in Figs. 2 and 13, permit the springs 328 to elevate the platen roll into and out-of-use position and which, when the handles are rotated 90° from this position, hold the platen roll in a lowered and working position. The platen and impression rolls are geared together by intermeshing gears 334 and 336 fixed to the shafts 308 and 314 respectively. The electrotype roll 302 is driven through gears 338 from a short shaft 340, which is driven through sprockets and a chain 342 from the shaft 48. The gearing ratios are such that the impression roll 302 and the shaft 48 rotate at the same angular velocity.

The platen roll 304 also constitutes a blotting roll against which the freshly inked front face of the web makes contact. To this end the periphery of the platen roll is covered with a sheet 344 of blotting paper which is held removably on the periphery of the roll by the locked flanges 346 in a more or less usual manner. The platen roll 304 is preferably of definitely larger diameter than the cooperating impression roll and, as here shown, is considerably greater in diameter. While the gears 334 and 336 constrain the two rolls to rotate at the same surface speed, the angular velocities of the rolls are different, the gear 336 having more teeth than the gear 334, so that the same corresponding peripheral areas of the rolls do not come in opposition at each rotation of the impression roll. The ratio of teeth of the two gears preferably is odd so that the corresponding areas are infrequently in register. Hence successive impressions of the same set of printed data on successive bills are offset or are out of registration on the blotting surface so that about all of the peripheral extent of the blotting surface is available to receive ink and can be used for a long time before it is sufficiently charged with ink or worn to necessitate renewal.

The type characters of the impression roll 302 receive ink by an inking mechanism 348 which is essentially the same as the inking mechanism for the front-printing roll and need not be further described.

The completely printed and addressed web passes from the back-printing mechanism to the severing mechanism 24 from which the bills fall in superimposed order and into the tray 26. The severing mechanism 24 comprises a plate 350 fixed to the left hand end of the table and having a knife blade 352 secured thereto. A lever 354 is pivoted to said plate 350 and has a cooperating knife blade 356 at its free end. Said lever at its rear end carries a roll 358 which is held in rolling engagement with a cam disc 360 fixed to the shaft 48 by a tensile spring 362 connected with the front end of the lever. The cam disc 360 has a notch 364 therein into which the roll momentarily moves to permit the spring 362 to actuate the lever and shear off the end bill from the web. The bottom of the notch is provided with a resilient bumper 366 to absorb the movement of the lever so that it operates quietly. The severing mechanism is arranged to make one operation for each bill and to sever the web between successive bills.

The web is advanced in a continuous uniform manner by the front-printing impression and platen rolls 192 and 194 respectively at such a rate that one bill length passes from the front-printing mechanism and the addressing mechanism at the same time. Since, however, the addressing mechanism has reciprocating addressing elements which necessitate the web being stationary at the time the reciprocating elements are in operation and, since the sections of the bills are herein of unequal length, mechanism 18 is herein provided to convert the continuous advance of the web, under the action of the front-printing mechanism, into an intermittent advance by steps of unequal length in the addressing mechanism, so that the addresses and the printed data on all bills will be in constant registration with each other. Said feed converting mechanism 18 is illustrated particularly in Figs. 1, 6, 7, 8 and 9. Said mechanism comprises standards 368 which are disposed on opposite sides of the path of movement of the web and have vertical guide ways 370 in which bars 372 are slidable. A shaft 374 connects the lower ends of said bars and a web engaging roll 376 is journalled thereon. The standards 368 have idler rolls 378 and 380 journalled therebetween and the web is caused to pass under said idler rolls and over the roll 376. The roll 376 and the slide bars 372 are raised and lowered to control the movement of the paper web in the desired manner through the addressing mechanism 14. The vertical movements of the roll 376 are effected by a frame comprising a shaft 382 that is extended between and is pivoted to arms of the brackets 368 and is fixed to parallel arms 384. Said arms have slots 386 in the ends thereof in which are located rolls 388 loose on a rod 390 that is extended between and connects the upper

ends of the slide bars 372. Thus by reciprocating said arms 384 the roll 376 is moved vertically. An arm 392 is journalled loosely on the shaft 382 and overlies the rear arm 384 and is adapted to be fixed thereto in any one of various angularly adjusted positions by means of a screw 394 which is screw-threaded in an arm 384 and extends loosely through an arcuate slot 396 in said arm 392. Said arm 392 carries an outstanding stud 398 on which a cam roll 400 is rotatably supported. The roll 400 is engaged by a cam 402 which is fixed to a shaft 404 that is rotated through gears 406 by the operating shaft 48 and at the angular speed of said shaft. Said cam 402 is provided with as many lobes as there are addressed sections of the bill. Since the present machine is designed for making a four section bill the cam 402 has four lobes 408. The shape of the cam is such that the roll 376 is elevated by such successive amounts as to deflect the web laterally of its length between the rolls 378 and 380, and to alter the length of the path of travel of the web, and thereby draw such amounts of paper through the addressing machine that, added to the amount advanced by the front-printing mechanism 20 during such movements, the requisite amount of paper for the successive sections is drawn into the addressing mechanism. The shape of the cam is also such that after the requisite amount of paper has been drawn through the addressing mechanism for each section, the roll 376 is lowered at a speed that is at least equal to the rate at which paper is withdrawn from the deflected portion of the web between the rolls 378, 380 and 376 by the front-printing mechanism 20 so that the web in the addressing mechanism is stationary during the operation of the reciprocating addressing elements of said mechanism. The amount of throw or lift of the lobes 408 of the cam are different for bill sections of different lengths and are so arranged that the roll 376 is operated to move a greater amount of the web through the addressing mechanism for a long bill section than for a short bill section. Consequently, while the front-printing mechanism 20 advances the paper web in a continuous manner, the continuous movement of the web is converted into an intermittent advance by steps of different lengths and the web is held stationary momentarily in the addressing mechanism.

One of the cam lobes 408 has a retreating arcuate face 409 that is so shaped that the roll 376 is caused to be lowered just fast enough to hold the web stationary between the roll and the addressing mechanism, but without permitting any harmful amount of slack web over said roll 376. At such time the scoring mechanism is intended to operate to score the web between two successive bill sections. The other lobes of the cam can be similarly shaped although it is not necessary as the slack will not back up into the addressing mechanism.

The angular relation between the arms 392 and the reciprocating frame for the roll 376 is adapted to be adjusted upon need to vary the initial length of paper between the addressing mechanism and the front-printing mechanism for the purpose of initially adjusting registration between the addresses and the printed data applied to the web by said mechanisms.

The machine is started and stopped by a control shaft 410 rotatably supported beneath the table at the front end thereof and having a plurality of upstanding fingers 412 which extend through the table at suitable locations by which the shaft can be oscillated for starting and stopping the power mechanism 28. The shaft 410 is connected with the starting and stopping mechanism 34 of the power mechanism through a link 414. Said shaft is also operated to stop the machine by a solenoid 416 the plunger of which is connected to the shaft by a link 418. The solenoid is energized by the closing of the break detector contact 92. Rotation of the shaft 410 into a mechanism-stopping position also automatically effects the movement of the ink rolls 256 of the front-printing mechanism 20 out of engagement with the impression roll 196 and the ink roll 254. The mechanism for effecting this operation is illustrated especially in Figs. 1 and 7. The aforesaid link 414 has a bar 420 fixed thereto and extended upwardly through the table and terminated under but free from positive connection with, an arm 422 that is loosely rotatable on the shaft 257 and fixed to a cam 426. The cam extends in opposite directions and is adapted to engage rolls 428 on the rods 260 that support the swinging ink rolls 256, whereby to spread the rolls apart and out of engagement with the co-operating ink and impression rolls. Similar mechanism, not necessarily described, is provided for the inking mechanism 348 of the impression roll 302 of the back-printing mechanism 22.

I claim:

1. A bill printing and addressing machine having addressing mechanism for printing repetitions of the same address on different sections of the same bill and different addresses on different bills, some of the sections being of different length, printing mechanism for printing the same data on different bills, means for advancing a bill sheet through both mechanisms and in a continuous manner through said printing mechanism, and means dependent upon the advancing movement of the sheet for converting the continuous advance of the sheet into intermittent advances of different lengths at said addressing mechanism.

2. A bill printing and addressing machine having addressing mechanism for printing repetitions of the same address on different sections of the same bill and different addresses on different bills, some of the sections being of different length, printing mechanism for printing the same data on different bills, means including continuously rotating rolls associated with said printing mechanism which are in constant engagement with a bill-sheet for advancing the sheet through both mechanisms and in a continuous manner through said printing mechanism, and means dependent upon the advancing movement of the web for converting the continuous advance of the sheet into intermittent advances of different lengths at said addressing mechanism.

3. A bill printing and addressing machine having addressing mechanism for printing repetitions of the same address on different sections of the same bill and different addresses on different bills, some of the sections being of different length, printing mechanism for printing the same data on different bills, including continuously rotating impression and platen rolls which also constitute means for advancing a bill sheet in a continuous manner, and means dependent upon the advancing movement of the sheet for converting said continuous advance of the sheet into intermittent advances of different length at said addressing mechanism.

4. A bill printing and addressing machine having reciprocating addressing mechanism for

printing repetitions of the same address on different sections of the same bill, and different addresses on different bills at times when the bills are stationary in said mechanism, rotary printing mechanism for printing the same data on the moving bills, and mechanism for advancing a bill sheet through both addressing and printing mechanisms including means which acts to advance the sheet in a continuous manner and means dependent upon the advancing movement of the sheet for converting the continuous advance of the sheet into an intermittent advance at said addressing mechanism.

5. A bill printing and addressing machine having addressing mechanism for printing repetitions of the same address on different sections of the same bill and different addresses on different bills, some of the sections being of different length, printing mechanism for printing the same data on different bills, mechanism which acts to advance a bill sheet in a continuous manner through both said addressing and said printing mechanisms, and means dependent upon the advancing movement of the sheet which converts the continuous advance of the sheet into intermittent advances of different lengths at said addressing mechanism.

6. A bill printing and addressing machine having addressing mechanism for printing repetitions of the same address on different sections of the same bill and different addresses on different bills, some of the sections being of different length, printing mechanism for printing the same data on different bills including constantly-rotating feed-rolls which act to advance a bill sheet in a continuous manner through both said addressing and said printing mechanisms, and means dependent upon the advancing movement of the sheet which converts the continuous advance of the sheet into intermittent advances of different lengths at said addressing mechanism.

7. A bill printing and addressing machine having addressing mechanism for printing repetitions of the same address on different sections of the same bill and different addresses on different bills, some of the sections being of different length, printing mechanism for printing the same data on different bills, including continuously-rotating co-acting impression and platen rolls which also include means for advancing a bill-sheet in a continuous manner through both said addressing and said printing mechanisms, and means dependent upon the advancing movement of the sheet which converts the continuous movement of the sheet into intermittent movements of different lengths at said addressing mechanism.

8. A bill printing and addressing machine having addressing mechanism for printing repetitions of the same address on different sections of the same bill and different addresses on different bills, some of the sections being of different length, printing mechanism for printing the same data on different bills, including continuously-rotating co-acting impression and platen rolls which also include means for advancing a bill sheet in a continuous manner through both said addressing and said printing mechanisms, and means dependent upon the advancing movement of the sheet and located between said rolls and said addressing mechanism for converting said continuous advance of the sheet into intermittent advances at said addressing mechanism.

9. A bill printing and addressing machine having addressing mechanism for printing repetitions of the same address on different sections of the same bill and different addresses on different bills, some of the sections being of different length, printing mechanism for printing the same data on different bills, means which acts to advance a bill sheet in a continuous manner through both said addressing and said printing mechanisms, and means dependent upon the advancing movement of the sheet and located between said advancing means and said addressing mechanisms for converting said continuous advance of the sheet into intermittent advances of different lengths at said addressing mechanism.

10. A bill printing and addressing machine having addressing mechanism, printing mechanism including means which acts to drive the sheet continuously to advance it through both mechanisms, and means dependent upon the advancing movement of the sheet which converts the continuous advance of the sheet into an intermittent advance at one of said mechanisms.

11. A bill printing and addressing machine having reciprocating addressing mechanism, rotary printing mechanism including means which acts to drive the sheet continuously to advance it through both mechanisms, and means dependent upon the advancing movement of the sheet which converts the continuous advance of the sheet into an intermittent advance at said addressing mechanism.

12. A bill printing and addressing machine having reciprocating addressing mechanism, rotary printing mechanism including continuously-rotating co-acting impression and platen rolls which also include means which acts to advance a sheet in a continuous manner through both mechanisms, and means dependent upon the advancing movement of the sheet for converting the continuous advance of the sheet into an intermittent advance at said addressing mechanism.

13. A bill printing and addressing machine having reciprocating addressing mechanism, rotary printing mechanism including continuously-rotating co-acting impression and platen rolls which also include means which acts to advance a sheet in a continuous manner through both mechanisms, and means dependent upon the advancing movement of the sheet and located between said rolls and said addressing mechanism for converting the continuous advance of the sheet into an intermittent advance at said addressing mechanism.

14. A bill printing and addressing machine having reciprocating addressing mechanism, printing mechanism including continuously rotatable rolls which act to advance a sheet in a continuous manner through both mechanisms, and means dependent upon the advancing movement of the sheet and located between said rolls and said addressing mechanism which converts said continuous advance of the sheet into an intermittent advance at said addressing mechanism.

15. In a bill printing and addressing machine, addressing mechanism, printing means which acts to advance a sheet in a continuous manner through said mechanism, and means dependent upon the advancing movement of the sheet which converts the continuous advance of the sheet into an intermittent advance by steps of unequal length at said mechanism.

16. In a bill printing and addressing machine, addressing mechanism, printing means including a pair of continuously-rotating co-acting printing rolls which act to advance a sheet in a continuous manner through said mechanism, and means dependent upon the advancing move-

ment of the sheet for converting the continuous advance of the sheet into an intermittent advance by steps of unequal length.

17. In a bill printing and addressing machine, addressing mechanism, printing means including a pair of continuously-rotating co-acting rolls which act to advance a sheet in a continuous manner through said mechanism, and means dependent upon the advancing movement of the sheet for converting the continuous advance of the sheet into an intermittent advance by steps of unequal length.

18. In a bill printing and addressing machine, addressing mechanism, printing means which acts to advance a sheet in a continuous manner through said mechanism, and mechanism dependent upon the advancing movement of the sheet for converting the continuous advance of the sheet into an intermittent advance including means defining a path of travel for the sheet, and means for changing the length of said path of travel.

19. In a bill printing and addressing machine, addressing mechanism, means located beyond said addressing mechanism which drives a sheet in a continuous manner for advancing it through said addressing mechanism, and means located between said driving means and said addressing mechanism, for at times adding to and at other times subtracting from the speed of the sheet in such manner that the rate of advance of the sheet through said addressing mechanism is at times greater than the rate of advance of the sheet by said driving means and at other times the sheet is stationary in said addressing mechanism.

20. A bill printing and addressing machine comprising mechanism for printing repetitions of the same address on different sections of the same bill and different addresses on different bills, printing mechanism for printing the same data on different bills, means which acts in a continuous manner on a sheet to advance it through both mechanisms, and means for converting the continuous advance of the sheet into an intermittent advance through said addressing mechanism including means defining a path of travel for the sheet between said mechanisms, and means which changes the length of such path of travel in such manner that the rate of advance of the sheet through said addressing mechanism is at times greater than its rate of advance by said advancing means and that at other times the sheet is stationary in said addressing mechanism.

21. A bill printing and addressing machine comprising mechanism for printing repetitions of the same address on different sections of the same bill and different addresses on different bills, printing mechanism for printing the same data on different bills, means which acts to advance a sheet through both mechanisms, in a continuous uniform manner, and means having a part which at times engages and moves the sheet sideways and modifies the continuous uniform advance of the sheet so that at times the sheet moves faster through, and at other times is stationary in, said addressing mechanism.

22. In a bill printing and addressing machine, printing mechanism, addressing mechanism, means which acts to advance a sheet in a continuous manner through both mechanisms, and reciprocating means located between said advancing means and said addressing mechanism which acts on the sheet transversely of its length to deflect a portion of it and thereafter to release the deflected portion, so that the advancing means draws from the deflected portion of the sheet prior to moving that portion of the sheet that is between the deflected portion and said addressing mechanism.

23. In a bill printing and addressing machine, addressing mechanism for printing repetitions of the same address on successive sections of a bill and different addresses on different bills, some of the bill sections being of different lengths, printing mechanism for printing the same data on different bills, means which acts to advance a bill sheet in a continuous manner to move it through both mechanisms, and reciprocating means located between said advancing means and said addressing mechanism which is engageable with and is movable transversely of the length of the sheet to deflect a portion of it sideways by different amounts and thence to release the deflected portion, so that said advancing means is constrained to draw from the deflected portion of the sheet prior to moving that portion of the sheet that is between the deflected portion and said addressing mechanism, whereby the sheet is moved intermittently by steps of different lengths through said addressing mechanism.

24. In a bill printing and addressing machine, reciprocating addressing mechanism, rotary printing mechanism including continuously-rotating co-acting impression and platen rolls which also include means for advancing a sheet through both mechanisms, and means for converting the continuous advance of the sheet to an intermittent advance in said addressing mechanism including a member located under the sheet between said mechanisms, and means for reciprocating said member against and transversely of the sheet to deflect a portion of the sheet laterally and for moving said member away from said deflected portion of the sheet at least as rapidly as said deflected portion diminishes so that the sheet at times is stationary in said addressing machine.

25. In a bill printing and addressing machine, reciprocating addressing mechanism for printing the same address on different sections of a bill and different addresses on different bills, the bills having sections of different lengths, printing mechanism for printing the same data on different bills, means for advancing a sheet in a continuous manner to move it through both mechanisms, and means dependent upon the advancing movement of the sheet for converting the continuous advance of the sheet into an intermittent advance by steps of different length in said addressing mechanism including a member located beneath the sheet between said advancing means and said addressing mechanism, and means for reciprocating said member different amounts against and transversely of the sheet to deflect a portion of the sheet laterally different amounts so that the sheet is advanced by steps of different lengths in said addressing mechanism, said reciprocating mechanism also moving said member away from the deflected portion of the sheet at least as rapidly as said deflected portion diminishes so that the sheet is moved intermittently different amounts in said addressing mechanism.

26. In a printing and addressing machine, addressing mechanism, means including a pair of continuously-rotating feed rolls which act to advance a sheet in a continuous manner to move it through said addressing mechanism, and means

dependent upon the advancing movement of the sheet for converting the continuous advance of the sheet into an intermittent advance by steps of different length in said addressing mechanism including a member which is located beneath the sheet between said feed rolls and addressing mechanism, means for reciprocating said member against and transversely of the sheet by different amounts whereby to deflect the sheet laterally of different amounts, said reciprocating mechanism also moving said member away from the deflected portion at least as rapidly as said portion diminishes by the action of said feed rolls so that the paper is moved intermittently different amounts in said addressing mechanism.

27. In a printing and addressing machine, addressing mechanism, means including a pair of continuously-rotating rolls which act to advance a sheet in a continuous manner to move it through said addressing mechanism, and means for converting the continuous advance of the sheet into an intermittent advance in said addressing mechanism including a pair of idler rolls located above the sheet between said sheet-advancing rolls and said addressing mechanism, a sheet-deflecting roll located under the sheet between said idler rolls, and means for reciprocating said sheet-deflecting roll transversely of the sheet, whereby to deflect the sheet laterally, and also for moving said sheet-deflecting roll away from the deflected portion of the sheet so rapidly that the sheet is stationary at times in said addressing mechanism.

28. In a printing and addressing machine, addressing mechanism, a pair of continuously-rotating rolls which continuously engage a sheet and act to advance it in a continuous manner to move it through said addressing mechanism, a pair of idler rolls located above the sheet between said sheet-advancing rolls and said addressing mechanism, a sheet-deflecting roll located under the sheet between said idler rolls, and means for reciprocating said sheet-deflecting roll transversely of the sheet by different amounts, whereby to deflect the sheet laterally by different amounts and to move the sheet different distances in said addressing mechanism, and also for moving said sheet-deflecting roll away from the deflected portion of the sheet so rapidly that the sheet is stationary at times in said addressing mechanism.

29. A bill printing and addressing machine comprising addressing mechanism for printing different addresses on the front of different bills, rotary printing mechanism including an impression roll for printing the same data on the front of different bills and means for advancing the bill sheet in succession through said mechanisms, other printing mechanism including an impression roll for printing data on the rear face of different bills in registration with the addresses while the bills are engaged by said first impression roll, and means for operating the aforesaid mechanism in timed relation with each other, said second impression roll operating at a slower surface speed than said first roll.

30. A bill printing and addressing machine comprising addressing mechanism for printing addresses on the front face of different bills, printing mechanism for printing the same data on the front face of different bills, other printing mechanism for printing data on the back face of different bills in registration with the addresses, said front printing mechanism having means for advancing a bill sheet in succession through said mechanisms and thence to a severing mechanism, and a severing mechanism for severing the successive completely printed and addressed bills from the sheet, and said back printing mechanism having means to advance the sheet at times at a slower rate than said front printing mechanism.

31. A machine for making public service and the like bills wherein each bill has repetitions of the same address on one face thereof and printed data on both faces thereof and wherein different bills have different addresses and the same printed data, said machine including addressing mechanism for printing a repetition of the same address on a bill and different addresses on different bills, two rotary printing mechanisms each having co-acting impression and platen rolls which apply data on opposite faces of a bill sheet, one pair of co-acting rolls having a constant engagement with the sheet and constituting means for advancing the sheet into said other pair of rolls and through said addressing mechanism, and means for rotating said pairs of rolls at different surface speeds and said other pair of rolls at the slowest surface speed so that the sheet collects between said pairs of rolls at times when said other pair of rolls is in engagement therewith.

32. A machine for making public service and the like bills wherein each bill has repetitions of the same address on one face thereof and printed data on both faces thereof and wherein different bills have different addresses and the same printed data, said machine including addressing mechanism for printing a repetition of the same address on a bill and different addresses on different bills, two rotary printing mechanisms which apply data on opposite sides of a bill sheet, each mechanism having a pair of co-acting impression and platen rolls one pair of which is in constant driving engagement with the sheet and advances it in a continuous manner into the other pair of rolls and through said addressing mechanism, said other pair being engageable with the sheet for a portion only of their peripheral extents so that the sheet at times can advance through said rolls by and at the speed of said driving pair of rolls, and mechanism for severing the sheet beyond said other pair of rolls.

33. A machine for making public service and the like bills wherein each bill has repetitions of the same address on one face thereof and printed data on both faces thereof and wherein different bills have different addresses and the same printed data, said machine including addressing mechanism for printing a repetition of the same address on a bill and different addresses on different bills, two rotary printing mechanisms which apply data on opposite sides of a bill sheet, each mechanism having a pair of co-acting impression and platen rolls one pair of which is in constant driving engagement with the sheet and advances it in a continuous manner into the other pair of rolls and through said addressing mechanism, said other pair being engageable with the sheet for a portion only of their peripheral extents so that the sheet at times can advance through said rolls by and at the speed of said driving pair of rolls, mechanism for severing the web beyond the other pair of rolls, and means to drive said other pair of rolls at a slower surface speed than said sheet-driving rolls, so that the sheet at times accumulates between said pairs of rolls.

34. A machine for making public service and the like bills wherein each bill has repetitions of

the same address on one face thereof and printed data on both faces thereof and wherein different bills have different addresses and the same printed data, said machine including addressing mechanism for printing a repetition of the same address on a bill and different addresses on different bills, two rotary printing mechanisms which print data on opposite sides of a bill sheet, each mechanism including a pair of coacting impression and platen rolls one pair of which is in constant driving engagement with a sheet and advances the sheet through said addressing mechanism and into the other pair of rolls and the other pair of rolls arranged for intermittent driving engagement with the sheet, and means to rotate both pairs of rolls and said other pair of rolls at the slowest surface speed.

35. A bill printing and addressing machine comprising a reciprocating addresser, a rotary front printer, and a rotary back printer, said front printer having means to advance a sheet in a continuous manner and to move it through said addresser and deliver it to said back printer, said back printer having means to advance the sheet through it, means to convert the continuous advance of the sheet into an intermittent advance at said addresser, and means to form a loop in the sheet at times between the front and back printers.

36. A printing and addressing machine having means for advancing a sheet in a continuous manner and for printing on said sheet, means for converting the continuous advance of the sheet to an intermittent advance on one side of said sheet advancing means, means for at times forming a loop in the sheet on the other side of said sheet advancing means, a reciprocating addresser operable on the intermittently advancing sheet, and a printer operable on the sheet coming from the loop.

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