

July 21, 1953

M. H. CARDON

2,646,155

CORRECTING DEVICE FOR PRINTING APPARATUS

Original Filed July 25, 1946

13 Sheets-Sheet 1

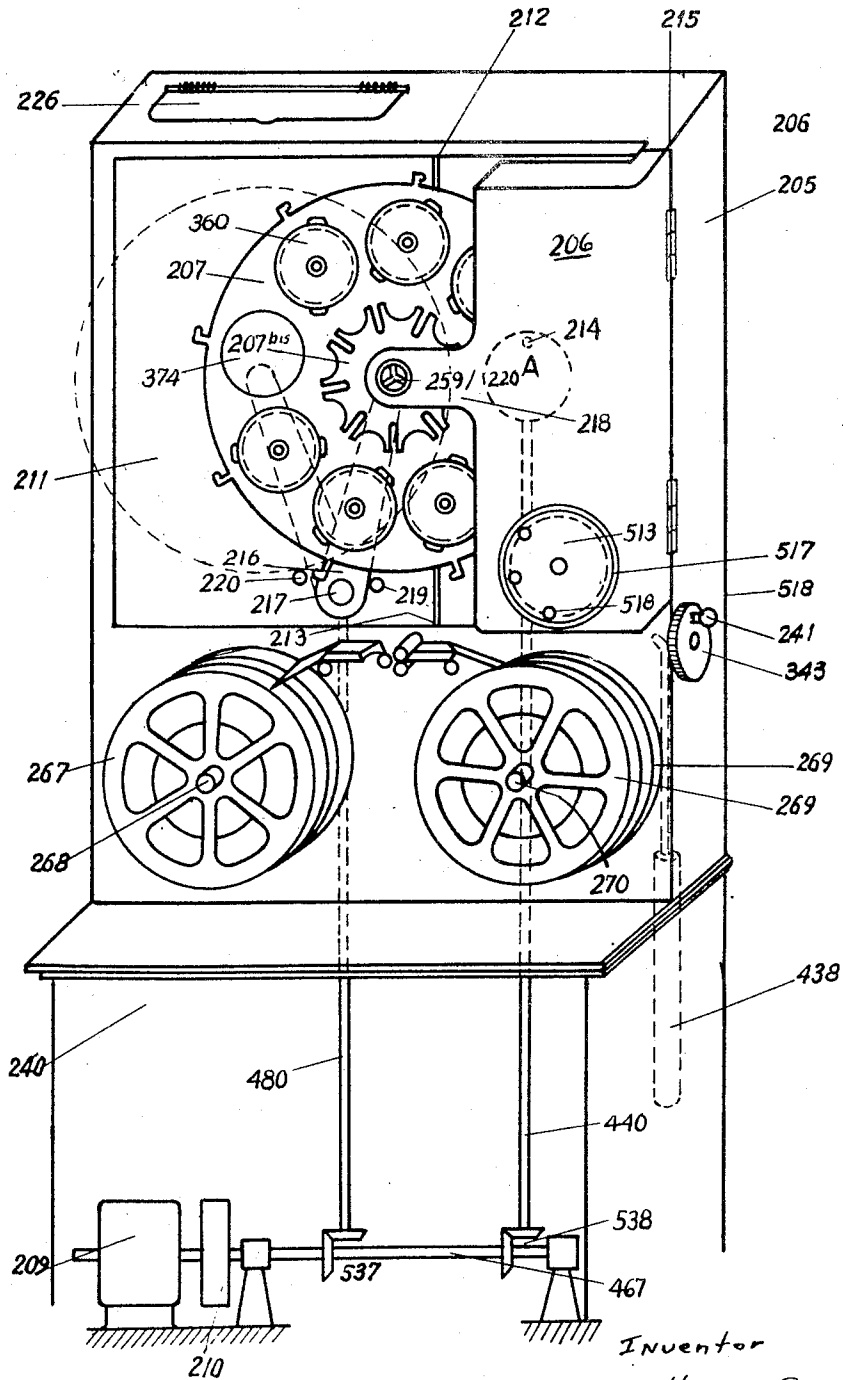


fig. 1

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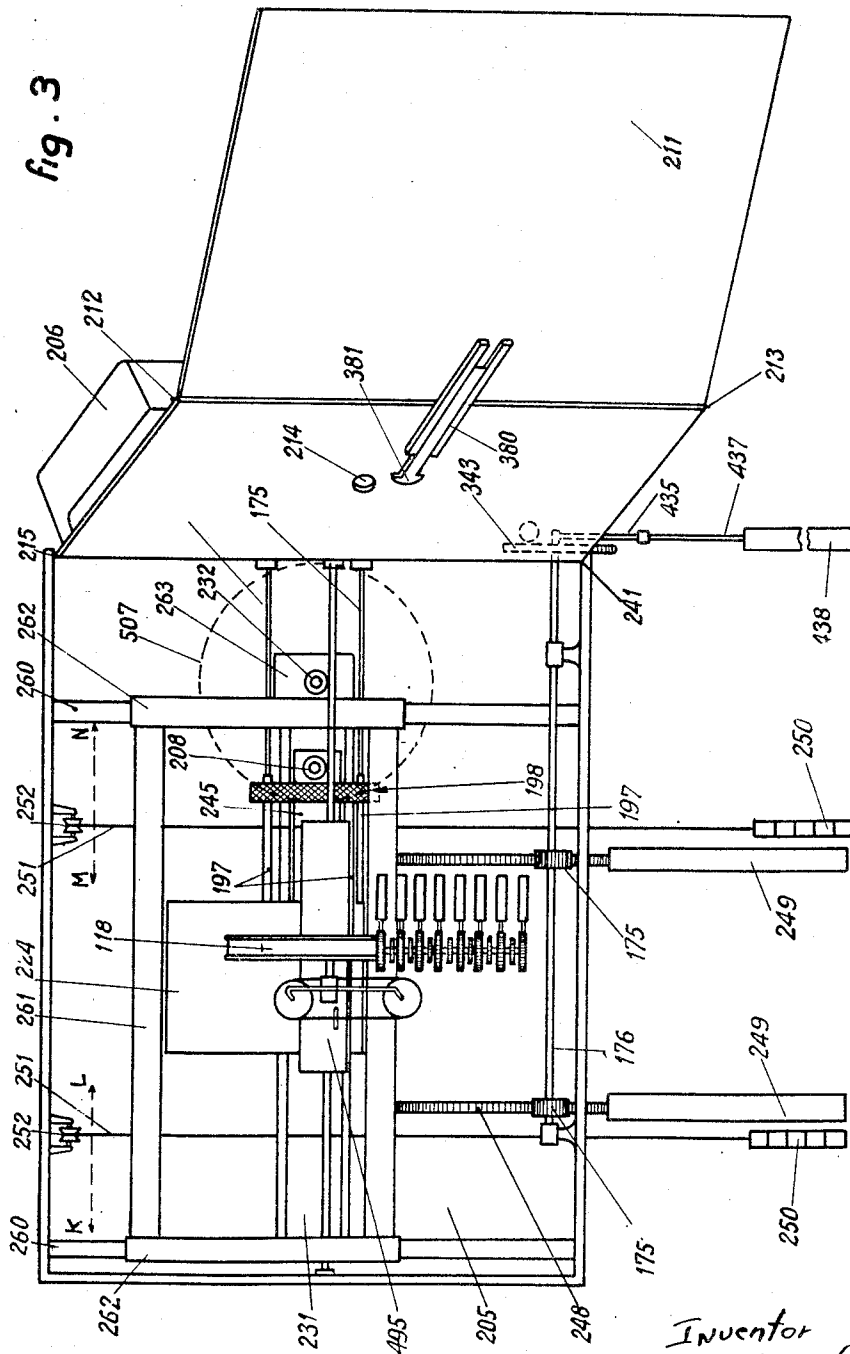
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13 Sheets-Sheet 2



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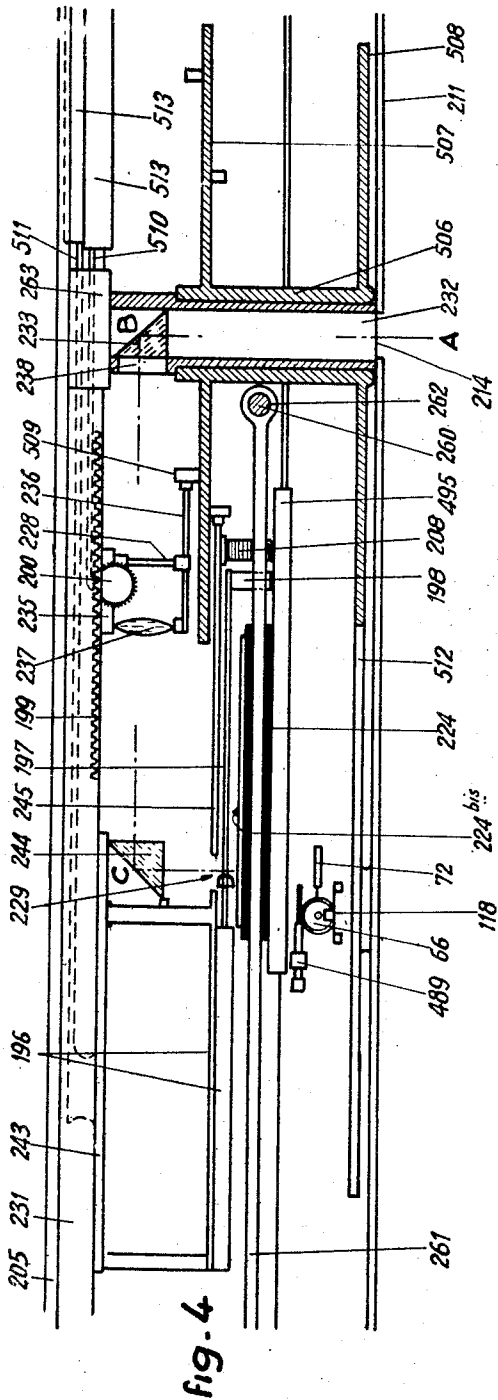
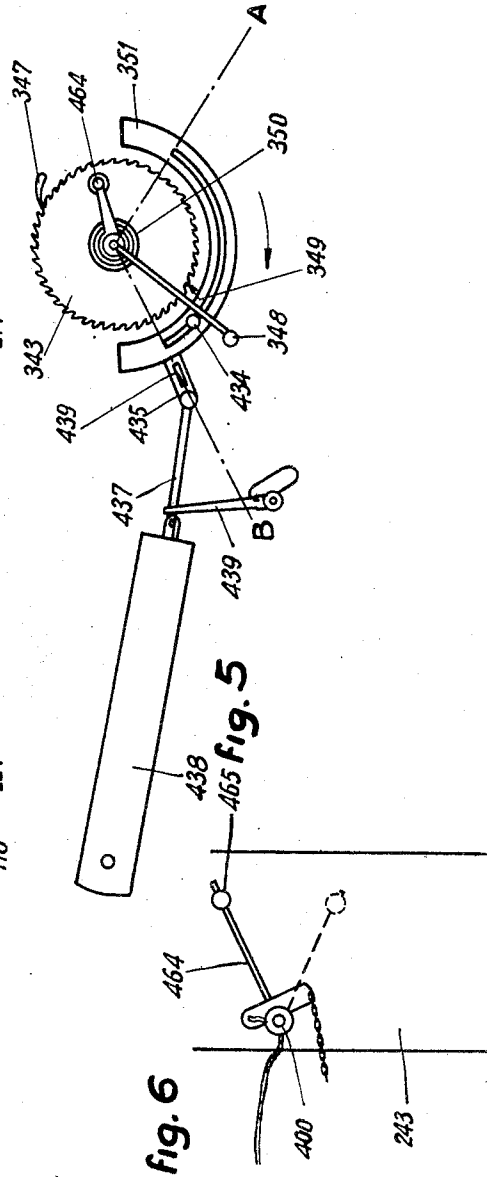
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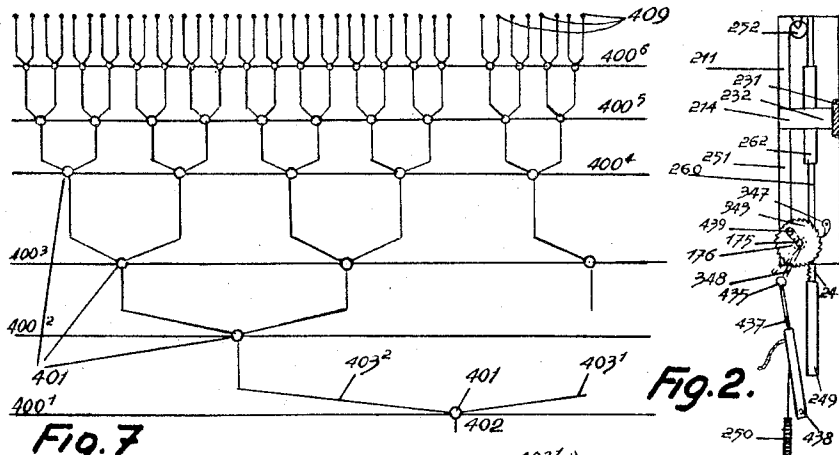
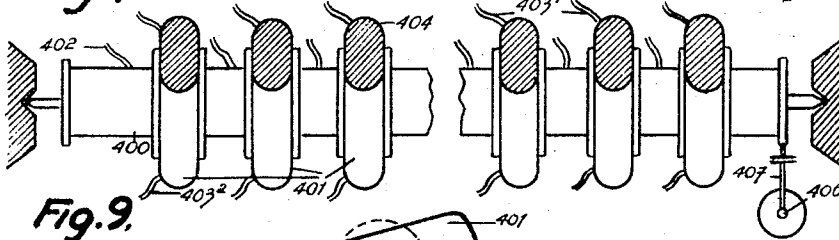
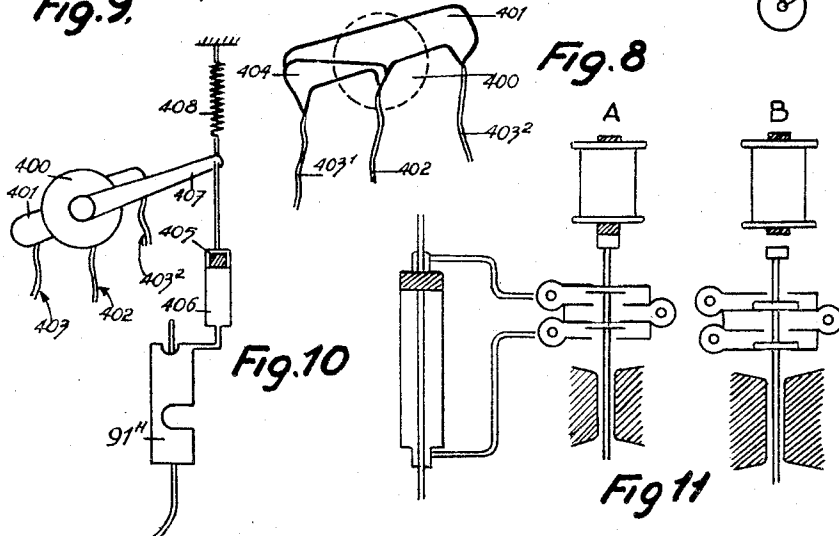
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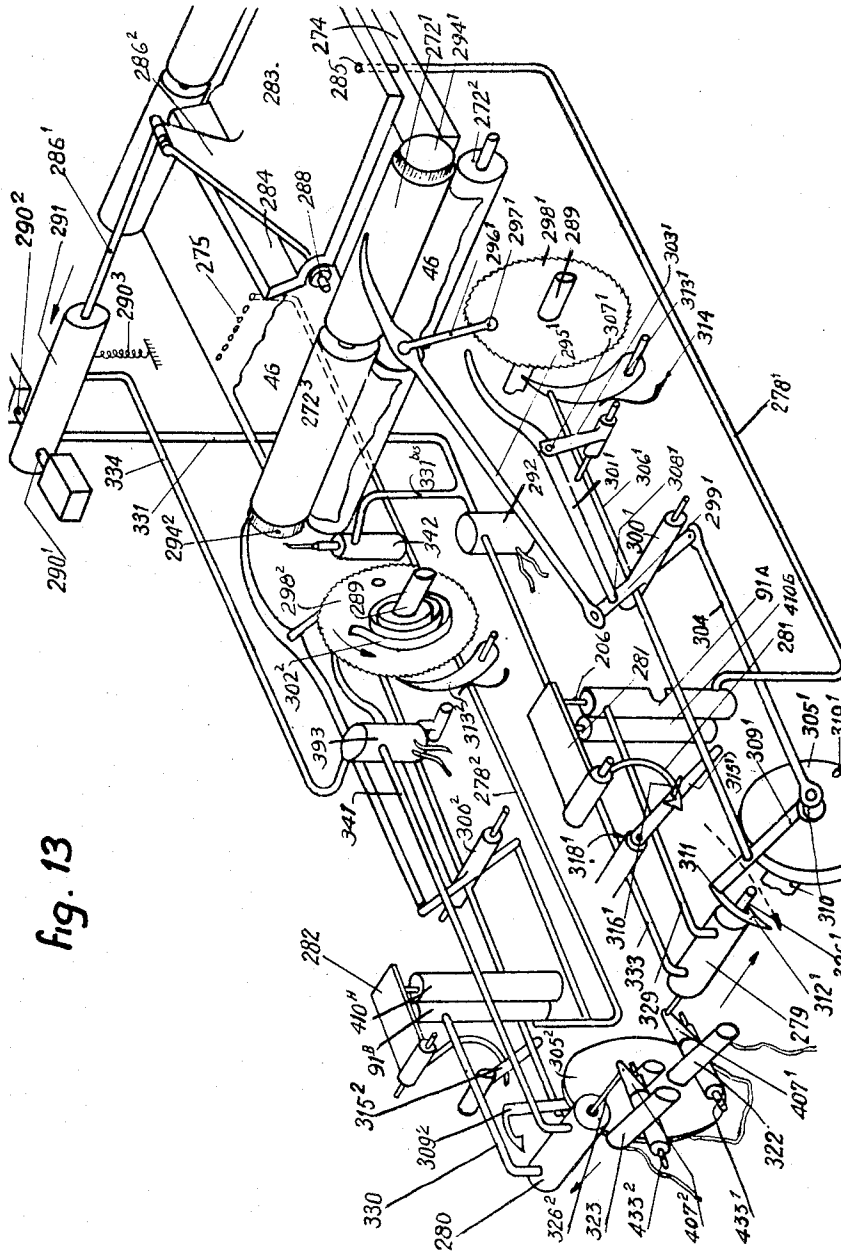
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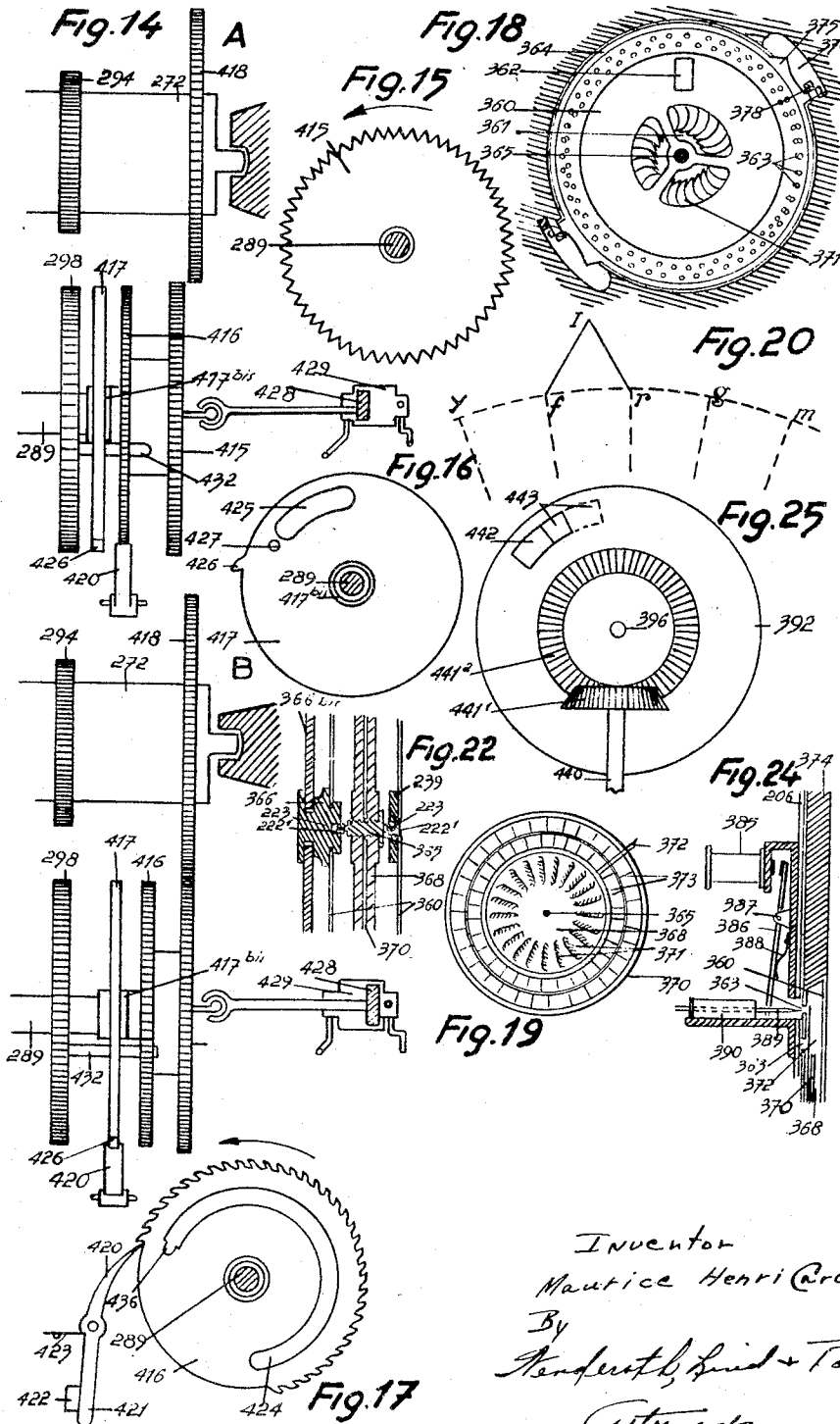
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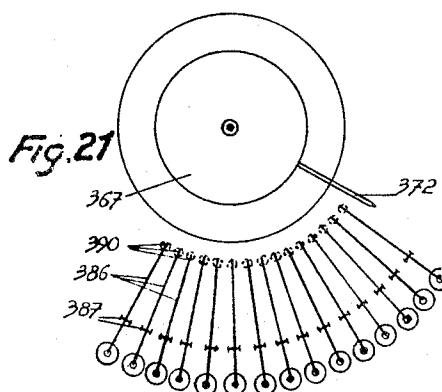
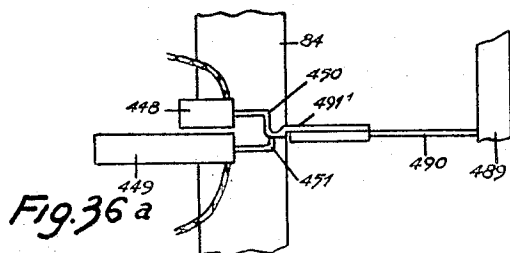
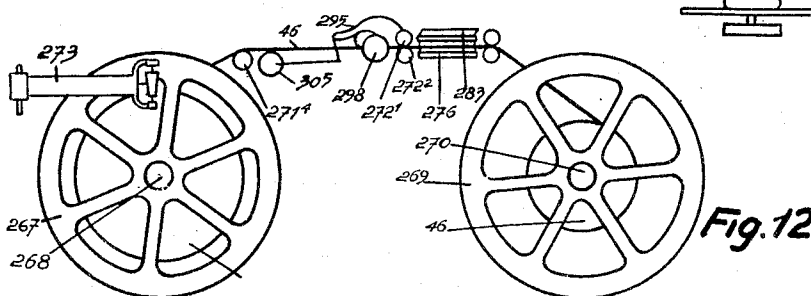
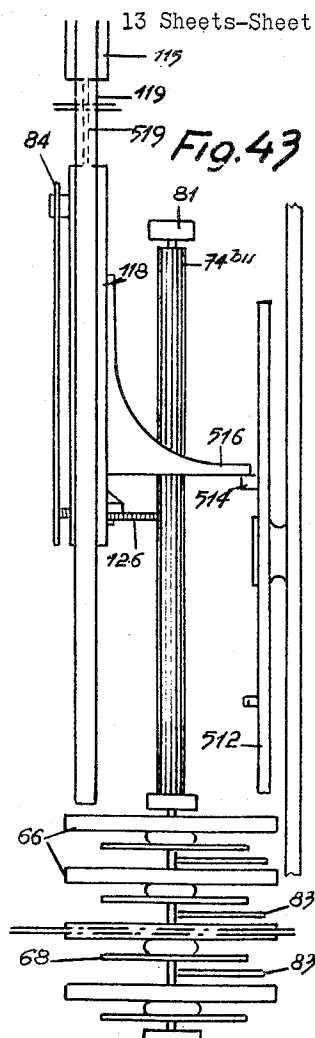
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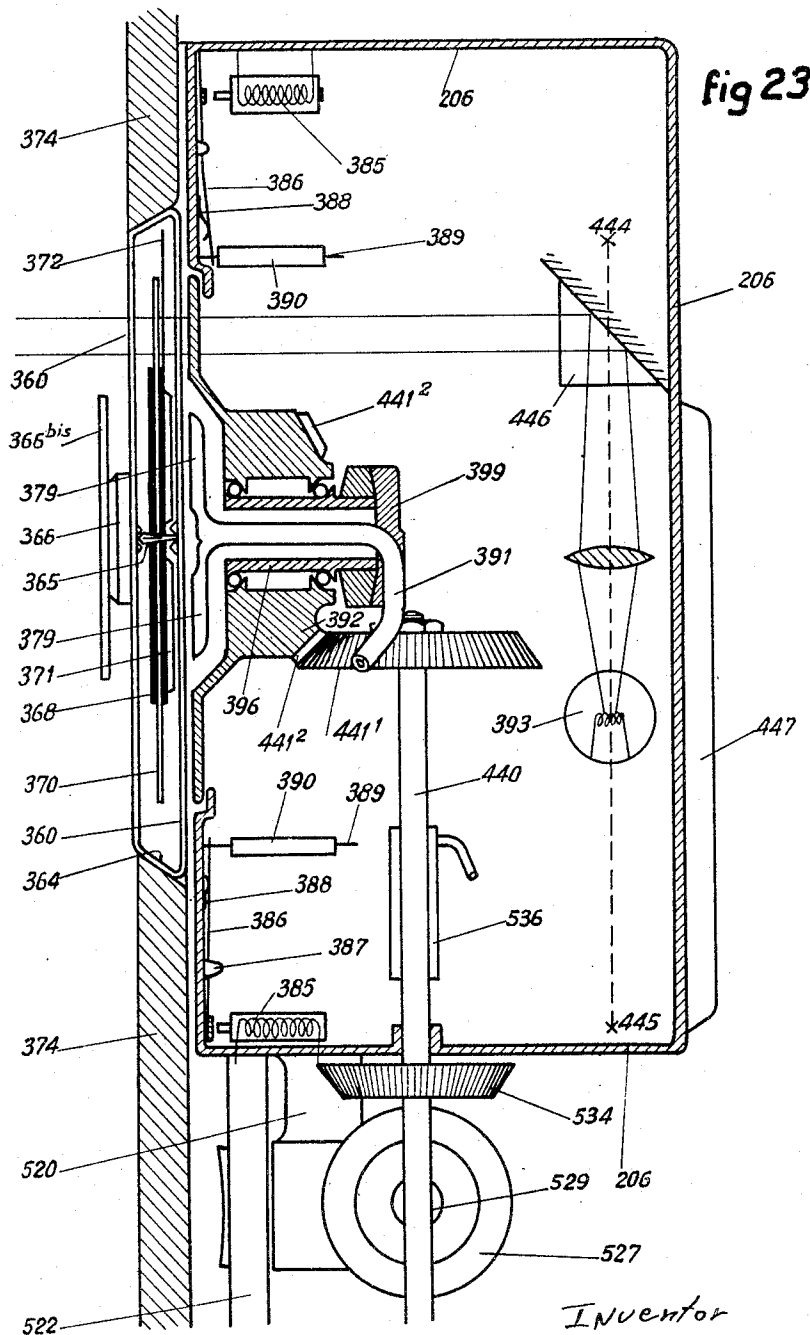
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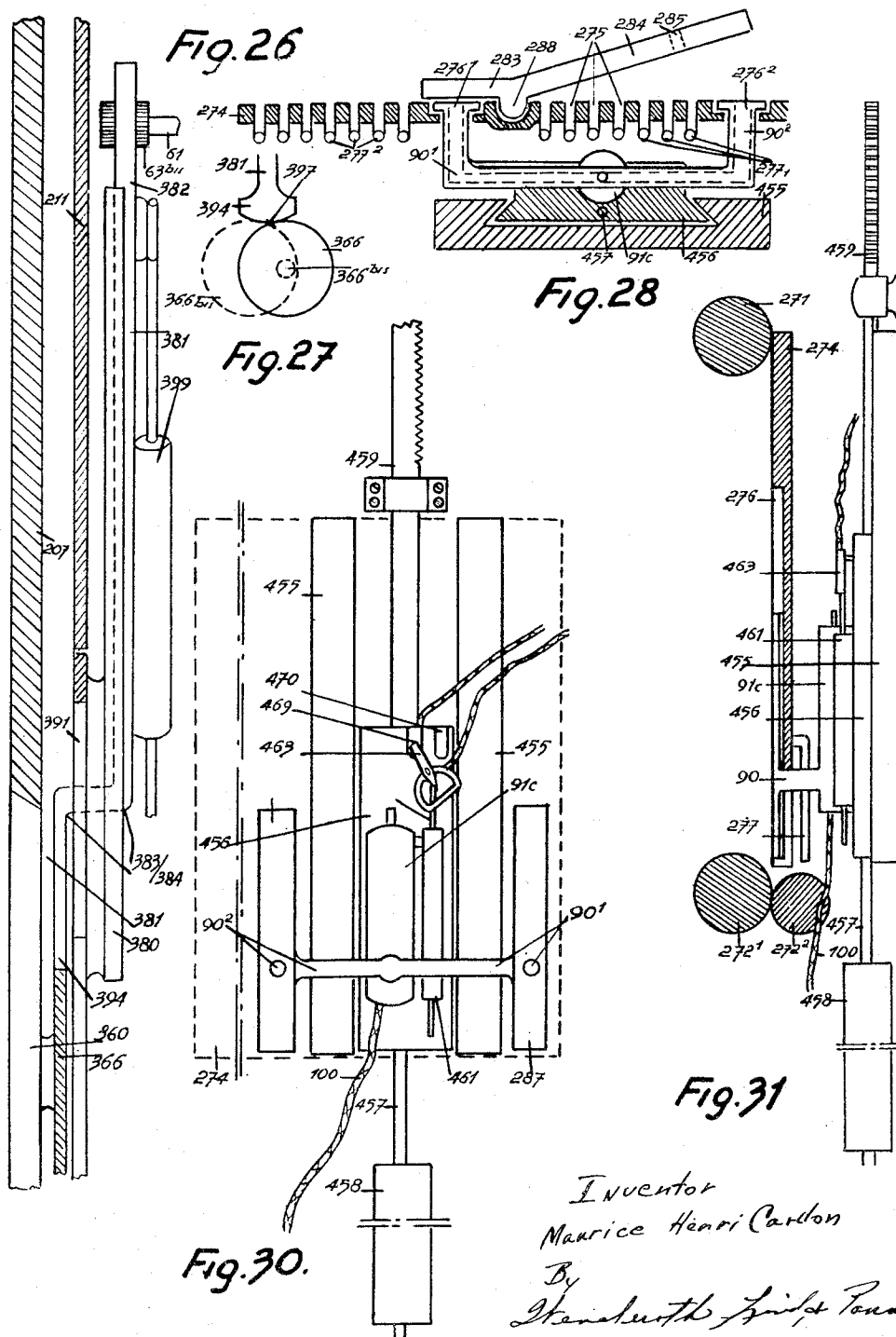
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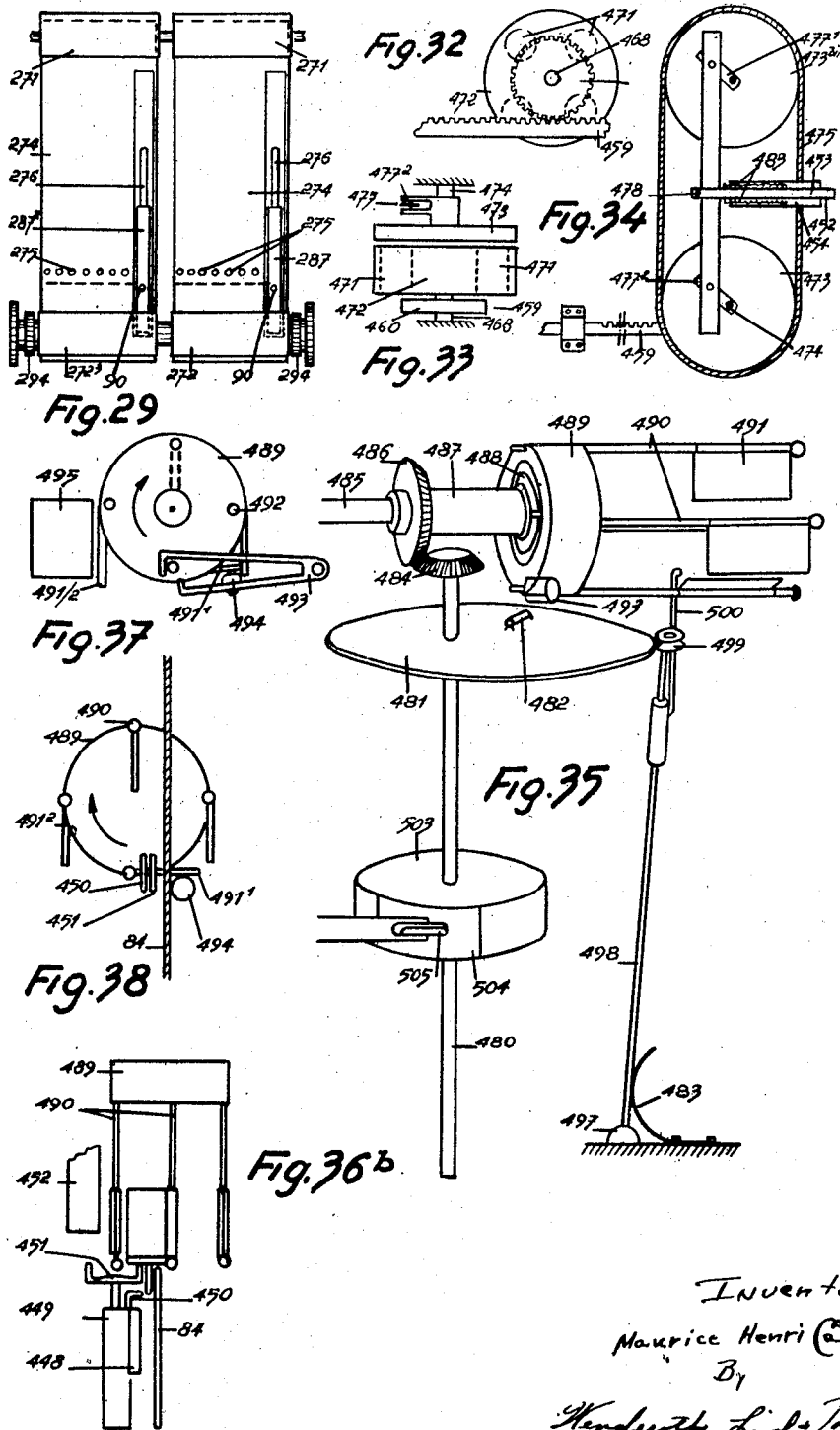
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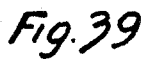
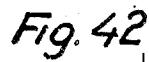
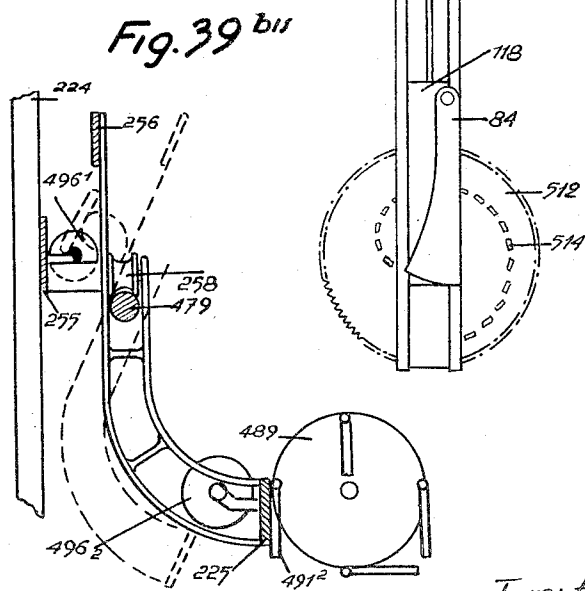
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13 Sheets-Sheet 11



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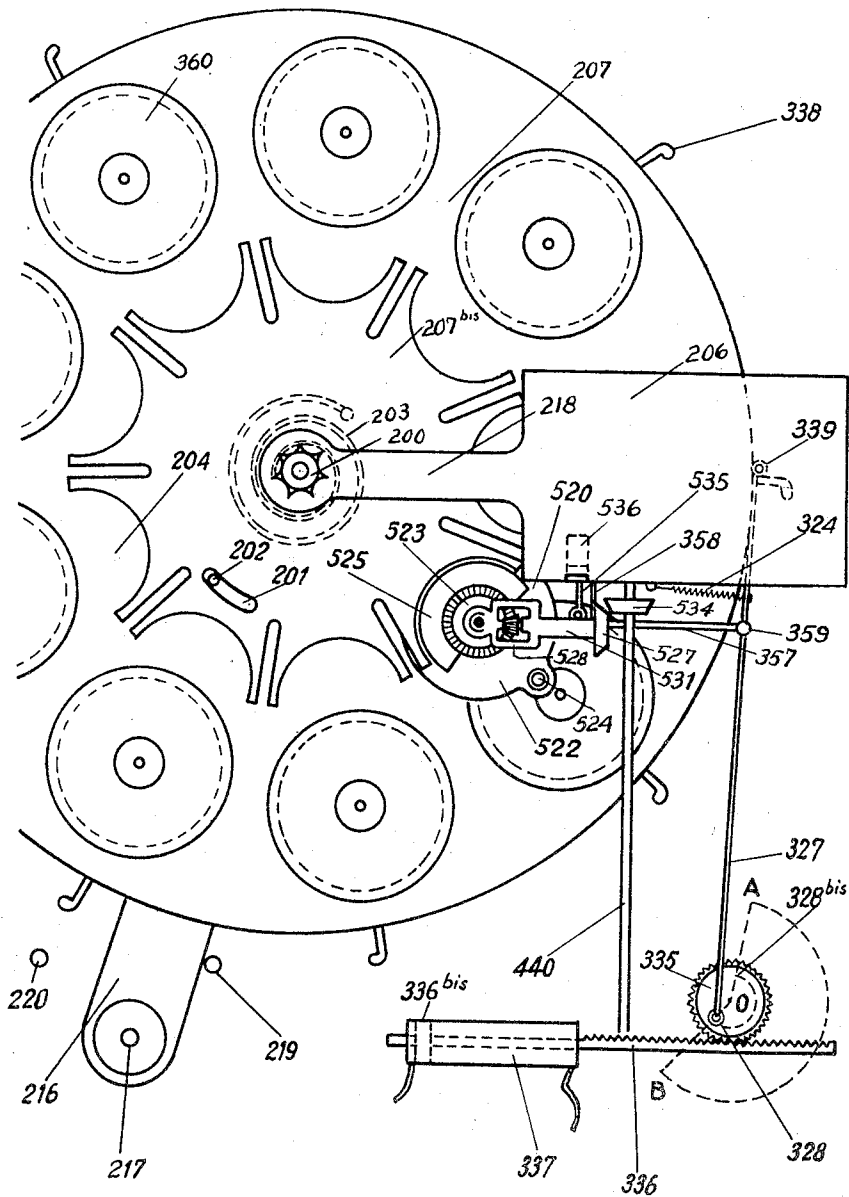
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Fig. 44.



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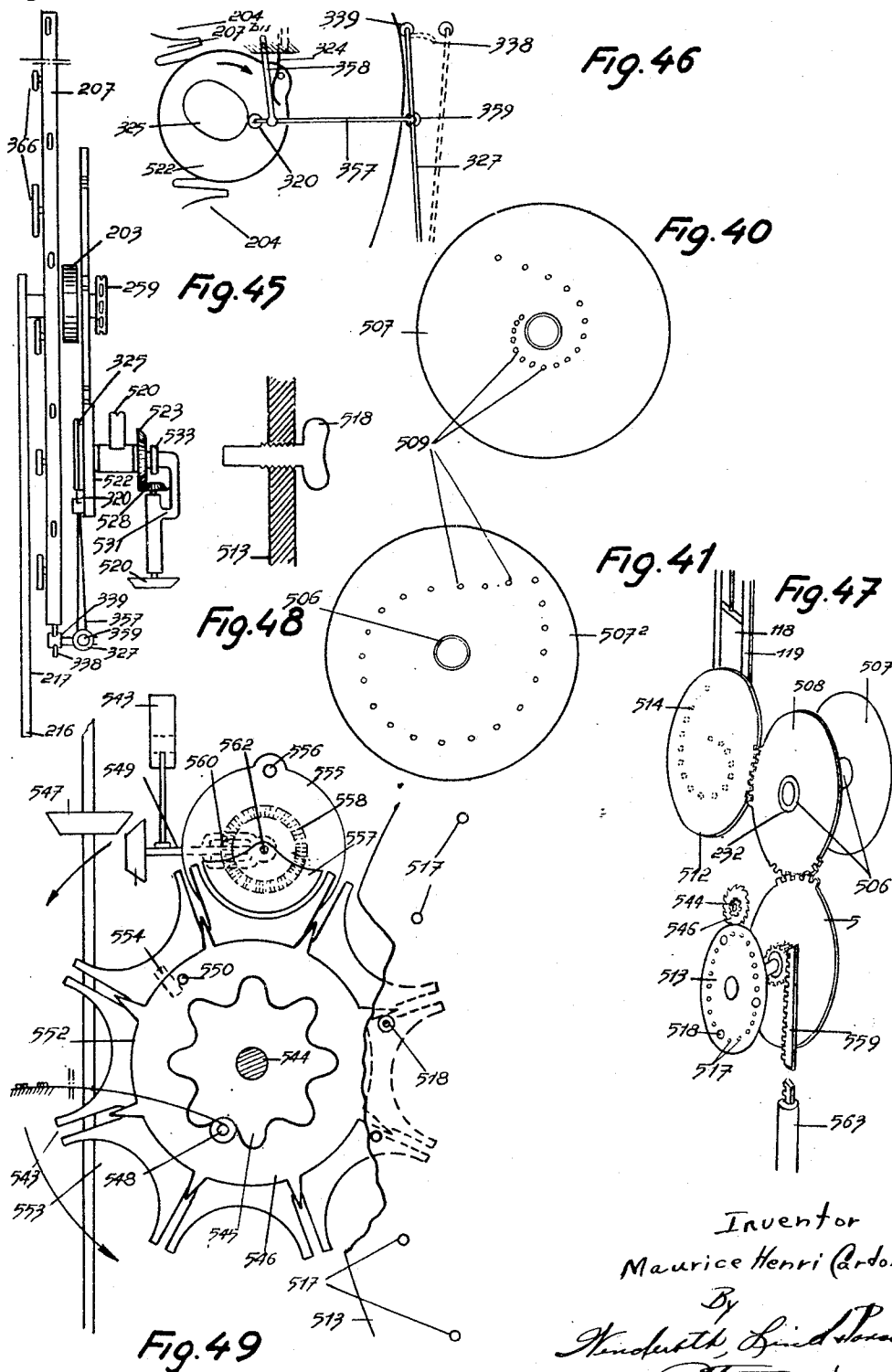
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CORRECTING DEVICE FOR PRINTING APPARATUS

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13 Sheets-Sheet 13



UNITED STATES PATENT OFFICE

2,646,155

CORRECTING DEVICE FOR PRINTING
APPARATUS

Maurice Henri Cardon, Paris, France

Original application July 25, 1946, Serial No.
686,112. Divided and this application August
4, 1947, Serial No. 766,023. In France July
31, 1945

2 Claims. (Cl. 197—20)

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This application is a division of U. S. application, Serial No. 686,112, filed July 25, 1946, and now abandoned.

Devices have already been proposed for composing, by means of light, forms intended for printing, but in a general manner, such devices have the major drawback of not allowing the operator to obtain, during the composing operation, any visual image of this work, and of thereby giving him a task which is difficult and readily liable to mistakes.

It is also known to effect composing work by double photographic printing, for instance by printing first the whole length of the text end to end on a photographic strip, the separation of the future lines of the text only being "prepared" by blank spaces. After this first operation, a kind of paging is effected, by cutting out the prepared lines from the original strip and projecting them on to a photographic form; the corrections are made after printing, by cutting out the incorrect lines, for which corrected lines are substituted.

It is also known to ensure the justification of the future lines of the text by a preliminary mechanical approximation, then to complete such justification by photographic enlargement or reduction when the text which has been cut into lines is being transposed.

Such processes of double photographic printing, cutting out, paging, photographic enlarging or reducing and justification are a long, complicated and expensive work. Furthermore, the corrections are some times made apparent by a difference of photographic density of the correction plates. Finally, photographic justification, in addition to the fact that it often involves very complicated processes does not prove entirely satisfactory for certain work such as vertical columns of figures, and the like.

The device according to the invention obviates these drawbacks without involving the use of delicate mechanisms. It enables, without offending the habits of the professional composers, while however providing them with additional operational facilities inherent to photographic processes, to obtain forms with a speed comparable to that of type composing machines, said forms being of a constant density which are perfectly justified by a process of simple mechanical division.

Finally, by using a method of corrections by means of a second strip, without any modification of the original strip, it enables corrections to be made with great ease and flexibility, with

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the least possible expenditure of time or material.

A device for composing printing plates by means of light making it possible to attain the preceding objects shows the features which will appear from the following description and more particularly from the appended claims.

Coding devices are already known which make it possible to establish a normal recording strip and a correction strip.

The present invention has for its object more particularly to provide a printing device making it possible to reproduce through the light, plates intended for printing purposes, more particularly through photo-mechanical (off-set) reproduction methods when starting from both said strips.

For this purpose, the photographic printing devices translates in a completely automatic manner all the markings of the strip and, after having been started, composes the form without the intervention of the operator.

The device is shown by way of example in Figures 1 to 49 of the accompanying drawings.

Illustrative embodiments of the invention are shown in the accompanying drawing in which

Figure 1 illustrates the complete photographic composing apparatus;

Figure 2 shows the interline spacing mechanism;

Figure 3 illustrates an interior view of the machine;

Figure 4 illustrates the optical system and the device for horizontally displacing the photographic plate;

Figures 5 and 6 show the details of the interline spacing mechanism;

Figure 7 shows the electrical circuit to decode the signals transmitted thereto;

Figures 10 and 11 illustrate the valves controlling the flow of hydraulic fluid;

Figure 12 shows the mechanism for unrolling the normal strip and the correction which is made;

Figure 13 illustrates the double gear mechanism and the selection of the normal strip and the correction strip;

Figures 14 to 17 show the details of the gear mechanism to permit the disconnecting of certain of the features as illustrated in Figure 13;

Figures 18-22 show the alphabetical disc and the disconnecting device therefor;

Figure 23 illustrates the projection mechanism;

Figure 24 shows the detail of the disconnecting mechanism for the alphabetical disc;

Figure 25 shows the interrupting device of the projector;

Figures 26 and 27 show the articulating mechanism between the alphabet disc and the justification mechanism;

Figures 28 and 29 illustrate the "testing elements" in the normal strip and the correction strip;

Figures 30 to 39 bis show the justification mechanism;

Figures 40-43 illustrate the mechanism for controlling the optical system as a function of the coefficient of the photographic enlargement;

Figures 44-46 illustrate the changing mechanism of the alphabetical disc and the selection of capital letters and small letters;

Figures 47-49 illustrate the changing mechanism in connection with the photographic enlargement.

The composing machine automatically effects the photographic composing work, from the strip produced by the tabulating machine.

For this purpose, the composing machine has to effect:

1. The unwinding of the strip 46 and the recording of the signals transmitted.
2. The rotation of an alphabet disc 360 and its successive stops, in the position for projection, at the letters or signs ordered.
3. The projecting and the photographing of said letters and signs.
4. The justification of said letters and signs.
5. The changes of alphabet discs 215.
6. The possible changes of the photographic enlargement or reduction ratio.
7. The changes of lines (interline spacing).

Description.—On the frame 240 are arranged (Fig. 1):

1. The camera 205 with its projection box 206 and its plate 207 and 207 bis.
 2. The distributing and receiving spools for the "normal" and "correction" strips 46, the driving mechanism for those strips, and the interpreting mechanism for said strips.
 3. The electric motor 269 and the air pump 210.
- The camera (Figs. 2, 3) is in the shape of a light-tight chest 205, the front side of which is adapted to open forming a flap 211, normally by pivoting about the line 212-213, and exceptionally (for instance for repairs) about the line 215-241.

Said flap is provided with a circular aperture 214 serving as a passage for the projection ray; which aperture can be closed by a shutter effecting a two-stage time exposure commonly used in photography, the operation of which is controlled by a control signal.

The projection box 206 which is secured to the flap 211 contains the projection lamp 593, the shutter 392 and the mechanism for selecting the letters or signs (Fig. 23 and Fig. 24).

In front of the flap 211, mounted on a support 216 pivoting about 217, a plate 207 is provided with circular holes 374 forming a housing for a number of alphabet discs 360 (9 or 12 for instance), the rotation of which discs about the hub 259 enables one of the alphabet discs 360 to be successively stopped at A in position for projection, the others being kept in reserve for the variations of the composing characters.

The plate 207 is secured, with a certain degree of freedom, to a plate 207 bis which is cut out in the shape of a Maltese cross and which is provided with as many recesses 204 as the plate 207 has alphabet discs 360, the flexible coupling be-

tween the two plates being effected by a spiral spring 203 which bears, on the one hand against the plate 207 bis, and on the other hand against the plate 207, the relative degree of freedom of the two plates being limited by the travel, in the slot 201 provided in the plate 207 bis, of a pin 202 mounted on the plate 207 (Fig. 44).

The plate 207 is shown (Fig. 1) in the normal operative position with its right hand part inserted between the flap 211 and the projection box 206, the position of the alphabet disc 360A, in position for projection, being shown in dotted lines.

The pivoting support 216 is stopped by the abutment 219, by pivoting at 217; the said support when in the stopped position abuts against the stop 220 and can assume a position shown in dotted lines in order to enable the plate 207 to be disengaged from the projection box 206 and the alphabet discs 360 to be changed or removed. An arm 218 mounted on the projection box 206 enables the disc 207 to be accurately centred by means of the fixing screw 200.

Inside the chest 205 (Figs. 2 and 3) can move vertically along the columns 269, by means of sliders 262, a frame 261 of which the upper and lower sides (Fig. 3) form a guide for a carriage 224 which can thus move from left to right of the frame 261 and conversely. On said carriage may be fixed in a removable manner a dark slide 224 bis carrying the photographic film, said film, like the dark slide, being turned to face the bottom of the chest 205. An appropriate aperture 228 (Fig. 1) is provided along the top of the chest 205 to allow said slide 224 bis to be positioned; on the left hand side of the chest 205 is located a special key 227 enabling the slide to be opened and closed in the dark, as in a camera.

It is the lateral movements of the carriage 224 which are imparted by the action of the justification or the interline spacing mechanism that enables the composing form to be scanned by the projection beam, along the horizontal composing lines.

The optical system (Figs. 4 and 3) inside the case 205 comprises a slideway 231 fixed on the bottom of the case, opposite the photographic film. One of the ends of said slideway leads to a sleeve 232 firmly fixed to the bottom of the case 205 by the bracket 263. Said sleeve passes through the thickness of the case 205 and rests its mouth against the periphery of the light aperture 214, the flap 211 being closed.

Said sleeve 232 is provided, at its base, with an aperture 233, and opposite said aperture, and also the light aperture 214, is a total reflection prism 253.

On the guideway 231, in a dovetail groove, can slide:

(1) A movable carriage 235 carrying the arm 236, said carriage carrying at the same time the lens 237 and a polarizer 238, the purpose of which is to extinguish more or less, according to the enlargement ratio, the light transmitted; the intensity of the source of light and the speed of opening of the shutter are adjusted once and for all to produce a perfect exposure for the greatest enlargement ratio.

Following the movement of the lens carrier carriage 235 along the guideway 231, the polarizer 328, surrounded by a round frame provided with conical teeth, can rotate in its round mount which is secured to the carriage 235, and can be suitably rotated by the action of a gear wheel

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200 which is also secured to the carriage 235, the said wheel meshing on the one hand, at right angles, with the conical teeth of the frame of the polarizer 228, and on the other hand with a rack 199 arranged along the guideway 231.

(2) A movable carriage 243 carrying a total reflection prism 244 facing the prism 233, the whole arrangement procuring a total reflection of the light ray, along the broken line ABCD, on the composing form fixed to the carriage 224 facing the bottom of the case 205.

Said carriage 243 is extended by a rigid plate 245 provided with an aperture 229 for the light rays to pass. The length of the carriage 243 with its plate 245 is slightly more than double the length of the carriage 224.

In order to enable the light ray to sweep the whole length of the form 224 bis, it is only necessary for the following to be equal to the width of the carriage 224 (Fig. 3).

(a) The distance between the left-hand end of travel point "K" of the carriage 224 and the extreme left-hand point "L" reached by the carriage 243 for the greatest coefficient of optical amplification.

(b) The distance between the right-hand end of travel point "N" of the carriage 224 and the extreme right-hand point "M" reached by the carriage 243 for the optical amplification coefficient equal to 1.

On the removable carriage 243 are fixed two symmetrical "interline spacing" cylinders 196, the pistons of which carry, at the end of their rods 197, a transverse bar 198 extending vertically; the two rods 197 are hollow and are supported in their stroke by the guides 173 fixed to the wall of the case 205; the length of travel of the pair of pistons is equal to the width of the carriage 224.

By the action of the interline space signal, the two pistons, which are assumed to be in their extreme right-hand position are simultaneously sucked from the right to left; the bar 198 encounters the right-hand side of the carriage 234 carrying said carriage towards the left until the right hand end of the carriage 224 stops at the end of its travel opposite the aperture 229, for the composing of the next line, whatever be the relative position of the carriage 243 along the guideway 231.

The termination of the interline spacing signal produces inter alia, the retraction of the pistons to their initial position on the right (inoperative position) by the suction in the opposite direction of a double-acting valve of the 410 type.

It should be noted that during the interline spacing operation, the carriage 224 undergoes a horizontal movement which is combined with the vertical movement applied to the frame by the interline spacing signal, the side of the carriage 224 sliding along the bar 198.

READING THE SIGNALS

The perforations of the "normal" and "correction" strips 48 cause, when they come into register with the holes 275 of the table 274 (Fig. 29), an inflow of air to the chamber 97 of valves 91 and thus cause these valves to operate (1 per hole 275, plus a valve 91 which explodes, as will be seen hereinafter, a longitudinal slit 276 of the table 274 corresponding to the justification perforation of each strip 46) (Figs. 29, 30, 31).

The six first valves 91 convert the signals of

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letters and signs as follows into electric currents which are distributed over a predetermined circuit.

On six rocking shafts 400—1—2—3, etc. . . . (Figs. 7, 9) are arranged a set of electric reversing switches 401 which are distributed in the proportion of one on the first shaft 400, 2 on the second, 4 on the third, 8 on the fourth, 16 and 32 on the fifth and sixth shafts.

Each reversing switch 401 which is fixed transversely at its center on a shaft 400, comprises, according to a known type, a tube in which there is a vacuum, provided at its centre and at its two ends, with three electrodes connected by a flexible wire as follows: the central electrode to an input circuit 402 and the side electrodes to two output circuits 403—1 and 2; a drop of mercury 404 closes one or the other circuit according to the slope assumed by the tube.

In the inoperative operation all the reversing switches of a given shaft close the circuit 402—403¹, by the action of the valve 91H (Fig. 10); a piston 405 sliding in a cylinder 406 exerts a pull on the lever 407 and on the retracting spring 408 and causes the shaft 400 to pivot, thereby closing the circuit 402—403² of all the switches of the shaft 400.

The two output wires of each reversing switch 401 of a given rocking shaft are connected to the input terminal of two reversing switches 401 of the next rocking tube, the whole of the connections forming a bunch of connections in cascade according to Fig. 7 to the 64 output terminals 409 of the 32 last reversing switches 401⁶. The combined action of the various valves 91H enables, by means of the switching to the right or to the left of the electric circuits by the reversing switches, any one of the 64 output terminals to be connected successively and at will to the input terminal.

Between the frame of the composing machine and the 63 terminals 409 of the 32 last reversing switches (one terminal being kept as a dead point), it is possible to form as many different electric circuits for converting the letters and signs and the control signals, taking into account, furthermore, that each signal has a double efficiency since it can be used as a capital letter and as a small letter.

In each of these circuits may be inserted electromagnets of two categories of use. Some (Figs. 21, 23); such as the electromagnets 335 for selecting the letters and signs of the alphabet discs 218, directly control a function, others act as relays for a reduced air pressure valve 410 with three superposed chambers of which the communications with one another are controlled by a double valve 411 which is normally urged by its weights or a retracting spring, and at times in the opposite direction by magnetic attraction of the electromagnet 412 (Figs. 11A and B).

The chamber 410² is permanently connected to the vacuum pump through the pipe 413; the chamber 410¹ is connected to a utilization piston 414 through the pipe 415 and can communicate either with the atmosphere (Fig. 11B), or with the vacuum chamber 410² (Fig. 11A); the chamber 410³ communicates either with the atmosphere (Fig. 11B), or with the vacuum chamber 410² (Fig. 11B).

Valves of this kind can be used as single acting valves as above; they can also be used as double-acting valves, the suction produced in the chamber 410³ being transmitted through a pipe 415 bis to the other end of the cylinder 414, thereby

acting on the other face of the piston for returning same and holding it stationary.

The mechanism for driving the strips makes it possible to obtain:

(1) Either the feed of the "normal" strip 46, the "correction" strip remaining stationary, or the simultaneous feed of the "normal" and "correction" strips 46, the "normal" strip becoming "dumb" (inoperative),

(2) A stoppage in the feed of one or other of the strips 46 to enable certain signal controlled operations to be carried out (controlled operations requiring a longer time to carry out an ordinary letter: for instance changing an alphabet disc, the enlarging ratio etc.) or a given letter or sign to be repeated a predetermined number of times, thereby reducing the consumption of the strip to three signals only: a signal to be repeated, a repeated signal and a signal fixing the number of repetitions.

The driving device is constructed in accordance with Figs. 12 and 13.

The "normal" and "correction" strips can unwind in parallel and simultaneously from their distributing spools 267 mounted on the same shaft 268, and wind on to their receiving spools 269 which are also mounted on one shaft 270, both strips passing over the rubber rollers 291 and between the rollers 272—1 and 2. The rotation of the distributing spools 267 is constantly limited, by a friction member 273, to the unwinding of the part of the strip which is driven by the driving mechanism while by the action of a spiral spring lodged in the hub 270 and not shown, the receiving spools 269—1 and 2 exert a constant pull on each strip 46. The two driving and unwinding systems are symmetrical, but independent.

While they are unwinding, the two strips 46 can slide on a common table 274 which is provided, along a transverse line, with a double set of 7 holes 275—1 and 2 which correspond to the possible perforations of the signals of each strip 46 and to the beginning of line perforation of each strip 46.

From the six first holes 275 of each set of 7 holes extend six tubes 277—1 and 2 having a double twin mouth (Figs. 28 and 29) opening in the chambers 97 of six valves 91H (Figs. 10 and 7) controlling the six rocking shafts 400, thereby effecting the "reading" of the perforated signals transmitted.

From each 7th hole 275 corresponding to the beginning of line perforation of each strip 46, extends a tube having a single mouth opening onto the chamber 97, of a valve 91A or 91B, of which valves the outgoing vacuum tube opens into the cylinders 279—280, while the end of the valve head 206 of each valve 91A and B is adapted, as it lifts, to release the lever 281—282 (Fig. 13).

A flap formed by two unequal leaves 283—284, hinged at 288 can assume two positions:

(a) One of the leaves (284) closing the justification perforation of the "correction" strip 46 and the longitudinal slit 276—1 of the table 274 (Figs. 3 and 28),

(b) The other (283) closing all the perforations of the "normal" strip 46, the holes 275 and the slit 276—2 of the table 274, with the exception however of the hole 275 corresponding to the beginning of line perforation of the "normal" strip, for which there is provided, in the said leaf 283, a special hole 285 making it always possible for the air to enter.

The justification perforation of one or the other of the bands 46 is explored by two ducts 90—1 and

2 of a valve 91C which can slide under the table 274 as will be seen hereinafter.

The driving mechanism for the "normal" and "correction" strips comprises:

1. A system of wheels and levers with driving ratchet;

2. A double set of electric switches;

3. A set of control valves and pistons.

1. System of levers with driving ratchets

This mechanism which comprises a double symmetrical system of levers, connecting rods and wheels according to Fig. 13, effects the gradual feed of the normal strip 46 or one or other of the strips 46, either the normal or the correction strip, by acting on the ratchet wheels 294—1 and 2 of the rollers 272—1 and 3.

Taken separately, each feed system comprises a lever 295—1 or 2 forming a ratchet for driving the ratchet wheel 294—1 or 2. Said lever is pivotally connected, on the one hand to the connecting rod 296—1 or 2 which can pivot on the shaft 297 fixed on a point of the ratchet wheel 298—1 or 2, and on the other hand to the connecting rod 299—1 or 2 pivoting on the fixed shaft 300.

The lever 295—1 or 2 is doubled by a lever 301—1 or 2 forming a driving ratchet for the ratchet wheel 298—1 or 2 which is normally constrained to rotate in the direction of the arrow by a light spring 302. Said lever 301—1 or 2 is pivotally connected to the connecting rods 303—1 or 2 and 299—1 or 2.

A reciprocating movement is imparted to the whole system by a connecting rod 304—1 or 2 which is connected with a slight eccentricity to the wheel 305—1 or 2 which is driven with suitable reduction by the general driving shaft, as will be seen.

The rod 306—1 or 2 which is pivotally connected to the lever 309—1 or 2 controls the retaining pawl 313—1 or 2; the lever 309—1 or 2 which is pivotally connected to the shaft 310, is terminated by the arm 311—1 or 2 and its stop hook 312—1 or 2.

A lever 315—1 or 2 carrying the transverse finger 316—1 or 2 normally retained in the high position by the hook 281—1 or 2 is adapted to pivot about its shaft 318—1 or 2 first by the action of gravity, then by the pressure exerted on it at a given instant of the rotation of the wheel 305 by a roller 319—1 or 2 fixed to said wheel.

2. A double set of electric switches

A set of two switches operating by means of a drop of mercury in vacuo 322—323, of a type comparable with the switches 401, but having a single output circuit 403 are connected in series in an electric circuit. The two switches in the "closed" position allow the current to flow, the two or one only in the "open" position cut off the current (Fig. 13).

Each of said switches 322—323 is mounted on a support 433—1 or 2 which pivots in a similar manner to that of the reversing switches 401 (Fig. 10) and has its "closed" or "open" position controlled by the pull or the push exerted on a connecting rod 407 of the rod 326 of the piston sliding in a cylinder 279 or 280.

In the closed position, the rod 326 of the piston projecting from one of the ends of the cylinder 279 or 280 intersects the plane of oscillation of the lever 309—1 or 2 so that said lever, if it is suddenly made to move backwards in the direction of the dotted line arrow engages said rod with its hook 312.

3. A set of control cylinders and valves

Being directly connected through the tube 278—1 or 2 to the hole 275 of the table 274 corresponding to the "beginning of line" perforation of each strip 46, the pneumatic valves 91A and 91B become operative each time a "beginning of line" perforation passes; through the tube 329 or 330 they exert a suction on one of the faces of the piston of the cylinder 279 or 280, causing the corresponding switches 322—323 to close and placing the end of the rod 326 in a suitable position for engaging the lever 309—1 or 2.

Furthermore, said valves are so arranged that the rod 206 of their upper valve lifts the hook 281 or 282 releasing the lever 315—1 or 2 from the corresponding driving system.

When the two switches 322—323 "in series" are in the "closed" position, an electric current flows and operates the valve 292 (of the 410 type) which causes a simultaneous suction:

(1) Through the tube 331 in the cylinder 291, urging the piston in the direction of the arrow, the rod 286—1 of the piston exerting a pull on the lever 286—2 causing it to describe an arc of a circle by means of the articulation of the piston 291 at 290—1 or 2; a light spring 290—3 exerts a constant pull which keeps the lever 286—2 in the position it has assumed at the end of its travel. The flap 284 is thus pressed against the slit 276—2 of the table 274 on the "correction" side and the flap 283 is open.

(2) Through the tube 331 bis in the cylinder 342, the piston rod of which acts on the wheel 294—2 and feeds the "correction" strip 46 forward one tooth.

(3) Through the tube 333 in the cylinder 279, thereby returning the piston in the opposite direction to the arrow; the switch 322 is placed in the "open" position; the current is cut off; the end of the rod 326 escapes from the lever 309—1 which is released.

The operation of the feed device for the strips 46 includes several cases:

Assuming that at the outset composing is effected on the "normal" strip, the switch 322 is in that case in the "open" position; the lever 309—1 is free; the driving mechanism of the "normal" strip is operating.

On the other hand, the switch 323 is in the "closed" position, the lever 309—2 is hooked, the pawl 313—2 is released from the wheel 298—2 and said wheel is retracted by its spring 302—2; the lever 295—2 is thus in the high position, and has no action on the ratchet wheel 294—2: the "correction" strip is thus stationary.

Furthermore, the flap 284 is closed and the flap 283 open.

The "normal" strip unwinds alone, controlling the automatic composing work until the instant when the "beginning of line" perforation comes into register with its opening 275 of the table 274 ("normal" side).

The tube 278—1 then fills with air and operates the valve 91A the plunger 206 of which lifts the hook 281 which releases the lever 315—1, and the lever 315—1 falls into the vertical position, things being so arranged that it is only released immediately after the driving roller 319 of the wheel 305—1 has passed beyond the point where it could drive the said lever 315—1.

On the other hand, the valve device 91A draws the piston of cylinder 279 in the direction of the arrow and the switch 322 is thus placed in

the "closed" position while the rod 326¹ of the piston of the cylinder 279 projects towards the wheel 305—1, preparing the hooking of the lever 309—1.

Since by hypothesis the switch 323 is already in the "closed" position, the current flows immediately and acts on the valve 292 (of the 410 type) which, as seen above:

(a) Closes the flap 284 and opens the flap 283,

(b) Feeds the "correction" strip 46 forward one tooth,

(c) Acts on the cylinder 279, returning the piston and the rod 206 in the opposite direction to the arrow thereby preventing the hooking of the lever 309—1 and returning the switch 322 to the "open" position, cutting off the current.

The sequence of these various operations is regulated by the cross-section of the supply tubes and the relative size of the cylinders. It is, moreover, only necessary that the current should not be cut off before these various operations are completed.

During this time, the wheel 305—1 has effected a complete revolution, the roller 319—1 has encountered the lever 315—1 and has moved it in the direction of the dotted line arrow, the finger 316—1 abuts against the lever 309—1 which it rocks until the arm 311—1 and its retractable hook 312—1 engage beyond the rod 326 of the piston of the cylinder 279.

This rotary movement of the lever 309—1 produces a retracting movement of the connecting rod 306—1 and thus of the ratchet 313—1 which is disengaged from the wheel 298—1; said wheel is abruptly moved backwards by its spring 302—1 (not shown); the lever 295—1 then assumes the high position (position of Fig. 3), and the drive of the ratchet wheel 294—1 and, consequently, of the "normal" strip 46 is momentarily stopped.

Continuing its rotation, the roller 319—1 releases the lever 315—1 and said lever, pushed sharply back by the action of the spring 314—1 through the lever 309—1, returns and engages the hook 281, while the lever 309—1 (which, in the present case, does not encounter the rod 326 onto which it should hook) returns to its normal position, the pawl 313—1 again engaging the wheel 298—1, each rotation of the wheel 305—1, by the action of the lever 301, and the pawl 313—1, feeding the wheel 298—1 one tooth forwards towards its operative position of the lever 295—1.

If the feed of the "correction" strip 46 one tooth forward (see above) has brought in front of the line of the holes 275 of the plate 274 a section of the "correction" strip 46 on which there is no perforated signal, the position of the driving mechanism of the "correction" strip 46 remains unchanged, i. e. the "correction" strip 46 remains inoperative, and the drive of the "normal" strip 46 will continue until the next "limit signal" perforation is reached; the first signals which appear being in this case the combined interline spacing and justification signal, for the new line to be composed (normal strip).

If on the contrary, the feed of the "correction" strip 46 one tooth forward places the "correction" signal in front of the line of the holes 275, this signal acts immediately on a valve 393 (of the 410 type) which creates a vacuum.

(a) Through the tube 334 in the cylinder 291, drawing the piston in the opposite direction to the arrow, opening the flap 284 and closing the flap 283, thereby making the "normal" strip in-

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operative and the "correction" strip operative.

(b) Through the tube 341 in the cylinder 280, drawing the piston in the opposite direction to the arrow, placing the switch 323 in the "open" position and releasing the lever 309—2 and consequently the driving mechanism of the "correction" strip 46.

Both the "normal" and "correction" strips 46 will therefore be driven simultaneously, the "normal" strip being inoperative, as soon as the two driving mechanisms have respectively repositioned their wheels 298—1 or 2 in the operative position.

The two strips will unwind up to the next "beginning of line" perforation. Two cases may then arise:

If it is the "beginning of line" perforation of the "correction" strip 46 which is the first to reach the hole 275 of the table 274 corresponding to it, the valve device 91B places the switch 323 in the "closed" position without however enabling the current to flow since the switch 322 remains in the "open" position and releases the hook 315—2 preparing for the next thrust of the roller 319—2, the engagement of the lever 309—2 on the end of the rod 326 of the cylinder 280, and thus the locking of the "correction" strip.

When the "limit signal" perforation of the "normal" strip 46 in its turn arrives opposite its hole 275, the mechanism acts as in the case seen above in which only the normal strip is fed, and the cycle starts again.

If, on the contrary, it is the "limit signal" perforation of the "normal" strip which arrives first, the normal strip is locked by the same process as above for the "correction" strip, but without action on the valve 292, since the switch 323 remains in the "open" position.

When the "limit signal" perforation of the "correction" strip arrives in front of the hole 275 which corresponds to it, the drive of the "correction" strip is stopped, and the two switches in series 322—323 being in this case both in the "closed position," the current acts on the valve 292 and the cycle starts over again.

CORRECTION OF THE "NORMAL" STRIP

The device therefore thus actually selects—line by line—one or the other of the strips 46, retaining them, or then replacing both of them at the starting point of the next line, thereby enabling, with the greatest of ease, the original proof to be corrected line by line, without making any modifications in said proof.

If the "correction" text is longer than the original text (for instance six lines instead of three), it is only necessary, as from the third line of the "correction" text, to type the "correction" text only effecting the changes of line by means of the interline spacing and justification signal, without making use of the "limit signal." Thus the excess lines of the "correction" text will be reproduced without the "limit signal" mechanism being involved, therefore without the "normal" strip's being fed, the same being momentarily held stationary its driving mechanism having been released and hooked at the end of the third "normal" line by the action of the "limit signal" perforation of the next line of the text of the "normal" strip. When the six lines of the "correction" strip are exhausted, the operator follows them up with a division without any signal, then with the "limit signal" of the next line of the "correction" text, thereby making operative the

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whole "correction" strip locking and strip selecting mechanism, as already seen, thus enabling the "normal" strip to be started again from its 4th line (and if desired the "correction" strip from the 7th line, the 4th "normal" line in that case remaining inoperative).

On the other hand if the "correction" text is shorter than the text of the "normal" strip (for instance one line instead of three), it is only necessary to follow up the first and only line of the "correction" strip by two complementary "limit signals"; each followed by a space without signal and a "correction" signal, each of these two "limit signals" and "correction" signals successively actuating the mechanism for selecting the two strips, i. e., making inoperative the driving mechanism of the "correction" strip and allowing to pass without interline spacing, since the flap is closed and the strip is inoperative, one line of the "normal" strip up to the point when the "limit signal" perforation of the next line of the "normal" strip again actuates the "normal" strip "correction" strip selecting mechanism for a fresh line. Thus the two excess lines of the "normal" strip are passed through the feed mechanism without acting on the signals of the composing machine, thereby returning, at the end of the operation, both strips to the starting position for a fresh line of composition, either in respect of the "normal" strip, or of the "correction" strip.

The driving mechanism also enables, in the course of a line, the strip 46 which is operative to be kept stationary for a fixed time corresponding to several revolutions of the driving shaft, in order to make possible certain control operations which are of longer duration than that of one revolution of the wheel 305—1 or 2 (for instance the change of the alphabet disc, or of the enlarging ratio).

To this end, one of the hole signals called "fixed duration repetition" signal acts on a valve 410—G or H which lifts the hook 281 or 282, so as to disengage the lever 315—1 or 2.

The next revolution of the wheel 305—1 or 2 will bring the next signal (which is to be prolonged beyond the normal duration) in front of the holes 275 of the table 274 and will operate, as already seen, each lever 309—1 or 2 by means of the roller 319—1 or 2. If the actuating system 295—301—304—309 corresponding to the lever 309—1 or 2 is in the course of operating, in other words if the rod 326 of the piston of cylinder 279 or 280 is not in a position which enables the hook to engage, the assembly formed by lever 309—1 or 2, connecting rod 306—1 or 2 and pawl 313—1 or 2 will be driven backwards just the time necessary to enable the ratchet 293—1 or 2 to return abruptly, then the whole linkage 309—1 or 2, 306—1 or 2, 313—1 or 2 not finding any hooking point will return to its initial position. The lever 301—1 or 2 will gradually catch up the backward movement of the wheel 298—1 or 2 during a number of revolutions of the wheel 305—1 or 2 therefore for a time corresponding to the number of teeth which the wheel 298—1 or 2 has rotated backwards which backward rotation is limited as will be seen hereinafter.

Finally, the driving mechanism enables also a given letter or sign to be repeated a number of times determined by the operator, from a single signal, thereby limiting the consumption of the strip 46 and facilitating the changes of alphabet disc or of the optical enlargement ratio, as will be seen hereinafter.

In order to obtain these repetitions "of fixed

duration" and "of predetermined duration," a free wheel 417 with its hub 417 bis is mounted with a running fit on the end of the common shaft 289, and a pair of rigidly connected wheels 416—415 is mounted with a running fit on said hub 417 bis (Figs. 14 to 17).

The wheel 415, which is toothed, can be engaged with a gear wheel 418 secured to the roller 272. The wheel 416 is provided with a semi-circular slit 424; said wheel 416 only has teeth over a part of its circumference; the wheel 417 is provided with a slit 425 substantially shorter than the slit 424; furthermore, the wheel 417 only has a single tooth 426 and, at the end of the slit 425 a small pin 427 which is constantly engaged in the slit 424 and is adapted to lock in a housing 436 provided in the end of the slit 424.

On the shaft of the pawl 307—1 or 2 is mounted a retaining pawl 420—1 or 2, the tail 421 of which encounters the stop 422 and limits the downward movement caused by the spring 423, so that the point of the pawl 420 can never come into contact with the smooth portion of the periphery of the wheels 416 and 417.

Along the shaft 289, the block of wheels 415—416—417 can assume laterally two distinct positions (A and B) which are controlled by a piston 428 sliding in a cylinder 429 with a reciprocating movement by the action either of a valve of the 410 type controlled by a "totalisation" signal (change from A to B); or by the action of a second 410 type valve controlled by a "repeat of controlled duration" signal (change from B to A).

In the normal position A, the wheel 415 is completely disengaged from the wheel 418, while the wheel 416 has engaged one of its teeth in the point of the pawl 420, preventing any backward movement of the wheel 416.

In fact, in this position A, the wheel 416 is ordinarily locked on the pawl 420 by its last left-hand tooth, thereby holding the slit 424 in such a position that the small pin 427 of the wheel 417 is engaged in the housing 436 of the slit 424, the end of said slit 424 registering with that of the slit 425—1 or 2.

If, by the action of a "limit signal" or of a "fixed duration repeat" signal, the wheel 298 is released by the retraction of the pawl 313, its backward rotation is limited by the travel of the pin 432 in the slits 424 and 425, which travel corresponds, by construction, to a fixed number of teeth of the wheel 298 (three for instance).

In the second position (B), the wheel 416 is completely disengaged from the pawl 420, while on the contrary the wheel 417 has engaged its single tooth 426 in the pawl 420, thereby locking the wheel 417 in the same conditions as in the position 2 limiting any backward movement of the wheel 298 to 3 teeth if said wheel is released while the mechanism is in the position "B" by a "limit signal" or a "fixed duration repeat" signal.

Finally, the wheel 415 has engaged the wheel 418 and, for an appropriate gear-up ratio, rotates in the direction of the arrow an angle corresponding to one tooth of the wheel 298 for each rotation of one division of the wheels 294 by the action of the lever 293.

Thus the pair of wheels 415—416, while it remains in the position "B," effects a predetermined rotation until the "controlled duration repeat" signal returns the whole arrangement of wheels 415—416—417 etc. to the position "A," locking, by means of the pawl 420, the tooth of

the wheel 416 corresponding to the angular displacement acquired at B and thus fixing the relative position of the slit 424; at the same time, said "controlled duration repeat" signal has acted on the valve 410—G or H, lifting the hooks 281, 282 which release the levers 315, thereby releasing, at the second revolution of the wheel 305, the wheel 298 which rotates until the pin 432, loosely driving on its way the wheel 417 by the end of its slit 425 abuts and stops against the end of the slit 424, thereby imparting to the wheel 298 an angular displacement of 3 divisions definitely acquired, plus a number of divisions determined by the angular displacement effected by the system 415—416.

The return of the wheels 416—417 to the normal position (i. e., to the position which only permits of a fixed rotation of the wheel 298, limited for instance to 3 divisions) is effected by the action of the set of levers 301 which, as they gradually return the wheel 298 to its original position, at the same time drive the wheel 416 by its teeth until the instant when the pawl 420 locks its last left-hand tooth. The wheel 416 automatically drives into a similar position the wheel 417, the pin 427 of which has come into contact with the end of the slit 424 in the housing 431 which is provided for it.

Thus, in order to obtain a repeat at will (beyond 3 divisions) of a given letter or sign, it is only necessary to register on the strip 46 the sign to be repeated and the controlled duration repeat signal, then to count from the sign to be repeated the number of signals, letters or signs of the composition corresponding to the desired number of repetitions and then to insert on the strip a "totalisation" signal. By the effect of the reverse reading of the strips 46 by the composing machine, the "totalisation" signal will appear first and will ensure the suitable actuation of the mechanism 415—416—417 before the "controlled duration repeat" signal becomes operative.

For all the signals which do not have any justification movement (for instance change of alphabet disc or of the enlarging ratio), the repeat mechanism operates as above, thus prolonging the duration of their operation.

For all the other signals having a justification movement (letters, signs, etc.) which are to be repeated a predetermined number of times, it is absolutely necessary for the supply current controlled by the signal to be cut off at each revolution of the driving wheel so as to allow of the repetition of the normal operation of the justification mechanism.

To this end, the common output wire of all the electromagnets 412 controlling the valves 410 of the justification cylinders 72 is connected to a copper roller 505 (Fig. 35) which constantly rolls on the copper periphery of a wheel 503 driven by the shaft 480. Said wheel 503 is connected to the frame and the circuit is made so long as the roller 505 rolls on the copper. On a predetermined part of its periphery, the wheel 503 is provided with an insulating segment 504 which thus breaks the circuit for a predetermined period during each revolution.

Furthermore, this device is so adjusted that at the appearance, during the normal unwinding of the strip 46, of each fresh signal in front of the holes 275 of the table 274, the action of the valves 91 H and of the rocking shafts 400 has the time to make all the fresh connections of the reversing switches 401 controlled by said signal before the

electric current flows again, this being in order to prevent wrong connections during the operation of the rocking tubes 400. In the same conditions the supply is cut off before the rocking tubes 400 return to their inoperative position when the signal ceases to be operative.

ROTATION OF THE ALPHABET DISC AND SELECTION OF THE LETTERS

The selection of the letters to be projected for composing is effected as follows:

The alphabets for composing comprise:

(1) A projecting case 360, with the holes 361 of its central portion, its projection aperture 362, its peripheral perforations 363 arranged along two circumferences, its flange 364 and its manipulating lugs 375 (Fig. 18).

At the centre of the case 360 are fixed, on the rear face towards the flap 211 (Fig. 12), a metal knob 366 forming a pivot for a disc 366 bis, called "justification" disc (Figs. 23 and 27), the radius of said disc being proportional to the actual width of the type of alphabet contained in the case 360, and also at the centre, on the other side of the case, inside the same, a metal disc 239.

In the knob 366 and the disc 239 are screwed the bushes 222—1 and 2 in which rotate the two journals 225 of the shaft 365 of the alphabet disc proper;

(2) The alphabet disc proper comprising a double aluminum plate 368; said plate has a central portion of a certain thickness, which is provided at its centre with a hole of which the screw thread enables the shaft 365 to be fixed (Fig. 19).

The aluminum plate is cut out and forms a set of vanes 371 forming a minute turbine. On said plate is fixed a steel needle 372, the point of which extends beyond the circumference of the alphabet disc 370.

The alphabet disc 370 is provided at its periphery with all the letters or signs of the alphabet 373 which are arranged in the form of a double ring, the capital letters on the outer ring, the small letters on the inner ring. The small letters are staggered laterally relatively to the capital letters.

The various letters of each ring are aligned relatively to an ideal circumference which passes, for each letter (Fig. 20), through the point of intersection of the perpendicular, on the one hand, dropped from the extreme left-hand point of each letter, and on the other hand the horizontal corresponding to the typographic base of the letter. For projecting, the letter must be kept stationary over the path of the light ray, in such a manner that the optical axis passes through the point of intersection 1.

The letters or signs may be obtained by a photographic process, the letters or signs as a negative, therefore transparent, the background of the disc being black.

At any point of the circumference corresponding to the path of the steel needle 372, one division of the row of capital letters and one division of the row of small letters do not bear either a letter or a sign and therefore remain obscure, in order to prevent any photographic action during the "spaces" and also during certain controlled operations not requiring to be printed.

The perfect centering of the alphabet disc 370 in the case 360 is obtained by means of the relative length of the journals and bearings. Furthermore, to prevent objectionable play occurring, provision is made for changing, at regular intervals of time, the parts which are subject to

wear: to this end, the bushes 225—1 and 2 are made removable by construction, and also the spindle 365 of the alphabet disc 370 which screws in the aluminum plate 368 (Fig. 22).

A number of alphabet discs 370 (for instance 9 or 12), enabling a sufficient variety of alphabets of the same family to be grouped together for the work, are fitted by means of their case 360 on the plate 207 in the cut out portions 374 of same, the manipulating lugs 275 of the cases 360 being brought opposite the wings 376, and the operator giving a slight rotary movement to the case in order to engage the knife 377 of the lug 375 behind the flange 379 of the plate 207 and thus fix the case 360.

Owing to their low cost of construction, the operator will have a large collection of alphabet discs which will enable the most varied work to be carried out while making a comparatively restricted use of photographic enlargement or reduction, the types of alphabets not always being adapted to the substantial variations from the size for which they were designed.

The alphabet discs 367 are automatically brought as will be seen hereinafter, by the composing machine, into the projection position, by the rotation of the plate 207. Said plate stops at a given point such that one of the small letters, at the operator's choice, can, at the top of the alphabet disc in the projection position A, be stopped if desired opposite the projection aperture 214 of the flap 211.

As soon as it is placed in the projection position A, the alphabet disc is rotated rapidly, by the action of a jet of air blown from the nozzles 379 on the vane wheel 371 (Fig. 23).

This current of air furthermore offers the advantage of constantly cooling the alphabet discs kept near the projection lamp 395.

The projection of the letters and signs is made possible by the successive stoppages of the alphabet disc placing the desired letter or sign in front of the projection lamp, opposite the optical system.

In order to produce the stoppages of the alphabet disc 370, there is arranged, on the wall of the projection box 206 directly facing the plate 207, a ring of electromagnets 385, each controlling a soft iron knife 386 pivoting on two journals 387 apart from the electromagnet 385. The other end of said knife passes through the eye of a special steel needle 389 adapted to slide in the guide 390 (Fig. 24).

During the period of magnetization of a given electromagnet 385, the soft iron armature 386 is attracted, thereby causing the end of the needle 389 to move forward through one of the openings of the foraminous ring 363 of the case 360 of the alphabet disc and intersect the plane of rotation of the needle 372 of the alphabet disc, locking for a time said needle as it first passes, and, consequently the alphabet disc selecting a predetermined letter.

As soon as the magnetization stops, the knife 386 is returned to its inoperative position by the action of its spring 388, the needle 389 is retracted, the needle 372 is released and the alphabet disc begins to rotate again.

SELECTION OF THE CAPITAL LETTERS AND SMALL LETTERS

The electromagnets 385 are all provided with one winding, save one controlling the "spaces." This electromagnet is provided, connected in different circuits, with various windings of which

the lead out wires control justification movements which are appropriate for its multiple functions: fixed space, variable space, justification space, or on the contrary does not control any justification movement for all the cases in which the space is only intended to stop the projection in the case of operations which are not directly involved in the projection (change of alphabet disc for instance).

The plate 207 having stopped in such a manner that the small letters of the alphabet disc in the position A can come successively in front of the projection aperture 214 of the flap 211, the selection of the small letters is obvious.

In order to obtain the selection of the capital letters, it is only necessary to impart a very slight rotation to the plate 207, sufficient, taking into account the length of the radius 259—214, to make the capital letters ring in its turn pass in front of the projection aperture 214 (Fig. 44).

In order to compensate the fact that in this second position of the plate 207, the alphabet disc is slightly eccentric relatively to the centre of the circumference of the locking needles 209 which has remained stationary, the small letters are slightly displaced relatively to the capital letters when the alphabet disc 370 is being constructed (and also the perforations 363 of the case 360 are arranged in two rings which intercross one another) (Fig. 18).

The selection of the capital letters and small letters is obtained by imparting to the plate 207 a slight angular displacement in one or the other direction of rotation, which, according to the case, enables one of the divisions, at will, of the capital letter ring or the small letter ring to be placed in the path of the light ray in front of the projection aperture 214.

This oscillatory movement is controlled by a mechanism connected to the alphabet disc changing mechanism, which will be seen hereinafter. For the time being, it is only necessary to remember that this mechanism stops the plate 207 bis during the angular displacements of the plate 207.

The mechanism for selecting the capital and small letters comprises a rod 327 (Fig. 44) pivoted at a point 328 of a wheel 335 of which the freedom of rotation which is limited to about 200° (angle AOB), can bring the pivot 328 into a low position 328 or a high position 329 bis, by the reciprocating action of a rack 336, operated by a piston 336 bis sliding in a cylinder 337, the said piston 336 bis receiving its driving action from the vacuum created at one or the other hand of the cylinder 337 by two single-acting valves of the 410 type, one controlled by the "capitals" signals, the other by the "small letters" signal. The electric circuit opened by the "capitals" or the "small letters" signal also produces the magnetization of the electromagnet 385 controlling the spaces (winding or controlling the spaces without justification), this being to prevent the light ray from exposing the plate when the slit 442 of the shutter disc 392 passes.

Along the periphery of the plate 207 are fixed short equidistant rods 338, at the rate of one rod per alphabet disc (Fig. 44).

The roller 339 which is mounted at the end of the rod 327 being pressed against one of said rods 338 exerts, on the plate 207 urged by the spiral spring 203 in the direction of the arrow, a pull which, according to the position of the pivot 328, constrains the plate 207 to take up two well-defined positions, corresponding to the

"capitals" or the "small letters" position of the alphabet disc 210 in the operative position.

In changing from "capitals" to "small letters" or conversely, it is necessary to reverse the circuits of the electromagnets 412 of the type 410 valves controlling the cylinders 72 which regulate the justification of the various capital and small letters.

For this purpose, the wheel 335 is mounted on a rocking shaft of the 400 type (Fig. 2) provided with a number of two-way reversing switches 404 operating by means of a drop of mercury in a vacuum. All the outgoing wires of the electromagnets 385 for holding the letters and signs stationary lead—by groups which are variable in number—to the inlet passages 402 of the reversing switches 404. Said reversing switches, according to the relative position of the shaft of the wheel 336, transmit the current to one or the other of their terminals 403 controlling by means of a type 410 valve the operation of such a cylinder 72. The current is then transmitted to the frame through the troller 505 rolling along the periphery of the wheel 503, Fig. 35.

The grouping of the outgoing leads of the electromagnets 385 and the various switchings of the output terminals 403 enable the two suitable justifications combinations to be obtained for each signal, taking into account the type of letter given by the signal (i. e. a half-wide letter and a wide letter: example *m* and *M*; a narrow sign and another narrow sign: example . and , —and so forth).

PROJECTING AND PHOTOGRAPHING THE LETTERS AND SIGNS

The projection mechanism contained in the projection box comprises:

The shutter disc 392.

The source of light 393.

The shutter comprises a disc 392 rotating on the shaft 396 screwed on the cross member 399 mounted on the projection box 206 in exact alignment with the shaft 365 of the alphabet disc in the position A for projecting the small letters. This disc 392, by means of bevel gears 441—1 and 2 receives from the drive shaft, through the intermediary of the shaft 440, a constant rotary movement.

The rotary switch is provided with an opening 442, the surface of which may, moreover, be limited by a sliding shutter 443 in order to permit of the adjustment of the optimum time of exposure, for the maximum coefficient of optical amplification, taking into account the intensity of the source of light and the speed of rotation of the disc 392. The opening 442 allows the light ray, emitted by the lamp 393 and continuing its path through the light aperture 214 after having passed through the alphabet disc, to pass intermittently.

The source of light formed by an electric lamp 393 can be shifted along the axis 444—445 for the adjustments, the light ray being reflected in the direction of the aperture 214 by the prism 446; cooling fins 447 are provided.

JUSTIFICATION

It is through the instrumentality of the justification mechanism that the composing form 224 gradually moves along the horizontal rails of the frame 261 and ensures the longitudinal exploration of the plate by the optical ray.

Said justification mechanism comprises:

1. The mechanism for selecting the characters in accordance with each type of alphabet used

and the mechanism for selecting the fixed spaces and the justification spaces.

2. The mechanism for adjusting the shaft provided with unequal wheels 61 in accordance with the alphabet disc used.

3. The mechanism for materializing the justification constant (justifiable spaces).

4. The system for transmitting the justification movements to the composing form, and for transferring the ratio of optical enlargement or reduction.

1. *Mechanism for selecting the characters in accordance with the type of alphabet used, and the fixed and justifiable spaces*

The mechanism for selecting the characters is of the same type as the one operating on the tabulating machine such as it has been described hereinbefore, but used vertically (and no longer horizontally) (Figures 3 and 41). Furthermore, the angle to be given to the shaft 61 for each type of alphabet used will in this case no longer be controlled by the operator, but this operation will be effected automatically by the composing machine, in accordance with the alphabet disc used as will be seen hereinafter.

To this mechanism, but independently, thereof, are added (Figs. 61A/B) along the lever 84, two superposed cylinders 443 and 449 the rods 450 and 451 of which produce directly, by their linear movement (without the intermediary of a gear 68 and of the shaft 74), the first: a space of invariable width, common to all the alphabets and necessary for certain composing work, the stroke of this piston being fixed once and for all, and the second: by its linear movements the justification spaces which are variable from one line to the other, the variations of the abutment 452 limiting the stroke of said piston being controlled by the mechanism for materializing the justification constant as indicated hereinafter.

The end of the rods of the pistons of said two cylinders extend on the right or on the left of the lever 84 up to the height of the point of utilization of said lever 84 as indicated hereinafter.

The movements of the pistons 75 of the cylinders 73 are controlled as follows:

The valves 81 having expressed, by the movements of the oscillating shafts 400 and of the switches 491, the signal transmitted by the strip 46, the corresponding electric current flows through one of the electromagnets 395 which is adapted to hold the alphabet disc stationary for the projection of a given letter, and through one of the electromagnets 412 (according to the actual width of the letter) which controls, through a three-chamber pneumatic relay, according to Fig. 36, the suction in the corresponding cylinder 72, producing an appropriate movement of the lever 84. The central chamber 410² is in permanent communication with a pipe 413 which is common to all the relays and which leads to the rarefied air pump; one of the end chambers 410¹ communicates with one of the ends of one of the cylinders 72 and with the surrounding air; the other end chamber 410³ communicates with the other end of the same cylinder 72 and with the surrounding air (see operation above).

2. *Device for adjusting the shaft provided with unequal wheels 61 according to the type of alphabet disc used*

Along the horizontal diameter of the plate 207

can slide, in the guideway 389 fixed to the inner side of the flap 211, on the left of the line 212—213 (Fig. 3), a rod 381 forming, over a certain length, the rack 382, which meshes with a gear 63 bis fast on the shaft 61, provided with unequal wheels, of the justification mechanism, in place of the handle 63 of the same mechanism on the tabulating machine.

One of the ends of the rod 381, after a double curve 383—384 which causes it to pass outside the flap 211 through the groove 391, widens out in the shape of a plate 394 having a rounded side 397. A flap, not shown, mounted on the rod 381 prevents any light from entering through the slot 391.

The rod 381 is made fast to a piston sliding in a cylinder 392 controlled by a type 410 double-acting valve (Fig. 26).

The "change of alphabet disc" signal which controls, as will be seen hereinafter, the rotation of the plate 207 acts on a type 410 valve which causes the suction from right to left of the piston, carrying with it the rod 381 and the rack 382 to the end position in this direction, thereby returning the shaft provided with unequal wheels 61 to the zero position.

When the alphabet disc selected is placed in position, the disappearance of the "change of alphabet disc" signal stops the supply to the electromagnet 412 and, by reversal of the operation of the type 410 valve, causes the piston 398 to be sucked in the opposite direction.

The rack 382 therefore moves in the opposite direction driving the shaft 61, until the rounded side 397 of the plate 394 comes into contact with and stops against the edge of the wheel 366 of the new alphabet disc in position for projection A which wheel represents the justification width of this alphabet disc. Thus a proportional movement is applied to the rack 382 and, consequently, to the shaft 61 of the justification mechanism.

3. *Mechanism for materializing the justification constant*

The purpose of this mechanism is to control the linear movements and the stops of a slider 453 (Figs. 34 and 36B) of which the end 453 is adapted to limit the stroke of the piston 451 of the cylinder 449 proportionally to the variable width of the "justifiable spaces" such as it is recorded on the strip 46 for each line of text, by the justification perforation.

For this purpose, along a guideway 455 (Fig. 28) provided underneath the board 274 over which slide the normal strip 46 and the correction strip 46, can move a slider 456 carrying a valve 91C, this reciprocating sliding movement being controlled by the action of the partial vacuum by means of the rod 457 of a piston moving in a cylinder 458.

In its sliding movement, the slider 456 produces, by the action of the rack 459, the alternating rotation of a steel wheel 472 which is secured to the pinion 460 and is mounted on the shaft 468 and carries the electromagnets 471 (Fig. 12).

The chamber 97 of the valve 91C is provided with two vacuum tubes 90—1 and 2 terminating in two plates 287—1 and 2 which are adapted to slide in the grooves 276—1 and 2 of the board 274 in the axis of movement of the justification perforations of the two strips 46 (Figs. 53 to 56).

The outlet tube of the valve 91C leads to the cylinder 461 and, when the valve operates, i. e.

when one of the tubes 90—1 and 2 comes opposite the justification perforation of the strip 46 which is operative, the rod 462 acts on a switch 463 which is capable of moving from a contact 469 to a contact 470. Said switch controls or cuts off the current from a set of electromagnets 471 mounted on the wheel 472.

Opposite said wheel 472 and immediately adjacent same, is loosely mounted on a shaft 474 a steel wheel 473 forming part of a system which includes the wheels 473 and 473 bis which are coupled to one another by the belt 475 and the rod 476 pivoted on the cranks 477—1 and 2 (Fig. 34).

The bar 453 which can slide in a guide 454 can register the lateral movements of the rod 476 by means of the roller 476 and of the retracting springs 483.

Returning to the slider (Figs. 29-30-31), the movement of which was started by the "justification" signal as soon as one of the vacuum tubes 90—1 and 2 of the valve 91C secured to the slider comes opposite the perforation of the justification signal of the operative strip, the valve immediately becomes operative owing to the action of the cylinder 461 and the switch 463 cuts off the supply from the electromagnets 471. The wheel 473, which by hypothesis, was magnetically engaged with the wheel 471, is released and, by the action of a spring, returns to its inoperative position carrying the crank 477—1 or 2 into a vertical position thereby causing the bar 453 to move into its extreme forward position and the end 452 of said bar comes into contact again with the end of the rod 451 of the piston sliding in the cylinder 449, which corresponds to the zero position (Figs. 32-33-34).

The slider 456 and the justification valve 91C continue their travel, then, the motion being reversed, return towards the starting point; when the vacuum tube 90—1 or 2 of the valve 91C again passes over the justification perforation of the operative strip, the valve 91C again becomes operative and, acting again on the switch 463, closes the supply circuit of the electromagnets 471; the wheel 473 engages magnetically with the wheel 472 and accompanies same up to the end of its revolution, the slider 456 returning to its starting position.

At this instant, the rod 478 undergoes a lateral movement which corresponds exactly or proportionally to the movement of the first rod 156 of the justification grid of the tabulating machine for the same line of the text, which movement is transmitted to the abutment 452 and maintained throughout the duration of the line, the electromagnets 471 remaining energized and locking the system in the position which it has acquired.

4. System for transmitting the justification movements to the composing forms

The mechanism for driving the carriage 224 comprises a "coupling bar" 495 (Figs. 3 and 39), the two sides of which are formed, one by two soft iron blades 255 and 256 and the other by a soft iron blade 225.

Electromagnets 496—1 which are housed in the body of the coupling bar and which can magnetize the blade 255 are kept almost constantly energized, their supply only being cut off during the change of line, by the upsetting, by the lever 435, of a mercury switch 439 (type 401) but with only one outlet wire (Figs. 5 and 8).

The electromagnets 496—2 which can mag-

netize the bar 225 are intermittently supplied by the wheel 503 (Fig. 35) which forms a switch. The periphery of said wheel 503 which is mounted on the shaft 480, forms a pole piece and is broken by a short section of insulating material 504; around said periphery rolls a roller 505 which closes the circuit.

The coupling bar 495 is supported by the rollers 258 and can move along the rod 479 parallel to the carriage 224 (Fig. 3) and slightly retracted from said carriage. It is also capable of oscillating slightly on the rod 479 (Fig. 39 bis) which has the effect, by the influence of the magnetism of the electromagnets 496—1 and 2, of bringing the blade 255 into contact with the carriage 224 with which it becomes fast and the blade 225 in such a position that it can, at a point of their travel, magnetically fix the movable justification parts, as will be seen hereinafter.

During the short periods when the electromagnets 496—1 are not supplied (change of line), the coupling bar oscillates on the rod 479 by its own weight, thereby disengaging it from any contact with the carriage 224 on the one hand, and with the movable justification parts on the other hand.

A vertical shaft 480, the continuous rotary movement of which is controlled by the drive shaft, drives a cam 481 on which is fixed the small roller 482. Finally, the upper part of said shaft terminates by a bevel gear 484 (Fig. 55).

On the shaft 485 is loosely mounted a bevel gear 486 meshing with the piston 484, the gear-up ratio being such that the wheel 486 rotates four times slower than the pinion 484.

Said wheel and its hub 487 are connected, by a spiral spring 488, to a light part 489 also rotating on the fixed shaft 485, said part 489 comprising a central body 489 carrying four rods 490. Along each of said rods can slide a small steel blade 491 forming a kind of movable "hinge," the maximum longitudinal movement of said "hinge" being equal to the largest justification width provided. The central body 489 carries, at its rear part, four small pins 492 (Figs. 35-37-38).

For each revolution of the wheel 486, the part 489 also effects a complete revolution; however the revolution of the part 489, which is driven with a certain degree of freedom by the spring 488, is effected in four stages, the stoppages of rotation being controlled by the escapement 493 which, at each revolution of the shaft 480, is lifted by the roller 482 (Fig. 37).

At each stoppage of the part 489, the metal hinges 491 are in the position of Fig. 38, i. e. three of them hang vertically below their rod 490, one of them only being held in the horizontal position by the bearing rod 494.

This latter hinge has one of its ends exactly at the height of the point of utilization of the lever 84 of the justification mechanism and the end of the rods of the pistons sliding in the cylinders 488—489 (Figs. 36A and B).

If it is assumed that before coming to a standstill in its low position, the hinge 491 has been pushed up to the front end of the rod 490, the justification movement of the lever 84 or of the rod 450 or 451 of one of the pistons of the cylinders 448 or 449 will push the hinge 491 along the rod 490 a length which corresponds exactly to said justification movement, the friction of the hinge 491 on the rods 490 and 494 not allowing the movable part to exceed the movement which is applied to it.

The roller 482 acting on the escapement 493

causes the part 489 to rotate a quarter revolution; the "justified" hinge 491 escapes from the bearing rod 494 and presses against the blade 225 of the "coupling bar" 495 which fixes it by magnetism by the action of the electromagnet 496—2, the actual width of the hinge and its relative position enabling it, by the underneath, to pass a certain length beyond said bar (instead of being actuated by the lower part, the hinges 491 could just as well be provided with a lateral actuating projection).

Pivoted at 497 and urged by the small spring 483, a lever 498 carrying the grooved roller 499 registers the movements which are imparted to it by the rotation of the cam 481 and transmits them to the free section of the hinge 491 which is pressed against the bar 256 by means of the arm 500, according to the justification position of the hinge 491²; the arm 500 comes into contact with the hinge 491 more or less immediately, but in any case the arm 500 is designed to actuate the hinge up to the end of its possible travel, i. e. up to the end of the rod 490.

This mechanism therefore transmits to the composing form, through the intermediary of the coupling bar 495, the left to right movements for all the letters and signs, according to their justification widths.

Things are arranged in such a manner that, while the justification mechanism is justifying the hinge 491—1, the arm 500 transmits the justification movement to the hinge 491—2 and so on the composing forms.

The supply to the electromagnets 496—1 and 2 is cut off by the wheel 503 at the precise instant when the hinge 492 is to be released, thereby making possible the rotation, through a quarter revolution, of the part 499.

Thus, during the short lapse of time of letter signal the following sequence of operations takes place:

(a) During the first part, which is relatively the longest, the new character is selected and locked, the justification of said character is registered and, as it were, placed in store, by the hinge 491¹; the justification of the previous character is transmitted to the composing form, then the hinge 491¹ is reset to zero.

(b) During the second part, the shortest, the photographic exposure is effected, then the part 489 for registering the justification moves forward a quarter revolution and the justification mechanism proper returns to the inoperative position; the alphabet disc starts to rotate again.

MECHANISM FOR CHANGING THE ALPHABET DISC

This mechanism comprises:

(1) Carried by an arm 520 forming the extension of the light box 266, a system of wheels 522—523 (Figs. 34 and 35) which are secured to their shaft, the wheel 522 forming the driving wheel, with its roller 524, of the Maltese cross of the plate 207 bis, and the wheel 523, with its conical teeth forming the driving wheel (Fig. 34).

This system of wheels, which is normally kept inoperative (the wheel 523 locking the Maltese cross by means of its section 525 inserted in one of the recesses 204), can be rotated by the rotary assembly comprising the bevel gear 527, the shaft 529 and the bevel gear 528 meshing with the wheel 523.

Said rotary assembly is supported by the guide 531 which is allowed by an articulation 533 a

very slight angular displacement which places the wheel 527 in contact with the bevel gear 534 mounted on the continuously rotating shaft 440. These two wheels 527—534 may be provided with intermeshing conical teeth or may act by friction (Figs. 34, 35).

The angular displacement of the assembly is controlled by a piston 535 sliding in the cylinder 536 housed in the projection box, the suction in said cylinder being controlled by a single acting type 416 valve which obeys the change of alphabet disc signal.

(2) A rod 357 supported by the oscillating lever 358 pivoted on the projection box is pivoted by one of its ends 359 to the rod 327 and carries, at its other end, a roller 320 which, by the pull of the spring 324, is constantly pressed against a cam 325 mounted on the face of the wheel 522 opposite the flap 211 (Fig. 36).

The "change of alphabet disc" signal by means of suitable electric connections, acts on the winding of the electromagnet 385 controlling the space (without justification) for neutralizing the optical ray and, through the piston 535, presses the wheel 527 against the wheel 534 of the shaft 440; the wheels 522—523 are immediately rotated, the cam 325 pushes back the rod 357 and the roller 359 of the rod 527 is disengaged from the rod 538 for stopping the plate 207 bis and, through same, the plate 207. Meanwhile the rod 327, by the action of the spring 324 and of the roller 320 on the cam 325, has been retracted towards the centre and the roller 539 has again come into position in the path of the next stop rod 338, so that when the plates 207 bis and 207 have moved forward one division, the roller 339 and the rod 327 retain the stop 338, and the next alphabet disc is thus placed in the operative position (capital or small letters according to the position of the wheel 335 before the changing of the alphabet disc).

The degree of freedom allowed the plate 207 bis relatively to the plate 207 and the action of the spring 203 automatically compensate any play of the plate 207 and of the wheel 522.

If the gear-up ratio of the wheels 534—527 and 523—522 is suitably chosen, such, for instance, that it requires three revolutions of the shaft 440 for one revolution of the wheel 523—522, it is only necessary, in order to obtain the change of any alphabet disc and its replacement by any other, to repeat the change of alphabet disc signal a number of times equal to the number of the alphabet discs to be passed over multiplied by three, this repetition being automatically effected according to the method hereinafter indicated.

DEVICE FOR ADJUSTING THE OPTICAL SYSTEM AND THE JUSTIFICATION MECHANISM ACCORDING TO THE CHANGES OF THE COEFFICIENT OF PHOTOGRAPHIC ENLARGEMENT OR REDUCTION

On the front part of the sleeve 232 of the optical system leaving the aperture 238 uncovered, can rotate with running friction a second sleeve 506 on which are mounted the plate 507 and the gear 509 (Figs. 4 and 47).

The two faces 507—1 and 507—2 of the plate are provided, along imaginary radii dividing the circumference into a number of equal arcs (for instance 24 in the figure) with stops 509, at the rate of one stop per radius, on each face of the plate 507 (Figs. 40 and 41).

Said stops are more less distant from the centre

according to the distance determined by the optical law which fixes the distance of the lens and of the plane of projection from the image to be projected, proportionally to the focal length of the lens and the ratio of optical enlargement or reduction, the position of the source of light being fixed, and account being taken of the lengths A B and C D which are fixed by construction (Fig. 4).

If it is assumed that the disc 507 is kept stationary in such a manner that one of its imaginary radii is in alignment with the axis of the guideway 231 of the optical system (Fig. 4), it is only necessary, in order to give the optical system a predetermined ratio of enlargement, if the location of the stops 509 has been accurately fixed, to press the end of the rod 236, and of the plate 245 (Fig. 4), of the sliders 235 carrying the lens and the sliders 243 carrying the prism respectively against both of the stops 509 of the sides 507—1 and 507—2, for instance by pulling two rods 510 and 511 attached to the two sliders 235 and 243 and secured to pistons 512—1 and 2 sliding in the cylinders 513—1 and 2 which are controlled by a double acting type 410 valve.

If the number of the pairs of stops 509 is sufficient there can thus be distributed over the plate 507 a scale of photographic enlargement and reduction which is sufficient to express all the variations which are likely to be used in practice ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$ etc, up to the ratio 4 for instance).

It should be noted that in practice, the whole scale can be used for the same alphabet, the reproduction of a given alphabet only remaining correct for a fairly small enlargement ratio, but the greatest enlargement ratios can be used in order to obtain, in composing, correct large body characters from alphabet discs in which the characters for projection are voluntarily deformed in their reduced size.

On the sleeve 232 is also mounted a gear 508 which meshes with gear 512 on the one hand, and with a gear 513 bis on the other hand (Fig. 47).

The gear 512, like the plate 507, is provided with a set of stops 514 which transfer the arithmetical ratios of photographic enlargement or reduction corresponding to the stops 509 of the plate 507.

In a plane parallel to the wheel 512 can move vertically along the guideway 119, the slider 118 of the lever 84 for transferring the photographic enlargement or reduction ratio of the justification mechanism (Figs. 32, 33). At each change of photographic enlargement ratio, the appropriate signal controls, inter alia, first by suction in the cylinder 115, the maximum lift of the slider 118 then, when the signal disappears, the suction in the opposite direction in the same cylinder causes the slider 118 to move downwards until the finger 515 of said slider abuts against the stop 514 of the wheel 512, stopping its operation and determining the new enlargement ratio.

MECHANISM FOR CONTROLLING THE SYSTEM OF PHOTOGRAPHIC ENLARGEMENT

The wheel 513 (Figs. 1, 47, 48) is provided, round its periphery, with as many tapped holes 517 as there are imaginary radii and therefore stops 519 or 514 on one face of one or the other of the wheels 507 and 512. Before a composing operation is started, the operator, after having selected the suitable enlargement ratios, screws

a stud 518 into each hole 517 corresponding to the desired enlargement ratios (Fig. 48).

Parallel to the wheel 513 (Figs. 47-49) and slightly to the rear, are mounted on the shaft 544 the group of wheels 545-546 which are secured together and the free-wheel 552.

The wheel 545, by the action of the roller 548 at the end of the spring, determines the rotation of the wheel 546 through regular angles.

The wheel 546 is provided with a number of teeth (8 in Fig. 49) which are adapted successively to intersect the circumference of the tapped holes 517 of the wheels 513 and a locking projection 550.

The wheel 552 is cut out in the shape of a Maltese cross with 8 recesses 553, said wheel being provided with a stop 554 opposite the projection 550.

The rotation and the stoppages of the wheel 552 are controlled in a similar manner to those of the plate 207 bis by a system of wheels 555-558 which are secured together by their shaft, the wheel 555 forming the driving wheel for the Maltese cross, with its roller and its stopping zone 557, the wheel 558 with its bevel teeth forming the driving wheel.

This system of wheels 555-558 which is normally kept inoperative, the wheel 555 stopping the Maltese cross by means of its section 557 inserted in one of the recesses 553, can be rotated by the group comprising the bevel gear 560, the shaft 549 and the bevel gear 561 meshing with the bevel gear 547 of the shaft 420.

This assembly, which is articulated at 562, can undergo, by the pull of a piston contained in the cylinder 543, a slight angular displacement which brings the wheel 561 into contact with the wheel 547 of the continually rotating shaft 440. These two wheels may be provided with bevel teeth or may act by friction.

The angular displacement of the assembly is controlled by a piston sliding in the cylinder 543, the suction in the cylinder being controlled by a single-acting type 410 valve obeying the "change of enlargement ratio" signal.

Said signal thus causes the wheel 552 to rotate at a rate, for instance, of one recess 553 for 3 revolutions of the shaft 440.

This "change of enlargement ratio" signal, by means of suitable electric connections, acts on the winding of the electromagnet 335 (Fig. 46) controlling the space without justification, for neutralizing the optical ray.

Operation.—Assume that the composing machine is operating with any enlargement ratio; the point of the stud 518 of the wheel 513 corresponding to this ratio is locked in contact with one of the teeth of the wheel 545 (position of Fig. 49), which is itself locked by its projection 550 in contact with the stop 554 of the wheel 552.

If this enlargement ratio is to be replaced by the ratio shown, for instance by the 3rd threaded stud 518 (which may represent a difference measured by any number of tapped holes 517 of the wheel 513), it is only necessary to repeat three times the "change of enlargement ratio" signal.

This signal three times repeated causes the wheel 552 to be fed three recesses forwards and locks it in this new position.

Then a "start the mechanism" signal becomes operative and, by acting on the suitable type 410 valves, simultaneously produces:

(a) The suction in the cylinders 513—1 and 2 of the pistons connected to the rods 510 and 511

(Fig. 4) and the return to their extreme left-hand position of the sliders 235 and 243, disengaging the stops 509 of the wheel 507;

(b) The suction in the cylinder 115 (Figs. 42-43) of the piston connected to the rod 519 and the raising of the slider 118 to its extreme high position, disengaging the stops 514 of the wheel 552;

(c) The suction in the cylinder 563 of a piston connected to the rack 559, causing the rotation of a gear secured to the wheel 513 by a ratchet device and thus the slow rotation of the whole system of wheels 513—513 bis—508—507 and 514 (Fig. 47). The first two studs 518 of the wheel 513 which are encountered feed the pair of wheels 545—546 two divisions forwards, when the third stud in its turn encounters the tooth of the wheel 546 and pushes it until the projection 550 of the wheel 546 encounters the stop 554 of the wheel 552, thereby locking the whole system, the wheels 507 and 512 having placed their appropriate stops 509—1 and 2 and 512 in a suitable position.

When the "start" signal has died out, its disappearance produces, by reverse suction of the double acting type 410 valves in the cylinders 513—1 and 2 and 515 (see above):

(1) The suction of the sliders 235 and 343 towards the right until their rod 236 and plate 245 abuts against the fresh stops 509—1 and 2 of the wheels 507—1 and 2.

(2) The downward suction of the slider 118 until the finger 516 encounters the fresh stop 514 of the wheel 512.

The change of the optical enlargement ratio is thus effected in a stable manner, the suction continuing to be exerted in the same direction in the cylinders 513—1 and 2 and 515, preventing any play of the sliders and locking the wheels 507 and 512 owing to the pressure exerted on their stops 509 and 514 which are engaged.

The rack 558, contained by suction on its driving piston in the cylinder 563 by the reversed action of the double-acting type 410 valve, returns to its original position, the driven gear wheel then being disengaged, by the action of its ratchet device, from the wheel 513.

During the movements of the slider 243, it is important for the carriage 224 to be secured to said slider, so as not to alter the relative position of these two parts.

For this purpose, at the right-hand end of the plate 245 (Figs. 3-4) of the slider 243, beyond the limit of the travel of the bar 198 and thus of the carriage 224, is mounted a plunger electromagnet 208 which can magnetically fix the connecting bar 495 at any point of its blade 256, thereby securing the carriage 224 to the slider 243.

Said electromagnet is provided with a double supply:

(1) On the one hand, by its connection to the circuit of the "start" signal which supplies the electromagnet throughout the entire duration of said signal,

(2) And on the other hand, direct from the electric source, through an "inertia" switch mounted on the slider 243.

Said switch comprises (Fig. 6) a type 401 mercury contact (Fig. 8) with a single outlet lead 403, mounted on a small rocking shaft of the 400 type. On said shaft is fixed a rod 434 which is loaded, at its upper part, by a weight 465, it being possible, by rocking the shaft 400, for said rod to assume two extreme positions placing the type 401 switch in the "closed" position or in the

"open" position. Normally, i. e. when the slider 243 is located towards the right, the inertia switch is in the open position, but at the end of travel of said slider towards the left, the inertia moves the weight 465, the switch moves into the closed position, thereby retaining the supply to the electromagnet 208 when the "start" signal flies out and the slider 243 is then carried towards the right, still secured to the carriage 224, to bring the plate 245 against the stop 209, i. e. when the travel of the slider 243 and consequently of the carriage 224 is definitely completed, the inertia switch operates in the opposite direction, cutting off the current and releasing the carriage 224.

INTERLINE SPACING

Interline spacing is effected in the following manner:

The frame 251 which is guided by the slide-blocks 262 can move downwards along the guide columns 260, but remains constantly urged upwards by the cords 251 passing over the pulleys 252, and their counterweight 250 (Fig. 3).

At the lower part of the frame 251 are arranged two racks 248 guided by the slides 249. Two gears 175 fast on a transverse shaft 176 can drive said rack and produce the interline spacing.

On the same shaft 176 is fixed outside the camera 205, a very fine toothed ratchet wheel 343, with its retaining pawl 347.

On the end of the same shaft 176, there can rotate loosely:

(1) A lever 345 provided with a pawl 349 for driving the ratchet 343; said lever is constantly urged in the direction of the arrow by the spring 350 (Fig. 5); its travel, from the end of travel radius OA can be limited at will along the slide 351 provided with interline spacing reference marks, by locking in the slit of said slide, a stop 434.

(2) A lever 435, the rocking movement of which from the radius OB to the radius OA is controlled by the rod 437 of a piston sliding in the oscillation cylinder 438 by the action of the interline spacing signal. In its rocking movement, the lever 435 first reverses the position of the switch 439, cutting off the supply from the electromagnets 496 of the coupling bar 495, then encounters the lever 348 at its stopping point fixed by the operator on the slide 351 and carries it along up to the radius OA, thus causing the shaft 176 to rotate proportionally to the position in which the lever 348 is stopped, which rotation drives the racks 248 and determines the interline spacing.

The return of the lever 435, when the interline spacing signal ceases, causes ipso facto the return of the lever 348, the position acquired by the ratchet 343 being maintained by the pawl 349, and the switch 439 to be reset to the closed position.

At the end of the composing operation, the operator by exerting a certain pressure on the handle 464 of the ratchet wheel 343 produces a slight lateral displacement of the wheel by sliding on its shaft, thereby disengaging it from the pawls 347 and 349 and, by rotating the ratchet thus released, in the opposite direction to the arrow, replaces the frame 261 in its original position, i. e. in the high position.

TRANSMISSION OF THE DRIVING MOVEMENT

The mechanism of the composing machine is

synchronously controlled by two vertical drive shafts 440 and 480; the shaft 440 operating the shutter 392 and accessorially the alphabet disc changing mechanism and the enlargement ratio changing mechanism by means of the wheels 524 and 547, and the shaft 480 operating the mechanism for transmitting the justification movements (Fig. 35); furthermore, this shaft drives, by means of bevel gears, the shaft 310 of the two mechanisms for feeding the strips 46 (Fig. 13) (in order to enable the lever 339—2 to be driven eccentrically the shaft 310 forms a crank).

The two shafts 440 and 480 are driven by the drive shaft 467 by means of bevel gears 537 and 538. Every care is taken to prevent the vibrations of the motor from being transmitted to the composing machine (for instance by mounting the motor independently of the frame of the composing machine) (Figure 1).

I claim:

1. In a printing device, a first strip for registering the text to be printed termed a normal strip, a limit signal preceding each line in the normal strip, a second strip for registration termed the correcting strip constituted independently from the first named strip and comprising the corrections to be applied to the original text registered on the normal strip, said second correcting strip comprising as correcting lines the limit signals corresponding to each limit signal of the normal strip, only for the lines of this strip which are to be corrected, and registration signals only for the lines being corrected, this correction capable of being totally different in the number of lines and containing the lines for correcting the original text registered on the first strip, so that if the number of lines in the corrected text is equal to the number of lines in the normal text the registration signals of each line are inserted by means of the limit signal and if the number of lines in the corrected text is less than the number of lines in the normal text, the registration signals of the corrected lines are inserted by means of the limit signals, the limit signals corresponding to the corrected lines of the original text which do not have their equivalent in the corrected text, being followed for each one of these lines by a correction signal and a blank space constituted by a single division without signal, whereas if the number of corrected lines is greater than the number corresponding to the lines in the normal text, the limit signals are inserted on the correcting strip for each line of text to be corrected from the normal strip, the two final limit signals inserting the entire supplement of the corrected text with respect to the original text, this supplement being equivalent to many of the lines of the composition, the division in the lines of the composition in the supplementary text being assured by signals which are termed interline spacing and justification signals and which are placed in suitable locations, a correction signal behind each limit signal of the correcting strip, driving means for advancing the correcting strip by one division when the limit signal is simultaneously presented by the normal strip and the correcting strip, driving means for unrolling the normal strip only during the interval when the limit signal of the correcting strip is followed by a blank without signal, driving means for unrolling the correcting strip up to the next limit signal when a limit signal is followed by a correcting signal, means to assure the unrolling of the normal strip simultaneously with the correcting strip and to render

ineffective the action of the registering signals on the normal strip, an impression device, a justification device, and means operating the impression device and the justification device from the registering signals of the normal strip or the correcting strip, following the selection operated by the aforesaid means.

2. In a printing device, a first strip for registering the text to be printed termed a normal strip, a limit signal preceding each line in the normal strip, a second strip for registration termed the correcting strip constituted independently from the first named strip and comprising the corrections to be applied to the original text registered on the normal strip, said second correcting strip comprising as correcting lines the limit signals corresponding to each limit signal of the normal strip, only for the lines of this strip which are to be corrected, and registration signals only for the lines being corrected, this correction capable of being totally different in the number of lines and containing the lines for correcting the original text registered on the first strip, so that if the number of lines in the corrected text is equal to the number of lines in the normal text the registration signals of each line are inserted by means of the limit signal and if the number of lines in the corrected text is less than the number of lines in the normal text, the registration signals of the corrected lines are inserted by means of the limit signals, the limit signals corresponding to the corrected lines of the original text which do not have their equivalent in the corrected text, being followed for each one of these lines by a correction signal and a blank space constituted by a single division without signal, whereas if the number of corrected lines is greater than the number corresponding to the lines in the normal text, the limit signals are inserted on the correcting strip for each line of text to be corrected from the normal strip, the two final limit signals inserting the entire supplement of the corrected text with respect to the original text, this supplement being equivalent to many of the lines of the composition, the division in the lines of the composition in the supplementary text being assured by signals which are termed interline spacing and justification signals and which are placed in suitable locations, a correction signal behind each limit signal of the correcting strip, a testing element for the normal strip operating during the passage of the limit signals to establish these signals formed by the perforations, and to assure the continuity of fluid in a pneumatic circuit, a first electrical contact for closing an electrical circuit, a testing element for the correcting strip operating during the passage of the limit signals to establish these signals formed by the perforations and to assure the continuity of fluid in a pneumatic circuit, a second electrical contact for closing the electrical circuit, an electrical circuit feeding and driving means to displace the correction strip one division at a time, this circuit being controlled by the closing of the two electrical contacts mounted in series, so that when the limit signals of each of the strips are simultaneously placed before their respective test element, only the correcting strip advances by a single division, a closing device bringing into play the closing of the two electrical contacts in series to limit the advancement of the normal strip and causing the breaking of the corresponding electrical contact, a test element for the correction signal of the correcting strip which actu-

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ates the normal strip and which cuts off the second electrical contact by its establishment of a continuous circuit of fluid from the pneumatic circuit, the second electrical contact causing the activation of the entrainment mechanism for the correcting strip, said test element being inoperative when the correcting strip does not carry a correcting signal after the limit signal, and which permits the selection of the strip which is to be utilized, an impression device, a justification device, and means operating the impression device and justification device from the registering signals of the normal strip or the correcting strip, following the selection operated by the aforesaid means.

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