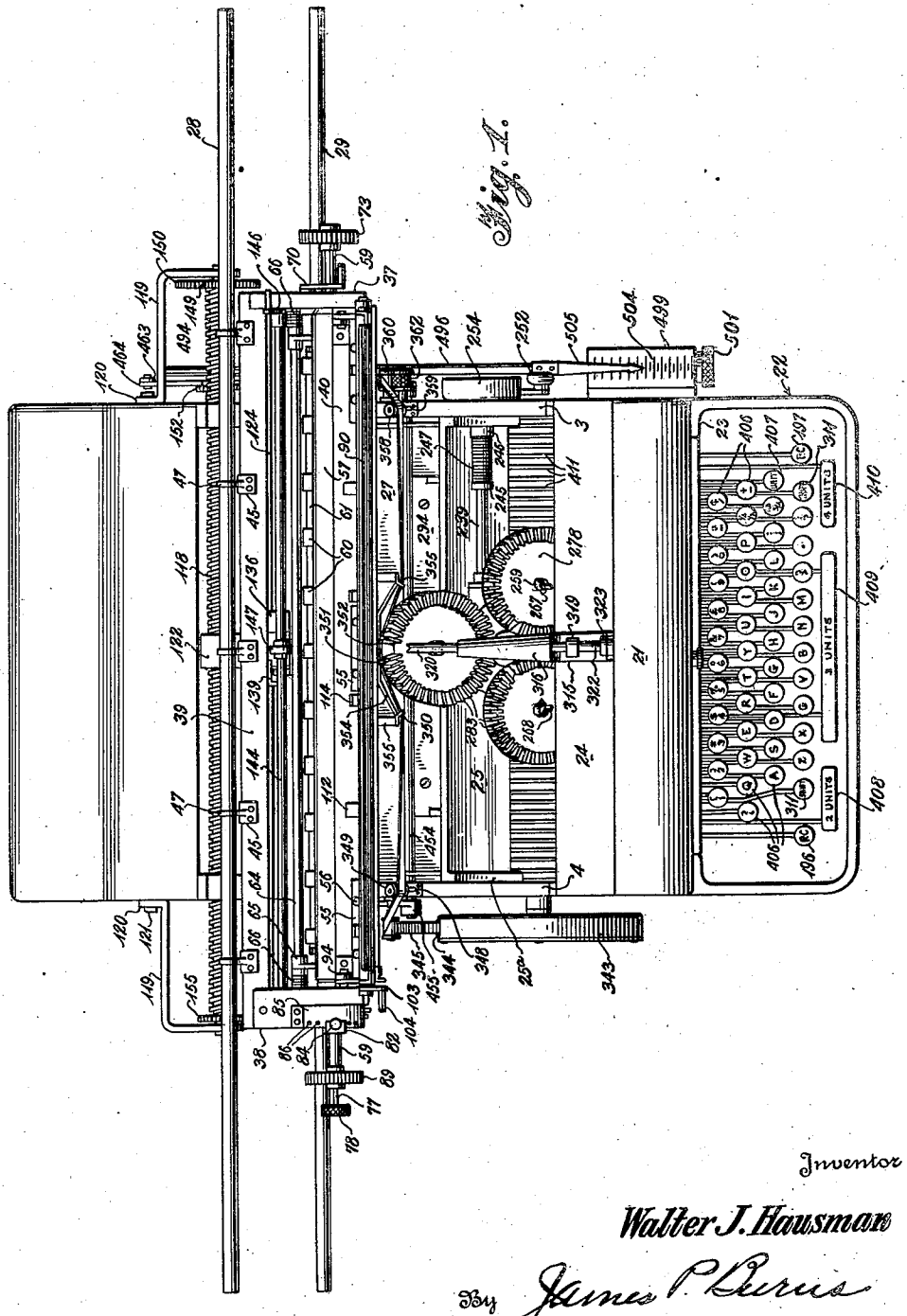
Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

Filed Feb. 20, 1943 17 Sheets-Sheet 1



Inventor

Walter J. Hausman

By James P. Burns

Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

Filed Feb. 20, 1943 17 Sheets-Sheet 2

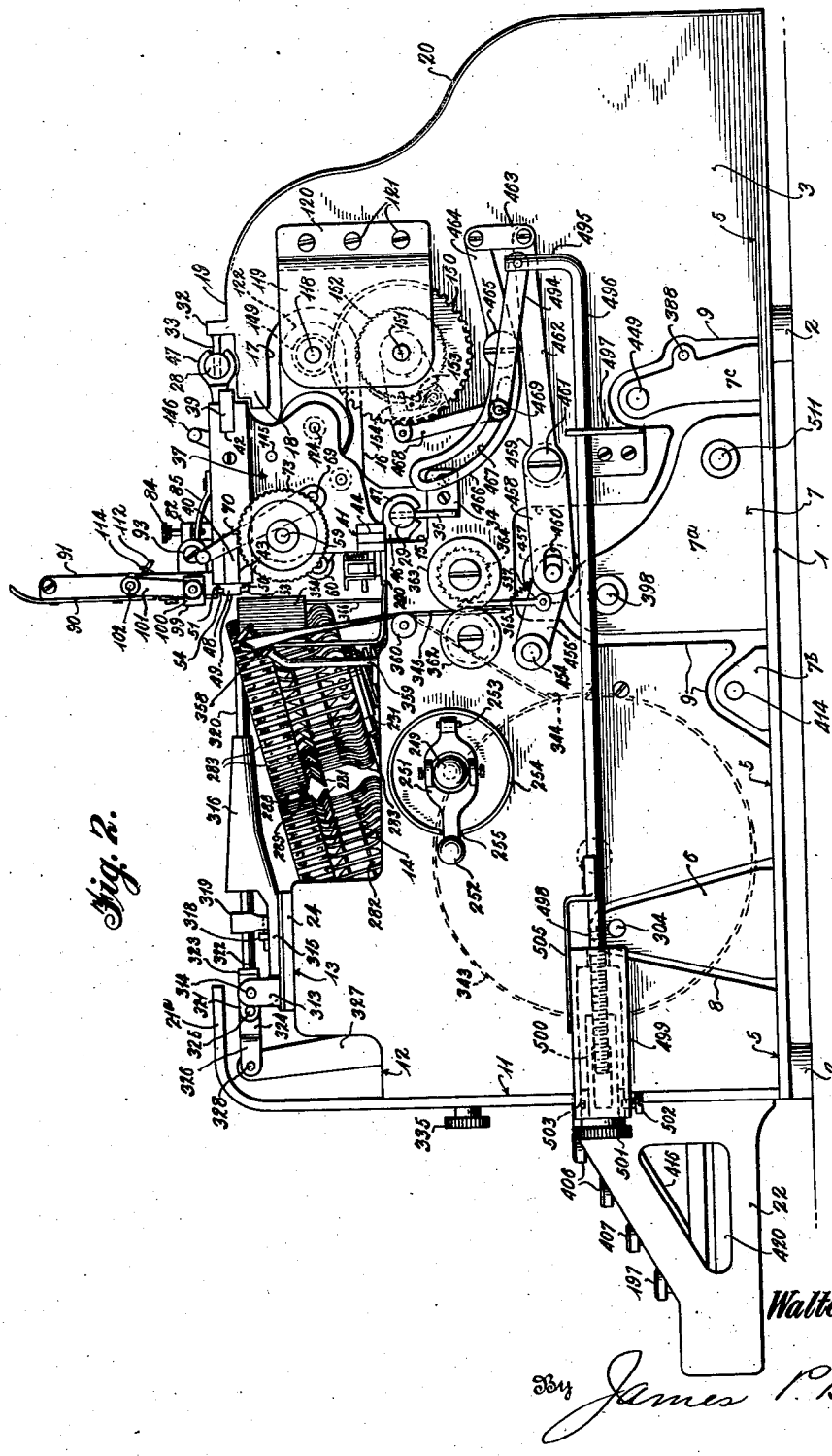


Fig. 2.

Inventor
Walter J. Hausman
By James P. Burns.
Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

Filed Feb. 20, 1943 17 Sheets-Sheet 3

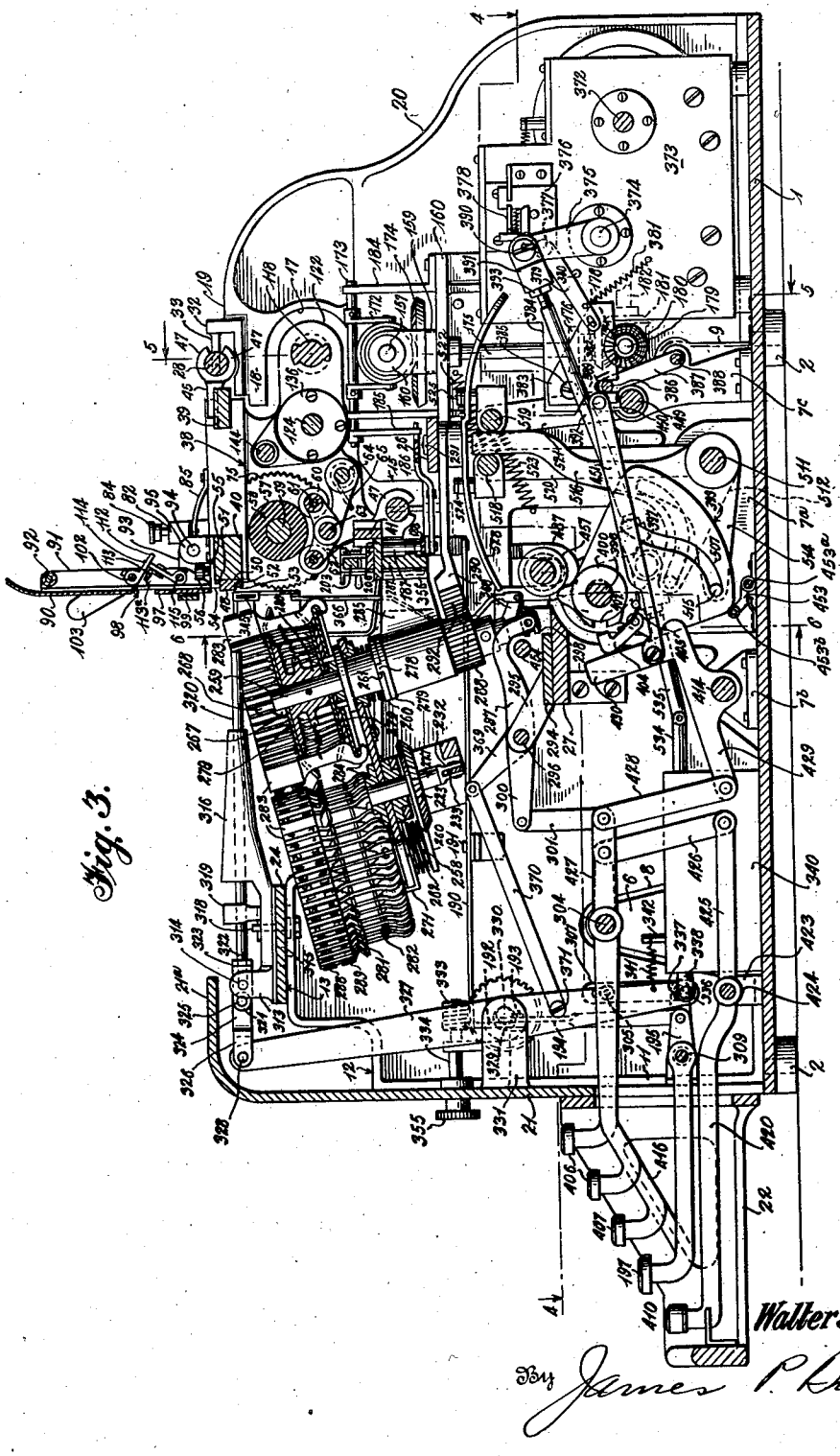


Fig. 3.

Inventor
Walter J. Hausman
By James P. Burns
Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

Filed Feb. 20, 1943 17 Sheets-Sheet 4

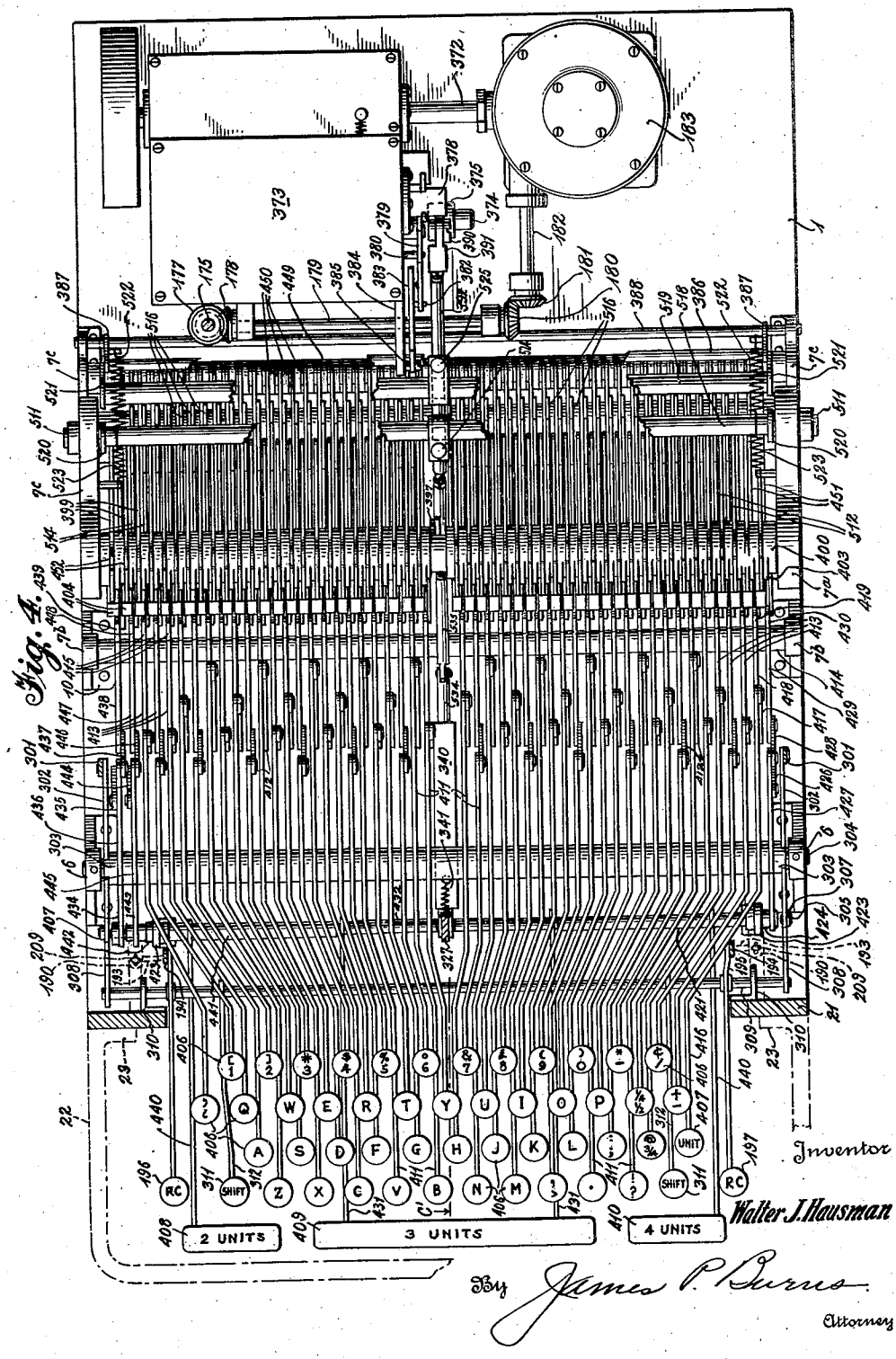


Fig. 4.

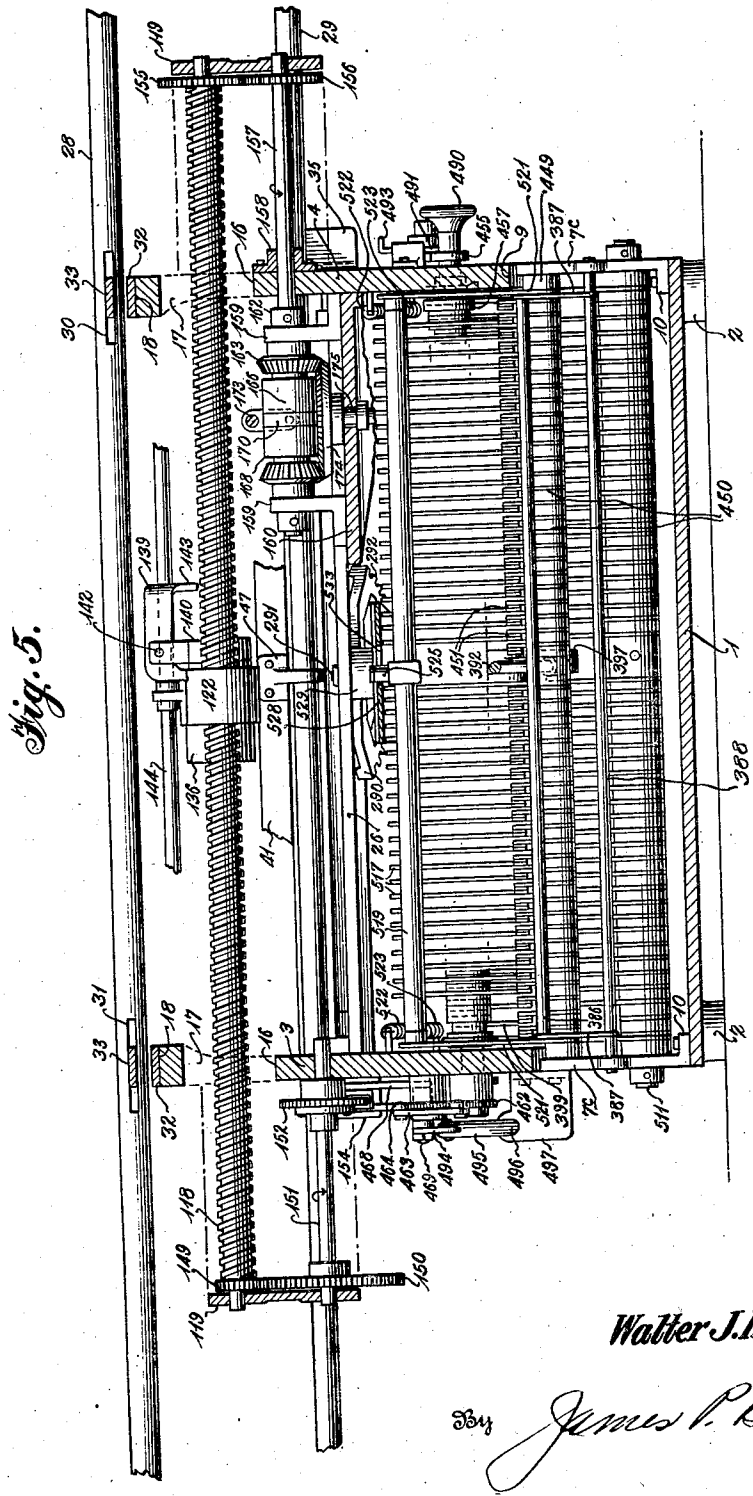
Inventor
Walter J. Hausman
By James P. Burns
Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

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Fig. 5.



Inventor

Walter J. Hausman

By James P. Burns

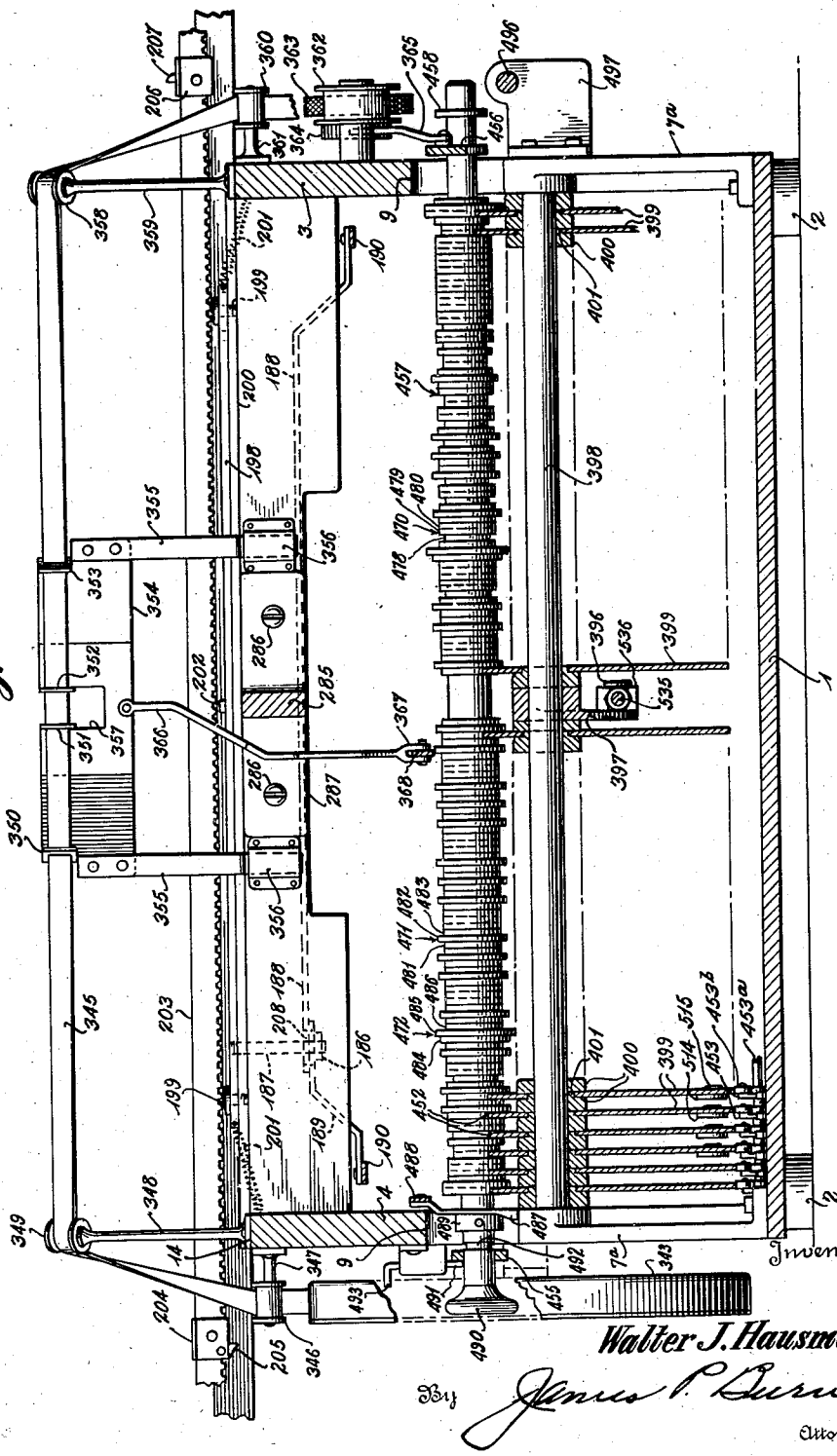
Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

Filed Feb. 20, 1943 17 Sheets-Sheet 6

Fig. 6.



Inventor

Walter J. Hausman

By James P. Burns

Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

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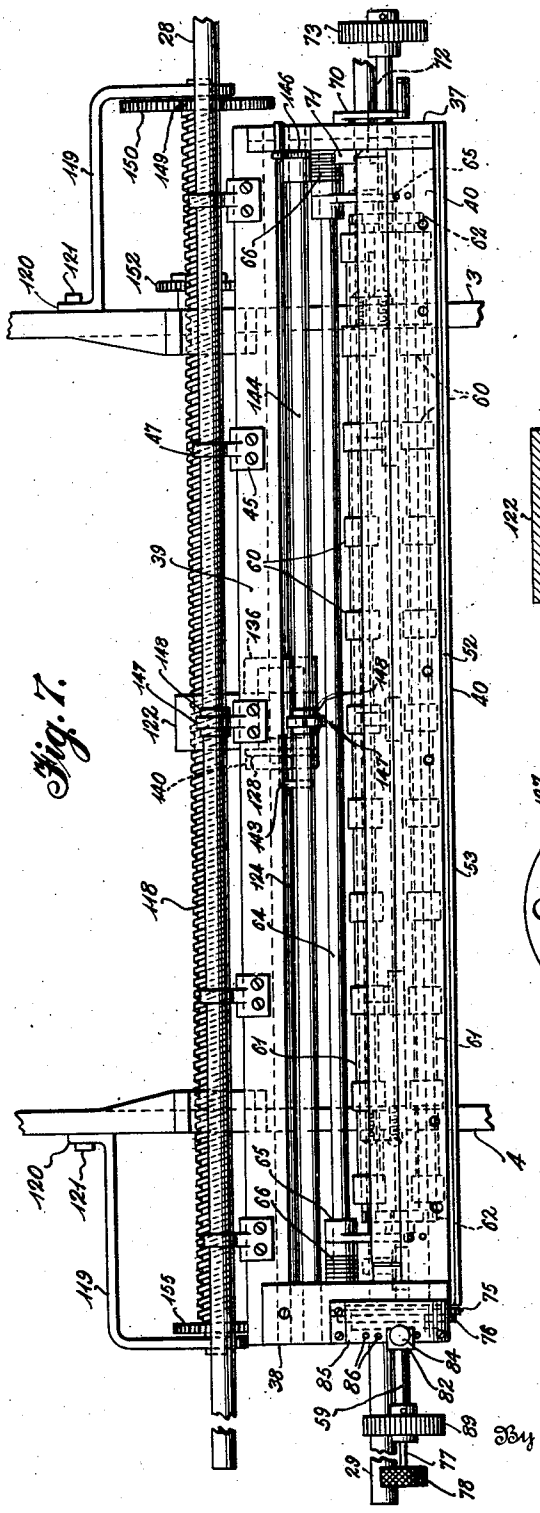


Fig. 7.

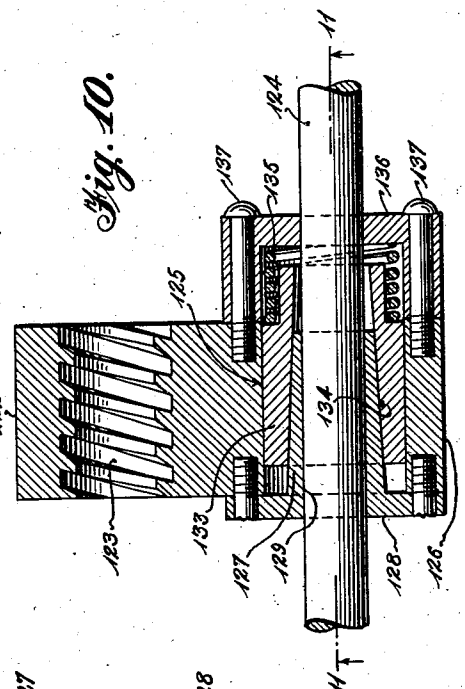


Fig. 10.

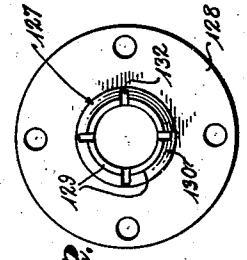


Fig. 12.

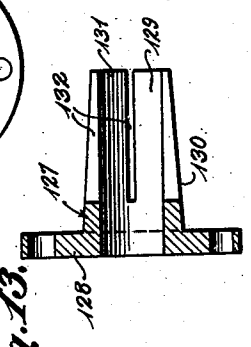


Fig. 13.

Inventor

Walter J. Hausman

By James P. Burns.

Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

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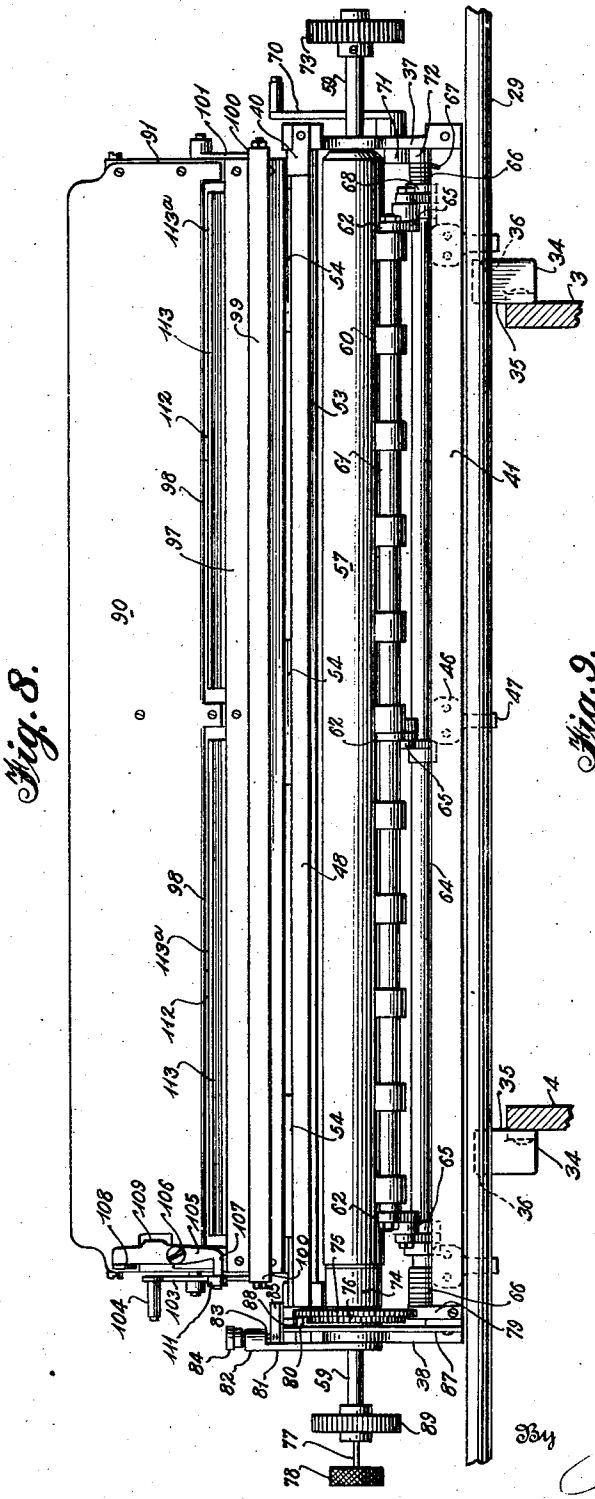


Fig. 8.

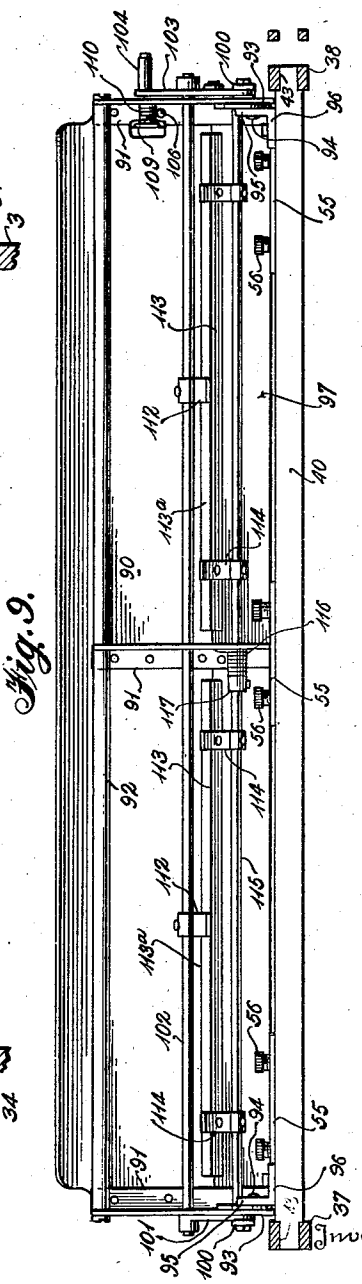


Fig. 9.

Inventor

Walter J. Hausman

By James C. Burns

Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

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Fig. 11.

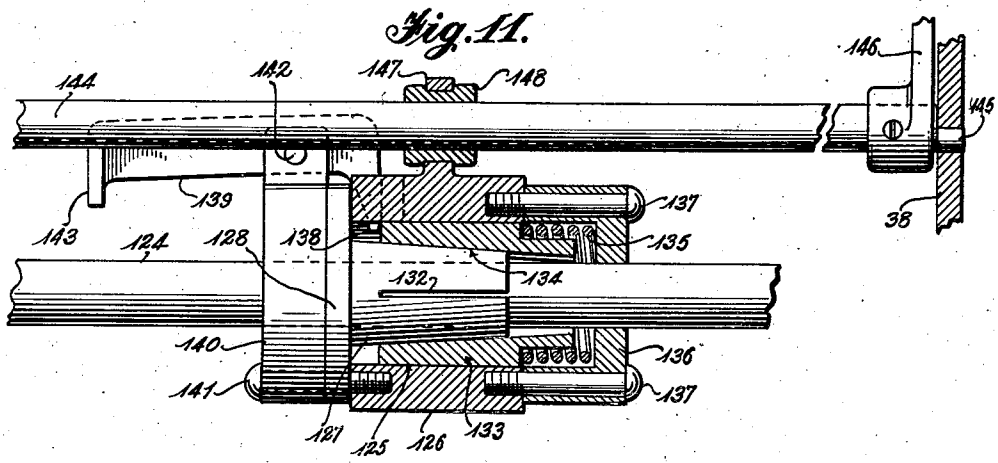


Fig. 14.

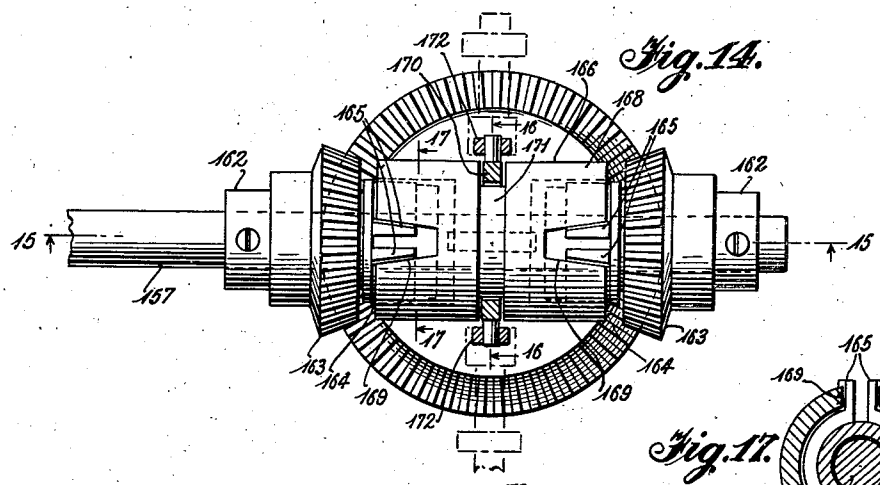


Fig. 17.

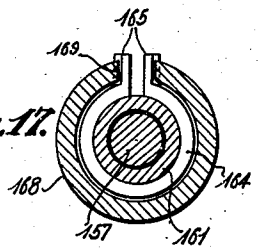


Fig. 15.

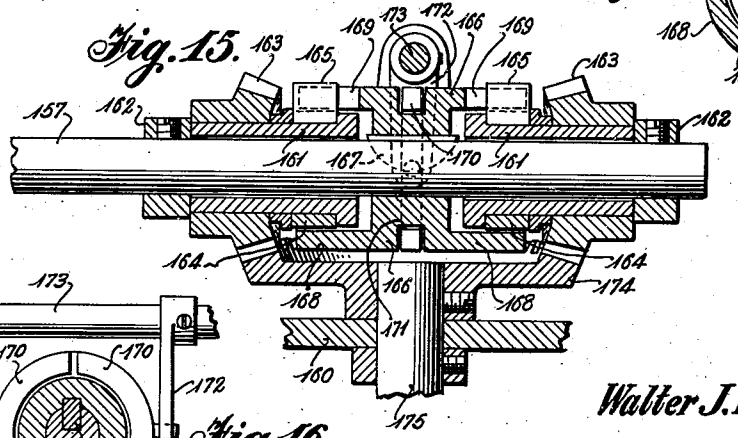
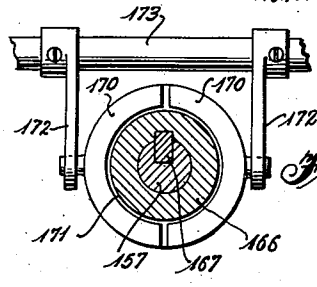


Fig. 16.



Inventor

Walter J. Hausman

By James P. Burns

Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

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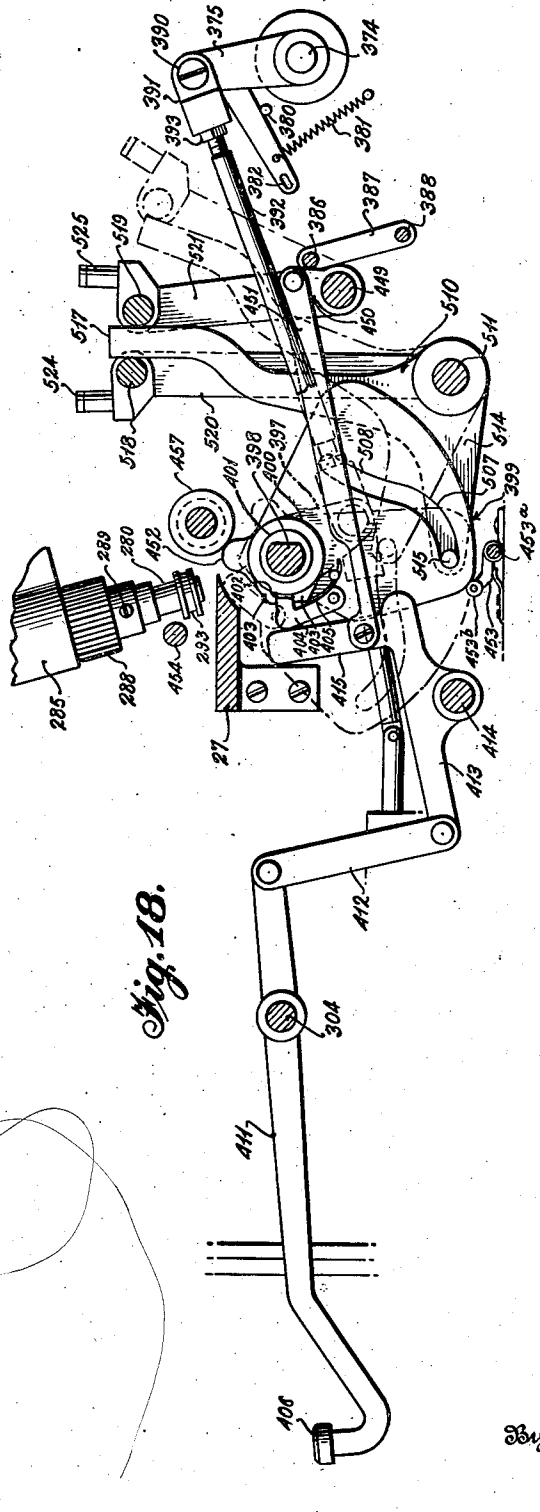


Fig. 18.

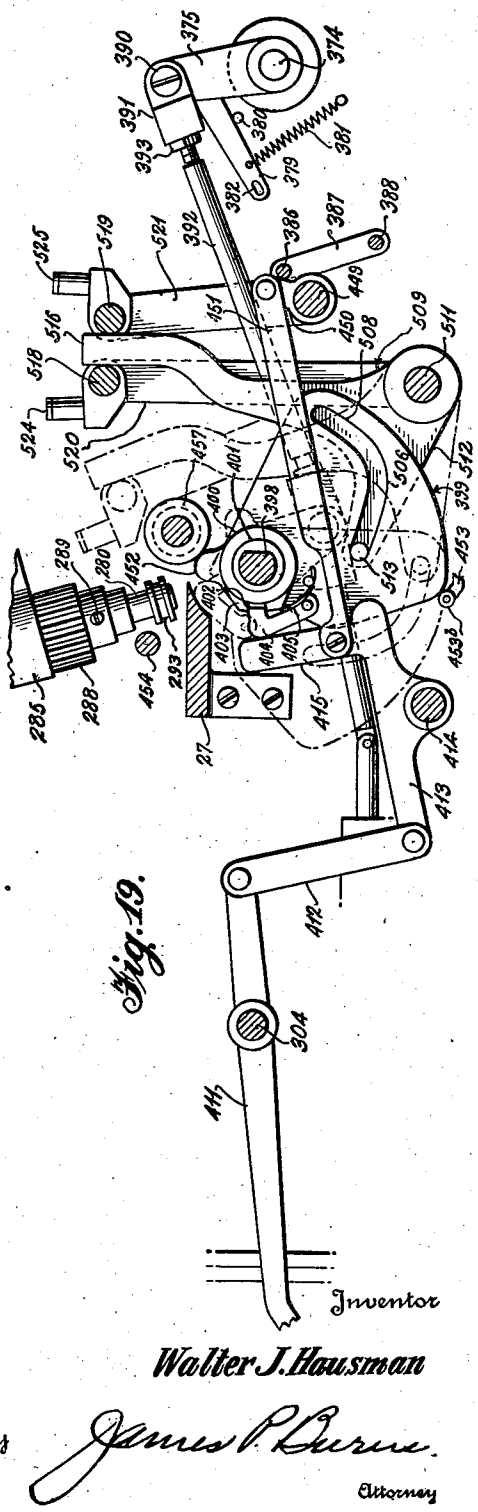


Fig. 19.

Inventor

Walter J. Hausman

By James P. Burns

Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

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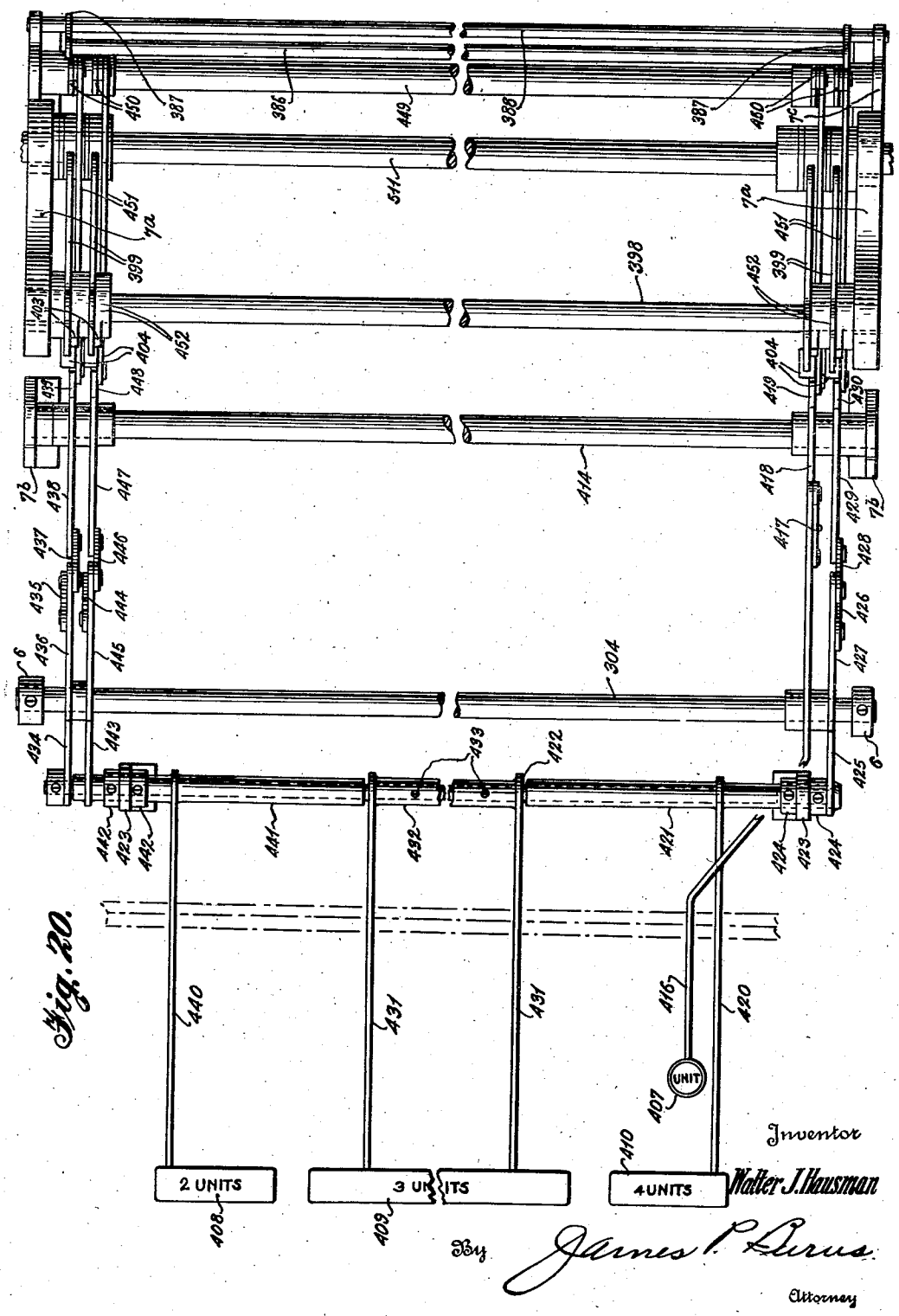


Fig. 20.

Inventor
Walter J. Hausman
By James P. Burns
Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

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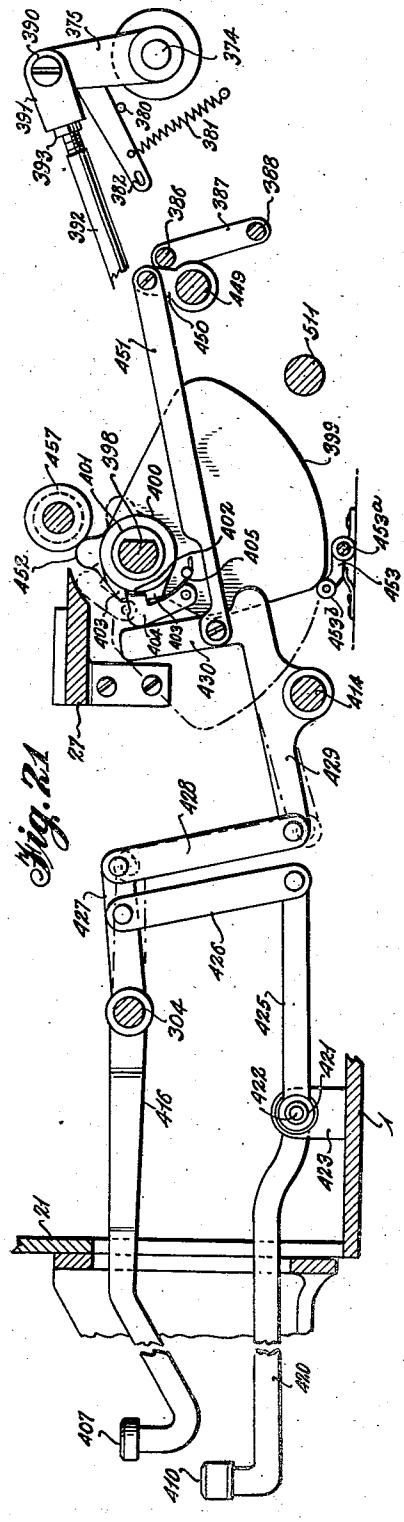


Fig. 21.

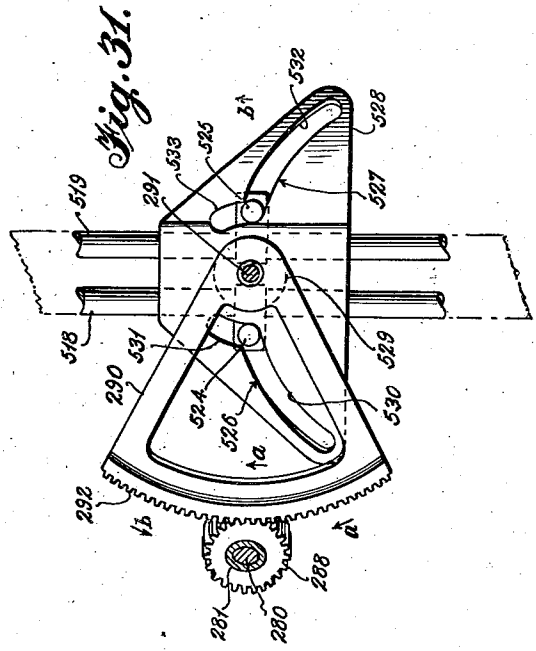


Fig. 31.

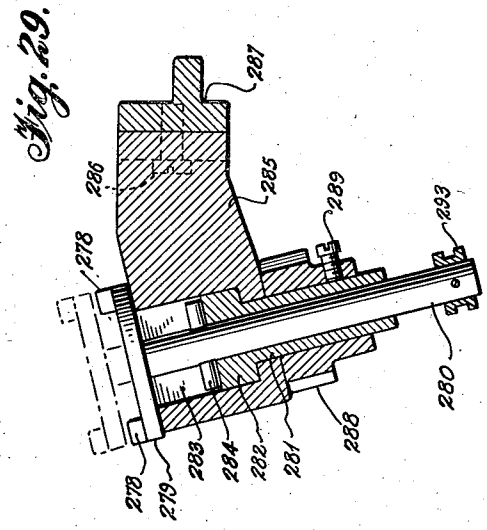


Fig. 29.

Inventor

Walter J. Hausman

By James P. Burns

Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

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Fig. 22.

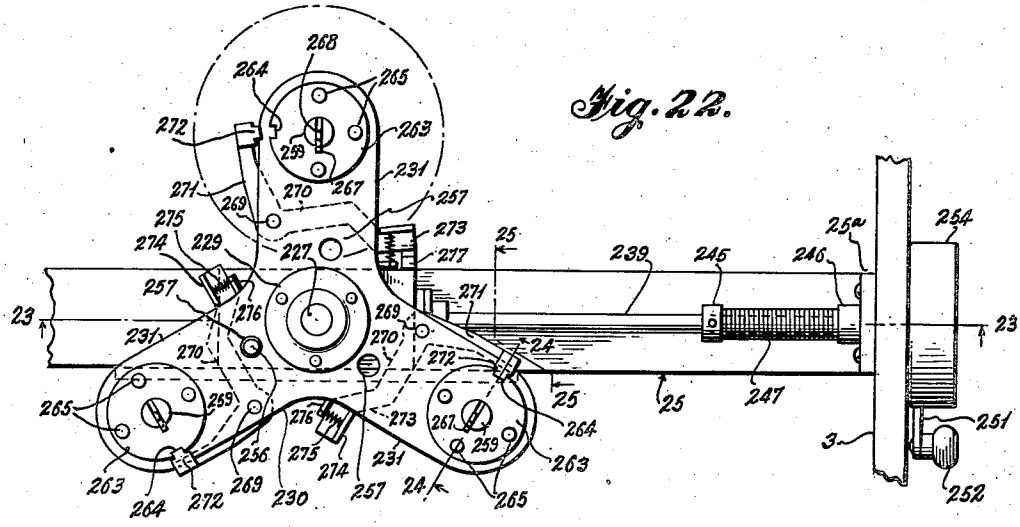


Fig. 23.

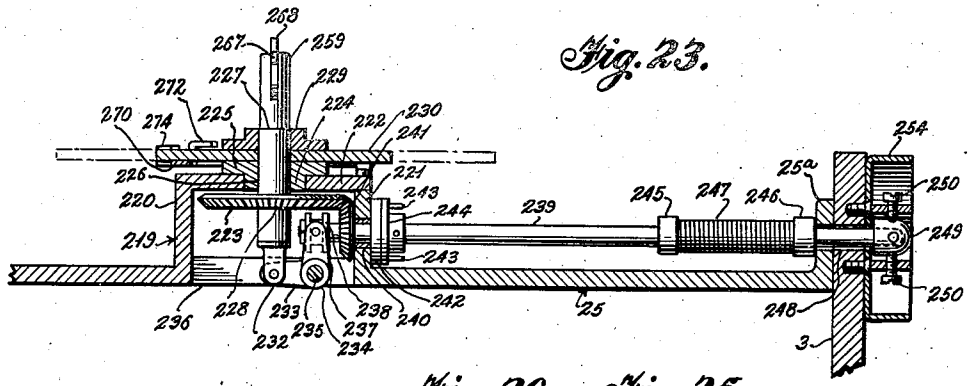


Fig. 24.

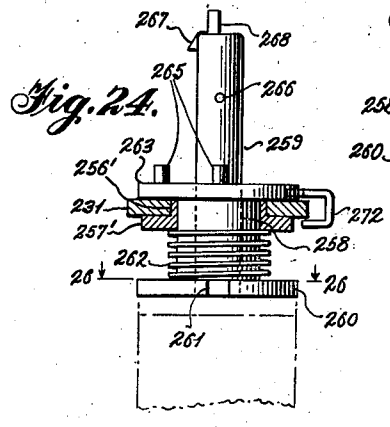


Fig. 26.

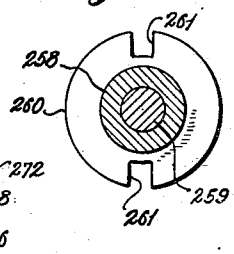
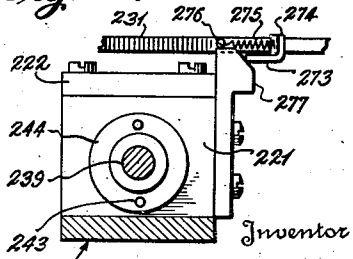


Fig. 25.



Inventor

Walter J. Hausman

By James P. Burns

Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

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Fig. 28.

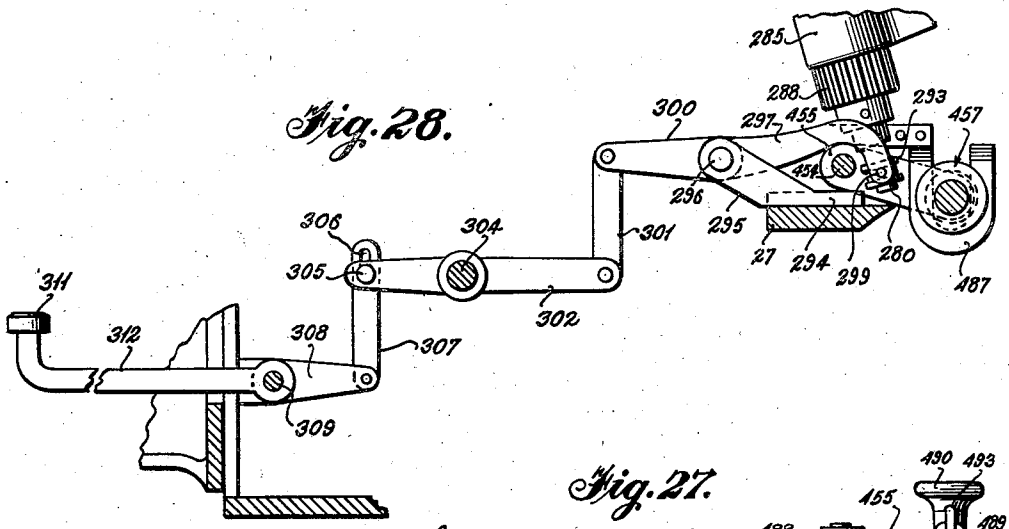
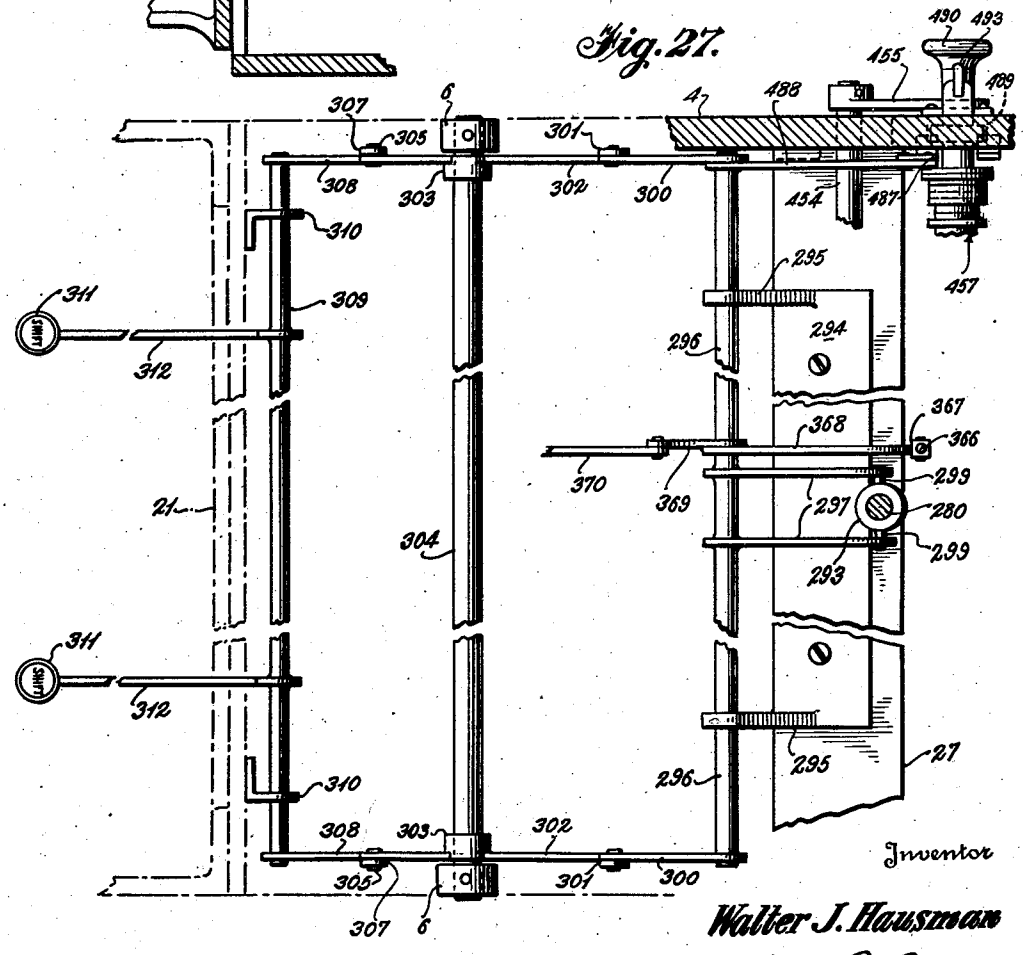


Fig. 27.



Inventor

Walter J. Hausman

By James P. Burns

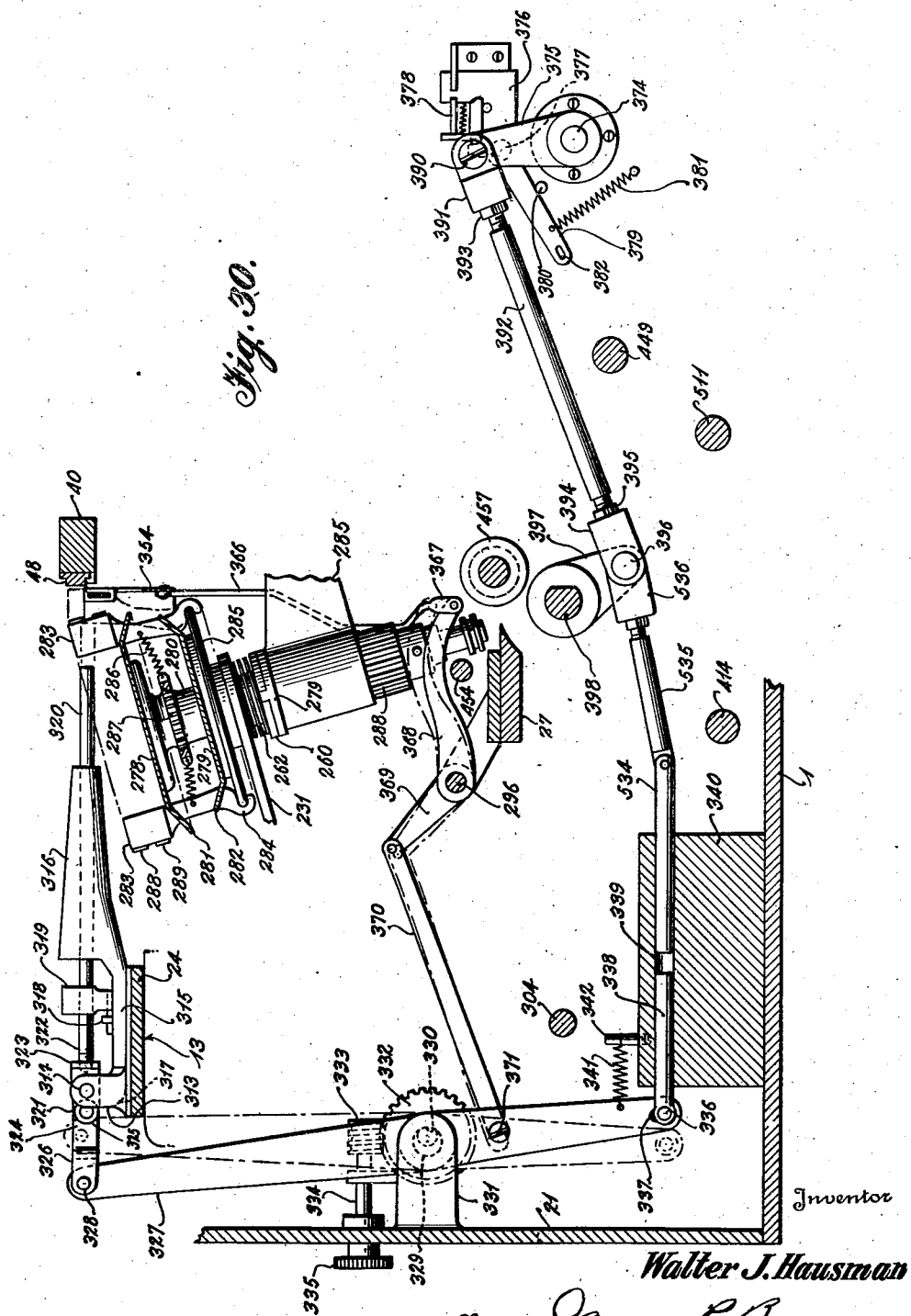
Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

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Fig. 30.



Inventor

Walter J. Hausman

By James P. Burns

Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

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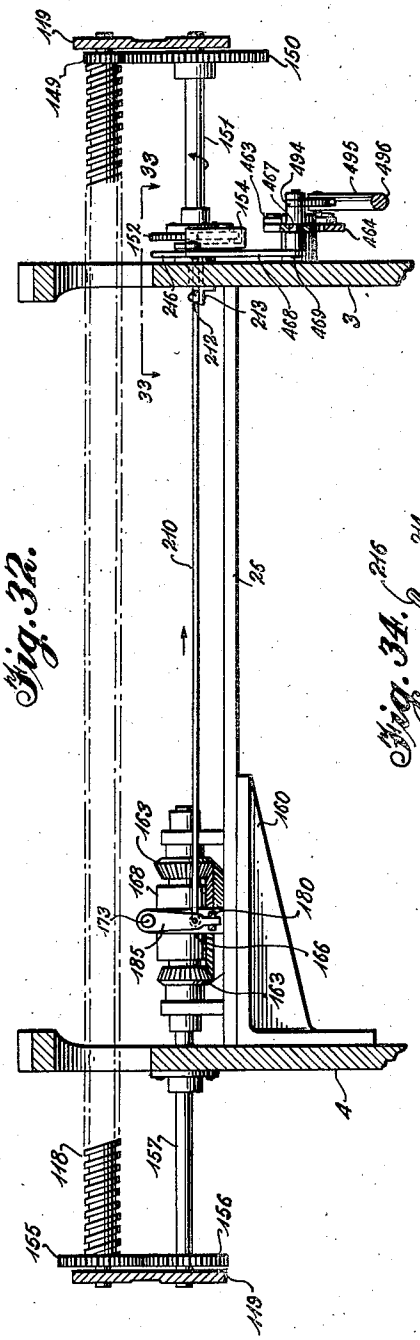


Fig. 32.

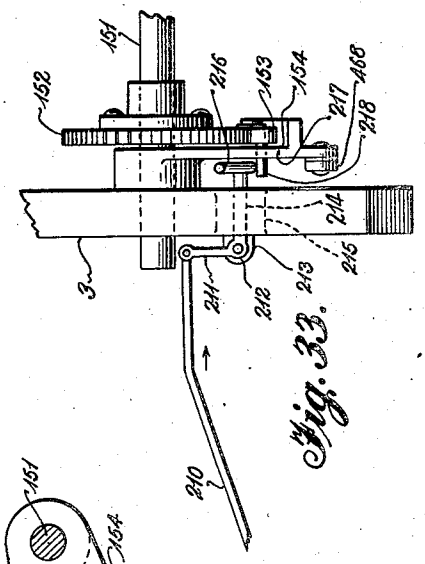


Fig. 33.

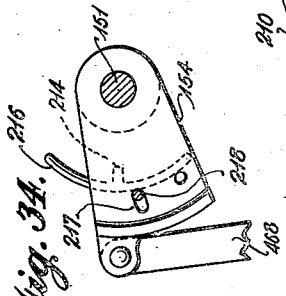


Fig. 34.

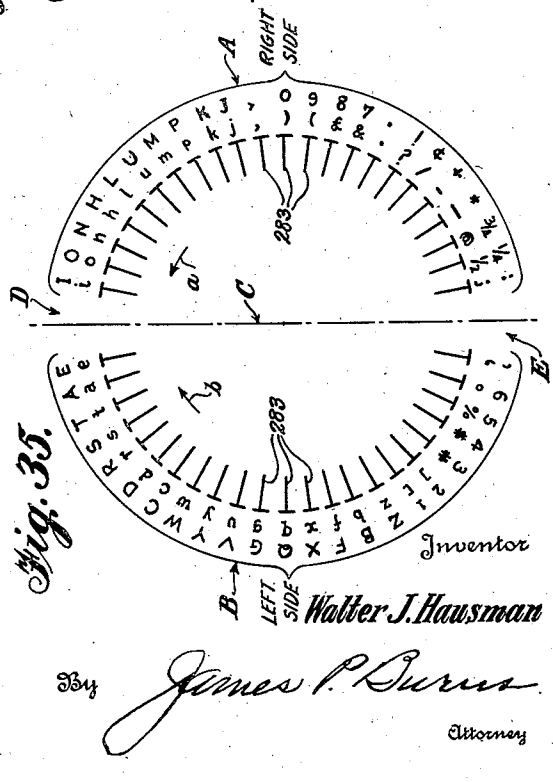


Fig. 35.

Inventor

Walter J. Hausman

By James P. Burns

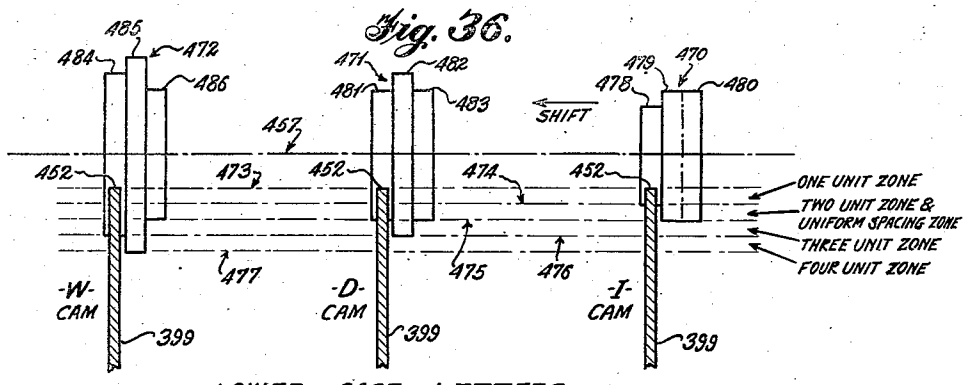
Attorney

Nov. 26, 1946. W. J. HAUSMAN 2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

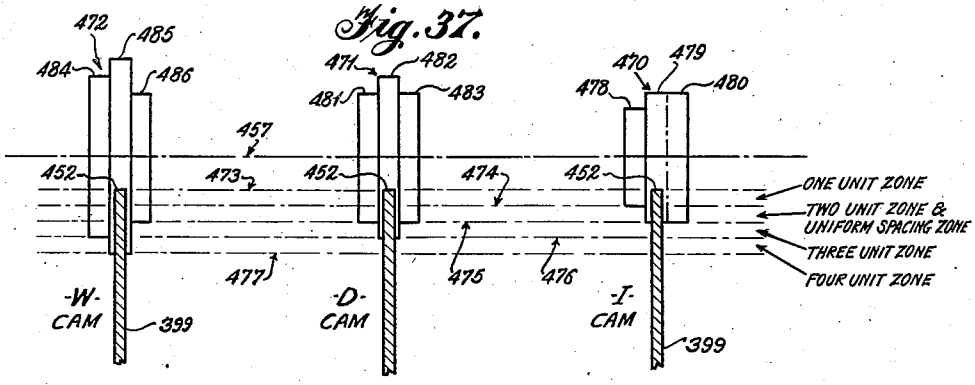
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Fig. 36.



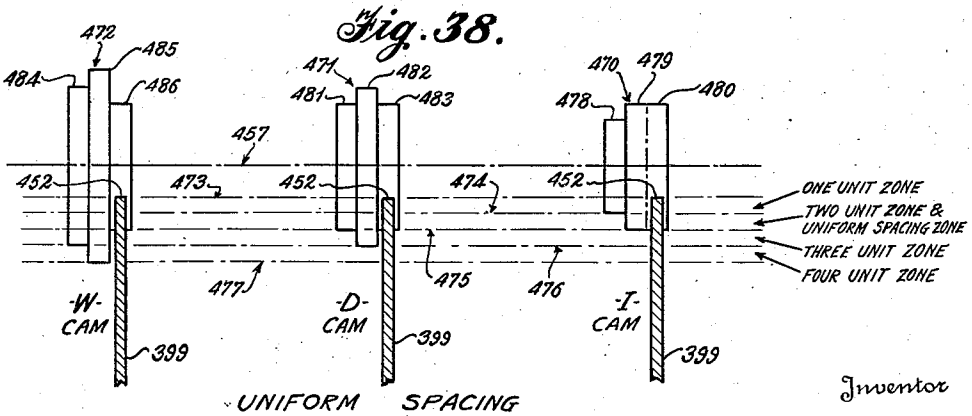
LOWER CASE LETTERS

Fig. 37.



CAPITAL LETTERS

Fig. 38.



UNIFORM SPACING

Inventor

Walter J. Hausman

By James P. Burns

Attorney

Patented Nov. 26, 1946

2,411,723

UNITED STATES PATENT OFFICE

2,411,723

VARIABLE SPACING MECHANISM FOR KEY OPERATED PRINTING MACHINES

Walter J. Hausman, Washington, D. C., assignor to Burnell Machine Company, Incorporated, Wilmington, Del., a corporation of Delaware

Application February 20, 1943, Serial No. 476,572

12 Claims. (Cl. 197—84)

1

This invention relates to key operated type printing machines and more specifically to such a machine which is adapted to print copy to be used as either high quality originals or as compositions for all forms of reproduction processes which employ photographic steps in the preparation of their printing stones or plates, and which is also adapted to produce compositions for processes which compose directly on the plates and employ stencils and hectograph masters.

The designing of a key operated type printing machine which is only capable of producing copy to be used as high quality originals is no longer a remarkable accomplishment because there are typewriting machines now available on the open market which are capable of attaining this desired result, and any improvements which might now be made thereover could only relate to details, such as type face design and possibly line justification. However, the designing of a key operated type printing machine which is not only capable of producing high quality originals, by the use of different styles and sizes of typewriter type faces, but is also capable of producing from foundry type faces copy which will meet all of the demands and requirements made of text compositions to be used in the several reproduction processes employing photography in the preparation of printing plates, or the like, and directly composed plates, stencils, and hectograph masters is indeed an accomplishment. To meet such demands or requirements, a machine must be able not only to print or make impressions with a reasonable number of different "families" of foundry type faces, but it also must be able to operate with a reasonable number of different styles and sizes of type faces for each one of the selected "families" and the characters of the copy or composition must be spaced as intended by the designers or founders of the type faces. To the best of my knowledge and belief, such a machine has never been designed before.

In the printing of text or reading matter by means of the stones or plates used in such planographic processes as photo-lithography, photo-lithography-offset, and pantone, and in such intaglio processes as photogravure, it is necessary to prepare a composition which is photographed as a step in the production of the printing plate or stone. It is the usual practice to assemble the complete composition for a plate, which may print one or more pages of the matter to be reproduced, before resorting to the step of photographing the composition.

2

If the characters of the text are to be those of foundry type faces, the copy has always been run off by letter-press printing machines employing composed type. The composed type must be set either by hand or by a type setting machine or it must be produced by a type-casting machine, such as the linotype or monotype. Setting the type by hand, of course, can only be employed profitably for headings or other parts employing unusual type faces. Type setting and type-casting machines entail a large capital investment and the employment of highly skilled craftsmen to operate the same. Before the copy can be prepared, the composed type must be locked in a chase and leveled on a "stone" or imposing table to eliminate light spots. It may even require a certain amount of "underlay" work before an even impression can be obtained.

It is very evident from the above brief description of the procedure which has been necessary to prepare text copy of foundry type faces, that, as compared to letterpress printing, the principle advantages obtained from the use of the aforesaid mentioned branches of planographic and intaglio processes have been in connection with reproducing illustrations or pictorial parts. This difficulty of producing text copy undoubtedly has been the principle reason why photo-lithography, pantone, and photogravure processes have not succeeded in entirely dispensing with the use of the letterpress for printing large quantity work. That these processes which employ photographic steps otherwise would accomplish this result is borne out by the fact that practically all reprints or reproductions of previously printed books, or the like, now are produced by the same because the pages of the original prints can be employed as copy.

Two devices intended to overcome this recognized difficulty have been tried out to a limited extent commercially. These devices are photo-composing machines and typewriter machines which are capable of interchangeably using several sets of type faces of different sizes and styles.

There have been developed several different types of photo-composing machines but they all employ the same basic principle. This principle embodies the production of a print which is composed by making a succession of photographic pictures on a sensitized negative from a set of master characters which, for example, may be carried by a film. The desired characters are successively moved into the exposure position, in response to the actuation of the appropriate keys of a keyboard, and a picture is taken of each

character. Character by character, the matter is photographically printed until a complete composition of a page, or the like, is formed. The print is then removed, developed, and fixed, and it is to all intents and purposes the same as a print made of letterpress copy produced by the use of composed type. A more complete understanding of this principle may be obtained by a study of the Edgar K. Hunter patent, No. 1,732 049, issued October 15, 1929, which is illustrative of this development.

Although this photo-composing process specifically, and the general subject of photo-typography under which photo-composing falls, have been in the development stage for quite a number of years, as evidenced by expired United States patents dealing with the subject, the problem of economically providing foundry type face copy for photolithography, and the like, reproducing processes has remained unsolved.

Photo-composing processes, and the like, have failed commercially because of several undesirable features. First, the production of composition by this method is very time consuming and costly because of the aforementioned tedious method of photographically printing the composition character by character. Second, the composition is prepared "blind"; i. e., it cannot be seen until the composition is complete. Therefore, errors cannot be detected until the print is removed, developed, and fixed, and, as it is impossible to correct errors, considerable time is lost in completing a composition, in which an error has been made unknowingly, which must be discarded after the error is detected. This, naturally, adds materially to the cost of using this process. Third, it almost always is necessary to edit compositions one or more times before they are entirely satisfactory, as the party responsible for the work cannot determine just how it will appear until he can view the completed composition. As changes cannot be made in photo-composition prints, new ones must be prepared after each edit.

Of course, any typewriting machine is capable of preparing copy which can be used in making compositions for reproduction processes, and such copy is entirely satisfactory if the typewriter type face characters and the uniform spacing of said characters of the final printed matter are acceptable. Such printed matter, however, cannot be made to have the appearance of foundry type face printing. This is due to the fact that all typewriter type faces must be specifically designed to provide harmony when all of the printed characters are uniformly spaced, whereas foundry type faces are designed to provide harmony when all of the printed characters are spaced according to their respective widths. Furthermore, the ordinary typewriter machine is only capable of printing with one size and style of type; i. e., capital and lower case letters for a given size.

As stated above, it now is possible to obtain typewriter machines which are capable of printing with different sizes and styles of type faces. However, for any given size and style, the characters must still be uniformly spaced and the type faces must be specially designed to provide harmony for this uniform spacing. Reference may be made to Patent No. 1,964,748, issued to Frank H. Trego, on July 3, 1934, for a disclosure of a typewriter machine of this kind.

It is obvious from the above that even this variable type size and style of typewriting machine is not capable of preparing copy for reproduction processes which will have the appearance of copy prepared from foundry type.

With the above discussion in mind, it is the primary object of this invention to provide a key operated type printing machine which is capable of producing copy suitable for use either as high quality originals or to take the place of and be the full equivalent in appearance of reproduction copy which has heretofore been prepared either from ordinary or special typewriter type faces or from composed foundry type faces.

A further important object of the invention is to provide a machine of the above mentioned type which is capable of preparing reproduction copy, or copy for reproduction compositions, which may be written with many styles and sizes of typewriter type faces, with all of the written characters for any given style or size properly, uniformly spaced, or with many styles and sizes of foundry type faces, with all of the written characters differentially spaced in accordance with the sizes of the different characters and the intentions of the designers of the type faces.

Still another object of the invention is to provide feeding mechanism for the copy paper holding carriage which will operate to advance or space the carriage in response to actuation of the several character printing and/or certain control keys either a uniform distance for all characters, including lower case letters, capital letters, and figures, so that typewriter type faces may be employed, or a plurality of different distances for lower case letters and capital letters and a uniform distance for figures, so that foundry type faces, with their various widths, may be employed.

Another object of the invention is to provide proper carriage feeding mechanism of the above mentioned type which is adapted to be adjusted to permit the machine to interchangeably employ many different points and styles of typewriter type faces and many different "families," including different points and styles of each "family," of foundry type faces.

Still another object of the invention is to provide a power operated drive for the aforementioned adjustable carriage feeding mechanism which also may be employed for moving the carriage its full length of travel, or any desired fraction of its full length of travel, in response to depressing certain control keys.

Another object of the invention is to provide a paper carriage and drive mechanism with a selectively operable connection between the same so that the carriage normally will be connected to its drive mechanism but may be disconnected therefrom and moved independently to any desired point in a line being printed and then either reconnected to its drive mechanism at said new position or returned to its former position and then reconnected to the drive mechanism.

A further object of the invention is to provide line spacing mechanism for the carriage which will space or move the paper vertically any one of a suitable number of different distances, each of which is a multiple of $1/72$ part of an inch, or a multiple of one "point" in type sizes.

A still further object of the invention is to provide a platen structure on the carriage which will afford an appropriate printing surface for flat faced foundry type which may vary in size from 6 pt. to 14 pt., the said printing surface of the platen structure being so constructed as to

permit it to be replaced at the will of and by the operator when the one in use becomes uneven or pitted or when a printing surface of a different character or degree of hardness is desired.

Another object of the invention is to provide a novel form of spacing mechanism, for spacing between words, which operates on the principle of spacing different numbers of "units," a "unit" being the width of the narrowmost type face character which can be used with the machine, and which may be used to effect justification of the right-hand margin of the copy printed on this machine.

Still another object of the invention is to provide a machine which possesses all of the above mentioned features and yet one which will require the services of a skilled typist and not a craftsman skilled in the printing art to operate the same.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a plan view of the key operated printing machine embodying this invention,

Figure 2 is a side elevational view, taken of the right side of the machine shown in Fig. 1, with the exterior finishing plate or panel removed to better illustrate the mechanism,

Figure 3 is a vertical sectional view taken through the machine of Figs. 1 and 2, the said section not being taken on any particular section line of the preceding figures but being laid out to best illustrate certain parts of the mechanism of the machine,

Figure 4 is a top plan view which illustrates the keyboard, or the bank of character and control keys, with the links, levers, cams, etc., actuated by said keys, and also illustrates the source of power and a power transmitting or clutch mechanism which interconnects the source of power to the parts of the machine to be operated thereby, the said plan view approximately illustrating the mechanism lying below the line 4—4 of Fig. 3,

Figure 5 is a vertical sectional view taken on line 5—5 of Fig. 3,

Figure 6 is a vertical sectional view taken on line 6—6 of Fig. 3,

Figure 7 is a detail plan view of the carriage which supports and feeds or advances the paper on which the printing is to be impressed, this figure also showing a portion of the carriage feeding mechanism,

Figure 8 is a front elevational view of the paper carriage and more clearly illustrates the paper pan and platen structure,

Figure 9 is a rear elevational view of the paper pan and platen structure included as a part of the disclosure of Fig. 8,

Figure 10 is a detail horizontal sectional view of a portion of the paper carriage drive mechanism and more particularly illustrates a clutch unit by means of which the carriage may be disconnected from its drive mechanism and moved independently thereof and by means of which the carriage may be again connected to its drive mechanism either at its former position or at any other desired selected point throughout the line being printed,

Figure 11 is a detail, substantially vertical sectional view of the carriage clutch mechanism and taken on line 11—11 of Fig. 10,

Figure 12 is a detail, end elevational view of a compressible clutch collar which forms a part of the clutch mechanism disclosed in Figs. 10 and 11,

Figure 13 is a central longitudinal sectional view of the clutch collar shown in Fig. 12,

Figure 14 is a detail plan view of a reversing drive clutch by means of which the paper carriage may be power shifted to any extent desired in either one of its two possible directions of travel,

Figure 15 is a detail, vertical sectional view of the reversing clutch and taken on line 15—15 of Fig. 14,

Figure 16 is a detail, vertical sectional view taken on line 16—16 of Fig. 14 and specifically illustrating the shifting mechanism for the sliding collar of the reversing clutch,

Figure 17 is a detail, vertical sectional view taken on line 17—17 of Fig. 14 and more specifically illustrating one of the contractible clutch bands of the reversing clutch mechanism,

Figure 18 is a partly vertical sectional view and elevational view illustrating a character controlling or actuating key with its mechanism which operates to position its particular type bar in printing position with respect to the printing surface of the platen structure,

Figure 19 is a view similar to Fig. 18 but illustrates a different character key and its type bar positioning mechanism,

Figure 20 is a detail plan view illustrating a key and three bars which may be operated to effect movement of the paper carriage four different predetermined distances to provide desired spaces between words, or the like, with the link, lever, and cam elements which are actuated by said key and bars to bring about the desired movements of the paper carriage,

Figure 21 is a detail, vertical sectional view taken through the carriage spacing mechanism of Fig. 20,

Figure 22 is a plan view illustrating a spider employed for holding and collectively moving into printing position three different type baskets carrying a like number of different sized or styled type bars,

Figure 23 is a substantially vertical sectional view taken on line 23—23 of Fig. 22,

Figure 24 is a detail, vertical sectional view taken on line 24—24 of Fig. 22,

Figure 25 is a detail, vertical sectional view taken on line 25—25 of Fig. 22,

Figure 26 is a detail, horizontal sectional view taken on line 26—26 of Fig. 24,

Figure 27 is a detail plan view illustrating control keys and the mechanism operated thereby which is employed for elevating a type basket, arranged in printing position with respect to the platen, not shown, for the purpose of printing capital letters,

Figure 28 is a vertical sectional view of the mechanism shown in Fig. 27,

Figure 29 is a detail, vertical sectional view of the shaft which is elevated or moved vertically in an axial direction to raise a type basket into its capital letter printing position,

Figure 30 is a detail, vertical sectional view illustrating one type basket in printing position, a plunger and its operating mechanism which will move the selected and positioned type to impress or print the selected character on the paper to receive the impression, and printing ribbon

vibrating mechanism which is operated by the type actuating plunger mechanism,

Figure 31 is a detail, plan view of the selector mechanism by means of which the properly positioned type basket is rotated in the proper direction to arrange the selected type in printing position with respect to the platen structure.

Figure 32 is a detail view, partly in vertical section and partly in front elevation, of the reversible clutch mechanism and its actuating means which may be employed for driving the feed screw of the paper carriage in opposite directions by the prime mover of the machine,

Figure 33 is a detail view taken on line 33—33 of Fig. 32,

Figure 34 is a detail side elevational view of a part of an automatic control device for the reversible clutch mechanism,

Figure 35 is a diagrammatic view which illustrates the arrangement of the various type bars and their type members in a type carrier or basket, and

Figures 36 to 38, inclusive, illustrate diagrammatically the grooved construction of a follower bar employed in this machine for effecting spacing movement of the paper carriage.

The machine embodying this invention is in the nature of an improvement on or an advancement of certain of the principles of operation and mechanisms covered by the following commonly owned patents: Charles A. Fuchs, 2,127,507, Aug. 23, 1938; Charles A. Fuchs, 2,127,508, Aug. 23, 1938; Charles A. Fuchs, 2,127,509, Aug. 23, 1938; Walter J. Hausman, 2,127,514, Aug. 23, 1938; and Richard V. Reppert, 2,127,530, Aug. 23, 1938.

Additionally, this machine includes entirely new mechanisms and principles of operation which, when combined with the aforementioned improvements, make possible the accomplishment of the objects set forth above.

MAIN MACHINE FRAME OR CHASSIS

The main machine frame is best illustrated in Figs. 1 to 6, inclusive, and will be described in connection with the same.

Figs. 2 to 6, inclusive, disclose the bottom of the machine as being defined by or formed by a solid base plate 1 which is clearly illustrated in Fig. 4 as being of substantially rectangular shape in plan. This base plate is carried by or supported on a suitable number of feet or pads 2. The opposite sides of the machine are formed of side plates or castings. The side plate or casting located on the right hand side of the machine is identified by the reference character 3, while the side plate or casting for the left hand side of the machine is designated by the reference character 4. These side plates are attached at their lower edges to the side edges of the base plate in any suitable manner. By considering Figs. 2, 3, 5, and 6, the shape of these side plates or castings, in elevation, may be determined. To assist in this determination, the various edges or margins of the plates will be referred to. These side plates are substantially identical in contour so that one description will be sufficient for both plates. It will be noted that each side plate has a flat bottom edge portion at the three points designated by the reference character 5. Between each one of these straight or flat bottom edge portions 5, the side plate is cut away to accommodate the upstanding bearing bracket member 6 and the group of bearing bracket members 7. The cut out portion 8 accommodates the bearing bracket 6. The cut out portion 9 accommodates the group of bearing brackets 7. It will be noted that this group of bearing brackets 7 includes three bearing portions which will be designated by the reference characters 7*a*, 7*b*, and 7*c*. By the application of the reference character 9 to different parts of the cut out portion it designates, the shape of this cut out portion may readily be determined. It will be noted that directly over the bearing bracket portion 7*a* the cut away portion 9 departs from the top edge of this bracket to provide an appreciable opening. This opening, as will be explained at a later point, is provided to accommodate the throw of a certain part of mechanism to be later referred to. Figs. 5 and 6 clearly illustrate attaching flanges 10 through which screws, bolts, or the like pass to detachably mount the bearing brackets 6 and 7 on the base plate 1.

Figs. 2 and 3 disclose the front vertical margin 11 of each side plate as being straight and uninterrupted. These two figures also disclose the top margin of each side plate as being shaped to provide a flat section 12, at the front of each plate, a raised shelf portion 13, a second substantially flat lower portion 14, a depressed portion 15, a third flat portion 16, a rearwardly directed depression 17 which undercuts a second raised portion or shelf 18, and a final rear edge portion 19 which merges into the ornamentally shaped rear margin 20.

Figs. 1, 2, and 3 disclose a front plate 21 which is attached to the front marginal portions 11 of the side plates 3 and 4. This front plate has an inwardly directed top portion 21*a* which overlies part of the top marginal edges 12 and 13 of the side plates and serves to shield a portion of the mechanism of the machine.

A keyboard or key bank enclosing frame 22 is attached by means of the flanges 23 to the front plate 21 and the front edge portions or margins 11 of the side plates 3 and 4.

It will be appreciated that commercial machines will have the base plate 1 and the side plates 3 and 4 skeletonized or cut away wherever possible to reduce the weight of the machine. It has been deemed to be advisable, however, not to show these cut outs or openings in the base and side plates as additional lines defining the same would serve no other purpose than to confuse the observer.

For the purpose of transversely bracing the side plates 3 and 4 and for the additional purpose of supporting the mechanism located between these side plates, transversely extending bars 24, 25, 26, and 27 are provided. These transverse bars will be repeatedly referred to in connection with the mechanism they support.

It will be understood that appropriate cover plates, finishing panels, or the like, will be applied to the outer faces of the side plates 3 and 4 for the purpose of concealing and protecting the mechanism which would otherwise be exposed. The rear of the machine, also, will be covered or closed by an appropriate finishing panel to enhance the general appearance of the machine and to protect the mechanism.

PAPER CARRIAGE

The paper carriage is fully disclosed in detail in Figs. 1, 2, 3, 5, 6, 7, 8, and 9. In these figures there are disclosed an upper rear guide rod 28 and a lower front guide rod 29. Figs. 2, 3, and 5 best disclose the manner in which these two guide rods are mounted on the side plates 3 and 4 of the main machine frame or chassis. Fig. 5 dis-

closes the guide rod 28 as being longitudinally slotted at 30 and 31. An angular mounting bracket 32 is suitably secured to each portion 18 of the top marginal edge of each side plate. Each one of these angular bracket members 32 is provided with a laterally projecting blade or finger 33 which extends into slots 30 or slots 31 of the guide rod. Any suitable connection may be established between the guide rod and these blades or fingers 33, such as rivets, not shown, with their heads or opposite ends countersunk, or the like. This type of mounting leaves exposed practically the entire circumference of the rod 28. This rod extends laterally beyond each side plate 3 or 4 a suitable distance to provide the proper amount of travel for the carriage.

The lower guide rod 29 is supported by bracket members 34 which are secured to the outer side faces of the side plates 3 and 4, as is clearly illustrated in Figs. 2 and 8. These mounting brackets 34 also have blade or finger portions 35 which are received in appropriate slots 36 formed in this guide rod 29. Any suitable means of attaching the blades or fingers 35 to the guide rod may be employed.

The carriage proper includes the two end plates 37 and 38. These end plates 37 and 38 are of somewhat triangular formation in side elevation and are interconnected and braced by the three bars 39, 40, and 41. These three bars are located approximately at the three corners of each end plate and are connected to these corner portions of the plates by being received in notches 42, 43, and 44, respectively. Pins, screws, or the like are employed for retaining the ends of the bars in these notches. The end plates 37 and 38 and the bars 39 to 41, inclusive, form the frame or chassis of the paper carriage. To attach the paper carriage to the guide rods 28 and 29, the frame bars 39 and 41 are provided with bracket members 45 and 46, respectively. Each one of these bracket members 45 and 46 is provided with a pair of curved fingers 47. These fingers are so shaped and arranged as to substantially encircle their associated guide rods 28 or 29, as is best illustrated in Figs. 1, 2, 3, 7, and 8. By means of these bracket members 45 and 46, and their fingers 47, the frame of the paper carriage is slidably mounted on the guide rods 28 and 29.

This paper carriage is not provided with the conventional roller type of platen. Foundry type faces are not curved like ordinary typewriter type faces, and for that reason a curved platen or printing surface cannot be employed in this machine. The platen of this machine is a platen strip 48. This strip may be made of any desired material or materials. It may either be a one-piece strip, or it may be of laminated construction. Its construction and the material or materials from which it is made will depend entirely upon the type of printing to be produced on this machine and the character of the printing receiving sheet.

Figs. 2 and 3 disclose this platen strip as possessing a flat printing face 49 formed on its main body portion. Extending laterally in opposite directions from this main body portion are the two base flanges 50 and 51. The longitudinal base flange 50 is received in a groove 52 cut in a shelf or ledge 53 formed on the front edge of the carriage bar 40. Figs. 2 and 3 disclose the strip flange 51 as being engaged by flanged edges 54 formed on the clamping plates 55 which are detachably secured to the top face of the carriage frame bar 40 by the screws 56 which are provided with knurled heads. When the screws 56 are properly tightened, the platen strip 48 is securely held in place. By loosening these screws 56, the platen may be removed in a longitudinal direction and a different platen strip substituted therefor. This construction, therefore, permits the ordinary operator of the machine to substitute new platen strips for worn out or badly pitted strips or to change platen strips when different platen material is desired.

The flat printing face or surface 49 of the platen strip 48 is of sufficient width, or height when considered vertically, to provide a proper printing surface for the largest size or point of type to be used in this machine. For example, it is proposed to employ foundry or typewriter type faces in this machine which will range in size from 6 to 14 points. As each type point is standardized at 1/72 of an inch, the width or height of the platen strip base 49 should exceed 14/72 of an inch by an amount which will be sufficient to properly support the paper, or the like, against which 14 point type will bear to make an impression.

To advance the paper, or other material, to and past the platen strip 49, appropriate paper feeding means are provided. This means is best illustrated in Figs. 1 to 3, inclusive, 7, and 8. It includes a large paper feed roll 57 which is best illustrated in Fig. 3 as including a rubber, or other suitable feeding material, surface portion or roll body 58, which is mounted on a metal shaft 59. This shaft 59 is journaled adjacent its opposite end portion in suitable bearing openings formed in the end plates 37 and 38 of the paper carriage.

Rubber idler feed rolls 60 are carried by the two parallel rods 61. These parallel rods are supported by three double armed brackets 62 which in turn are pivotally connected by the pins, or the like, 63 to an actuating shaft 64 by means of the three arms 65. The actuating shaft 64 is suitably journaled at its opposite ends in bearing openings formed in the end plates 37 and 38 of the carriage frame. One or more springs 66 are employed for normally urging the idler rolls 60 into engagement with the periphery of the main paper feed roll 57. Each of such springs has an extremity 67 hooked over the carriage frame bar 41. The remaining extremity of the spring is attached to a collar 68 which is suitably anchored to the actuating shaft 64. If two or more springs are employed, each one of the same will be wrapped about the actuating shaft 64 and connected to the same and the carriage frame bar 41 in this manner.

The means employed for effecting rotation of the operating shaft 64 to shift the idler rolls 60 out of pressure engagement with the periphery of the main feed roll 57 is disclosed in detail in Figs. 2, 7, and 8. This mechanism includes a shaft 69 which is journaled in a suitable bearing opening formed in the carriage end plate 37. This shaft is actuated by an operating lever 70 positioned outside of the end plate 37. The inner end of the shaft 69 has mounted thereon a cam 71, see Figs. 7 and 8, which engages a cooperating cam 72 formed on the operating shaft 64. Movement of the operating lever 70 toward the front of the machine, or into the position illustrated in Fig. 2, actuates the shaft 64 to move the idler rolls 60 away from the main paper feed roll 57. When the operating lever 70 is moved rearwardly of the machine, the cam 71 releases the cam 72 and the spring or springs 66 operate to force the idler

rolls 60 toward and into pressure engagement with the periphery of the main feed roll 57.

There are means provided at each end of the main paper feed roll 57 for rotating the same. At the right hand end of the feed roll, see Figs. 1, 2, 7, and 8, the feed roll shaft 59 has secured thereto an operating knob or wheel 73. The operator of the machine may employ this wheel for rotating the main feed roll 57 without regard for distance or extent of rotation.

At the left hand or remaining end of the main feed roll 57 there is provided mechanism which may be employed by the operator of the machine for advancing the paper, or the like, being printed upon predetermined distances which will properly space the printed lines for receiving six, eight, ten, twelve, and fourteen point printed characters. This paper feed roll advancing or rotating mechanism is more or less conventional and, for that reason, will not be disclosed and described in great detail.

The feed roll shaft 59 has associated therewith, adjacent the carriage end plate 38, a clutch housing 74 which encloses suitable clutch mechanism, not shown, by means of which the ratchet wheels 75 and 76 may be connected to or disconnected from the shaft 59. To operate this clutch, a rod 77 passes through a bore formed in this end portion of the shaft 59. An operating knob 78 is secured to the end of this rod 77. When the knob and rod are in the position illustrated in Figs. 1, 7, and 8, the clutch within the housing 74 is conditioned for coupling the two ratchet wheels to the shaft 59. When the operating rod 77 is moved outwardly by means of a knob 78, the clutch is conditioned to disconnect the ratchet wheels 75 and 76 from the roll shaft 59. To prevent unintentional retrograde movement of the paper feed roll 57, a safety pawl 79 is mounted on the carriage frame bar 41 and engages the larger diametered ratchet wheel 75.

A sector shaped guard or shield 80 is positioned to overlie a portion of the periphery of the smaller diametered ratchet wheel 76. This guard or shield 80 is adjustable into different positions relative to the circumference of the ratchet wheel 76 by means of the arm 81. This arm is provided with an enlarged head 82 at its outer end in which is adjustably positioned a pin 83 having an operating knob 84 secured to its upper end. This pin cooperates with a suitably apertured plate 85 which is mounted on the top face of the carriage end plate 38. The apertures 86 formed in this plate 85 are so arranged that the pin 83 may be successively inserted into the same to provide rotation of the feed roll for advancing the paper, or the like, to provide properly spaced lines for receiving from 6 to 14 point type.

A lever 87 is suitably journaled on the shaft 59 and carries a pawl 88 at its upper end. By swinging the lever 87 about its pivot, the pawl 88 will be moved over the top surface of the guard or shield 80 and into engagement with the teeth of the ratchet wheel 76 for rotating this wheel and advancing the paper feed roll 57. This lever 87, and its pawl 88, are limited to a predetermined distance of movement, or to a predetermined throw. By adjusting the sector shaped guard or shield 80 in different positions with respect to this throw of the lever 87, the pawl 88, actuated by the lever 87, will engage the teeth of the ratchet wheel 76 at different points throughout the throw or distance of travel of the said pawl 88. With the pin 83 occupying the aperture 86 located at the front end of the series of apertures, the sector shaped guard or shield 80 will be shifted toward the front of the machine and the pawl 88 will engage the teeth of the ratchet wheel 76 early enough in its throw to rotate the paper feed roll 57 for advancing the paper to properly space for 14 point type. When the pin 83 is positioned in the aperture 86 located at the rear of the series of apertures, the sector shaped guard or shield 80 is moved rearwardly to a point which will limit the engagement of the pawl 88 with the ratchet wheel 76 to a very small portion of the throw of this pawl. This limited active movement of the pawl 88 will rotate the feed roll 57 for advancing the paper proper distances to accommodate 6 point type.

This end of the feed roll 59, also, is provided with an anchored operating wheel or knob 89 by means of which the feed roll 57 may be rotated any desired distance.

After the top edge of the paper, or the like, is fed past the platen strip 48, it is taken care of by the paper pan and its associated devices. This mechanism is best illustrated in Figs. 2, 3, 8, and 9.

This paper pan consists of a plate 90 which is attached to the three arms 91 in any suitable way. Fig. 9 discloses the upper ends of these arms 91 as being braced and reinforced by the rod 92 which is attached in any suitable manner to these arms. The end arms 91 have attached to their lower extremities laterally, rearwardly projecting mounting ears 93 which are pivotally connected by pins 94 to the upstanding ears 95 of brackets 96 which are attached to the top face of the upper, front carriage frame bar 40. This manner of mounting the paper pan 90 permits the latter to be swung from a normal, vertically extending position, see particularly Figs. 2 and 3, to a substantially horizontally extending position rearwardly located with respect to its normal position.

Figs. 3 and 8 disclose a strip or plate 97 as being attached to the arms 91 and lying in the plane of but spaced from the lower edge of the paper pan 90. This spacing of the lower edge of the paper pan and the upper edge of the strip or plate 97 provides two elongated slots or openings 98, see Fig. 8.

For the purpose of loosely holding the paper in superimposed relation to the paper pan 90, a swingable bar 99 is provided. Figs. 3 and 8 disclose this holding bar as extending longitudinally of the strip or plate 97. The opposite ends of this bar are bent rearwardly at 100. The rearwardly bent end portion 100 at the right hand end of the bar 99 is attached to an arm 101 which is fastened to one end of a holding bar operating shaft 102. This operating shaft is journaled in suitable bearing openings formed in the three arms 91. The remaining rearwardly bent end portion 100 of the holding bar 99 is illustrated as being attached to the lower end of a substantially bell crank shaped lever 103 which is fastened to the remaining end portion of the paper holding bar operating shaft 102. An operating handle 104 is carried by the lever 103. This operating lever 103 is disclosed in its normal position in Figs. 3, 8, and 9. When this lever is pivoted to cause its upper actuating end portion to be swung rearwardly or backwardly of the paper pan 90, the arm 101 and the lower portion of the operating lever 103 will move forwardly and upwardly and will carry the paper holding bar 99 away from the front face of the strip or plate 97. The holding bar 99 is moved

into this forwardly and upwardly swung position when paper is initially placed in the carriage and moved sufficiently past the platen strip 48 to start the printing operation. To retain the holding bar 99 in its inoperative or non-paper holding position, a latch 105 is pivoted at 106 to the arm 91 located at the left hand end of the paper pan 90. This latch 105 has a finger 107 at its lower end which is movable into a position to underlie the lower arm of the bell crank operating lever 103 when the paper holding bar 99 is swung into its inoperative position. This latch member may be actuated by a finger piece 108 which is bent laterally at its upper end. A second finger piece 109 is bent rearwardly of the latch and this portion 109 is illustrated in Fig. 9 as having a spring 110 bearing thereagainst. This spring normally urges the latch 105 toward its position where the latch finger 107 will underlie the lower arm of the bell crank operating lever 103. When the paper holding bar 99 is in its normal position, or located close to the front face of the strip or plate 97, the latch 105 is retained in the position illustrated in Fig. 8, against the force of the spring 110, by means of a lug 111 which is carried by the lower arm of the bell crank lever 103 and is aligned with the extremity of the latching finger 107. Figs. 3 and 9 disclose the operating shaft 102 as having mounted thereon two camming blades or arms 112. These camming arms or blades 112 bear against the strips 113 which are adjustably carried by the arms 114. These arms are anchored to a shaft 115 which is journaled in suitable bearing openings formed in the three pan supporting arms 91. These strips 113 are clearly illustrated in Figs. 3, 8, and 9 as being of angular formation in vertical section and as having the upper branch 113*a* extending horizontally.

When the operating lever 103 is moved to swing the holding bar 99 away from the strip or plate 97, the camming arms or blades 112 swing the strips 113 forwardly so that their upper, horizontal branches 113*a* project through the slots or elongated openings 98 and will lie in the path of the upper edge of the paper. These strips 113, therefore, will be employed as gauges to determine the location of the upper edge of the paper when the latter is properly positioned within the carriage to start printing thereon. When the paper holding bar 99 is returned to its normal position, see Figs. 2 and 3, the camming blades or arms 112 will be moved away from the gauge strips 113. These strips will be withdrawn from the elongated openings 98 by the spring 116, see Fig. 9, which is wrapped around the shaft 115 and is anchored to this shaft by means of a collar 117. The remaining end of the spring 116 bears against the intermediate pan supporting arm 91. This spring 116 normally functions to retain the paper gauge strips 113 in their retracted positions.

CARRIAGE SPACING OR DRIVING MECHANISM

It will be appreciated that to produce copy on a key operated printing machine which will have the appearance of copy produced on a letter-press printing machine, the key operated printing machine must be capable of employing foundry type faces of various sizes and styles and the printed characters must be spaced in accordance with their different widths or in the same manner they would be spaced if the copy were produced on a letter-press by means of foundry type. Additionally, for a key operated printing machine to produce copy which will simulate copy produced on either an ordinary typewriter or on a typewriter of special design which is capable of employing different sizes and styles of typewriter type faces, all of the letter characters, figures, and punctuation marks, including both lower case and upper case or capital letter characters, must be uniformly spaced for each given size or style of type faces. That is, all characters, etc., for any given size or style of typewriter type faces will be uniformly spaced, but this uniform spacing will be varied for other sizes or styles of type faces.

It will be appreciated that an extremely unique form of carriage spacing or driving mechanism must be provided to bring about this wide variation of spacing movement of the carriage. This spacing action, naturally, must be controlled or its action determined by the particular character keys which are depressed and produce copy which compares with letter-press copy. The spacing action, also, must be varied in accordance with the different sizes and styles of type faces which are to be employed. The control mechanism which operates in response to depressing the various character keys and the setting mechanism which takes care of situations where different sizes and styles of type face are employed will not be described in this section of the specification but will be referred to at a later point. The carriage spacing or driving mechanism which will now be described will only include that portion of the machine which actually brings about the desired movements of the carriage in response to actuation of the key operated control mechanism and the type size and style setting mechanism. The mechanism which now will be described is best disclosed in Figs. 1 to 7, inclusive, and 10 to 17, inclusive.

The desired carriage spacing movements are produced as a result of rotation of the double threaded feed screw 118. This feed screw is illustrated in Figs. 1, 2, 5, and 7 as being journaled at its opposite ends in the bearing brackets 119 which are attached by means of their rear flanges 120 and screws, or the like, 121 to the outer faces of the machine frame or chassis side plates 3 and 4.

A feed nut 122 is illustrated in Figs. 1, 3, and 7 as being threaded on the feed screw 118. Fig. 10 discloses this feed nut in section, and the female threads 123 for this nut are clearly disclosed in this latter figure. This feed nut must necessarily be connected to the carriage to effect sliding movement of the carriage as a result of angular movement of the feed screw. It is not desirable, however, to provide a permanent or non-disconnectable connection between the feed nut and the carriage as many situations will arise during the ordinary use of this machine which will make it desirable for the operator to be able to completely disconnect the carriage from its feeding mechanism and move the carriage in either direction to any extent desired. Also, it should be possible for the operator to reconnect the carriage to its feed or spacing mechanism either at its former point of connection or at the selected new point. To provide this desired control over the connection between the feed nut and the carriage, a suitable clutch mechanism has been incorporated. This clutch mechanism is best illustrated in Figs. 5, 7, and 10 to 13, inclusive.

The carriage frame has suitably connected to its opposite end plates 37 and 38 a smooth sur-

faced rod 124. This rod is unobstructed and is of uniform diameter throughout its length. This rod passes through an opening 125 formed in a solid extension 126 of the feed nut 122. Figs. 10 to 13, inclusive, disclose a clutch sleeve or collar 127 through the bore of which the rod 124 passes. This clutch sleeve or collar has a peripheral, end mounting flange 128 which is secured to one face of the feed nut extension 126. This positioning is such that the clutch sleeve or collar will be concentrically arranged with respect to the opening 125. This clutch sleeve or collar is provided with a truly cylindrical bore 129 but is exteriorly tapered in an axial direction, as is illustrated at 130. The main portion of the body of this clutch sleeve or collar is formed into a plurality of spring fingers 131 by being slotted at 132.

Slidably associated with the periphery of this clutch sleeve or collar 127 is a compressing or contracting sleeve 133. This compressing or contracting sleeve is not longitudinally slotted but is continuous in a circumferential direction. The bore of this sleeve is tapered at 134 in an opposite direction to the taper of the clutch sleeve or collar 127. A spring 135 normally functions to urge the compressing or contracting sleeve 133 in an axial direction with respect to the tapered periphery of the clutch sleeve or collar 127. Due to the tapering fit between these two elements, this movement of the exterior sleeve will contract or compress the spring fingers 132 of the clutch sleeve or collar into gripping engagement with the periphery of the rod 124 so as to rigidly lock or clutch the feed nut 122 to the carriage rod 124. The spring 135 is retained in place by means of the cap 136 which is attached to the nut extension 126 by the screws 137.

To unclutch or disconnect the sleeve or collar 127 from the carriage rod 124, it is necessary to move the compressing or contracting sleeve 133 in an axial direction and against the force of the spring 135.

This axial movement of the compressing or contracting collar 133 is effected by means of the arm 138 which is carried by the clutch lever 139 pivoted to a mounting member 140 which is attached to the feed nut extension 126 by a suitable number of screws 141. These same screws 141 also pass through suitable apertures formed in the mounting flange of the clutch collar or sleeve 127 and therefore attach this clutch collar or sleeve to the feed nut extension 126. The pivotal connection between the clutch operating lever 139 and its mounting member 140 is designated by the reference character 142 in Figs. 5 and 11. These two figures disclose this lever as extending toward the left-hand side of the machine frame or toward the side plate 4 of the frame. The extremity of this operating lever 139 is bent to extend in a lateral direction to provide an operating arm 143. This operating arm underlies a rod 144 which is clearly illustrated in Fig. 11 as being eccentrically mounted at 145 in the carriage end plate 38. The opposite end of the rod 144 is similarly mounted in the remaining carriage end plate 37. An operating lever 146 is suitably anchored to this eccentric clutch operating rod 144. By inspecting Figs. 5 and 11, it will be appreciated that when the eccentric rod 144 is rotated it will cause the operating arm or end 143 of the clutch lever 139 to be moved downwardly. This pivotal movement of the lever 137 will cause the operating arm or finger 138 of the lever to force the contracting or compressing collar 133 of the clutch structure axially against the force of the spring 135 and the carriage rod 124 will be released from the feed screw 122 for permitting the carriage to be moved any desired distance in either direction. When it is again desired to reconnect the carriage to the feed nut 122, the eccentric rod 144 is returned to its normal position which will allow the clutch operating lever 139 to be pivoted and the compressing collar 133 to be shifted by the spring 135. This shifting of the collar 133 will contract the spring fingers 131 into clutching or gripping engagement with the carriage rod 124.

As an additional bracing and guiding means for the feed nut 122, an apertured lug 147 projects laterally from the nut extension 126. A bearing member 148 is received in the aperture of the lug 147 and is slidably keyed on the eccentric rod 144. The bearing member 148 has its bore eccentrically positioned to the same degree as the rod 144 but oppositely arranged.

In Figs. 1, 2, 5, and 7 the right-hand end portion of the feed screw 118 is illustrated as having fixed thereto a spur pinion 149. This pinion meshes with a spur gear 150. The spur gear 150 is illustrated in Fig. 5 as being fixed to the shaft 151 which is journaled at one end in a suitable bearing opening formed in the right-hand bracket 119 and at its other end portion in the side plate 3 of the main frame or chassis of the machine. Figs. 2, 5, and 7 clearly illustrate the shaft 151 as having fixed thereon a ratchet wheel 152. Fig. 2 clearly discloses a spring loaded pawl 153 as being carried by an arm 154 which is mounted to swing about the shaft 151. It will be appreciated that the shaft 151 and its spur gear 150 may be rotated different amounts by varying the stroke or throw of the pawl 153 in an upward direction from its normal position which is illustrated in Fig. 2. The stroke or throw of the pawl 153 will also bring about rotation or angular movement of the feed screw 118 because of the gearing connection provided between the shaft 151 and the feed screw by the pinion 149 and gear 150. As it is desirable to multiply or increase the throw or stroke of the pawl 153 when converted to angular movement of the feed screw 118, a four to one increase in speed ratio is provided by the spur pinion 149 and the spur gear 150. As the throw of the pawl 153 is controlled by the key operated mechanism and the setting or adjusting mechanism which takes care of different sizes and characters of type faces, this throw or stroke will be explained in connection with these other mechanisms.

The printing of a line, of course, starts at or adjacent the left-hand margin to be maintained on the paper, or the like, which receives the printing. This line progresses toward the right-hand edge of the paper or toward the right-hand margin of the printed line. This progress of the line is produced by travel of the carriage to the left. This movement of the carriage to the left is brought about by depressing appropriate keys which results in rotating the feed screw 118. Upon the completion of a printed line, it becomes necessary to again move the carriage to its starting point or so that the first printed character of a new line will lie beneath the first character of the preceding line. This arrangement of the respective lines establishes the left-hand margin of the copy. The carriage must be moved to the right to arrange the copy receiving paper for the start of this new line. It is desirable to be able to rapidly move the carriage to the right. This rapid return of the carriage is accomplished by rotating the feed screw 118 in the opposite direction. The

mechanism for accomplishing this reverse rotation of the feed screw now will be described.

This carriage return mechanism is disclosed in Figs. 1, 3, 4, 5, 7, and 14 to 17, inclusive. Figs. 1, 5, and 7 disclose the left-hand end of the feed screw 118 as having mounted thereon a spur pinion 155 which meshes with a spur gear 156 carried by and affixed to the shaft 157. This shaft is journaled at one end in a suitable bearing opening formed in the left-hand bracket 119; in a bearing 158 which is carried by the side plate 4 of the main machine frame or chassis, and in two bearing brackets 159 which are mounted on a supporting plate 160 which is attached to and extends laterally inwardly of the side plate 4 of the machine frame or chassis.

The shaft 157 has loosely mounted thereon the two clutch drums 161 which are spaced axially of each other and which are prevented from moving away from each other by the two stop collars 162 which are attached to the shaft 157. Fixed with these two clutch drums 161 are the opposed bevel pinions 163. In other words, the pinions 163 and their clutch drums 161 normally will be permitted to rotate relative to the shaft 157.

Each clutch drum 161 has loosely wrapped therearound a clutch band 164. Each clutch band has its extremities formed into two parallel, radially extending ears 165 which are normally spaced from each other. Fig. 14 discloses each pair of clutch band ears 165 as collectively being of tapered formation.

A shiftable clutch collar 166 is positioned between the adjacent ends of the clutch drums 161 and is keyed to the shaft 157 by the key 167. This clutch collar is formed with oppositely extending sleeves 168 which are provided with tapered notches 169 that receive the tapered ears or lugs 165 of the clutch bands 164. This clutch collar 166, and its sleeves 168, may be shifted in opposite directions by the forks or yokes 170. These forks or yokes are received in a groove 171 formed in the clutch collar 166. The forks or yokes 170 are connected to the arms 172 that are attached to a control shaft 173 which overlies the shaft 157 and is arranged at right angles thereto.

By considering particularly Figs. 14 and 15, it will be appreciated that by shifting the clutch collar 166 to the right, the tapered notch 161 formed in the right-hand clutch sleeve 168 will cause the clutch band lugs or ears 165 received therein to be forced toward each other. This movement of the ears or lugs 165 will cause the clutch band 164 to be tightly clamped to the clutch drum 161. As a result of this clutching action, the bevel pinion 163, arranged at the right of this reversible clutch mechanism, is connected to the shaft 157. When the clutch collar 166 is shifted to the left of Figs. 14 and 15, the clutch band 164 associated with the left-hand clutch sleeve 168 will be tightened about the left-hand clutch drum 161 and the associated bevel pinion 163 will be clutched to the shaft 157.

The bevel pinions 163 are illustrated in Fig. 15 as constantly meshing with a bevel gear 174 which is fastened to a perpendicular shaft 175 that is supported in the aforementioned laterally inwardly directed supporting plate 160. Fig. 3 discloses the lower end portion of this shaft 175 as being journaled in a supporting arm 176 which extends laterally inwardly of the machine frame side plate 4. The lower end of this shaft is illustrated in Figs. 3 and 4 as having fastened thereto a bevel pinion 177 which meshes with a bevel pinion 178 fastened to the adjacent end of the drive shaft 179. The second end of this drive shaft 179 has secured thereto a second bevel pinion 180 which meshes with a bevel pinion 181 carried by a shaft 182 which is driven by the electric motor 183.

It will be appreciated that with this motor shaft 182 constantly rotating in a single direction, the clutch collar 166 may be shifted in either of its two possible directions for effecting rotation of the shaft 157 in opposite directions. With the clutch collar 166 shifted in one direction, the feed screw 118 will be driven from the electric motor 183 so as to move the paper carriage to the right to return the carriage for the starting of a new line. Of course, like operation of the clutch collar 166 at any time during the printing of a line will bring about a return movement of the carriage, or a movement of the carriage to the right. When the clutch collar 166 is moved in the opposite direction, the feed screw 118 will be rotated in a proper direction to effect movement of the carriage to the left, or the direction in which it normally moves during the printing of a line. It is obvious, therefore, that by rotating the control shaft 173 in opposite directions, the carriage may be moved by the feed screw 118 any desired distance in opposite directions.

This control shaft 173 is actuated by the following mechanism. Fig. 3 discloses this shaft as being rotatably supported by the bearing arms 184 which are supported by the bracket plate 160. The forward end of this shaft 173 has attached thereto the depending lever 185 which is disclosed in this figure as being pivotally connected at its lower end to the lever 186. This lever extends toward the front of the machine and is illustrated in Fig. 6 as being connected by an upstanding pin 187 to the long link 188 that extends almost entirely transversely across the machine and also to a short link 189 which also extends transversely of the machine but in the opposite direction to the link 188. These two links 188 and 189 are each connected to a forwardly extending lever 190. The link 189 and the lever 190 connected thereto are illustrated in Fig. 3 as being pivotally mounted at 191 on a bracket carried by the side plate 4 of the machine frame. Fig. 3 discloses the forward end of the lever 190 as being connected to the upstanding arm 192 of a bell crank lever 193. The horizontally extending arm of this bell crank lever is connected to the upper end of a link 194, the lower end of which is connected to an arm 195 of the reversible clutch control key 196 located at the left-hand side of the keyboard or frame 22, see Figs. 1 and 4. A similar key 197, at the other side of the keyboard, is connected to the lever 190 of the link 188 by the same type of mechanism.

It will be appreciated that when the reversible clutch key 196 is depressed, the clutch collar 166 will be shifted in one direction and that when the reversible clutch key 197 is depressed, the shiftable clutch collar 166 will be moved in the opposite direction. Of course, the direction of rotation of the perpendicular shaft 175 and its bevel gear 174 will determine which one of the two bevel pinions 163 will rotate the feed screw 118 to cause the carriage to be moved to the left and, naturally, the other bevel pinion 163 will cause the feed screw 118 to be rotated in a proper direction to move the carriage to the right. The natural tendency of an operator of this machine would be to depress key 196 when it was desired to shift the carriage to the left and to depress the

clutch key 197 when it was desired to cause the carriage to travel to the right. This natural or desired result will be accomplished if the electric motor 183 is connected to the shaft 182 so as to cause this shaft to rotate in the proper direction to effect rotation of the bevel gear 174 in a counter-clockwise direction when viewed from above. With the bevel gear 174 rotating in a counter-clockwise direction, the left-hand bevel pinion 163 should be connected to the shaft 157 to cause the carriage to travel to the left, and for that reason the left-hand reversible clutch key 196 will operate, through its link and leverage mechanism, to shift the clutch collar 166 to the left in Figs. 14 and 15. The reversible clutch key 197, therefore, will operate to shift the clutch collar 166 to the right of these two figures for connecting the right-hand bevel pinion 163 to the bevel gear 174.

The keys 196 and 197 will only be used when the operator is desirous of shifting the carriage to the left independently of the operation of any character printing keys and when the operator is desirous of moving the carriage to the right, either when it is necessary to start a new line of printing or to move backwardly along a line which already has been printed. The reversible clutch key 197, therefore, will be depressed every time the operator is desirous of moving the carriage to the right for bringing the paper into proper position to start a new line. The operator, however, should not be required to judge when the right-hand reversible key 197 should be released to stop the drive of the carriage to the right so that the printing point will be lined up with the left-hand margin of the copy being produced on this machine. Therefore, automatic mechanism is provided for shifting the clutch collar 166 into its neutral position, from its right-hand position, when the carriage has been moved to the right the proper distance to start a new line of printing at the left-hand margin. This automatic mechanism now will be described.

Fig. 6 discloses the aforementioned pin 187 as being connected at its upper end to a slidable rod 198 which is guided in its sliding movements by the pins 199 attached to the transversely extending bar 200. This bar is disclosed in Fig. 2 as resting at its opposite ends on the top margins 14 of the right-hand and left-hand side plates 3 and 4 of the machine frame. This slidable rod is retained in its neutral position by the opposed springs 201, see Fig. 6. The center of this rod 196 is provided with a forwardly extending pin 202. Figs. 2, 3, and 6 disclose a marginal rack 203 as being carried by the frame bar 41 of the carriage for movement therewith. This marginal rack 203 has adjustably mounted thereon a marginal stop 204 which is provided with a depending lug 205 which will engage the forwardly extending pin 202 of the slidable rod 198 during the movement of the carriage to the right. This engagement, of course, will occur at any desired time to maintain a proper left-hand margin and will be varied by shifting the marginal stop 204 longitudinally of the rack 203. When the lug 205 of the marginal stop has engaged the pin 202 and moved this pin with its rod 198 a sufficient distance to the right to shift the clutch collar 166 toward the left into its neutral position, the return drive, or right-hand movement of the carriage, will cease because the electric motor 183 will no longer be drivingly connected to the feed screw 118.

When the carriage is moving to the left, either in response to depression of the character keys in printing a line or as a result of the carriage being driven from the motor 183, the operator should be notified when the printing point is approaching the right-hand margin of the copy being produced. The marginal rack 203, for that reason, is provided with a marginal stop 206 which is adjustable along the rack 203. This marginal stop is provided with a lug 207 which will engage the actuating mechanism of a signal bell, not shown. This rack member 206 should be set or positioned so as to give the operator the desired advance notice of the approach of the right-hand margin of the copy.

When the reversible clutch control key 196 is depressed to effect forward movement of the carriage by means of the motor 183, it would not be desirable to have the reversible clutch control key 197 moved from its normal position. The same is true when the reversible clutch control key 197 is depressed to cause a return movement of the carriage by means of the motor 183. To permit each one of these control keys to be depressed without affecting the other control key, lost motion slot connections 208 are provided between the links 188 and 189 and the pin 187. A lost motion connection 209, also, is provided between the upstanding arm 192 of the bell crank lever which is connected to the link 194, and the adjacent end of the lever 190. This lost motion connection is necessary because the upper extremities of each one of these bell crank lever arms 192 will swing laterally in opposite directions about a horizontal axis which extends longitudinally of the base plate 1 of the machine and these upper extremities, therefore, will move different distances from the pivot axes 191 for the levers 190.

It has been described above that the pawl 153 is actuated in response to depression of the character printing keys for effecting rotation of the feed screw 118, in a step-by-step manner, to cause travel of the carriage to the left to advance the printing of the line to the right. Fig. 2 discloses this pawl 153 as being spring loaded so that it normally will engage one of the teeth of the ratchet wheel 152. There, also, has been set forth above the fact that the electric motor 183 may be employed for rotating the feed screw 118 in the proper direction to cause the carriage to be moved to the right, or to return the carriage so that the left-hand margin of the copy will be presented to the printing point. Of course, the motor 183 may be employed at other times for moving the carriage to the right a lesser distance than would be necessary to realign the left-hand margin of the copy with the printing point. In either event, or whenever the motor 183 is employed for rotating the feed screw 118 in a direction to cause the carriage to move to the right, the feed screw is rotated in the opposite direction to its direction of rotation when actuated by the pawl 153. As this pawl normally engages the teeth of the ratchet wheel 152, the pawl would prevent this opposite rotation of the feed screw, and the resultant opposite rotation of the ratchet wheel 152, unless the pawl is disengaged from the ratchet wheel 152 when the carriage is to be moved to the right. Mechanism for accomplishing this disengagement of the pawl 153 is disclosed generally in Figs. 2, 3, and 5 and specifically in Figs. 32, 33, and 34. This mechanism will be described as follows:

Figs. 3 and 32 disclose the operating lever 185, for the reversible clutch control shaft 173, as having a link 210 pivotally connected thereto. The remaining end of this link 210 is illustrated

in Figs. 32 and 33 as being pivotally connected to the arm 211 of a bell crank lever 212 which is pivoted on a mounting bracket 213 carried by the right-hand side plate 3 of the machine frame. This bell crank lever swings in a horizontal plane about a vertical axis. The second arm 214 of this bell crank lever passes through a slot or opening 215 formed in the side plate 3 and is provided, as is clearly illustrated in Figs. 33 and 34, with an arcuate cam member 216 which lies in a vertical plane parallel with the plane of the arm 154 which carries the pawl 153. Figs. 33 and 34 disclose this arm 154 as being provided with a slot 217 through which the pin 218, carried by the pawl 153, extends. This pawl carried pin 218, therefore, lies across the outer or convex side of the arcuate cam 216.

The clutch collar 166 is moved to the right, see Figs. 14, 15, and 32, to connect the right-hand bevel pinion 163 with the shaft 157 for rotating the feed screw 118 in the proper direction to cause the carriage to move to the right. This is the rotation of the feed screw 118 which is opposite to the direction of rotation effected by the pawl 153. When the clutch collar 166 is moved to the right, the reversible clutch operating arm 185, also, has its lower end moved to the right, or in a counter-clockwise direction when viewed in Fig. 32. This movement to the right of the control lever 185 causes the link 219 to move longitudinally to the right. This movement of the link 219 will cause the bell crank lever 212 to pivot and will move the arcuate cam member 216 so as to effect disengagement of the pawl 153 with respect to the teeth of the ratchet wheel 152 as a result of engagement of the arcuate cam member 216 with the pin 218 carried by the pawl. When the clutch collar 166 is returned to its normal or neutral position, the bell crank lever 212, also, is returned to its normal position and the arcuate cam member 216 will no longer hold the pawl 153 out of engagement with the teeth of the ratchet wheel 152.

TYPE CARRIER MECHANISM

It has been found desirable in this type of printing machine to have available for instant use more than one size or style of type so that, for example, an operator may be able, with practically no delay, to print a heading in one point of type, the body in a different point of type, and footnotes in a still different point of type. For such an operation of the machine, three complete sets or fonts of type must be operably arranged in the machine.

Also, it is highly desirable to have the machine constructed so that the operator of the machine may substitute a still different font or set of type for any one of the fonts or sets already positioned in the machine. It should be possible to make this change with practically no delay.

This type carrier mechanism is illustrated in Figs. 1, 2, 3, 22 to 26 inclusive, 29, 30, and 35. In certain respects, the type carrier mechanism of this machine is similar to the type carrier mechanism disclosed in the aforementioned patents issued to Charles A. Fuchs, numbered 2,127,507, and 2,127,509, and the patent issued to Richard V. Reppert, numbered 2,127,530. For that reason, the type carrier mechanism of this machine will not be described in as great detail as would be necessary if there were no prior art disclosures of somewhat similar devices.

Referring first to Figs. 3, 22, and 23, the transversely-extending brace bar 25 of the machine frame, which is attached at its opposite ends to the side plates 3 and 4 of said frame, is illustrated as possessing an off-set portion 219 which is located intermediate its ends. This off-set portion is formed of two perpendicular side parts 220 and 221, which are joined at their upper ends by a horizontal top portion 222.

Journaled for rotation in a bearing opening formed in this top portion 222 is a bevel gear 223. This bevel gear is provided with a hub 224 for this purpose. The hub is formed with a top flange 225 for retaining the gear in place beneath the bar portion 222. The bevel gear 223 and its hub 224 are provided with a bore 226 in which is mounted, for vertical sliding movement, a shaft 227. A keyway 228 is formed in this shaft and receives a pin, or key, carried by the bevel gear 223 for interconnecting the gear and the shaft. Above the top flange 225 of the bevel gear hub 224, the shaft 227 has attached thereto a collar 229 to which is secured the multiple-armed spider 230. This spider is provided with the three equally-spaced, radially-arranged arms 231.

The lower end portion 232 of the shaft 227 is reduced and bifurcated for receiving the arm 233 of the bell crank lever 234. This bell crank lever 234 is pivoted by means of the shaft 235 to support 236 which is carried by the frame bar 25. The remaining arm 237, of the bell crank lever 234, is bifurcated to straddle the grooved head 238 which is attached to the inner end of the shaft 239. This shaft is slidably journaled in the tubular portion 240 which interconnects the bevel pinion 241 and a disc 242. This tubular connecting portion 240 is journaled for rotation in a bearing opening formed in the perpendicular side part 221 of the transverse brace bar 25. The pinion 241 constantly meshes with the bevel gear 223. The disc 242 is provided with the laterally-projecting pins 243 which are slidably received in suitable apertures formed in a second disc 244. This second disc is pinned, or otherwise secured, to the shaft 239. These pins 243, therefore, establish a driving connection between the shaft 239 and the bevel pinion 241 but permit the shaft 239 to move axially relative to the pinion.

By referring to Figs. 22 and 23, it will be seen that the rotatable and longitudinally-shiftable shaft 239 is provided with a collar 245, which is pinned to the shaft. A second collar 246 is loosely mounted on the shaft and bears against the inner face of the mounting end 25a of the transverse brace bar 25. Between these two collars is positioned a spring 247 which normally functions to urge or force the shaft 239 inwardly, or to the left, as viewed in Figs. 22 and 23.

This shaft extends through an opening 248 formed in the side plate 3 of the machine frame. Outwardly of the side plate 3, the shaft has pinned thereto a rounded head 249. Figs. 2 and 23 disclose this head as having pivotally connected thereto, by means of the diametrically arranged pins or screws 250, a lever 251. This lever is shown in Fig. 2 as including an operating knob or handle 252, at one end, and a roller 253, mounted for rotation, at its other end. A cup or flanged member 254 is secured to the side of the side plate 3 and is concentrically arranged with respect to the shaft 239. Fig. 2 discloses this cup or flanged member as having a notch 255 formed in its periphery. The lever 251 is of such a length as to project radially of the flanged peripheral portion of the cup 254. The longer

end of this lever, therefore, normally occupies the notch 255.

The mechanism which has just been described is employed for raising and lowering the spider 230 and rotating the same when in its raised or elevated position. This is accomplished by grasping the operating knob or handle 252 of the lever 251 and pulling outwardly or laterally on the same to disengage the long arm of the lever from the notch 255 of the cup 254. This outward movement of the operating end of the lever 251 causes the same to fulcrum on the roller 253 and thereby shift the shaft 239 axially outwardly. This shifting of the shaft operates the bell crank lever 234 for moving the shaft 227 axially upwardly. The spider 230 is carried upwardly by this shaft 227. In this elevated position, the spider may be rotated by operating the lever 251 as a crank. The roller 253 permits the lever to turn with the shaft 239 while acting as a movable fulcrum for the lever 251.

Fig. 22 discloses a pin 256 as being carried by and projecting upwardly from the top portion 222 of the brace bar 25. This pin is adapted to register with the openings 257 formed in the arms 231 of the spider 230. Fig. 22 discloses this pin 256 as occupying one of the openings 257. When arranged in this manner, one of the arms 231 of the spider will be arranged so as to locate a set or font of type in printing position. To allow the spider 230 to rotate so as to locate a different arm 231 in printing position, the spider must be elevated so as to withdraw the pin 256 from the opening 257 it had been occupying. This illustrates the need for elevating the spider 230 before it is rotated. When the longer arm of the lever 251 is located in the notch 255, one of the arms 231 of the spider will be positioned, as shown in Fig. 22, for arranging the set of type carried by this arm in printing position. Either one of the remaining two arms 231 may be moved into the said printing position by withdrawing the lever from the notch 255 and rotating the shaft 239 one complete revolution in the proper direction. Rotation of the shaft 239 in one direction will present one of the two arms 231 in the printing position. Rotation of the shaft 239 in the opposite direction will properly position the other arm 231.

Fig. 24 discloses one of the arms 231 of the spider as having a relatively large opening 256' formed therein. Mounted in this opening is a flanged bearing sleeve 257'. This bearing sleeve slidably and rotatably receives the enlarged journal 258 for the spindle 259. This spindle projects well above the arm 231.

Figs. 24 and 26 disclose the lower end of this journal as having formed integrally therewith a clutch plate 260 which is provided with diametrically arranged peripheral notches 261. A spring 262 is coiled about the journal 258 and bears at its opposite ends against the flange of the bearing 257' and the clutch plate 260. This spring, therefore, normally maintains the journal 258 and its spindle 259 in their lowermost position. To limit this downward movement of the journal and spindle, the upper end of the journal has secured thereto the disc 263 which normally will bear against the top face of the arm 231.

Figs. 22 and 24 disclose this upper disc 263 as having formed in its periphery a notch 264 which will be explained as acting as a part of the latching mechanism. This upper disc, also, is disclosed in these two figures as being provided with three upstanding pins 265. Fig. 24 thus illustrates the spindle 259 as having mounted in its upper end, for pivotal movement about the pin 266, a latch 267. An operating finger 268 is carried by this latch and projects axially upwardly of the spindle.

The mechanism disclosed specifically in Fig. 24 is duplicated for each one of the spider arms 231, as is clearly illustrated in Fig. 22. The spindles for the several arms are intended to support separate type carriers or baskets which are removably retained in place by the latches 267 and are keyed for rotation with the spindle by means of the three pins 265. When a type carrier or basket is positioned on a spindle 259, it may be released for removal from the spindle by actuating the latch operator 268 for withdrawing the latch 267 into or inwardly of the spindle. The type carrier or basket will be described in detail at a later point.

When the arms 231 are not in printing position, it is desirable to maintain the spindles 259 latched against rotation. However, when a spider arm 231 is in the printing position, its spindle 259 should be free to rotate. The mechanism for accomplishing this desired result now will be explained.

Fig. 22 illustrates each spider arm 231 as having pivotally mounted on its under side, by means of a pin 269, a bell crank lever 270. The arm 271 of this lever is provided with a hook-shaped latch 272, see specifically, Fig. 24. This lever arm 271 extends longitudinally of one edge portion of its spider arm 231 so as to arrange the latch 272 in position to have its end portion occupy the notch 264 of the spindle disc 263 carried by that particular spider arm 231. The remaining arm 273 of the bell crank lever 270 projects beyond the opposite side edge of its spider arm 231 and is formed with an upstanding flange 274 to which is connected a spring 275. The remaining end of this spring is connected to a pin 276 extending from the edge of the arm. This spring 275 normally urges the bell crank lever 270 in a direction to cause its latch 272 to occupy the notch 264. Figs. 22 and 25 disclose a cam member 277 as extending upwardly of the side 221 of the raised portion upon the transverse bracing bar 25. This cam is so positioned as to engage the end portions of the bell crank lever arms 273 when the spider arms 231 are moved into printing position, see Fig. 22. This upstanding cam 277 will move the bell crank levers 270 against the tension of their springs 275 for disengaging the latch members 272 from the spindle notches 264. This cam 277, therefore, releases the spindles 259 as their arms 231 are moved into printing position. The laterally projecting end of the bell crank lever arm 273, carried by a spider arm 231 arranged in the printing position, may be moved past the cam 277 as a result of elevating the spider 230 prior to its being rotated.

Figs. 1, 2, 3, and 30 disclose the various spindles 259 with their type bar carriers or baskets. Figs. 2, 3, and 30 best illustrate the detail features of construction of each carrier or basket. It will be understood that all of these type bar holding devices are of identical construction so that a description of one will suffice for all.

Each type bar carrier or basket includes two circular plates 278 and 279, which are joined by an intermediate throat 280. The plate 278 is formed with a downwardly-bent or extending marginal flange 281. The circular plate 279 is provided with an upwardly-bent or extending marginal flange 282. These marginal flange por-

tions are provided with an equal number of radially inwardly extending slots. The slots of the two flanges are arranged in vertical or axial alinement with each other. The slots, therefore, may be considered as being arranged in pairs with one slot of each pair being formed in the flange **281** and the second slot of each pair being formed in the flange **282**. These pairs of slots are intended to each receive a type bar **283**. Each one of these type bars is formed with a hook-shaped lower end **284**, which acts as a fulcrum. These fulcrums receive the rounded edge **285** of a lower circular plate which is suitably attached to the throat or sleeve portion **280**. To maintain the fulcrum **284** seated on the plate **285** and the type bars seated at the inner ends of their pairs of slots formed in the flanges **281** and **282**, each bar is provided with a spring **286**. The outer end of each one of these springs is connected to its respective type bar. The inner ends of all of the springs are connected to an annular flange or bead **287**, which is formed on the throat **280**.

The upper end or head portion of each type bar **283** has mounted therein standard or conventional foundry type **288** and **289**. The type **288**, of course, are lower case while the type **289** are upper case. The manner of mounting these conventional or standard type members in the upper ends of the type bars **283** forms no specific part of the invention covered by this particular application and, for that reason, will not be specifically disclosed.

It will be understood that the upper and lower case type carried by each type carrier or basket will include all of the letter characters, punctuation marks, and figures required to constitute a complete set of type. The type members carried by the respective baskets or carriers will differ, one from the other, as to size and/or design. The faces of these type members may be ordinary foundry type faces or they may be special typewriter type faces which are designed by all type founders for use in letter presses to simulate ordinary typewriter printing. These special typewriter faces will differ from the faces found on ordinary key-operated typewriter machines by being flat instead of curved. Such flat faces are necessary to properly cooperate with the flat face **49** of the previously described platen strip **48**.

With three different sizes or points of type assembled in the three different type carriers or baskets; for example, six point type in one carrier or basket, eight point type in another carrier or basket, and twelve point type in the third carrier or basket, copy may be produced by employing the eight point type for the body, the twelve point type for headings, and the six point type for footnotes. If the copy to be produced does not contemplate the inclusion of footnotes, for example, the three carriers or baskets need not be provided with three different points of type and one carrier or basket may be provided with italic faces of the same point as one of the remaining two sets of type. It will be appreciated that any given machine may have assembled therein any desired combination of three sets of type and I do not desire to be limited to the particular examples given above.

Fig. 35 diagrammatically illustrates the various type faces for a complete set of type bars. This figure discloses the fact that the various faces, or type members, are arranged in two groups, A and B. The group A is arranged at the right hand side of a type carrier or basket when this carrier or basket is positioned in printing relation to the platen strip **48**. The group B is located on the left side of the carrier or basket. These two groups are symmetrically arranged with respect to an imaginary center line or plane C. The groups of faces are illustrated in Fig. 35 so as to leave gaps D and E at diametrically opposite sides. A type carrier or basket, arranged in printing position, normally has the gap D arranged in the printing point; i. e., with the gap D presented to the platen strip **48**. With a carrier or basket arranged in this position, no type face is properly associated with the platen strip to permit a character to be impressed on the paper, or the like, overlying the said strip.

When the machine is operated to print one of the characters arranged in the right hand group, A, the type carrier or basket must be rotated in a counter-clockwise direction, when viewed from above, or in the direction indicated by the letter *a*. The type carrier or basket should be moved in this counter-clockwise direction just exactly the proper angular distance to position the selected character at the printing point, or so that the imaginary plane or line C will accurately intersect or bisect the said character at its transverse center. With the selected character occupying this position, suitable mechanism, to be described, will be actuated and will result in moving the type bar the proper distance to make the desired impression. After the impression is made, the type carrier or basket will be returned to its normal or neutral position, where the imaginary line or plane C will again intersect the gaps D and E at their transverse centers. The gap D again will be presented to the printing point.

If the next character to be printed is arranged in the left-hand group B, the type carrier or basket will be rotated in a clockwise direction, or in the direction indicated by the letter *b*, the proper distance to locate the selected character at the printing point. This character then will be intersected or bisected by the imaginary line or plane C at its exact transverse center.

ROTATING MECHANISM FOR TYPE CARRIER OR BASKET LOCATED IN PRINTING POSITION

Of course, it is only necessary to rotate the type carrier or basket located in the printing position to selectively and successively move the various type bars around to the printing point. The rotating mechanism, therefore, need only be connected to the type carrier or basket which is thus positioned. This rotating mechanism will be described in connection with Figs. 3, 5, 24, 26, 29 and 31.

In previously referring to Figs. 24 and 26, each spindle **259** was described as having a disc **260** positioned on the lower end of the spindle journal **258**. Each disc **260** was further described as having a pair of notches **261** formed in its periphery. Fig. 3 illustrates the spider **230** as being arranged on an inclined axis. Therefore, each one of these spindles **259** is arranged on a parallel inclined axis with respect to the axis of the spider. When the spider is rotated to position one of the type carriers or baskets in the printing position, the spider is first elevated and then rotated. When the selected type carrier or basket is properly arranged in the printing position, the spider again is lowered. The spindle **259** has been latched in a predetermined position all the time it has been removed from the printing position and is not released until the spider is lowered with the selected type carrier or basket in the printing position. This lowering of the spider

causes the cam member 277 to release the selected spindle. The notches 261 of the spindle disc 260, therefore, always are arranged in a predetermined position when its spindle 259 is released at the printing position. These notches 261, therefore, will always register with the clutch teeth 278 which are illustrated in Fig. 29 as projecting upwardly from the disc 279, which is carried by the shaft 280. This shaft is slidably received within a tubular shaft or sleeve 281. The upper portion of this tubular shaft is provided with an enlarged head 282 that is formed with a transverse slot 283. A pin or key 284 extends through the shaft 280 and is received in the slot 283 of the headed end of the tubular shaft 281. This key and slot arrangement, therefore, interlocks the shafts 280 and 281 against relative angular or rotary movement but permits the shaft 280, with its clutch disc 279, to be raised and lowered, or moved axially.

The tubular shaft 281 is journaled for rotation in the bearing arm 285, which is disclosed in Figs. 3, 6 and 29 as being secured by screws, or the like, 286 to a transversely extending supporting bar 287. This transverse supporting bar is best illustrated in elevation in Fig. 6. The opposite ends of this bar are suitably secured to the side plates 3 and 4 of the main frame.

Returning again to Fig. 29, it will be seen that the tubular shaft 281 has secured thereto a spur pinion 288 by means of the setscrew, or the like, 289. This attachment of the pinion 288 to the tubular shaft 281 holds this shaft against upward movement with the shaft 280. The pinion 288, therefore, may be employed for rotating both the tubular shaft 281 and the inner shaft 280.

Figs. 3, 5, and 31 disclose a sector-shaped rack 290 which is supported for rotation by the shaft or pin 291 on the transverse brace bar 26. This rack has a suitable number of teeth 292 which constantly mesh with the teeth of the pinion 288. This rack 290 must be rotated or swung proper distances in opposite directions to effect the desired angular movement of the type carrier or basket which is in printing position and is properly coupled with the shafts 280 and 281, to which is secured the pinion 288. This mechanism for swinging or pivoting the sector-shaped rack 290 is controlled by the keys of the keyboard and their selector mechanism and, for that reason, will be described at a later point.

SHIFTER MECHANISM FOR CHANGING FROM LOWER CASE TYPE TO UPPER CASE TYPE AND VICE VERSA

This shifter mechanism is best illustrated in Figs. 3, 4, 27 and 28, but will be described as to certain details by additionally referring to Figs. 1 and 29.

In Fig. 28, the shaft 280 is illustrated as having secured to its lower end the grooved collar 293. Figs. 3, 27 and 28 disclose a mounting plate 294 as being secured to the transverse brace bar 27 and as having two upwardly inclined bearing arms 295 which rotatably support a shaft 296 in their outer end portions. This shaft has fastened to its intermediate portion the parallel arms 297 which are illustrated in Figs. 27 and 28 as carrying laterally inwardly projecting pins 299 arranged to enter the groove of the collar 293 which is secured to the lower end of the shaft 280.

Figs. 3, 27 and 28 disclose the opposite end portions of the shaft 296 as having arms 300 rigidly attached thereto. A link 301 is illustrated in these figures as being pivotally attached to the outer end of each arm 300. These respective links 301 are pivotally connected at their lower ends to the adjacent ends of levers 302, which are mounted by means of the bushings 303 for pivotal movement on the main key-supporting shaft 304, which extends transversely of the machine and is journaled at its opposite ends in the bearing brackets 6, see Fig. 2. The remaining end of each lever 302 is connected by means of a pin 305 and a slot 306 to a perpendicular link 307, which is connected at its lower end to an arm 308 carried by the transverse shaft 309. This shaft is supported by brackets 310 on the front wall 21 of the machine frame. Two shift keys 311 are connected by their arms 312 to the shaft 309 so that the depression of either key 311 will effect rotation of the shaft 309.

In view of this mechanism, it will be appreciated that by depressing either one of the shift keys 311, the shaft 280 may be lifted or elevated from its full line position of Fig. 29 to its dash line position of this same figure. When the shaft 280 is in its full line position, the type carrier or basket drivingly connected thereto is arranged at a level which will line up the lower case type with the platen strip 43. When the shaft 280 is in its elevated, or dash line position, the upper case type, carried by the various type bars, will be at a proper level to cooperate with the platen strip. The depression of either shift key 311 will cause the shaft 309 to rotate. The arms 308 will be actuated by the shaft 309. The train of mechanical elements 300, 301, 302, and 307 will be actuated by the arm 308. Upward movement of the pair of arms 297, as a result of rotation of the shaft 296, will lift the shaft 280.

There will be other mechanisms actuated as a result of rotation of the shaft 296 to bring about proper spacing or shifting movement of the carriage to accommodate the upper case or capital characters when impressions are to be made therewith. This mechanism, however, will be described in detail at a later point.

Probably the most important feature of this mechanism employed for shifting between lower and upper case letters, or other characters, is the ability to shift the shaft 280, and thereby raise the associated type carrier or basket, without effecting relative movement between the pinion 288 and the sector-shaped rack 292. The drive connection between the transverse pin 284 and the shaft 280 and the slotted head 283 of the tubular shaft 281 makes possible this type of operation or action.

TYPE BAR ACTUATOR

As a result of proper operation of the type carrier or basket actuating mechanism, a selected type bar 283 has been moved around into operative position with respect to the printing point. The locating of the selected type bar at the printing point, however, does not bring about actuation of this type bar to make the desired impression, or to print the selected characters. Movement of the selected type bar 283 to make the impression is brought about by the type bar actuating mechanism disclosed best in Figs. 1, 2, 3, 4, and 30.

Referring first to Figs. 2, 3, and 30, the transverse bracing bar 24 is illustrated as having formed thereon two upstanding, transversely spaced mounting ears 313. Each one of these ears is formed with a short inwardly projecting hinge pintle or pin 314 which pivotally supports

the base portion 315 of a relatively long bearing barrel or sleeve 316. The base 315 is provided with rearwardly and upwardly extending ears 317 which are mounted on the pins 314 to provide this swinging or pivotal mounting for the base 315 and its bearing 316. Figs. 1, 2, 3, and 30 clearly illustrate the base 315 as normally being retained in the position in which it rests on the bar 24 by means of the latch 318 which is actuated or unlatched by means of the finger piece 319. This finger piece is merely moved laterally to release the base 315 so that this base and its bearing 316 may be swung upwardly in an arc about the pins 314.

Slidable axially in the elongated bearing 316 is a plunger 320. This plunger normally is positioned so that its inner end is slightly spaced from the rear edge of a type bar 283 when said bar is moved into register with or alinement with the printing point. The outer extremity or end of the plunger 320 is adjustably connected to a shackle or bifurcated head 321 by means of the thread 322 formed on this end of the plunger. A lock nut 323 is employed for maintaining the desired adjustment. A link 324 is connected by the pivot pin 325 to the shackle or bifurcated head 321. This link, also, is provided with a bifurcated head 326 which is connected to the upper end of a lever 327 by means of the pivot pin 328. Figs. 3 and 30 disclose the lever 327 as being mounted for pivotal movement about the shaft 329. This shaft is provided with reduced, eccentrically arranged journals 330 at its opposite ends which are mounted in bearing openings formed in the brackets 331 that project rearwardly from the front plate 21 of the machine frame. A screw gear 332 is suitably fastened to the shaft 329. This screw gear constantly meshes with a screw or worm pinion 333 that is carried by the shaft 334. An operating knob 335 is secured to the outer end of this shaft and is located on the front side of the front plate 21.

By rotating the shaft 334, the shaft 329 may be adjusted about the common axis of its eccentrically arranged journals 330. This adjustment of the shaft 329 will move or change the location of the fulcrum for the lever 327. This adjustment of the lever fulcrum is necessary to vary the stroke of the type bar actuator plunger 320 for accommodating varying thicknesses of paper, or the like, which is moved past the platen strip 48 for receiving the lines of printing. In other words, if it were not possible to vary the stroke of the plunger 320 with respect to the positioned type bars 283, it would not be possible to obtain uniform impressions on paper sheets of different thicknesses or on packs of paper as compared to single sheets. By eccentrically supporting the lever 327, the plunger 320 may be actuated to moving the properly positioned type bars 283 the proper distance to make just the right impression on paper sheets of different thicknesses and on packs of paper sheets.

The lower end of the lever 327 is connected by means of a pin 336 and a slot 337 to a rod 338 which is slidably received in the bearing opening 339 of the block 340 which is suitably mounted on the base plate 1 of the main machine frame. To normally maintain the rod 338 in the position best illustrated in Fig. 30, a spring 341 is attached to the lower arm of the lever 327 at one end and to a pin 342 which extends upwardly from the block 340.

This completes the description of the type bar actuating mechanism. The means employed for operating this actuating mechanism will be described in detail at a later point as it is controlled by and functions in response to actuation of the character selecting keys.

RIBBON SUPPORTING AND FEEDING MECHANISM

This machine is intended to employ a carbon paper type of ribbon which is fed through the machine only once; i. e., only one impression is made with any given area or portion of the carbon paper ribbon. After the ribbon is passed through the machine, it is torn off and thrown away. The carbon paper ribbon supplying, supporting, and feeding mechanism is disclosed in detail in Figs. 1, 2, 3, and 6.

Figs. 1, 2, and 6 disclose a casing or housing 343 which is suitably mounted on the side plate 4 of the main machine frame. This casing or housing is provided with an outlet slot 344 through which the ribbon 345 passes outwardly of the casing or housing. Within the casing or housing 343, the roll of ribbon is mounted on a rotatable support, not shown, which permits the ribbon to be fed from the periphery of the roll.

From the outlet opening or slot 344, the ribbon passes upwardly and around a guide sheave or spool 346 carried by a bracket 347 which is mounted on the side plate 4. An upstanding spindle 348 carries a second guiding spool or sheave 349 over which the ribbon 345 passes. These two guiding spools or sheaves 346 and 349 guide the ribbon from the supply roll into a position where the ribbon extends horizontally and is arranged in a vertical plane.

Figs. 1 and 6 disclose the horizontal run of the ribbon 345 as passing through slotted ears 350, 351, 352, and 353, which are carried by an angular plate 354. This angular plate is vertically slidably guided by the rods 355 which are received at their lower ends in bearings 356. The plate 354 is provided with an opening 357, see Fig. 6, which completely exposes both sides of the ribbon. This opening registers vertically with the printing point and allows the type bars to be moved into engagement with the front face of the ribbon. The ribbon thus engaged by the successively actuated type bars will be moved into printing engagement with the sheet of paper, or the like, which is carried by the paper carriage and is fed past or through the printing point. The angularity of the plate 354 and the ribbon guiding ears 350 to 353, inclusive, properly present the carbon paper ribbon 345 to the printing point of the machine.

After leaving the last guiding ear 353, the ribbon passes over a guiding spool or sheave 358, carried by an upstanding spindle 359, and a guiding spool or sheave 360, carried by a bracket 361 which is attached to the right-hand side plate 3 of the machine frame.

From this last guiding spool or sheave 360, the ribbon passes downwardly between a non-yielding roll 362 and a yieldable surface roll 363. The axes of rotation of these two rolls are so positioned relative to each other that the yieldable surface roll 363 will be properly compressed to provide an appropriate friction feed for the ribbon. In other words the roll 363 is provided with a rubber tread which will be compressed as a result of being held in tight engagement with one surface of the ribbon 345 which is backed up by or engages the non-yielding surface of the roll 362. The ribbon thereby, is firmly gripped by these two rolls and will be advanced through

the machine as a result of rotation of the yieldable surface roll **363**.

To bring about this feeding rotation of the roll **363**, it is provided with a ratchet wheel **364** which is engaged by a pawl **365**. Operating movement of the pawl **365** is accomplished by means of mechanism which will be described at a later point. This mechanism operates in response to actuation of the various character selecting keys.

RIBBON VIBRATING MECHANISM

It is customary to vibrate the ribbon of a key operated printing machine by moving it vertically into and out of alignment with the printing point of the machine. This machine is provided with ribbon vibrating mechanism which is best illustrated in Figs. 3, 6, and 30.

In Fig. 6, the plate **354** is illustrated as having connected thereto a link **366**. This link extends downwardly and is pivotally connected at its lower end **367** to the arm **368** of a lever that is loosely pivotally mounted on the shaft **296**, see Figs. 27 and 30. The second arm **369** of this lever is connected at its upper end to a link **370** that is pivotally connected at **371** to the lower arm of the type bar actuating lever **327**. When this latter lever is actuated to move a selected type bar **283** into printing engagement with the ribbon **345** for making an impression on the paper sheet presented to the platen strip **48**, the ribbon supporting plate **354** is moved upwardly to align the ribbon with or interpose the same between the type face and the platen strip **48**. When the lever **327** is returned to its normal position, the plate **354** is lowered to misalign the ribbon **345** with respect to the platen strip **48**. The raising of the ribbon **345** into vertical alignment with the platen strip **48**, naturally, permits the ribbon to be used to print the copy. The lowering of the ribbon to a level below the plane of the platen strip, after a selected type bar has been actuated to make an impression, permits the operator of the machine to inspect the printing being produced.

There has been described above the paper carriage which is to be spaced for permitting type faces to be employed which vary considerably in width with the operating mechanism for shifting the carriage; type bar carrying mechanism by means of which several complete sets or fonts of both upper and lower case letters, and the like, may be employed alternatively and the type bars of a given set or font successively selected to print the desired copy with operating mechanism for moving the operatively positioned set or font of type so that the desired characters may be placed successively in printing relation to the printing point, and type bar actuating mechanism which will move the successively selected type bars so as to cause the desired characters to be printed with operating mechanism for this type bar actuator. For this machine to properly print copy, these three instrumentalities or devices must be operated in a certain sequence, and this sequence, which may be considered as a complete printing cycle, should be set in motion or actuated as a result of depressing any one of the character selecting keys of the key bank. As it is not desirable to require sufficient force or power to be applied to the various character selecting keys to actually operate the aforementioned three instrumentalities or devices which perform a complete printing cycle, an additional source of power must be provided so that the character selecting keys may be employed solely for the purpose of conditioning the aforementioned instrumentalities or devices so that they may be driven or actuated by this additional source of power. The mechanism now to be described will include the additional source of power, the character selecting key mechanism, and the means actuated by this power source and selectively conditioned for operation by the keys to bring about the desired operation of the instrumentalities which perform a printing cycle.

SOURCE OF POWER

The source of power, or driving means, for the three instrumentalities which perform a printing cycle is best disclosed in Figs. 3, 4, and 30. In these figures there is disclosed an electric motor **183** which drives the shaft **372**. This shaft enters the casing or housing of a clutch mechanism of the type disclosed in the aforementioned patents to Charles A. Fuchs numbered 2,127,508 and 2,127,509. Because of this patented disclosure of the clutch, which will be designated in its entirety by the reference character **373**, no attempt will be made to disclose or describe the complicated details of this mechanism. It will be sufficient to state that the shaft **372** will constantly rotate in one direction and at a uniform speed whenever the electric motor **183** is energized and that the driven shaft, which projects from the clutch housing or casing **373**, will be oscillated or rocked a predetermined number of degrees every time the clutch mechanism contained within the housing **373** is rendered operative to cause a printing cycle to be performed. This oscillating or rocking shaft **374** is disclosed as having an arm **375** rigidly fastened thereto. Figs. 3, 4, and 30 disclose this arm in its normal or inactive position. When the arm occupies this position, the rock shaft **374** of the clutch mechanism is idle or at rest. When the rock shaft is actuated or rendered active, the arm **375** swings a limited number of degrees to the left, as viewed in Figs. 3 and 30, or in a counter-clockwise direction.

To render the clutch mechanism operative to thus rock or oscillate the shaft **374**, it is necessary to pivot the latch member **376** about its pivot pin **377**. Pivotal movement of this latch **376** releases a slide **378** which sets in motion the clutch mechanism. This latch member **376** is provided with an operating arm **379** that is normally retained in engagement with the pin **380** by means of the spring **381**. The free end of this actuating arm **379** is connected by a pin and slot **382**, see Figs. 3 and 4, to a lever plate **383** which is pivoted to the bracket arm **384**, projecting from the side of the clutch housing or casing **373**, by means of a pivot pin **385**. This lever plate **383** is swung about its pivot pin **385** by means of the transverse rod **386**, see Figs. 3 and 4, which is supported at its opposite ends for oscillatory movement by means of the arms **387** which are mounted by the pivot pins **388** on the bearing brackets **7b** secured to the opposite side portions of the base plate **1** of the machine frame. This transverse rod **386** rides in a notch **389** formed in the lower edge portion of the lever plate **383**. The mechanism which will function to operate the rod **386** will be described in detail at a later point.

Figs. 3, 4, and 30 clearly illustrate the arm **375** as having pivotally connected to its upper end, by means of the pin **390**, a head **391** which is threadedly adjustably connected to a rod **392**. To maintain the desired adjustment, a lock nut **393** is provided for this threaded connection. The remaining end of this rod **392** is threadedly adjustably connected to a second head **394**. A lock

nut 395 is provided to maintain this desired, adjusted connection. The head 394 is pivotally connected by the pin 396 to the arm 397 which is mounted on the chorded shaft 398. Due to the formation of the shaft 398, in transverse section, and the fact that the arm 397 tightly fits the periphery of this shaft, the said arm and shaft will be connected so as to rotate with each other about the axis of the shaft. This shaft, therefore, will be rocked or oscillated every time the clutch shaft 374 is rocked or oscillated, and this concurrent movement of these two shafts is brought about by the two arms 375 and 397 which are interconnected by the link or rod 392 and its heads 391 and 394. This shaft 398 may be considered as the drive shaft for mechanism which will be described at a later point and which functions to bring about actuation of the operating mechanism for the paper carriage and the operating mechanism for the carrier or basket of the set or font of type that is arranged in printing relation to the carriage.

KEY CONTROLLED CAM DEVICES ASSOCIATED WITH THE DRIVE SHAFT

The use of the drive shaft 398 to effect spacing of the paper carriage and to bring about proper selection of the desired type bars is controlled entirely by the various character keys best illustrated in Figs. 1 and 4, as well as certain multiple unit spacing keys or bars which are associated with the character keys and are additionally illustrated in Fig. 20. These various character keys and unit spacing bars accomplish their intended function by selectively connecting to the drive shaft 398 the proper cam members or plates 399. One of these cam plates is provided for each one of the character selecting and unit spacing keys and bars of the key bank. The various cam plates are best illustrated in Figs. 3 to 6, inclusive, and 18 to 21, inclusive.

Fig. 6 discloses the drive shaft 398 as having mounted thereon a series of bronze bushings 400. Each one of these bushings is provided with a main body portion and a reduced shoulder 401. The bushings are tightly fitted on the chorded drive shaft 398 so that each bushing rotates or rocks with the shaft when it is actuated by the clutch mechanism contained within the housing or casing 373. Figs. 3, 18, 19, and 21 show the bushings 400 as each being provided with a notch 402 which is formed by spacing two peripheral projections 403.

The several cam plates 399 are loosely, or relatively rotatably, seated on the shoulders 401 of the bushings 400. Each cam plate 399 is provided with a notch which normally registers with its respective bushing notch 402. That is to say, when the drive shaft 398 is at rest in its normal position, the notches of the several cam plates 399 and the bronze bushings 400 transversely register with each other. Each cam plate has pivotally mounted thereon a pawl 404 which is capable of being pivoted so as to occupy the notches 402 of its respective cam plate 399 and the bronze bushing on which the cam plate is mounted. A spring 405 is mounted on each cam plate and functions to normally maintain the pawl 404 of the plate out of the notches 402. Therefore, to connect a given cam plate 399 to its respective bronze bushing 400, and by the bronze bushing to the drive shaft 398, it is necessary to pivot the pawl 404 mounted on that cam plate so that it will occupy the notches 402 of the cam plate and its bushing. This necessary action is accomplished by depressing the character key and the unit spacing key or bar for the selected cam plate.

Figs. 1 and 4 disclose the complete bank of character selecting or printing keys with the single unit spacing key and the spacing bars which may be depressed for effecting spacing of the paper carriage either two, three, or four units. The various character selecting or printing keys 406 illustrated in Fig. 4 have applied thereto replicas of the characters or type bar faces which are controlled by the keys. The single unit spacing key in this figure is designated by the reference character 407. The two unit spacing bar has applied thereto the reference character 408, while reference characters 409 and 410 are employed for designating the bars which bring about spacing of the paper carriage three and four units, respectively. Each one of the character printing or selecting keys 406 is illustrated in Figs. 3, 4, 18, and 19 as being carried by a key bar 411. These several key bars are illustrated as being pivotally mounted on and supported by the shaft 304, which was previously referred to in connection with the lower and upper case shifting mechanism illustrated in Figs. 27 and 28. The plan view of Fig. 4 illustrates the shape of these respective key bars 411 which permits them to be arranged in a single plane where they are mounted on the shaft 304. Fig. 3 further illustrates the shapes these various key bars assume to permit the keys to be arranged in the four tiers or rows of the keyboard.

Figs. 18 and 19 clearly illustrate each key bar 411 as having pivotally connected to its inner end a depending link 412. Each one of these links is pivotally connected at its lower end to one arm of a rocker 413. These various rockers are pivotally mounted on the rod 414. This rod 414 is supported at its opposite ends in the bearing brackets 7b, see Fig. 2. Each rocker 413 is provided with a second arm 415 which is of angular formation or substantially L-shape in side elevation. The shaft 414 supports the rockers so that the perpendicular parts of the angular arms 415 normally act as stops for the pawls 404 and are, therefore, aligned with these pawls longitudinally of the entire machine. In other words, the upstanding portion of each rocker arm 415 has a pawl 404 pressed against its inner vertical edge by the spring 405 of the pawl.

When one of the character printing or selecting keys 406 is depressed. its key bar 411 is rocked about the shaft 304. The inner end of the key bar pulls upwardly on the link 412 which causes the rocker 413 connected thereto to be rocked or pivoted about its supporting shaft 414. The angular arm 415 of this particular rocker will swing the associated pawl 404 so that it will occupy the notches 402 of the particular bushing 400 and cam plate 399 for this depressed key 406. The depressing of any one of the character selecting or printing keys, therefore, will cause its respective cam plate 399 to be drivingly connected to the chorded shaft 398.

The mechanism of the single unit spacing key 407 and the two, three, and four unit spacing bars 408, 409, and 410 is best illustrated in Figs. 3, 20, and 21. The single unit spacing key 407 is provided with a key bar 416 which is pivoted on the shaft 304 in the same manner as each one of the bars 411 associated with the character selecting or printing keys 406. The inner end of this bar 416 has pivotally connected thereto a link 417 which in turn is pivotally connected to its respective rocker 418. This rocker has an arm 419 which is of angular shape in side elevation

and functions as an actuator or control for its respective pawl 404.

The four unit spacing bar 410 is carried by a key bar 420 which is rigidly attached at its inner end to a sleeve 421 that is mounted for rotary movement on the shaft 422. This shaft extends transversely of the machine and is supported at its opposite ends in short bearing arms 423 mounted on the base plate 1 of the main machine frame. This sleeve is held against axial movement on the shaft 422 by means of the stop collars 424, see Fig. 20. An arm 425 is rigidly fastened at one end to the sleeve 421 and, as is shown clearly in Figs. 3 and 21, passes transversely under the shaft 304. A link 426 is connected to the inner end of this arm 425 and extends upwardly to be connected to the arm 427 which is pivotally mounted at one end on the shaft 304. A second link 428 is pivotally connected at its upper end to the extremity of the arm 427. The lower end of this link 428 is pivotally connected to a rocker 429 that is pivotally mounted on the shaft 414, the same as all of the other rockers. This rocker 429 is provided with a branch 430 of angular formation which includes an upstanding portion adapted to control its respective pawl 404 for the cam plate 399 controlled by this four unit spacing bar 410.

Fig. 20 discloses the three unit spacing bar 409 as being carried by a pair of key bars 431. The inner ends of these key bars are attached to a sleeve 432. This sleeve is rigidly attached by pins or screws 433 to the shaft 422 so that depression of the bar 409 will rock this shaft. At its extreme left-hand end, the shaft 422 has fastened thereto the arm 434. This arm also extends beneath the shaft 304 and is connected at its end to a perpendicular link 435 which is pivotally connected to the arm 436 mounted for pivotal movement on the shaft 304 at one end. A second link 437 is pivotally connected to the extremity of the arm 436 and extends downwardly for being pivotally connected to a rocker 438 pivotally mounted on the rod 414. This rocker has an arm 439 including an upstanding portion which will actuate the pawl 404 associated with the cam plate that is to be controlled by this three unit spacing bar 409.

The two unit spacing bar 408 is carried by a key bar 440 which is secured at its inner end to a sleeve 441. This sleeve is mounted for rotation on the shaft 422 and is held against axial movement relative thereto by means of the stop collars 442 which are located on opposite sides of the bearing bracket 423. This sleeve 441 has secured to its left hand end portion an arm 443 which extends beneath the shaft 304. The inner end of this arm is connected to a link 444 which extends upwardly for being pivotally connected to an arm 445 that is pivotally mounted on the shaft 304. The extremity of this arm has pivotally connected thereto a depending link 446. The lower end of this link is pivotally connected to one arm of a rocker 447 pivotally mounted on the rod 414. The second arm 448 of this rocker controls the action of its respective pawl 404. From the above description, it will be appreciated that each one of the members 407, 408, 409, and 410 controls the action of a pawl 404 for its respective cam plate 399.

It will be apparent from the mechanism which has been described above that every time one of the keys or bars 406 to 410, inclusive, is depressed, a cam plate 399 will be drivingly connected to the chorded rock shaft 398. This connected cam plate, therefore, is ready for being used to operate desired mechanism when the rock shaft 398 is actuated.

KEY AND BAR ACTUATED MECHANISM FOR RENDERING CLUTCH OPERATIVE

As depressing of any one of the keys or bars 406 to 410, inclusive, will result in connecting a cam plate 399 to the drive shaft 398, it becomes necessary to render active the clutch mechanism enclosed in the housing or casing 373 so that the drive shaft 398 will be rocked to move or actuate the cam plate which is connected to this drive shaft. This mechanism is best illustrated in Figs. 3, 4, 5, 18, 19, 20, and 21.

We saw from the previously set forth description dealing with the clutch mechanism enclosed within the housing or casing 373 that this clutch mechanism would be rendered active whenever the transverse rod 386 was rocked about its supporting shaft 388. This rod 386 extends substantially the full width of the machine, as is clearly illustrated in Figs. 4 and 5. Extending in parallelism with the normal position of this clutch control rod 386 is a shaft 449 which is supported at is opposite ends in the bearing brackets 7b. This shaft 449 has pivotally mounted thereon a series of arms 450, there being one arm provided for each one of the keys and bars 406 to 410, inclusive. The clutch control rod 386 normally engages every one of this series of upstanding arms 450. Each one of these arms is connected by a link 451 to the perpendicular portion of the angular arm of a rocker. The rockers for the various character selecting or printing keys 406 are designated by the reference character 413 and the rod or link 451 for each one of these rockers is connected to the upstanding portion of the rocker arm 415. The single unit spacing key 407 and the two, three, and four unit spacing bars 408 to 410, inclusive, actuate rockers 418, 429, 447, and 438, respectively. These rockers are provided with arms 419, 430, 448, and 439, respectively. The links 451 are connected to these last mentioned rocker arms. Therefore, every time a rocker is actuated by a key or a bar, the clutch mechanism enclosed within the housing or casing 373 will be rendered active and the clutch actuated arm 375 will be oscillated. This oscillation of the arm, through the rod or link 392, will actuate the driving arm 397 for the drive shaft 398.

CAM PLATE OPERATION OF PAPER CARRIAGE SPACING OR DRIVING MECHANISM

It has been pointed out heretofore that this machine is intended to handle from six point to fourteen point type. The type faces may be either those ordinarily employed for letterpress printing or the type faces may be those employed in letterpresses for simulating typewriter faces. Each set of type employed in this machine, regardless of the point or the kind of face, will include lower and upper case letter characters of the entire alphabet, numerals from 1 through 9 to 0, and all the desired punctuation marks, etc., illustrated in Figs. 4 and 35. These various characters, including lower and upper case letters, numerals, punctuation marks, etc., for each set or font of type may be arranged in four groups, depending upon the width of the space each character requires when it makes an impression on copy paper, or the like. The characters arranged in the first group will all require the same width space. The characters arranged in the

second group will require twice the space needed for the characters of the first group. The characters arranged in the third group will require three times the space allotted to the characters of the first group, while the characters of the fourth group will require four times the space occupied by each one of the characters of the first group. This ratio will be maintained regardless of the point of the ordinary foundry type faces being considered. When the set of type being employed is designed to simulate typewriter type faces, all of the characters of a given set of type are spaced uniform distances. This uniform spacing will differ for each point of typewriter type faces employed but will be uniform for each given point of type.

In describing the paper carriage spacing or driving mechanism, it was pointed out that the carriage is spaced or advanced by means of the feed screw **118**. This feed screw is rotated by means of the pawl **153** and the ratchet wheel **152**. The feed screw **118**, therefore, can be rotated a distance which will correspond to the width of one tooth on the periphery of the ratchet wheel **152** or any desired multiple of the width of one ratchet wheel tooth. When the ratchet wheel is advanced the width of one tooth, the feed screw **118** will be rotated the proper amount to advance or space the paper carriage .014 of an inch. This spacing movement of .014 of an inch is equal to one-half of the unit which will constitute the basis for all character spacing movements of the carriage. In other words, one unit is .028 of an inch and all distances of spacing movement to accommodate printed characters will be multiples of this one unit.

It is believed to be unnecessary to specify how many units every character will occupy for all the different points of type, ranging from six point to fourteen point, or all of the different families of type faces, which may be used in this machine. It should be sufficient to classify or group all of the characters in the narrowest six point type which can be used in this machine. The various characters of this exemplary set of six point type will occupy or require one, two, three, and four space units. The characters falling under these four different unit spacings will be catalogued as follows:

NARROWEST 6 PT. TYPE FACE

Lower case

1 unit—.028 inch:
i, l, j . : ; ' ' ! , – (leader) [ ] ( )

2 units—.056 inch:
a, b, c, d, e, f, g, h, k, n, o, p, q, r, s, t, u, v, x, y, z
1, 2, 3, 4, 5, 6, 7, 8, 9, 0, ? * + — @ $ #

3 units—.084 inch:
w, m

Upper case

2 units—.056 inch:
I, J

3 units—.084 inch:
A, B, C, D, E, F, G, H, K, L, N, O, P, Q, R, S, T, U, V, X, Y, Z

4 units—.112 inch:
W, M

It has been stated above that all of the characters of a set of type faces which will simulate typewriter copy are to be uniformly spaced or are to be provided with the same space on a copy sheet. The narrowest set of six point typewriter type faces to be used in this machine will be allotted two units for each character. Larger point typewriter type faces, therefore, will be allotted multiples of two units.

In Figs. 3 to 6, inclusive, 18 to 21, inclusive, and 36 to 38, inclusive, each cam plate **399** is illustrated as being provided with a profile cam **452**. These profile cams are all of the same size and shape and are arranged on the upper side of the drive shaft **398**. Each one of these profile cams is provided with an active edge which will be described at a later point as functioning to actuate a grooved follower bar.

Figs. 3, 18, 19, and 21 disclose cam plates **399** as being engaged by spring pressed arms **453** which are journaled on a common transverse shaft **453***a*. Each arm is provided with a roller **453***b* at its free end which rides on the edge of its cam plate. These spring pressed arms perform the function of loading the cam plates and retaining all of the profile cam portions **452** in their normal or idle positions in transverse alignment with each other.

Figs. 2, 3, 27, 28, and 30 disclose a shaft **454** which is journaled at its opposite ends in the side plates **3** and **4** of the machine frame. This shaft extends longitudinally of and overlies the transverse bracing bar **27**. Figs. 3 and 27 disclose the left hand end of this shaft **454** as having fixedly attached thereto a rearwardly extending arm **455**. Fig. 2 discloses the right hand end of this shaft **454** as having rigidly attached thereto an arm **456** which is parallel with the arm **455**. These two arms, also, are partially illustrated in Figs. 5 and 6. Figs. 2, 3, 5, 6, and 27 illustrate these arms **455** and **456** as having journaled for rotation in their outer ends the reduced extremities of a grooved follower bar **457**. This follower bar is additionally illustrated in Figs. 18, 19, 21, 28, 30, and 36 to 38, inclusive. By inspecting Figs. 3, 5, 6, 18, 19, and 21, it will be seen that this follower bar is arranged in the path of movement of all of the profile cams **452**. Therefore, when the drive shaft **398** is rocked with a cam plate **399** drivingly attached thereto, the profile cam **452** of this cam plate will engage the periphery of the follower bar **457** and will cause this follower bar to be swung upwardly about the axis of its supporting shaft **454**. The front edge of each profile cam **452** will effect this upward pivotal movement of the follower bar during the initial portion of the rocking movement of the drive shaft **398**. After the actuated profile cam has passed under the periphery of the follower bar **457**, this follower bar will be allowed to drop back to its normal position in back of the actuated profile cam. When the profile cam is returned to its normal or idle position, the follower bar again will be elevated or pivoted upwardly and then allowed to return to its normal position. As a result of each complete cycle of movement of a cam plate **399**, it will be seen that the follower bar **457** will be swung about its pivot two times; i. e., one time for each direction of movement of the cam plate. The contour of the grooved followed bar **457** is very unusual and plays an extremely important part in bringing about differential spacing of the paper carriage. However, this feature will be skipped over for the time being to permit the follower bar to be mechanically connected to the pawl **153**.

Figs. 2 and 5 disclose the right hand end of the follower bar as being connected to the arm **458** of a lever **459** by means of the slot **460**, which re-

ceives the reduced end of the follower bar. This lever is pivotally mounted on the outer side of the side plate 3 by means of the pin 461. The remaining arm 462 of this lever 459 is pivotally connected to a link 463 at its extremity. The upper end of this link is pivotally connected to a second lever 464 which in turn is pivotally mounted on the side plate 3 by means of the pivot pin 465. The remaining arm 466 of this lever 464 is of arcuate formation and is provided with a longitudinally extending opening 467. A link 468 is connected at its upper end to the plate 154 which supports the pawl 153 and is pivotally mounted on the shaft 151. The lower end of this link 468 is provided with a connecting pin 469 that passes through the opening 467 of the lever arm 466. At the present time it merely will be stated that the connecting pin 469 is intended to be adjusted along the length of the opening 467 and to be held at any desired point along this length. This adjusting mechanism will be dealt with later.

It now will be seen that when the grooved follower bar 457 is swung upwardly by a profile cam 452, the lever 459 will be pivoted. The link 463 will cause the second lever 464 to be pivoted about its pin 465 as a result of pivotal movement of the lever 459. The link 468 will be moved upwardly, in a general longitudinal direction, by the pivotal movement of the lever 464. This upward movement of the link 468 will cause the pawl 153 to advance the ratchet wheel 152 a predetermined distance, depending upon the extent of upward movement of the follower bar 457 and the point of connection between the pin 469 and the lever 464. When the profile cam 452, which actuates the follower bar 457, is returned to its normal position, the follower bar again will be moved upwardly. Each time the actuated profile cam moves past the follower bar the link and lever mechanism will operate to return the pawl 153 to its normal starting position with respect to the periphery of the ratchet wheel 152.

Returning now to the profile of the grooved follower bar 457, it will be recalled that the various characters of a set or font of type require the paper carriage to be spaced four different distances which are multiples of the space required by the narrowest characters of the set. This differential spacing is needed for any set of ordinary founder's type faces. It was also explained that when a given set of typewriter type faces is employed, the carriage must be moved or advanced the same distance for each character.

If the follower bar 457 were of uniform diameter throughout the portion of its length which cooperates with the profile cams 452, the identical size of these various profile cams would cause the follower bar to be moved the same distance when all of the cam plates 399 were actuated. Such an operation would not be astisfactory. The follower bar, therefore, is provided with three truly cylindrical groove surfaces for each profile cam 452. One of these groove surfaces will cooperate with the profile cam for producing the desired movement of the follower bar to accommodate lower case letters. The second groove surface of each set will cooperate with its profile cam 452 to effect proper movement of the follower bar 457 to provide the necessary spacing movement to accommodate upper case or capital letters. The third groove surface of each set will effect proper movement of the follower bar to provide uniform spacing for typewriter type faces, or the like. By allowing for axial shifting movement of the follower bar 457 into three different positions, the three cylindrical groove surfaces may be selectively arranged in the vertical planes occupied by the profile cams 452. The follower bar normally will be arranged so that the groove surfaces for lower case letters will occupy the planes of the profile cams. To change to upper case or capital letters, the follower bar will be moved a predetermined distance axially to the left, or so as to line up the next adjacent groove surface of each set with the various profile cams 452. When uniform spacing is desired for typewriter type faces, the follower bar should be moved a greater distance to the left so as to align the third cam surface of each set with the profile cams. The shifting of the follower bar axially in opposite directions between its lower case and upper case positions will be accomplished by means of the shift keys 311 in a manner to be described at a later point. The shifting of the follower bar between its normal lower case position and its uniform spacing position may be accomplished by other mechanism which additionally will function to releasably maintain the follower bar in its uniform spacing position.

Diagrammatic or schematic views are set forth in Figs. 36 to 38, inclusive, to better illustrate the relative sizes of the various follower bar groove surfaces. The sets of three groove surfaces for characters I, D, and W have been selected for this purpose. The reference characters 470, 471, and 472 designate these three sets. Carrying forward the example of employing the narrowest six point type faces to illustrate the operation of the follower bar grooves, each one of the Figures 36 to 38, inclusive, has applied thereto five dash and dot lines which provide or set off four different movement zones. Legends and arrow lines are included at the right of each figure and indicate what each one of these zones represents. The dash and dot line 473 represents the common level of all of the top edges of the profile cams 452. The dot and dash line 474 represents the level of a follower bar groove surface which will bring about movements of the follower bar one unit, or will effect shifting movement of the paper carriage one unit. The dot and dash line 475 represents the level of a follower bar groove surface which will bring about spacing of the paper carriage two units, or which will cause the follower bar to be moved for spacing two units. The dot and dash line 476 represents the level of a follower bar groove surface which will effect movements of the follower bar for spacing three units, or which will cause the paper carriage to be spaced three units. The final dot and dash line 477 represents the level of the follower bar groove surfaces which will effect movements of the follower bar to bring about spacing of the paper carriage four units.

It should not be understood that a follower bar groove surface which is described as being of a depth to effect movement of the paper carriage the distance of one or more units brings about such movement each time a profile cam passes thereunder. The profile cams pass under the follower bar twice for each cycle of operation set in motion by a single depression of a character key, or the like. Therefore, the depth of each groove surface must be such that every time it is engaged by its profile cam and the follower bar is raised and lowered as a result of such engagement, the paper carriage will be advanced a distance which is equal to just one-

half the space required for the character which is controlled or represented by the actuated key.

For example, the space required for any printing character will equal one unit, .028 of an inch, or a multiple of one unit. When a follower bar groove surface is of a depth to effect advancement of the paper carriage one unit, the paper carriage is actually advanced one-half a unit, or .014 of an inch, each time the profile cam passes beneath that groove surface to effect one raising and lowering movement of the follower bar. For greater spacing distances, the follower bar groove surfaces will be of proper depths to effect advancement of the paper carriage only one-half the required distance for each passage of a profile cam beneath the follower bar. The need for dividing each spacing movement into two halves will be fully brought out as the description proceeds.

In Fig. 36, the follower bar **457** is illustrated in the position it assumes when lower case letters are being printed. By referring to the catalogued list given heretofore, it will be seen that the lower case "i" requires a one unit spacing of the paper carriage. The set of groove surfaces **470**, therefore, has a groove **478** with its periphery lying in or registering with the dot and dash line **474**. Actuation of the cam plate **399** by the key **406** which selects the letter character "i" will cause the follower bar to be moved through one zone. Fig. 37 illustrates the follower bar shifted into the position for printing upper case or capital letters. The profile cam **452** for the letter character I now registers with a groove surface **479**. When the I cam plate **399** is actuated, the follower bar will be shifted through two zones and will effect spacing movement of the paper carriage two units. Fig. 38 illustrates the position of the follower bar for providing uniform spacing, used in connection with typewriter type faces. The profile cam **452** for the character I now is lined up with the groove surface **480**. As uniform spacing is to be two units, the diameter of the groove surface **480** corresponds with the diameter of the groove surface **479**. Actuation of the I cam plate **399**, therefore, will move the follower bar through two zones to effect shifting of the paper carriage two units.

By again referring to the list of widths for the various characters, it will be seen that lower case letter "d" requires two units, while upper case or capital letter D requires three units. The set of groove surfaces **471**, therefore, is provided with a surface **481** which registers with dot and dash line **475**. A second groove surface **482** has a diameter which causes it to register with dot and dash line **476**. The third groove surface **483** has a diameter which causes it to register with dot and dash line **475**. The groove surfaces **481** and **483**, therefore, will effect spacing movement of the paper carriage two units. The groove surface **482** will effect paper carriage movement three units.

The aforementioned catalogue list of character faces shows that the letter character "w" requires three units while the upper case or capital letter W requires four units. The set of groove surfaces **472**, therefore, has a surface **484** which is of a proper diameter to cause it to register with the dot and dash line **476**. The second groove surface **485** of this set has a proper diameter to cause its periphery to register with the dot and dash line **477**. The third groove surface **486** is for uniform spacing, and its diameter corresponds with the level of dot and dash line **475**.

With the follower bar positioned as illustrated in Fig. 36, actuation of the cam plate **39** for the letter character "w" will cause the follower bar **457** to be moved through three zones which will bring about spacing movement of the paper carriage three units. When the follower bar is in the position illustrated in Fig. 37, actuation of the W cam plate **399** will cause the follower bar **457** to be moved through four zones and this movement will cause the paper carriage to be advanced or spaced four units. When the follower bar is arranged in the position illustrated in Fig. 38, actuation of the W cam plate **399** will cause the follower bar **457** to be moved through two zones, and this movement will cause the paper carriage to be advanced two units.

The foregoing explanation of the action of the follower bar to provide differential spacing for lower case and upper case characters and uniform spacing for typewriter type face characters covers the operation of the cam plates **399** which are actuated by the character selecting keys **406**. The cam plates **399** which are controlled by the single unit spacing key **407** and the two, three, and four unit spacing bars **408**, **409**, and **410**, respectively, will not cooperate with portions of the follower bar which are provided with three different diametered groove surfaces. The follower bar is provided with a separate area for each one of these spacing cam plates and the diameter of each area is uniform throughout its width. The diameter of the area which cooperates with the cam plate **399** for the single unit spacing key **407** is of a uniform diameter throughout its width which corresponds with dot and dash line **474**. The cam plate **399** for this single unit spacing key **407**, therefore, will shift the follower bar through one zone and will cause the carriage to be advanced one unit. The area of the follower bar which cooperates with the cam plate **399** controlled by the two unit spacing bar **408** corresponds in diameter with the dot and dash line **475**. Depression of this spacing key **408**, therefore, will cause the paper carriage to be shifted two units. The area of the follower bar which cooperates with the cam plate **399** for the three unit spacing bar **409** has a uniform diameter which corresponds with dot and dash line **476**. This spacing bar **409**, therefore, will cause the paper carriage to be shifted three units. The four unit spacing bar **410** has its cam plate **399** cooperating with an area on the follower bar **457** which possesses a diameter that corresponds with dot and dash line **477**. Depression of the four unit spacing bar **410**, therefore, will cause the paper carriage to be spaced or advanced four units.

The three unit spacing bar **409** has been made the largest of the four spacing controls because a space of three units normally should be employed between adjacent words in printing with ordinary letterpress or foundry type faces. When employing a set of type faces which will simulate typewriter type, the two unit spacing bar **408** should be employed normally for providing the spaces between adjacent words.

These four control members **407** to **410**, inclusive, for accomplishing spacing of the paper carriage are used to justify the lines of the final copy; i. e., provide a uniform or straight right hand margin. This justifying of the lines may be accomplished in the following manner:

Copy produced by letterpresses is provided with

a uniform right hand margin by justifying, or varying, the spaces between words of the respective lines. To justify in this same manner with the present machine, the first copy is produced on the machine by using the three unit spacing bar **409** between all adjacent words of the several lines. If we consider that the final copy should be provided with, for example, 90 unit lines, the various lines of this first copy are maintained as near to 90 units in length as is possible. The number of units actually used by each line of this first copy is then indicated opposite each line in one of the two margins. Let us now assume that three of the lines of this first copy have utilized 93, 85, and 89 units, respectively. In producing a second or final copy from the first, the operator will reprint the 93 unit line by using the two unit spacing bar **408**, instead of the three unit spacing bar **409**, between three pairs of words in the line. This will contract the first line three units and the line of the final copy will occupy exactly 90 units. In reproducing the second line of the original or first copy, this line occupying 85 units, five of the spaces between adjacent words of this line will be provided with four unit spaces instead of three unit spaces. If the line does not contain sufficient words, the line may be expanded by employing any desired combination of four and five unit spaces. A five unit space may be produced by depressing first the four unit space bar **410** and then the single unit space key **407** or by successively depressing the two and three unit spacing bars **408** and **409**. The third line of the original copy, which contains 89 units, may be expanded in the final copy to occupy 90 units merely by employing the four unit spacing bar **410** between one pair of words while the three unit spacing bar **409** is employed between all other pairs of adjacent words.

MECHANISM FOR AXIALLY SHIFTING THE GROOVED FOLLOWER BAR

Mechanism was described principally in connection with Figs. 3, 27, and 28, by means of which the type bar carrier or basket elevating shaft **280** could be raised and lowered to print either upper or lower case letters. Naturally, it would not be sufficient to merely elevate the type carrier or basket to accomplish printing with upper case or capital letters without providing proper spacing of the paper carriage to accommodate these wider characters. It has been explained that by shifting the follower bar **457** a certain distance to the left, the intermediate groove surfaces of each set of grooves will be vertically aligned with the several profile cams **452** of the cam plates and that these intermediate groove surfaces will bring about proper spacing of the paper carriage to accommodate capital letters. Figs. 27 and 28 disclose a substantially U-shaped cam which is attached to the shaft **296** by means of the arm **488**. It will be recalled that this shaft **296** is rocked by depressing the shift keys **311**. Figs. 6 and 27 best illustrate the shape of this cam member **487**. The cam cooperates with a collar **489** which is fastened to the follower bar **457**. When the shaft **296** is rocked, in a counter-clockwise direction as viewed in Fig. 28, the arm **488** will be swung upwardly for lifting the cam **487**. This upward movement of the cam will bring about axial movement of the follower bar **457** so as to align the intermediate groove surface of each group with the profile cams **452**. As long as the keys **311** are maintained depressed, the follower bar will be held in its intermediate position and the type carrier or basket will be held in its elevated position to cause the upper case or capital letters to register with the printing point of the machine. When the keys **311** are released, the type bar carrier or basket will be returned to its normal position and the follower bar **457** will likewise return to its normal position for realigning the lower case groove surfaces with the profile cams **452**.

It was explained above that the extreme right hand groove surface of each set of three grooves was to be employed for providing uniform spacing when typewriter type faces were used. To align these right hand groove surfaces with the several profile cams **452**, the follower bar **457** must be shifted a greater distance to the left, and it should be retained in this shifted position as long as the typewriter type faces are employed. Figs. 5, 6, and 27 disclose the left hand end of the follower bar as having secured thereto an operating knob **490** by means of which the follower bar may be shifted the desired distance to the left. When the follower bar has been moved the desired distance, a spring loaded latch pin **491** will drop into a groove **492** formed around the periphery of the reduced end of the follower bar which projects beyond the left hand side plate **4** of the machine frame. This latch pin **491** will retain the follower bar in its extreme left hand position until the pin is elevated by means of its upper end **493**.

ROTATION OF FOLLOWER BAR

It will be noted from the foregoing description which deals with the follower bar that all surface portions of this bar which cooperate with additional elements, principally the profile cams **452** of the several cam plates, are of circular or cylindrical formation. The follower bar is mounted for free rotation about its axis. These circular or cylindrical follower bar surfaces and the rotation of the follower bar will permit the bar to roll or rotate when a profile cam is operated to elevate the bar. This rolling of the bar on the profile cams will prevent uneven wearing of the groove surfaces of the follower bar and will materially reduce the wearing of these coacting grooves and profile cam surfaces.

SPACING VARYING MECHANISM FOR DIFFERENT POINT TYPE

We have seen from the above description how the paper carriage is properly spaced to accommodate the different width characters which make up a set or font of the narrowest six point type faces which can be used in this machine when it is constructed in accordance with the exact disclosure of the drawings. It now will be explained how this machine may be adjusted so that it can handle other widths of six point type and the several desirable widths of eight point, ten point, twelve point, and fourteen point type.

This adjusting mechanism is illustrated in Figs. 1 and 2. The aforementioned connecting pin **469** has attached thereto one end of the link **494**. The remaining end of this link is pivotally connected to the upstanding arm **495** of the adjusting rod **496**. Intermediate its ends, this rod is slidably supported by a bearing bracket **497** which is attached to the side plate **3** of the machine frame. This adjusting rod extends toward the front of the machine and terminates at its forward end in an externally screw threaded portion **498** which projects into a housing **499** that is suitably at-

tached to the side plate **3**. Journaled for rotation in this side plate is an adjusting nut **500** which is threadedly connected to the threaded portion **498** of the rod. A knurled operating handle or knob **501** is attached to the outer end of this adjusting nut **500** and by means of which the nut may be rotated. To prevent the nut from moving axially relative to the housing **499**, set screws, or the like, **502** pass through the wall of the housing and enter a groove **503** formed in the periphery of the nut body.

Fig. 1 discloses the top face of the housing **499** as having scale lines or graduations **504** formed thereon. A pointer **505** is attached to the rod **496** and cooperates at its extremity with the graduations **504** to indicate to the operator of the machine the setting of the adjusting mechanism.

By rotating the adjusting nut **500**, through the medium of the operating knob **501**, the rod **496** may be moved axially in opposite directions. This movement of the rod will bring about adjustment of the connecting pin **469** relative to the opening **467** of the lever arm **466**. Adjusting this connecting pin **469** will vary the effective length of the lever arm **466** in moving the pawl **153** to effect rotation of the feed screw **118** through the medium of the ratchet wheel **152**.

With this explanation, it will be seen that the follower bar **457** will cooperate with the profile cams **452** to effect spacing movement of the paper carriage four different distances, which always bear the same relation or ratio to each other and by varying the effective length of the lever arm **466**, as a result of adjusting the connecting pin **469**, the four different distances of shifting movement produced by the follower bar **457** may be lengthened or shortened. In other words, the connecting pin **469** may be adjusted so that the follower bar **457** instead of bringing about movement of the paper carriage one, two, three, and four units will effect movement of the paper carriage two, four, six, and eight units, for the four different diametered groove surfaces formed on the follower bar.

To further illustrate this operation, let us assume that the scale lines or graduations **504** formed on the housing **499** are distinguished from each other by numerals, for example, 1 to 50. The operator of the machine will be provided with a chart which will state that the pointer **505** should be set at scale line 1 when the machine is printing with six point Bodoni book type faces. With the pointer **505** set at scale line 1, the connecting pin **469** will be properly positioned to cause the follower bar **457** to accurately shift the paper carriage to space in the intended manner the various characters of this particular "family" and point of type. Let us now consider that the other two sets or fonts of type assembled in the machine are eight point Bodoni book and twelve point Bodoni book. The chart furnished the operator of the machine may state that the pointer **505** should be set on scale line 10 when using eight point Bodoni book type faces and that scale line 30 is the proper setting for pointer **505** when employing twelve point Bodoni book type faces. By changing the setting of the pointer **505** to these other scale lines, the connecting pin **469** will be adjusted along the length of the lever arm **466** and will increase the throw or stroke of the pawl **153** accordingly.

To provide different effects with printing, it is the practice of type setters to employ what are known as "regular," "condensed," and "expanded" type faces of the same size or point. The operator's chart, therefore, may state that in using condensed eight point Bodoni book type faces, the pointer **505** should be set on scale line number 8, and when employing eight point, expanded Bodoni book type faces, the pointer **505** should be set on scale line number 12.

It is to be understood that these examples are given only for the purpose of illustrating the principle of operation of this machine in handling different sizes and styles of type and is not intended to limit the adjusting of the connecting pin **469** to any particular combination of settings of the pointer **505** with respect to the scale lines **504**.

CAM PLATE CONTROL OF POSITIONING OF TYPE

In Fig. 35, the various type characters are illustrated as being arranged in the two groups A and B in a type bar carrier or basket. To arrange a printing character of group A at the printing point of the machine, the type bar carrier or basket must be rotated the proper distance in the direction indicated by the arrow line *a*. The type bar carrier or basket must be rotated in the opposite direction, or in the direction indicated by the arrow line *b* when a character arranged in group B is to be positioned at the printing point of the machine. These rotations of the type bar carrier were described as being obtained by moving the sector shaped rack **290**, see Fig. 31, in the proper direction and through the proper distances with respect to its normal position. This normal position is illustrated in this Fig. 31.

By inspecting Fig. 4, it will be seen that the indicia carried by the type selecting or printing keys **406** are divided into two groups by the dash line C'. This dash line corresponds with the dash line C of Fig. 35. In other words, the keys **406** arranged at the right of this line C' correspond with the type bars arranged at the right of line C, or arranged in group A, while the keys **406** located at the left of the line C' correspond with the type members arranged in group B or at the left of the line C of Fig. 35. Depressing any of the keys **406** arranged at the right of the line C', therefore, should bring about rotation of the type carrier or basket in the direction of the arrow line *a*, and depressing of any of the keys **406** located at the left of line C' should cause the type carrier or basket to rotate in the direction of the arrow line *b*.

Figs. 3, 18, and 19 disclose cam plates **399** which are provided with cam races **506** and **507**; i. e., the cam plates **399** which are controlled by the keys **406** located at the right of line C' are provided with cam races **506**, while the cam plates controlled by the keys **406** located at the left of the line C' are provided with cam races **507**. Figs. 18 and 19 separately disclose these two cam races. Fig. 3 discloses both of the races. By considering that the left hand end of each cam race is its starting end, it will be noted that these races extend in opposite directions with respect to the axis of the drive shaft **398**. In other words, the starting end of cam race **506** is closer to the axis of the shaft than is the finishing end of this race, while the starting end of cam race **507** is farther removed from the shaft axis than is the finishing end. By closely inspecting the cam races, it will be noted that each one of the same has a dwell portion **508** at its finishing end portion. These dwell portions are inactive parts of the races; i. e., they effect no operation of the members controlled by the cam races.

These three figures disclose bell crank levers 509 as being operatively associated with the cam plates having cam races 506 and bell crank levers 510 associated with the cam plates having the races 507. These various bell crank levers are pivotally mounted on the transverse shaft 511 which is supported at its ends in the bearing brackets 7a, see Fig. 2. The bell crank levers 509 are provided with a generally horizontally extending arm 512, each one of which is provided with a laterally extending pin 513 which rides in the cam race 506 of the plate with which the bell crank lever is operatively associated. Each bell crank lever 510 is provided with a generally horizontally extending arm 514 which is provided with a laterally extending pin 515 that rides in the cam race 507 of the cam plate with which the bell crank lever is operatively associated. Each bell crank lever 509 is provided with an upstanding arm 516 while each bell crank lever 510 is provided with an upstanding arm 517. All of these upstanding arms 516 and 517 normally have their upper end portions arranged in the same vertical plane; that is, all of these upper end portions are arranged in a transversely aligned series.

Fig. 19 discloses the bell crank lever 509 in its normal position in full lines and in its operated position in dotted lines. This figure also discloses the cam plate 399 in its normal and operated positions by means of the same full and and dotted lines. It will be appreciated, therefore, that when this cam plate 399 is operated by the drive shaft 398, the cam race 506 will cause the bell crank lever 509 to move from its full line position into its dotted line position. When the drive shaft 398 is returned to its normal position, the bell crank lever, also, is returned to its normal position. The cam race 506 causes the bell crank lever to move in a counter-clockwise direction as viewed in this figure.

Fig. 18 discloses the bell crank lever 510 and the associated cam plate 399 in their normal positions by full lines and in their operative positions by dotted lines. When this associated cam plate 399 is operated by the drive shaft 398, the bell crank lever 510 is moved in a clockwise direction, as viewed in this figure.

Figs. 3, 4, 5, 18, 19, and 31 disclose two transversely extending, parallel rods 518 and 519. The transverse rod 518 is supported at its end portions by arms 520 which are loosely mounted on the transverse shaft 511. The rod 519 is supported at its opposite end portions by the arms 521 which are loosely or rotatably supported on the transverse shaft 449. These rods 518 and 519 are intended to engage the opposite vertical edges of the bell crank lever arms 516 and 517 so as to normally retain the upper extremities of these arms in transverse alignment. To accomplish this desired result, the rod 518 is disclosed in Figs. 3 and 4 as having springs 522 attached to the opposite end portions of the rod while the rod 519 has similar springs 523 attached to its opposite end portions. The remaining ends of these four springs are suitably attached to the side plates 3 and 4 of the machine frame. Each rod has, therefore, two springs urging it in one direction, and the springs for the respective rods exert their forces in opposite directions. The clamping action produced by the influence of these springs on the rods 518 and 519 will function to retain the upper extremities of the bell crank lever arms 516 and 517 in their desired transversely aligned arrangement.

Figs. 3, 4, 5, 18, 19, and 31 disclose the rod 518 as having mounted on its intermediate portion a lug which is provided with an upstanding pin 524. A lug having an upstanding pin 525 is mounted on the rod 519 at its intermediate portion. Figs. 3 and 31 disclose these pins 524 and 525 as occupying cam races 526 and 527, respectively, of a cam plate 528 which is rigidly attached to the sector shaped rack 290 by means of its hub 529. This cam plate 528, therefore, will always move with the rack bar 290. The cam race 526 has an active portion 530 and a dwell portion 531. The cam race 527 has an active portion 532 and a dwell portion 533. The rod carried pins 524 and 525 normally occupy the point of juncture between the active and dwell portions of their respective cam races.

When a key 406 located at the right of line C' is depressed, its associated cam plate 399 will be operated, and one of the bell crank levers 509 will be moved from its full line position to its dotted line position, see Fig. 19. This movement of the bell crank lever will cause the rod 518 to be actuated and the pin 524 carried by this rod will travel through the active portion 530 of its raceway 526. This relative movement of the pin 524 with respect to the active portion 530 of its cam race will cause the cam plate 528 to be rotated in a clockwise direction, as viewed in Fig. 31, and the sector shaped rack bar 290 will be moved in the same direction. This movement of the rack bar 290 will cause the type bar carrier or basket to move in the direction of the arrow line *a*.

When one of the keys 406 located at the left of line C' is depressed, its associated cam plate 399 will bring about movement of the proper bell crank lever 510. In moving from its full line position to its dotted line position, see Fig. 18, this bell crank lever will actuate the transverse rod 519. The upstanding pin 525 carried by this rod will move through the active portion 532 of its cam race 527. This movement of the pin 525 relative to the length of the cam race portion 532 will cause the cam plate 528 to rotate in a counter-clockwise direction, as viewed in Fig. 31. The sector shaped rack bar 290, therefore, will swing or rotate in the same direction, and the type bar carrier or basket will be rotated in the direction of the arrow line *d*, see Fig. 35.

When one of the pins 524 or 525 is traveling through the active portion of its associated cam race, the remaining pin will travel through its dwell portion of the associated cam race. This dwell portion, therefore, will retain the rod which carries the latter pin in its normal position against the pull of its pair of end springs. When the actuated bell crank lever 509 or 510 is returned to its normal position, by the return movement of its cam plate 399, the rod 518 or 519 that was actuated by this bell crank lever will be returned to its normal position by the springs that are attached to its opposite end portions. The returning rod 518 or 519 will move its centrally carried pin 524 or 525 back to its normal position through the active portion of the cam race carried by the cam plate 528. This return movement of the cam plate will restore the type carrier or basket to its normal position, as is illustrated in Fig. 35. By inspecting Fig. 35, it will be appreciated that the type bar carrier or basket will only have to be rotated in the direction of the arrow line *a* a short distance to place the type bar carrying the upper and lower case type "i" and I into the printing point of the machine while the type bar carrier or basket

must be rotated almost 180° to position the upper and lower case characters ";" and ":" at the printing point of the machine. The type bars arranged intermediate the end bars of group A will have to be moved appropriate, intermediate distances to locate these various types at the printing point of the machine. The cam races **506** which are provided in the cam plates **399** that are operated by the keys **405** located at the right of line C', therefore, should be shaped so as to actuate their respective bell crank levers **509** appropriate distances to produce the desired extent of rotation of the type bar carrier or basket. The cam races **506** for all of the bell crank levers **509**, therefore, will be differently shaped. It will be appreciated from this description that the cam races **507** which actuate the bell crank levers **510**, also, will be differently shaped one from the other and will produce different degrees of movement of their bell crank levers.

There is one feature about the mechanism which has been described that is believed to be of such vital importance that further reference to the same is believed to be highly desirable. It will be recalled that the type carrier or basket will always start from its normal or neutral position, as is illustrated in Fig. 35, every time a printing character is selected and moved around to the printing point of the machine. After an impression of the character has been made on the copy sheet, or the like, the type carrier or basket must be returned to its normal or neutral position. If the type bar carrier or basket is not accurately returned to its normal position and held there until the next character is selected, it would not be possible to accurately register this next character with the printing point of the machine.

The actuation of the type bar carrier or basket rotating rack **290** by means of the cam plate **528**, the pins **524** and **525**, the cam races **526** and **527**, the transverse rods **518** and **519**, and the opposed springs **522** and **523** render extremely positive the operation of the type carrier or basket in moving both to register a printing character with the printing point and to return the type carrier or basket to its normal or neutral position.

It will be appreciated that the intermediate or active portion of each one of the cam races **506** and **507** is what accomplishes the desired movement of its associated or actuated bell crank lever **509** or **510**. The perpendicular arm **516** or **517** of the actuated bell crank lever, therefore, cannot overthrow or move beyond its intended type bar carrier or basket operating position. The springs **522** or **523** will prevent the actuated rods **518** or **519** from being thrown or moved to a greater extent than the operated bell crank lever arms **516** or **517**. The type bar carrier or basket, therefore, is bound to be rotated the proper distance to register the selected printing character with the printing point of the machine.

While one of the rods **518** or **519** is moved away from the transverse row of bell crank lever arms **516** and **517**, by the actuation of one of these levers, the upstanding arms of the unactuated bell crank levers are not engaged on one side by a rod **518** or **519**. These bell crank lever arms, however, will not be allowed to move away from the second, or inactive, rod **518** or **519** because the retained or inoperative bell crank levers are positively connected to their respective cam plates **399** and the spring pressed arms **453** which engage at least half of the cam plates **399** will be exerting forces which will oppose any tendency of the

springs **522** or **523** to move the inactive rod **518** or **519**. Such an undesired movement of this inactive rod would throw out of position all of the bell crank levers **509** and **510**, as well as their operatively connected cam plates **399**.

To briefly summarize, actual operation of the mechanism which has been disclosed and described has been found to very accurately actuate the type bar carrier or basket and will not result in overthrowing or underthrowing the same during any operation. It will be noted by inspecting Fig. 21 that the cam plate **399** illustrated therein is not provided with a cam race **506** or **507**. It will be recalled that this is one of the cam plates **399** which is actuated by a carriage spacing key or bar. As no printing character is to be selected and moved around to the printing point of the machine when the paper carriage is spaced between words, the carriage spacing cam plates **399** need not be provided with bell crank lever operating cam races.

CLUTCH OPERATION OF THE TYPE BAR ACTUATOR MECHANISM

The type bar actuator mechanism has been described heretofore principally in connection with the disclosures of Figs. 3, 4, and 30. In this description, the actuator **320** was described as being operated by the lever **327**. The lower end of this lever was described as being pivotally connected to a plunger **338** which slidably occupied an opening **339** formed in the bearing block **340**.

Fig. 30 discloses the opening **339** of this block as having a second plunger **534** slidably received therein. This plunger is connected to a link **535** which is threadedly, adjustably connected to a head **536** that is pivotally connected to the arm **397** which drives the shaft **398** from the clutch mechanism enclosed within the housing or casing **373**. When the arm **397** occupies its normal or rest position, there is a gap or space between the two plungers **338** and **534**. This gap or space allows for a lost motion movement of the plunger **534** before it engages and operates the plunger **338**. During this lost motion movement, the type bar carrier or basket is moved from its normal or neutral position the proper distance to register the selected type character with the printing point of the machine before the type bar actuator **320** is moved to pivot the selected type bar **283** to make the impression on the copy sheet, or the like.

ACTUATING MECHANISM FOR RIBBON FEED

The mechanism for feeding the carbon paper ribbon **345** was described heretofore principally in connection with Figs. 2 and 6. In this previous description, it was developed that the ribbon was fed through the machine by means of the rigid surface roll **362** and the yieldable surface roll **363**. The yieldable surface roll was described as being rotated in a step-by-step manner by means of the ratchet wheel **364** and the pawl **365**.

This pawl is operated as a result of being pivotally connected to the arm **456** which supports one end of the follower bar **457**. To retain the pawl **365** in engagement with the teeth of the ratchet wheel **364**, a spring **537** is connected at one end to the pawl and at its other end to the arm **456**.

As the pawl **365** is pivotally connected to the arm **456**, the throw or stroke of this pawl corresponds with the throw or stroke of the follower bar **457**. Therefore, the amount of ribbon advanced through the machine will be varied and

will correspond with the diameter of the follower bar groove surface which is engaged by a profile cam 452 to effect swinging movement of the follower bar.

GENERAL OPERATION

An attempt has been made heretofore to include with the disclosure of each different device or mechanism a description of the mode of operation of the same. It should not be necessary, therefore, to discuss at length the general operation of the machine.

When an operator starts to use this machine to produce a sheet or page of copy, the set or font of type to be employed should be arranged in printing position with respect to the platen strip 48. The blank copy sheet then should be fed into the paper carriage and arranged to receive the first line of printing. The marginal stops 204 and 206 should be adjusted to maintain the desired margins. The knob 501 should be operated to locate the pointer 505 at the proper scale line for the particular set or font of type arranged in printing position. After this preliminary manipulation of the machine has taken place, the operator may proceed to print the copy. When a character selecting or printing key 406 is depressed, the first operation to take place is the rendering of the clutch mechanism enclosed within the housing or casing 373 operative to connect the drive shaft 398 with the source of power. As the clutch is being rendered operative, the pawl 404 for the depressed character key is moved into the notches 402 of its associated bushing 400 and cam plate 399.

As soon as the clutch is rendered operative, the drive shaft 398 starts to rock or rotate, and the selected cam plate 399 is caused to rotate therewith. The profile cam 452 of this actuated cam plate starts almost immediately to operate the follower bar 457 so as to properly space the carriage to position the paper to receive the selected printing character. During the first half spacing movement of the paper carriage, the bell crank lever pin 513 or 515 starts to travel the length of its cam race 506 or 507. As the starting portion of each cam race 506 and 507 is a dwell or inactive portion, the bell crank lever 509 or 510 to be operated is not actually moved until after the paper carriage has been properly spaced. The intermediate or active portion of the cam race 506 or 507 then starts to operate its bell crank lever and the type bar carrier or basket is rotated in the proper direction and through the proper distance to position the selected type face at the printing point of the machine. The selected type face is properly positioned by the time the bell crank lever pin 513 or 515 has reached the end of the inactive portion of its cam race 506 or 507. The bell crank lever pin then enters the dwell portion of its cam race which is located at the finishing end of the race. This final dwell portion will not bring about movement of the associated bell crank lever.

This final dwell period at the end of the cam race 506 or 507 holds the selected type bar at the printing point of the machine while the type bar actuator 320 is reciprocated to make the impression on the copy sheet.

By this time the drive shaft 398 has been rocked or rotated to the extent of its movement in one direction and the rock shaft starts to rotate in the opposite direction. This retrograde movement of the drive shaft 398 first permits the type bar actuator 320 to be returned to its normal position. The active intermediate portion of the cam race formed in the actuated cam plate 399 then operates to return the type bar carrier or basket to its normal or neutral position. Finally, the follower bar is again actuated, by the return of the cam plate, to accomplish the second half spacing movement of the paper carriage. As the paper carriage is advanced by the operation of the pawl 153, and as this pawl will only rotate the ratchet wheel 152 in one direction, the return stroke or movement of the pawl will not effect rotation of the feed screw 118, and the paper carriage will be left in its shifted position. After a sufficient number of the character keys 406 have been depressed to print the first word, the desired shifting key or bar 407 to 410 is depressed and the paper carriage is advanced the proper distance to provide for the start of the second word.

If the first letter of this second word is to be capitalized, one of the keys 311 is depressed and held down until after the proper character key 406 is depressed. Operation of the key 311 has resulted in elevating the type bar carrier or basket to properly position the upper case characters with the level of the platen strip 48. When the proper character key 406 is depressed, the selected type bar 283 will be moved around into register with the printing point of the machine and the capital letter will be impressed upon the copy. The depressing of the key 311 also brought about axial movement of the follower bar 457 so as to align the intermediate groove surface of each set of three grooves with the profile cams 452 of the several cam plates 399.

Coming now to a further explanation of the need for dividing the paper carriage spacing movement for each printing operation into two halves, it will be appreciated that the space on the copy paper, or the like, which will receive the impression, the type face which will make the impression, and the type bar actuating plunger 320 will all be centered or symmetrically arranged with respect to each other when a character is printed. These three items, therefore, will be intersected by a common central vertical plane.

For one unit characters, this central vertical plane will be spaced one-half a unit, or .014 of an inch, from the opposite side margins of the involved impression space and the type face. For two unit characters, this plane will be spaced one unit, or 0.28 of an inch, from said side margins. For three unit characters, the spacing will be one and one-half units and for four unit characters, the spacing will be two units.

When we consider combinations of two adjacent printed characters we find that there are involved seven different distances between the central vertical planes of these characters. These distances are 1, 1½, 2, 2½, 3, 3½, and 4 units and represent the sum of one-half the width of each of the two type faces or impression spaces. For example, when two characters, each involving one unit, make their impressions side-by-side, the central vertical planes for these two impressions are spaced one unit apart. When the characters and their impressions require, respectively, one unit and two units, the distance between adjacent central vertical planes will be one and one-half units, and so forth.

Let us now consider the spacing movements of the paper carriage which will be involved in printing, for example, the word "Wide" and with this word starting a line at the left hand margin of the copy. The paper carriage, to start this new line, will be moved the proper distance to the

right. The carriage will come to rest with the central vertical plane of the type bar actuating plunger 320 and the printing point, or position to which the upper case "W" type face will be moved, registering with the left hand margin line of the copy. If the "W" impression were made while the paper carriage is in this position, the impression would have its central vertical plane exactly registering with the left hand margin line of the copy, or one-half of the impression, two units, would lie outwardly of the left hand margin line and the other half would lie inwardly of this line. Naturally, such a location for the impression would be improper.

To place the left hand margin of the type face in register with the left hand margin line of the copy, the paper carriage must be moved to the left a distance equal to two units and this movement must take place before the impression is made. After the impression has been made, the paper carriage must be moved again a distance equal to two units to place the central vertical plane of the printing point and the plunger 320 in register with the right hand margin of the "W" impression space. In other words, the first spacing movement centers the impression space on the copy paper with the printing point and the plunger 320. The second spacing movement clears this impression space with respect to the printing point and conditions the carriage for the next impression, regardless of its width.

As the next impression to be made in printing the word "Wide" involves the lower case letter "i," the carriage must be spaced one-half a unit before the impression is made and one-half a unit after the impression is made. The second part of the spacing movement for the letter "W" and the first part of the spacing movement for the letter "i" collectively cause the central vertical planes of these two impression spaces to be located two ane one-half units apart and the impressions, therefore, will be properly spaced.

The next two letters "de" each require a two unit impression space and prior to each impression the paper carriage will be moved one unit while after each impression the carriage will be moved one more unit. These movements will cause the central vertical planes of the "i" and the "d" to be spaced apart a distance equal to one and one-half units and the central vertical planes of the "d" and the "e" to be spaced two units.

After printing the entire word "Wide" a conventional three unit space may be provided before the next word is printed. Depression of the space bar 409 will cause the paper carriage to be moved one and one-half units before the plunger 320 is actuated and another one and one-half units after such actuation. This spacing movement will locate the central vertical plane of the printing point and the plunger 320 exactly at the left hand margin of the impression space for the first letter of the next word. The plunger 320 was referred to as being actuated between the two spacing movements which produced this three unit space for the next word. As the cam plate 399 which is actuated by depressing the space bar 409 does not have a cam race 506 or 507 no type bar will be presented to the printing point and the reciprocation of the plunger 320, therefore, will not result in making an impression.

It is believed that with this added explanation, the operation of the entire machine will be completely understood by anyone skilled in the key operated printing machine art.

It is to be understood that the form of this invention herewith shown and described is to be taken as the preferred example of the same, and that various changes in the shape, size, and arrangement of parts may be resorted to without departing from the spirt of the invention or the scope of the subjoined claims.

Having thus described this invention, I claim.

1. In a key operated printing machine, a frame, a paper carriage supported for movement transversely of the frame, a feed screw extending transversely across the frame parallel to the path of movement of the carriage, a feed nut threaded on the screw, a connection between the carriage and the nut to cause the carriage to partake of the same movements as the nut, means for effecting rotation of the screw in one direction each one of several different angular distances, said last mentioned means comprising a ratchet wheel drivingly connected to the feed screw, a pawl movable through different fractional portions of its maximum throw to effect rotation of the ratchet wheel in one direction different distances which are multiples of the pitch of the ratchet wheel teeth to cause the carriage to move different distances each one of which is a multiple of a given spacing unit, a bank of keys for selecting character printing type, means rendered active by the depression of each one of said keys for effecting movement of the pawl through the fractional portion of its throw which will result in spacing movement of the carriage the proper number of spacing units to accommodate the printed impression of the character controlled by the depressed key, means other than said pawl and ratchet wheel for effecting rotation of the feed screw in either direction to cause the carriage to move any desired distance without depressing any of said printing character selecting keys, and means for disengaging the pawl from the teeth of the ratchet wheel when the feed screw is moved by the next preceding means in the direction opposite to that effected by the ratchet.

2. In a key operated printing machine, a frame, a paper carriage supported for movement transversely of the frame, a feed screw extending transversely across the frame parallel to the path of movement of the carriage, a feed nut threaded on the screw, a connection between the carriage and the nut to cause the carriage to partake of the same movements as the nut, a ratchet drivingly connected to the feed screw, a pawl movable through different fractional portions of its maximum throw to effect rotation of the ratchet wheel in one direction different distances which are multiples of the pitch of the ratchet wheel teeth to cause the carriage to move different distances each one of which is a multiple of a given spacing unit, a bank of keys for selecting character printing type, a power driven rock shaft, a separate but identically shaped profile cam for each character selecting key loosely mounted on the rock shaft, independent means operatively connected to each one of said character selecting keys for causing the profile cams for said keys to be connected to the rock shaft when the keys are depressed, and means operated by each profile cam when it is connected to the rock shaft to effect movement of the pawl through the fractional portion of its throw which will result in spacing movement of the carriage the proper number of spacing units to accommodate the printed impression of the character controlled by the depressed key.

3. In a key operated printing machine, a frame,

a paper carriage supported for movement transversely of the frame, a feed screw extending transversely across the frame parallel to the path of movement of the carriage, a feed nut threaded on the screw, a connection between the carriage and the nut to cause the carriage to partake of the same movements as the nut, a ratchet wheel drivingly connected to the feed screw, a pawl movable through different fractional portions of its maximum throw to effect rotation of the ratchet wheel in one direction different distances which are multiples of the pitch of the ratchet wheel teeth to cause the carriage to move different distances each one of which is a multiple of a given spacing unit, a bank of keys for selecting character printing type, a power driven rock shaft, a separate but identically shaped profile cam for each character selecting key loosely mounted on the rock shaft, independent means operatively connected to each one of said character selecting keys for causing the profile cams for said keys to be connected to the rock shaft when the keys are depressed, and means operated by each profile cam when it is connected to the rock shaft to effect movement of the pawl through the fractional portion of its throw which will result in spacing movement of the carriage the proper number of spacing units to accommodate the printed impression of the character controlled by the depressed key, the means operated by the profile cams including a follow-up bar supported for pivotal and axial movements and having for each profile cam three different diametered grooved surfaces, said follow-up bar being pivotally moved as a result of operative engagement of any one of the profile cams with any one of that cam's three grooved surfaces and being axially movable to line up all of the profile cams with corresponding ones of the three grooved surfaces.

4. In a key operated printing machine, a frame, a paper carriage supported for movement transversely of the frame, a feed screw extending transversely across the frame parallel to the path of movement of the carriage, a feed nut threaded on the screw, a connection between the carriage and the nut to cause the carriage to partake of the same movements as the nut, a ratchet wheel drivingly connected to the feed screw, a pawl movable through different fractional portions of its maximum throw to effect rotation of the ratchet wheel in one direction different distances which are multiples of the pitch of the ratchet wheel teeth to cause the carriage to move different distances each one of which is a multiple of a given spacing unit, a bank of keys for selecting character printing type, a power driven rock shaft, a separate but identically shaped profile cam for each character selecting key loosely mounted on the rock shaft, independent means operatively connected to each one of said character selecting keys for causing the profile cams for said keys to be connected to the rock shaft when the keys are depressed, and means operated by each profile cam when it is connected to the rock shaft to effect movement of the pawl through the fractional portion of its throw which will result in spacing movement of the carriage the proper number of spacing units to accommodate the printed impression of the character controlled by the depressed key, the means operated by the profile cams including a follow-up bar supported for pivotal and axial movements and having for each profile cam three different diametered grooved surfaces, said follow-up bar being pivotally moved as a result of operative engagement of any one of the profile cams with any one of that cam's three grooved surfaces and being axially movable to line up all of the profile cams with corresponding ones of the three grooved surfaces, the three different diametered grooved surfaces of the follow-up bar for the profile cams being provided to effect spacing movements of the carriage to accommodate lower case and upper case foundry type faces and uniformly spaced typewriter type faces.

5. In a key operated printing machine, a frame, a paper carriage supported for movement transversely of the frame, a feed screw extending transversely across the frame parallel to the path of movement of the carriage, a feed nut threaded on the screw, a connection between the carriage and the nut to cause the carriage to partake of the same movements as the nut, a ratchet wheel drivingly connected to the feed screw, a pawl movable through different fractional portions of its maximum throw to effect rotation of the ratchet wheel in one direction different distances which are multiples of the pitch of the ratchet wheel teeth to cause the carriage to move different distances each one of which is a multiple of a given spacing unit, a bank of keys for selecting character printing type, a power driven rock shaft, a separate but identically shaped profile cam for each character selecting key loosely mounted on the rock shaft, independent means operatively connected to each one of said character selecting keys for causing the profile cams for said keys to be connected to the rock shaft when the keys are depressed, and means operated by each profile cam when it is connected to the rock shaft to effect movement of the pawl through the fractional portion of its throw which will result in spacing movement of the carriage the proper number of spacing units to accommodate the printed impression of the character controlled by the depressed key, the means operated by the profile cams including a follow-up bar supported for pivotal and axial movements and having for each profile cam three different diametered grooved surfaces, said follow-up bar being pivotally moved as a result of operative engagement of any one of the profile cams with any one of that cam's three grooved surfaces and being axially movable to line up all of the profile cams with corresponding ones of the three grooved surfaces, and means for increasing or decreasing the lengths of the movements of the pawl that result from depression of said keys.

6. In a key operated printing machine, a frame, a paper carriage supported for movement transversely of the frame, a feed screw extending transversely across the frame parallel to the path of movement of the carriage, a feed nut threaded on the screw, a connection between the carriage and the nut to cause the carriage to partake of the same movements as the nut, a ratchet wheel drivingly connected to the feed screw, a pawl movable through different fractional portions of its maximum throw to effect rotation of the ratchet wheel in one direction different distances which are multiples of the pitch of the ratchet wheel teeth to cause the carriage to move different distances each one of which is a multiple of a given spacing unit, a bank of keys for selecting character printing type, a power driven rock shaft, a separate but identically shaped profile cam for each character selecting key loosely mounted on the rock shaft, independent means

operatively connected to each one of said character selecting keys for causing the profile cams for said keys to be connected to the rock shaft when the keys are depressed, and means operated by each profile cam when it is connected to the rock shaft to effect movement of the pawl through the fractional portion of its throw which will result in spacing movement of the carriage the proper number of spacing units to accommodate the printed impression of the character controlled by the depressed key, the means operated by the profile cams including a follow-up bar supported for pivotal and axial movements and having for each profile cam three different diametered grooved surfaces, said follow-up bar being pivotally moved as a result of operative engagement of any one of the profile cams with any one of that cam's three grooved surfaces and being axially movable to line up all of the profile cams with corresponding ones of the three grooved surfaces, means other than said pawl and ratchet wheel for effecting rotation of the feed screw in either direction to cause the carriage to be moved any desired distance without depressing any of said printing character selecting keys, and means for disengaging the pawl from the teeth of the ratchet wheel when the feed screw is moved by the next preceding means in the direction opposite to that effected by the ratchet.

7. In a key operated printing machine, a frame, a paper carriage supported for movement transversely of the frame, a feed screw extending transversely across the frame parallel to the path of movement of the carriage, a feed nut threaded on the screw, a connection between the carriage and the nut to cause the carriage to partake of the same movements as the nut, a ratchet wheel drivingly connected to the feed screw, a pawl movable through different fractional portions of its maximum throw to effect rotation of the ratchet wheel in one direction different distances which are multiples of the pitch of the ratchet wheel teeth to cause the carriage to move different distances each one of which is a multiple of a given spacing unit, a bank of keys for selecting character printing type, a power driven rock shaft, a separate but identically shaped profile cam for each character selecting key loosely mounted on the rock shaft, independent means operatively connected to each one of said character selecting keys for causing the profile cams for said keys to be connected to the rock shaft when the keys are depressed, and means operated by each profile cam when it is connected to the rock shaft to effect movement of the pawl through the fractional portion of its throw which will result in spacing movement of the carriage the proper number of spacing units to accommodate the printed impression of the character controlled by the depressed key, the means operated by the profile cams including a follow-up bar supported for pivotal and axial movements and having for each profile cam three different diametered grooved surfaces, said follow-up bar being pivotally moved as a result of operative engagement of any one of the profile cams with any one of that cam's three grooved surfaces and being axially movable to line up all of the profile cams with corresponding ones of the three grooved surfaces, means for increasing and decreasing of the lengths of the movements of the pawl that result from depression of said keys, means other than said pawl and ratchet wheel for effecting rotation of the feed screw in either direction to cause the carriage to be moved any desired distance without depressing any of said printing character selecting key, and means for disengaging the pawl from the teeth of the ratchet wheel when the feed screw is moved by the next preceding means in the direction opposite to that effected by the ratchet.

8. In a printing machine, a frame, a paper carriage supported for movement transversely of the frame, means for advancing said paper carriage, a set of character printing type having faces which measure in width either one or multiples of one spacing unit, a bank of keys each one of which is operable to select a different one of said character printing type and causes the type face to make an impression, said paper carriage advancing means adapted to move the carriage either one-half or multiples of one-half of the aforesaid spacing unit, and means rendered active by the depression of the keys for causing two successive operations of the carriage advancing means, to thereby move the carriage the proper number of full spacing units to accommodate the width of the type faces selected by the depression of the keys.

9. A printing machine of the type defined by claim 8, further characterized by the last mentioned means being operable to cause the first of the two successive operations of the carriage advancing means to advance the carriage one-half of the spacing movement required to accommodate a given type face in advance of making of the impression and to cause the second of such operations to advance the carriage the second half of the required spacing movement immediately after the impression is made.

10. A printing machine of the type defined by claim 8, further characterized by the paper carriage advancing means including a ratchet wheel having its teeth pitched so as to produce the said one-half spacing unit movement, and a pawl for moving the ratchet wheel distances equal to one tooth pitch or multiples of one tooth pitch.

11. A printing machine of the type defined by claim 8, further characterized by the last mentioned means being operable to cause the first of the two successive operations of the carriage advancing means to advance the carriage one-half of the spacing movement required to accommodate a given type face in advance of the making of the impression and to cause the second of such operations to advance the carriage the second half of the required spacing movement immediately after the impression is made, the paper carriage advancing means including a ratchet wheel having its teeth pitched so as to produce the said one-half spacing unit movement, and a pawl for moving the ratchet wheel distances equal to one tooth pitch or multiples of one pitch.

12. In a printing machine of the type defined by claim 8, further characterized by the paper carriage advancing means including a lever, a link connected to one arm of the lever, and means for adjusting the point of connection of the link to the lever arm to increase or decrease the number of one-half spacing units through which the carriage is moved each time the advancing means is actuated.

WALTER J. HAUSMAN.