May 1, 1945. B. E. REYNOLDS 2,375,135

AUTOMATIC COMPOSING TYPEWRITER

Filed March 20, 1941 5 Sheets-Sheet 1

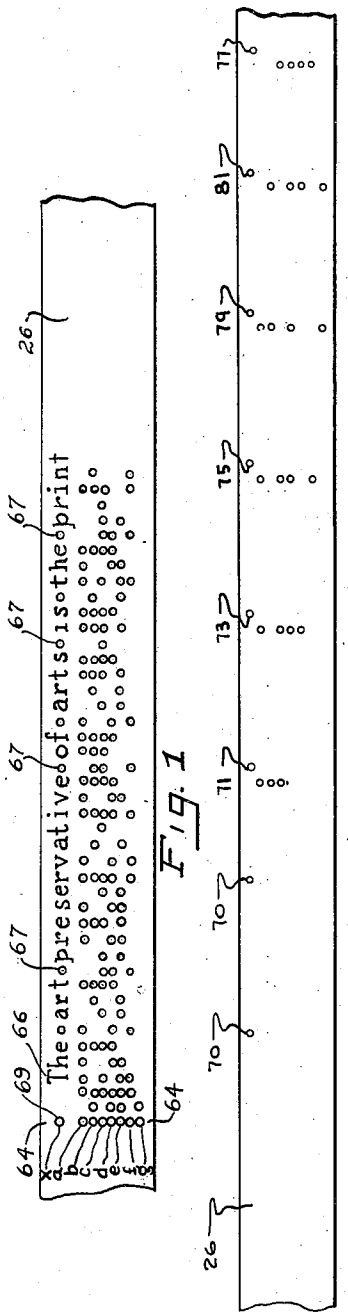


Fig. 1

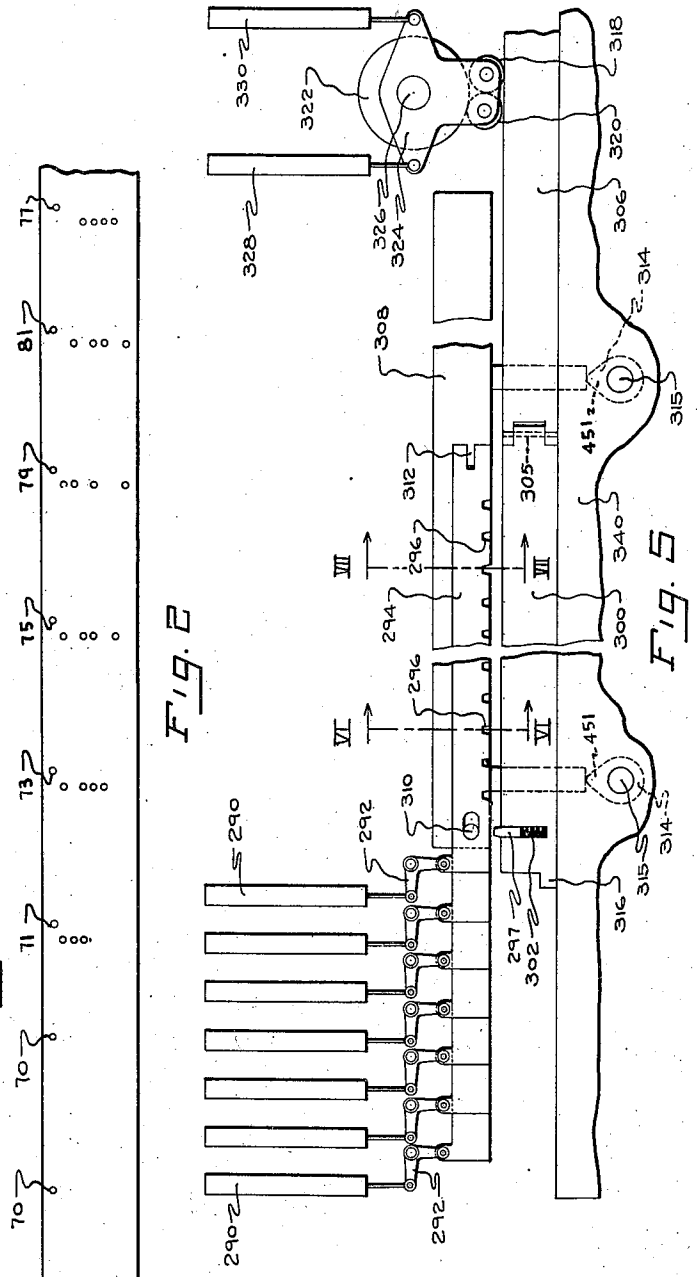


Fig. 2

Fig. 5

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AUTOMATIC COMPOSING TYPEWRITER

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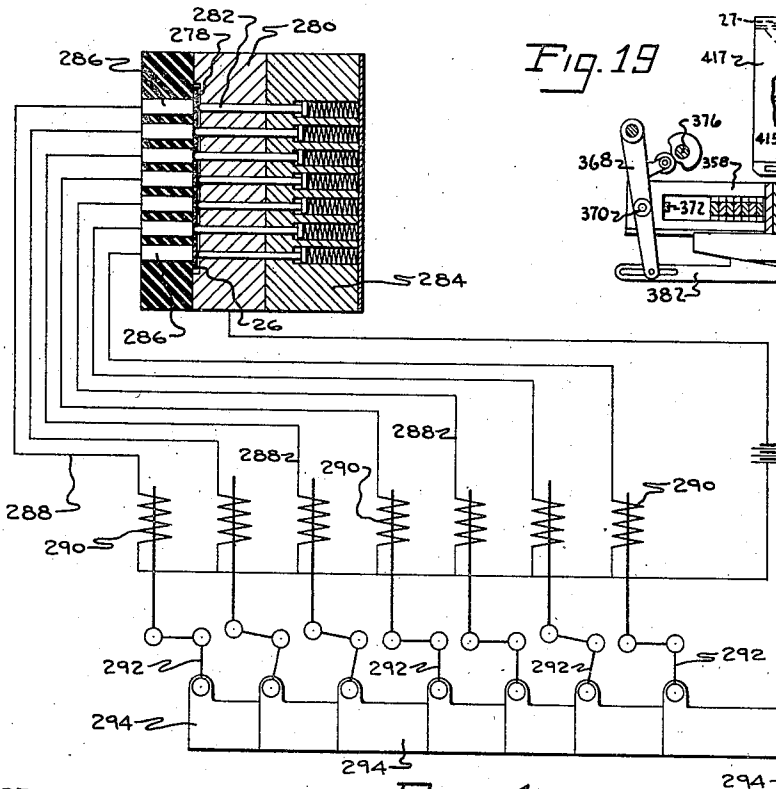


Fig. 4

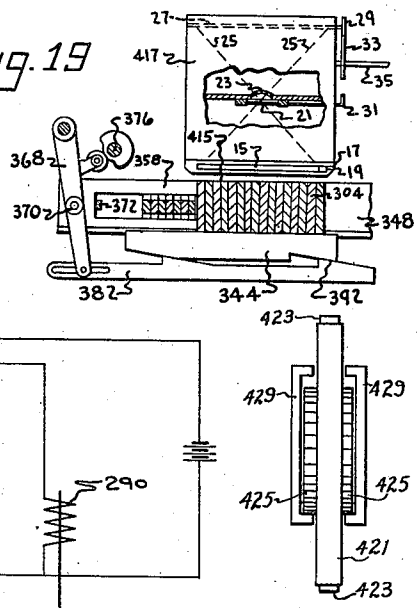


Fig. 19

Fig. 20.

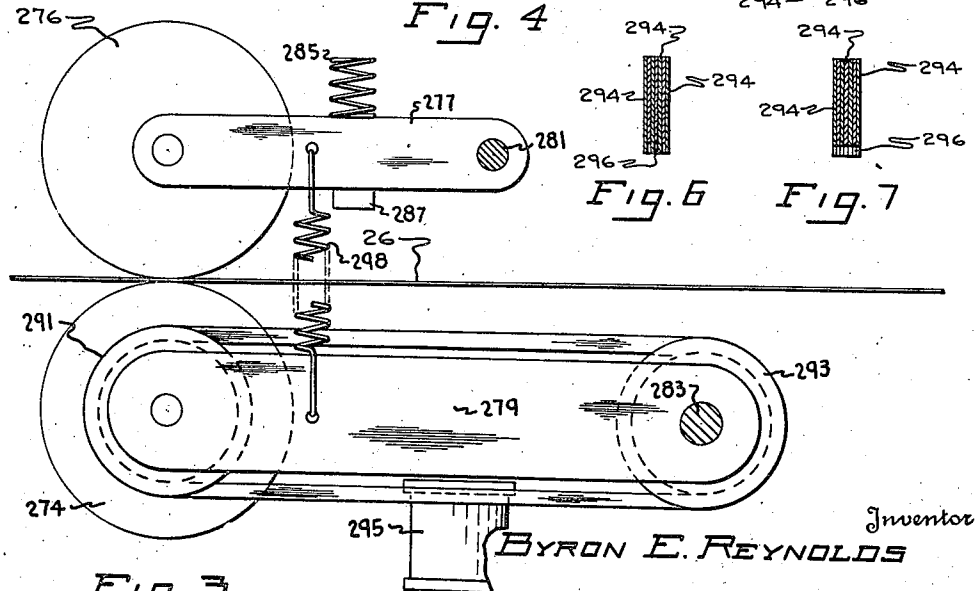


Fig. 3

Fig. 6

Fig. 7

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AUTOMATIC COMPOSING TYPEWRITER

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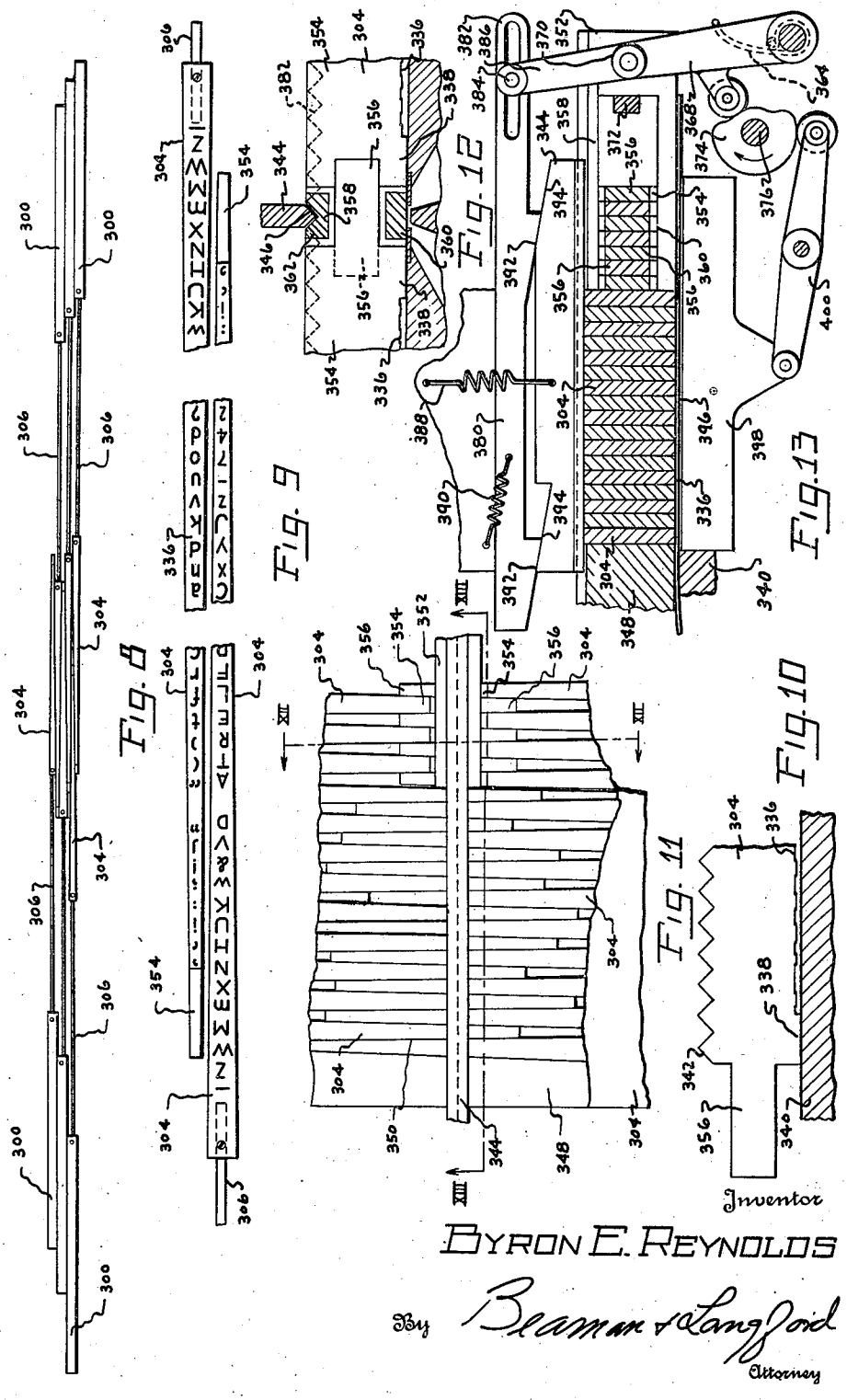


Fig. 8

Fig. 9

Fig. 12

Fig. 13

Fig. 10

Fig. 11

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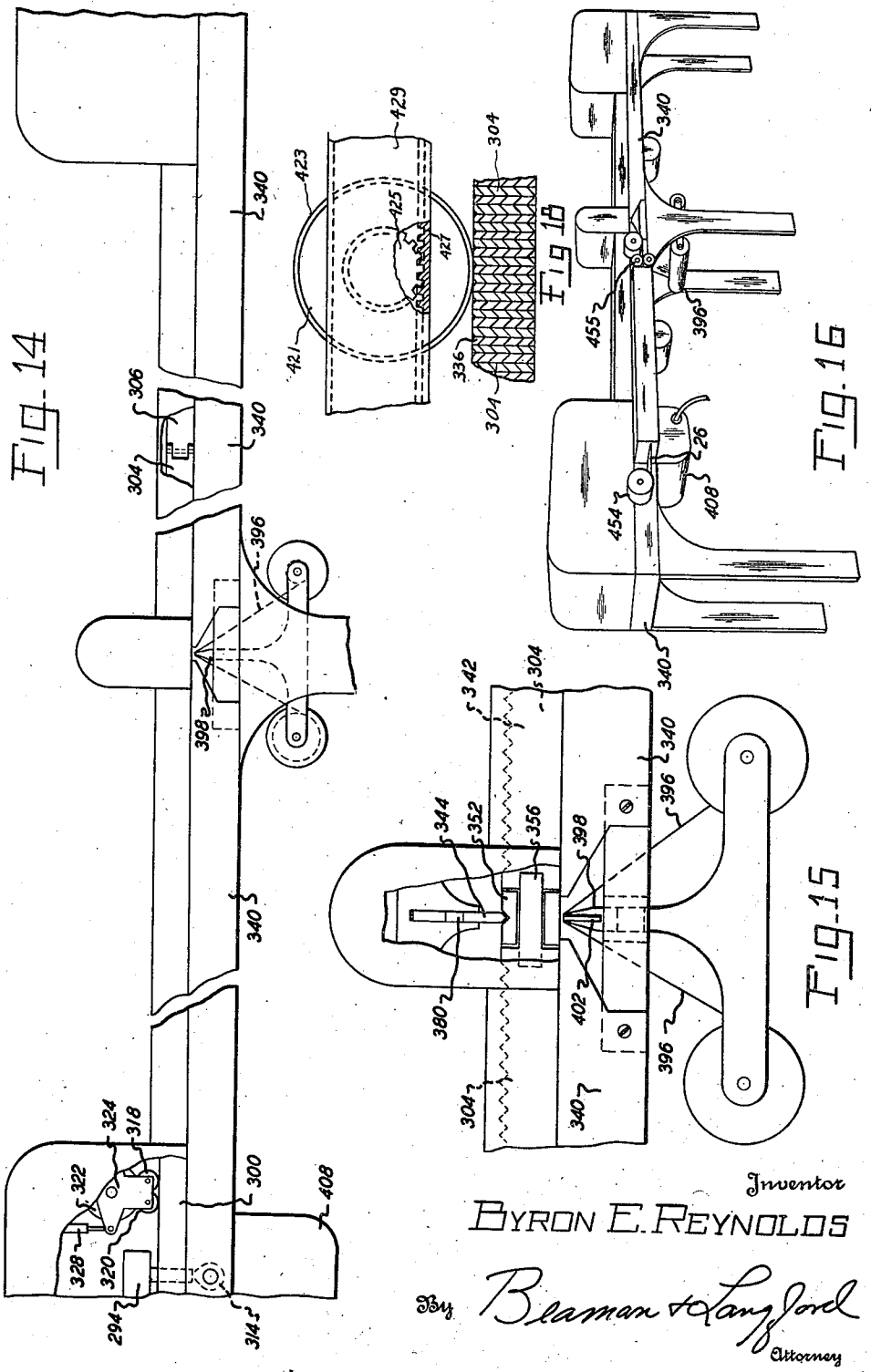
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AUTOMATIC COMPOSING TYPEWRITER

Filed March 20, 1941 5 Sheets-Sheet 4



Inventor

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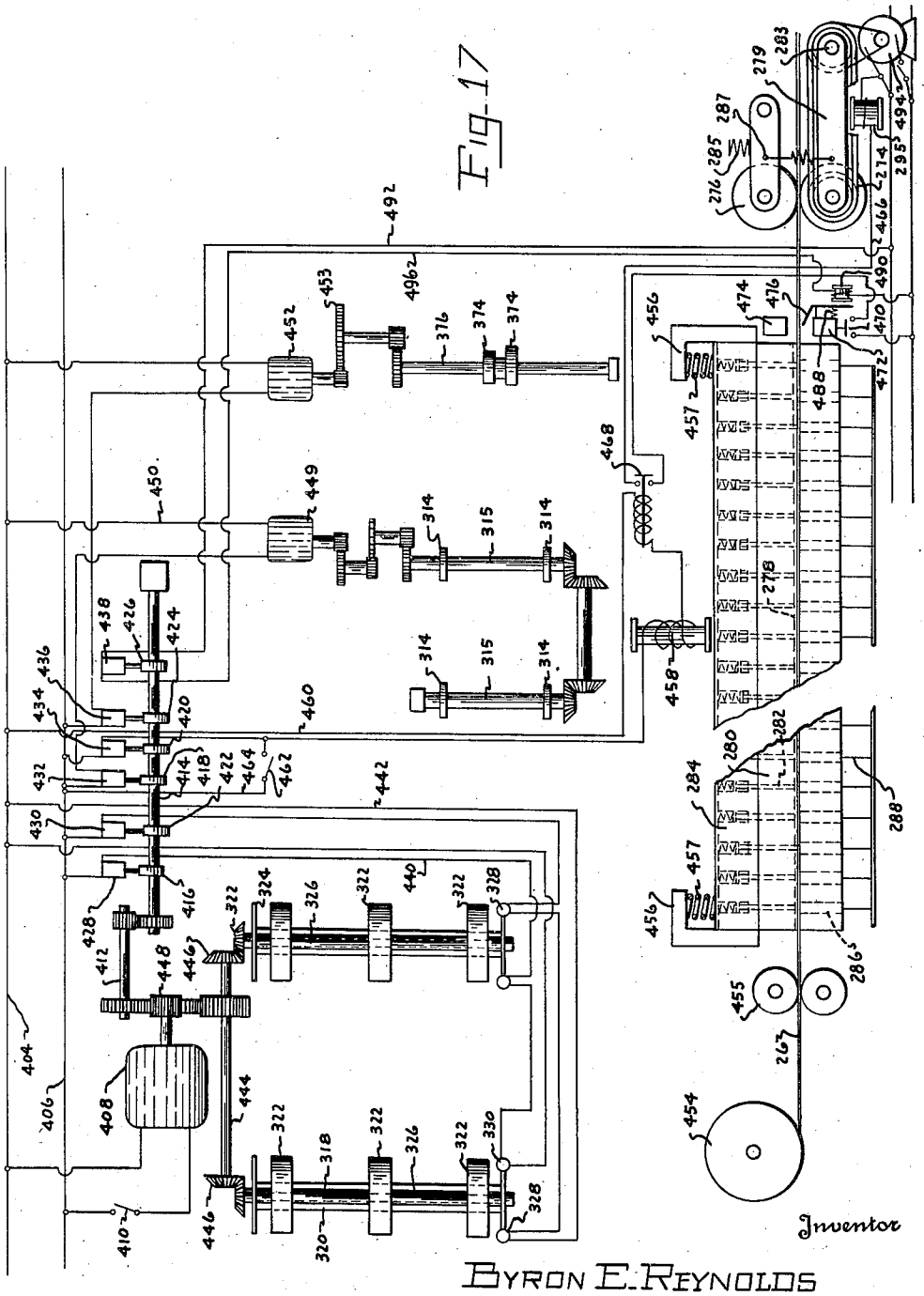
Attorney

May 1, 1945. B. E. REYNOLDS 2,375,135

AUTOMATIC COMPOSING TYPEWRITER

Filed March 20, 1941 5 Sheets-Sheet 5

Fig. 17



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Patented May 1, 1945

2,375,135

UNITED STATES PATENT OFFICE

2,375,135

AUTOMATIC COMPOSING TYPEWRITER

Byron E. Reynolds, Jackson, Mich.

Application March 20, 1941, Serial No. 384,278

4 Claims. (Cl. 101—93)

My invention relates to apparatus used to compose and to prove successive single lines of type characters, in its preferred form the invention being adapted to justified types of various widths.

The apparatus of the present invention has for its purpose to provide proofs upon suitable material of single lines of justified printing types successively. My primary aim has been to provide a machine for rapidly and economically transferring directly or by offset inked impressions of successive single lines of types to paper for reproduction purposes and transferring by offset inked impressions of lines of types to lithographic plates. Generally, I wish to include any and all purposes in which types are temporarily assembled in line to produce characters upon any material whatever.

The secondary purpose of the machine is to provide a method of photo-composition by use of the above methods with contrasting colored letters replacing the printing types and a suitable camera replacing the proving apparatus.

Thus, the primary object of the present invention is to provide apparatus for composing and proving successive single lines of type characters of various fixed widths.

Another object is to provide an apparatus for composing and proving successive single lines of justified types of various widths in which the justifying of the lines is determined in advance of the composing of the lines.

Another object is to provide an apparatus for composing and proving single lines of justified types in which the justifying of the lines is inherent in the composing of the lines.

A further object is to provide an apparatus for composing and proving single lines of justified types in which each line is composed as a unit, in contrast to being composed a character at a time.

Another object is to provide apparatus for simultaneously collecting and moving composite type and space bars to form a justified single line of type characters through the control of a preformed control element.

Other objects and advantages of the present invention residing in the combination, arrangement and construction of the parts of the apparatus will be more fully understood from a consideration of the following detailed description and annexed claims.

In the drawings,

Fig. 1 is an elevational view of a portion of the control tape,

Fig. 2 is a view similar to Fig. 1 of the control tape with specific spacing perforations indicated,

Fig. 3 is a side elevational view of the mechanism for moving the control tape to the composing machine,

Fig. 4 is a diagrammatic lay-out of a selector mechanism for the type bars of the composing machine,

Fig. 5 is a fragmentary side elevational view of a selector and drive mechanism for the type bars,

Fig. 6 is a cross-sectional view taken on line VI—VI of Fig. 5, of the selector elements for the type bars,

Fig. 7 is a view similar to Fig. 6 taken on line VII—VII of Fig. 5,

Fig. 8 is a plan view of a group of the type bars, showing their operating linkage,

Fig. 9 is an enlarged view of the type bars, shown in Fig. 8,

Fig. 10 is a fragmentary elevational view of the inner end of one of the type bars,

Fig. 11 is a fragmentary plan view showing the type bars shifted to compose a line,

Fig. 12 is a cross-sectional view taken on line XII—XII of Fig. 11,

Fig. 13 is a vertical cross-sectional view taken on line XIII—XIII of Fig. 11, showing the type bar clamping mechanism,

Figs. 14 and 15 are fragmentary side elevational views partly shown in broken section of the composing and proving units,

Fig. 16 is a perspective view of the composing and proving units,

Fig. 17 is a diagrammatic representation of the principal operating structure of the composing and proving units,

Fig. 18 is a modified form of the invention showing arrangement for offset proving, and

Fig. 19 is a modified form of the invention showing an adaptation for photocomposition,

Fig. 20 is a projection of the modified form showing arrangement for offset proving of Fig. 18.

The mechanism for preparing the copy may

take any suitable form which will permit the copy to be used for the simultaneous reproduction of all characters and spaces in any given line and preferably so arranged as to allot the spaces for justifying the line. The function of this mechanism is to fabricate the control copy, which in the illustrated form appears as a series of typewritten lines and adjacent to each character or space thereof appears a suitable symbol for the subsequent control of the composite type and space bars of the composing mechanism. Adjacent to each line of copy, there appear symbols representing various control functions desired in the integrated whole of the following groups, such as the end-of-line symbol 69 of Fig. 1, repeat-line symbol, and delete symbol.

It is intended that copyreading and proofreading be done in this copy form and all correction lines inserted in the control tracks where desired.

The symbols suggested are the well known perforation type of kind, similar to that now used by the trade. The symbols, however, may be other than of perforations, such as a control line to be read by an electric eye or an embossed line of raised symbols. The perforations may be converted into electrical impulses by any desired method; such as compressed air or partial vacuum; feelers to pick out the pattern, similar to the one used for the teletypesetter, being suggested. It is further anticipated that the control copy may be prepared by remote control through a sending station and a perforation station.

Type bar selection mechanism

The tape 26 is a complete control record for composing single lines of justified types of various fixed widths after it has passed the wordspace perforator. It may be stored for future use or the tape 26 may directly pass to the composing mechanism.

For its component parts, the composing mechanism comprises feed rollers 274 and 276 of Fig. 3 which may be intermittently driven by any suitable mechanism of well known construction for drawing the tape 26 with a measured step-by-step movement with reference to guide perforations 69 through the composing mechanism. The illustrated structure for operating the feed rollers 274 and 276 comprises supporting arms 277 and 279 pivoted on the shafts 281 and 283. A spring 285 holds the arm 277 against the stop 287 while the spring 298 holds the rollers 274 and 276 in driving relation with the tape 26. Fixed to the roller 274 is a V-pulley 291 over which runs a V-belt driven by the pulley 293 on the continuously driven shaft 283. A solenoid 295 controls the feeding operation of the rollers 274 and 276. As shown in Fig. 4, the tape 26 is drawn step by step through an elongated slot 278 in the feeler guide block 280 which carries a vertical row of feelers 282 for each character and word-space of the composed line. Each time the tape 26 is advanced a length of a line of recorded characters and spaces, the feelers 282 are withdrawn and held out of operation through the bodily movement of the feeler carrier 284 to the dotted line position by suitable mechanism including solenoid 458. When the carrier 284 is advanced to the position shown in Fig. 4, certain of the feelers 282 will pass through perforations in the tape 26 to engage the electrical contactors 286 insulated in the block 280. In this manner the circuits 288 are selectively closed to energize the solenoids 290 to rock the bell cranks 292 axially shifting the permutation bars 294.

As more clearly shown in Fig. 5, the permutation bars 294 have notches 296 along their lower edges. A group of seven permutation bars 294 in the illustrated embodiment in Figs. 14 and 15 is provided for the selective positioning of each type bar. The bars 294 are relatively thin and juxtapositioned as shown in Figs. 6 and 7. Depending upon the perforations of the tape 26, the selective shifting of the bars 294 will result in a single transverse alignment of a notch 296 in each of the seven bars 294. This provides a single master notch into which the stop pin 297 carried upon the type bar positioning slide 300 will be projected by the spring 302 to locate the position of the type bar 304 connected to the link 300 through the hinge link 306 (see Fig. 8). This hinge link is so constructed as to permit slight longitudinal movement of bars 304 without strain on pin 297 during alignment. Such longitudinal movement may be provided by dividing lost motion between the members 300 and 306. One simple arrangement is to employ an enlarged hole in the member 306 in which the pin 305 is received. In Fig. 6 the bars 294 are shown in section at a non-selected point while in Fig. 7, the section is taken at the selected point showing the notches 296 all aligned. In Fig. 5 the supporting frame 308, in which the bars 294 are supported and guided by the transverse rods 310 and 312, is shown elevated by the cams 314 on cross shafts 315 to enable the stop pin 297 to be cleared from the selected master notch of the group of bars 294 at the time the link 300 is to be moved to its outer position against the stop 316.

The mechanism for shifting the type bars 304 back and forth as illustrated comprising a pair of soft rubber rolls 318 and 320 in driving contact with each other. Spaced main drive rollers 322 through contact with the roller 320 drives the same counterclockwise as viewed in Figs. 5 and 14, while the roller 320 in turn drives the roller 318 clockwise. The rollers 318 and 320 are supported in a cradle 324 pivoted on the axle 326 of the roller 322. Solenoids 328 and 330 function to rock the cradle 324 to selectively bring the rollers 318 and 320 into shifting engagement with the upper surface of the positioning slide 306 of the type bar 304.

As more clearly shown in Fig. 9, the type bars 304 are tapered from one end to the other with adjacent bars tapered in opposite directions and move in from opposite sides to compose the line of type characters. This arrangement results in characters of every other type bar 304 being reversed with respect to the intermediate bar 304 so that the characters will all face the same direction. The taper of the bar 304 is to make possible the assigning of such narrow characters as i, l, ;, to the narrow end and wider characters such as W, M, to the wider end as shown in accompanying Table I. The spaces 332 are provided at spaced points along each type bar 304. Because of the taper of the type bar 304, the width of each word spacer 332 along the bar may progressively vary from one end of the bar to the other. In practice a variation of .018" in width between adjacent word spaces is practical and may be considered as presenting a "unit" of spacing. With this arrangement the narrowest space located most adjacent the narrow end of the type

bar will constitute a standard space. The type bars **304** illustrated carry ninety characters including upper and lower cases, figures, points, spaces and special characters.

Table I

Below are characters which appear on the composite type bar with their position numbers, widths in inches, and perforation patterns.

Position number—character	Width in inches	Perforations
0—space	.051¾	No pattern
1—space	.053	a
2—apostrophe	.054¼	b
3—quote	.055½	ab
4—i	.056¾	c
5—letter l	.058	ac
6—period	.059¼	bc
7—comma	.060½	abc
8—colon	.061¾	d
9—semicolon	.063	ad
10—hyphen	.064¼	bd
11—hyphen	.065½	abd
12—hyphen	.066¾	cd
13—!	.068	acd
14—j	.069¼	bcd
15—space	.070½	abcd
16—(	.071¾	e
17—)	.073	ae
18—t	.074¼	be
19—f	.075½	abe
20—r	.076¾	ce
21—I	.078	ace
22—c	.079¼	bce
23—s	.080½	abce
24—*	.081¾	de
25—e	.083	ade
26—1	.084¼	bde
27—2	.085½	abde
28—3	.086¾	cde
29—4	.088	acde
30—space	.089¼	bcde
31—5	.090½	abcde
32—6	.091¾	f
33—7	.093	af
34—8	.094¼	bf
35—9	.095½	abf
36—0	.096¾	cf
37—leader	.098	acf
38—o	.099¼	bc
39—z	.100½	abcf
40—$	.101¾	df
41—a	.103	adf
42—J	.104¼	bdf
43—b	.105½	abdf
44—p	.106¾	cdf
45—space	.108	acdf
46—q	.109¼	bcdf
47—v	.110½	abcdf
48—y	.111¾	ef
49—?	.113	aef
50—d	.114¼	bef
51—n	.115½	abef
52—k	.116¾	cef
53—h	.118	acef
54—u	.119¼	bcef
55—S	.120½	abcef
56—g	.121¾	def
57—x	.123	adef
58—fi	.124¼	bdef
59—fl	.125½	abdef
60—space	.126¾	cdef
61—C	.128	acdef
62—P	.129¼	bcdef
63—T	.130½	abcdef
64—ff	.131¾	g
65—F	.133	ag
66—L	.134¼	bg
67—B	.135½	abg
68—G	.136¾	cg
69—E	.138	acg
70—O	.139¼	bcg
71—R	.140½	abcg
72—Q	.141¾	dg
73—A	.143	adg
74—D	.144¼	bdg
75—space	.145½	abdg
76—V	.146¾	cdg
77—Y	.148	acdg
78—&	.149¼	bcdg
79—w	.150½	abcdg
80—K	.151¾	eg
81—U	.153	aeg
82—H	.154¼	beg
83—N	.155½	abeg
84—X	.156¾	ceg
85—m	.158	aceg
86—M	.159¼	bceg
87—W	.160½	abceg
88—Z	.161¾	deg
89— —	.163	adeg
90—space	.164¼	bdeg

Additional perforation patterns which can be used for control purposes correspond to the following position numbers: 91, abdeg; 92, adeg; 93, acdeg; 94, bcdeg; 95, abcdeg.

In the illustrated form of the invention the characters of the type bars **304**, generally designated in the drawings by reference character **336**, are on the lower edge of the type bar **304** (see Fig. 10) with supporting pads **338** being provided at opposite ends of each type bar to slightly support the characters above the table **304** upon which the type bar slides back and forth. Along the upper edge of each type bar **304** are aligning V-shaped grooves **342** with which an aligning bar **344** coacts having a corresponding V-shaped lower edge **346**.

As best shown in Fig. 11, a fixed side bar **348** is provided along the left side of the table **340** with the vertical side **350** corresponding to the left edge of the printed column. This vertical side functions as one side of a vise in which the selected type bars **304** are clamped by the clamp member **352** at the time the proof of the justified line is taken. When in a withdrawn position, with the slide **300** against the stop **316**, the inner ends **354** of the type bar **304** have tongue portions **356** which overlap. This arrangement enables the upper and lower fork arms **358** and **360** of the clamp **352** to pass above and below the tongues **356** of the inactive type bars **304**, to clamp the active bars **304**. As shown in Fig. 20, the arm **358** is provided with a V-shaped groove **362** so as to give clearance to the aligning bar **344**. A strong spring **364** acting upon the pivoted arm **368** connected at **370** to the clamp **352** urges the latter to the left. An adjustable stop **372** limits the movement of the clamp **352** toward the guide **348**.

It is notable that successive lines may be selected, justified, aligned, planed, locked and proved in whole or in part by manual operation of portions of the assemblies herein described. Such manual operations are considered novel and useful as applications of the method and combinations of processes described. A cam **374** on the drive shaft **376** functions to retract the clamp **352** while the type bars **304** are being shifted.

The mechanism for actuating the aligning bar **344** of Figs. 12, 13, and 15 in timed relation with the clamp **352** comprises a bar **380** guided for horizontal movement only and having an elongated slot **382** at one end in which a pin **384** operates, carried by an extension **386** of the arm **368**. With the clamp **352** withdrawn by the cam **374**, the pin **384** has engaged the right end of the slot **382** as viewed in Fig. 13, moving the bar **380** to the right from the position shown to permit the spring **388** to raise the bar **344** to clear the notches **342** in the type bars **304**. When the arm **368** starts its counterclockwise movement to move the clamp **352** against the type bars **304**, the bar **380** is urged to the left in advance of the clamping action of the spring **390** with the inclined surfaces **392** sliding over complementary surfaces **394** on the aligning bars **344**, lowering the bar **344** into the notches **342** to align and plane the type bars **304** prior to locking. With the type bars **304** aligned, planed and locked horizontally and vertically, a proof of a fully justified line is taken upon the tape **396** brought into engagement with the face of the characters **336** by the platen **398** of Figs. 13 and 15 carried upon the rocker arm **400**, operating off the cam **374**. A suitable inked ribbon **402** is traversed across the line of type in any well known manner. The tape **396** may be moved with a step by step move-

ment through the mechanism by any one of several well known devices and brackets not shown, each cycle of operation.

In Fig. 17 is a diagrammatic lay out of the principal operating parts of the composing and proving apparatus in which conductors 404 and 406 provide a source of electrical power to which the main motor 408 is connected through a manually thrown switch 410. Through suitable reduction gearing 412, the motor 408 drives the cam shaft 414 carrying cams 416, 418, 420, 422, 424 and 426 of the proper contour for operating in timed relation the electrical switches 428, 430, 432, 434, 436 and 438. The switches 428 and 430 are located in the circuits 440 and 442 including the solenoids 328 and 330 which function to control the direction of rotation of the rollers 318 and 320, driven by the main drive rollers 322 upon the shafts 326. The shafts 326 are driven in opposite directions by the shaft 444 through beveled gears 446; the shaft 444 being driven by the motor 408 through suitable gearing 448.

The switch 432 controls the motor 449 in the circuit 450, driving the cross shafts 315, carrying the cams 314, which control the up and down movement of the frame 308, shown in Fig. 5. The motor 449 has a built-in brake of well known construction so as to limit the over run to a minimum when the motor circuit is closed and then opened, thus controlling the position of the projection 451 of the cams 314.

Switch 436 controls the motor 452 which is also equipped with a built-in brake to control the cycle of operation of the shaft 376 through reduction gearing 453. A series of control cams 374 upon the shaft 376 operate the construction shown in Fig. 13 in timed relation.

The tape 26 is shown being fed from a roll 454, through suitable tension rollers 455, hence into the slot 278, defined in the fixedly supported guide slot 280. Obviously the tape 26 may be fed directly from the typewriter and perforating mechanism into the composing and proof mechanism with the elimination of any delay. The feed rollers 274 and 276 act to feed the tape 26 through the block 280, as heretofore described. Feeler carriers 284 are shown guided in ways 456 for movement relative to the block 280 to clear the feelers 282 from the perforations in the tape 26. Springs 457 urge the carrier 284 toward the block 280 and the feelers 282 into the slot 278, while a solenoid 458 in circuit 460 with the switch 434 functions to withdraw the feeler carrier 284 when the tape 26 is being moved. A normally opened switch 462 in the circuit 464 bridges the switch 434 to withdraw the carrier 284 at the time a new tape 26 is manually fed into the machine.

The solenoid 295 which controls the tape drawing relation of the rollers 274 and 276 is located in a circuit 466 in which a normally open solenoid operated switch 468 is located. This switch is only closed when a current flows in the circuit 466 energizing the solenoid 458 to withdraw the feeler carrier 284. Also, in the circuit 466 is a normally closed switch 470 under the control of the photo-electric cell unit 472 which is in turn controlled by the light beam of the projector 474, all of known construction. A pivoted shutter 476 is normally held out of the path of the light beam of the projector 474 by a spring 488. A solenoid 490 in the circuit 496 and under the control of the switch 438 acted upon by the cam 426 functions to momentarily interrupt the light beam of the projector 474 by swinging the shutter 476 counterclockwise to initiate the cycle of operation. It is to be understood that the tape 26 passes between the projector 474 and the cell 472 to normally interrupt the light beam. Under such conditions, the switch 470 is closed and the tape 26 will be advanced by the rollers 274 and 276. When the tape 26 has been sufficiently advanced to bring the start of line perforation 173 into the path of the light beam of the projector 474, the circuit 466 is closed by the switch 470 and the solenoid 295 is energized to act upon the roller 274 to interrupt the feeding of the tape 26. A motor 494 through suitable drive mechanism continuously rotates the shaft 283 to rotate the feed roller 274.

In the above apparatus the type bars 304 are tapered on both sides, but they can alternatively be tapered on either side, or slightly curved on either or both sides. Characters 336 may be constructed to furnish proofs reading left to right or vice versa. It may readily be observed that the apparatus illustrates a method applicable in many ways, and that changes in elevation, or construction in arcs instead of planes for the slides 300, links 306, and bars 304 may be effected.

In a modified form shown in Fig. 19 the above method and machine lend themselves to photocomposition. Enameled characters 415 replace relief type faces 336 on the composite type bars 304, and a camera 417 with a ratcheting film replaces the proving press. In use a roll of film is produced having characters in negative or positive form and reading either way desired. Referring to Fig. 19 the apparatus for preparing lines is identical to that shown in Fig. 13 for letterpress proving. In place of a platen press the camera and light source 15 coact to prove by photography. In the drawing, light is reflected by the white images 415 within limits of dotted lines 25 through a shutter 21 and lens 23 to act upon a light-sensitive film 27. The light source 15 has contacts 17 and 19 forming parts of a continuous circuit. The shutter 21 is actuated by a lever 31 acted upon by a cam 33 on shaft 35 suitably geared to shaft 376. The cam 33 also moves progressively the film 27 upon ratcheting spools 29.

An alternative method of proving is to offset ink from composed line of type bars 304 after inking by a suitable method. The impressions are picked up by transfer rollers 421 such as that shown in Figs. 18 and 20, having suitable surface 423, and applied to suitable materials, such as to paper or plate or both, with the rollers catapulted across the type at rather high velocity. Register is maintained by gears 425 acting in corresponding gearing 427 on a tract 429 to provide vertical alignment of the ends of successive lines as proved and a step-by-step feeding mechanism not shown functions to progressively move the material receiving impressions. In a preferred form ink is distributed to type characters 336 by rollers identical to above described rollers 421 and also catapulted across the imposed characters. This adapts my method to production of lithographic plates by use of a process resembling hand transfer. Use of this modification of the above apparatus is facilitated by inversion of type bars 304 and the central part of the related mechanism above described.

Having thus described my invention, what I desire to secure by Letters Patent and claim is:

1. A machine for composing justified lines, adapted to be controlled by a record having distinctive designations for characters and for spaces of various widths predetermined to pro-

duce justified lines, comprising record sensing means and type members selectively positioned under control thereof, said type members being tapered and provided with characters distributed according to their widths and with spaces distributed to provide a range of sizes to produce said justified lines.

2. Apparatus for composing single consecutive lines of justified characters of various widths comprising a plurality of tapered character bars, selectively settable means, a stop with a connection to said bars for coaction with said settable means to determine the selective setting of the bars, said connection being so constructed as to permit slight longitudinal movement of the bars, and means located adjacent the impression lines for accurately aligning the selected characters.

3. An apparatus for composing single consecutive lines of justified characters of various widths, comprising a set of composite character and space bars of elongated tapered construction, characters and justifying word spaces of varying widths spaced along said bars from one end to the other, said justifying word spaces being of different sizes and located at spaced points along each bar segregating groups of word characters, means for selectively moving said bars, means for supporting said bars for movement to dispose the selected characters and spaces in the plane of the composition line, lost motion means interposed between said bars and said bar moving means to permit slight longitudinal movement of said bars, and means located adjacent the impression line for accurately aligning the selected characters.

4. An apparatus for composing single consecutive lines of justified characters of various widths, a set of tapered type bars provided with characters distributed according to their width and the spaces distributed to provide a range of sizes to produce justified lines, drive means for said type bars including a cradle member, drive rolls supported in said cradle member and driven in opposite directions, and means for selectively rocking said cradle member to bring either of said rolls into driving engagement with said type bars in one direction or another.

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