

(No Model.)

6 Sheets—Sheet 1.

W. E. CRANE.

MACHINE FOR PRODUCING PRINTING SURFACES.

No. 582,178.

Patented May 11, 1897.

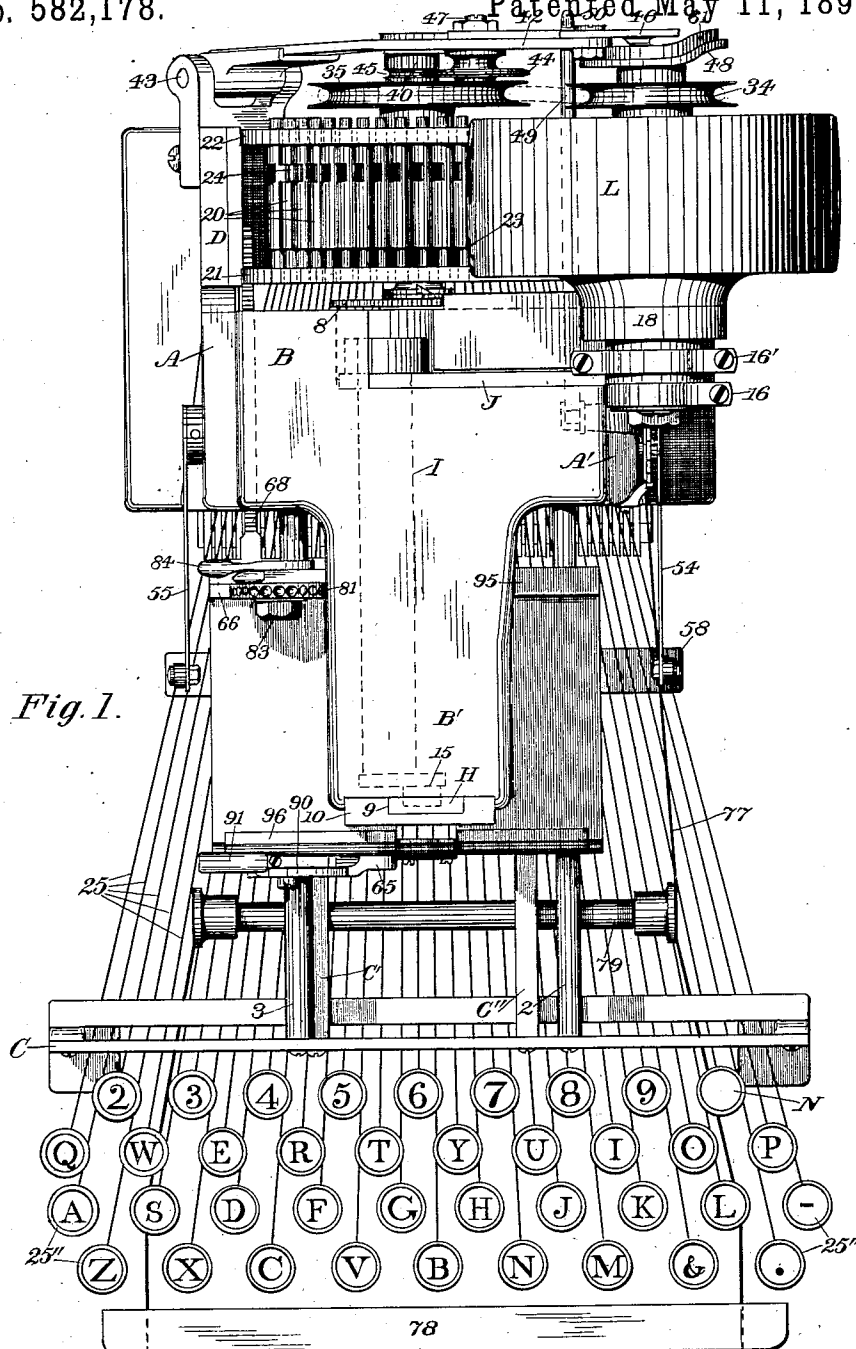


Fig. 1.

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BY F. H. Richards

ATTORNEY.

(No Model.)

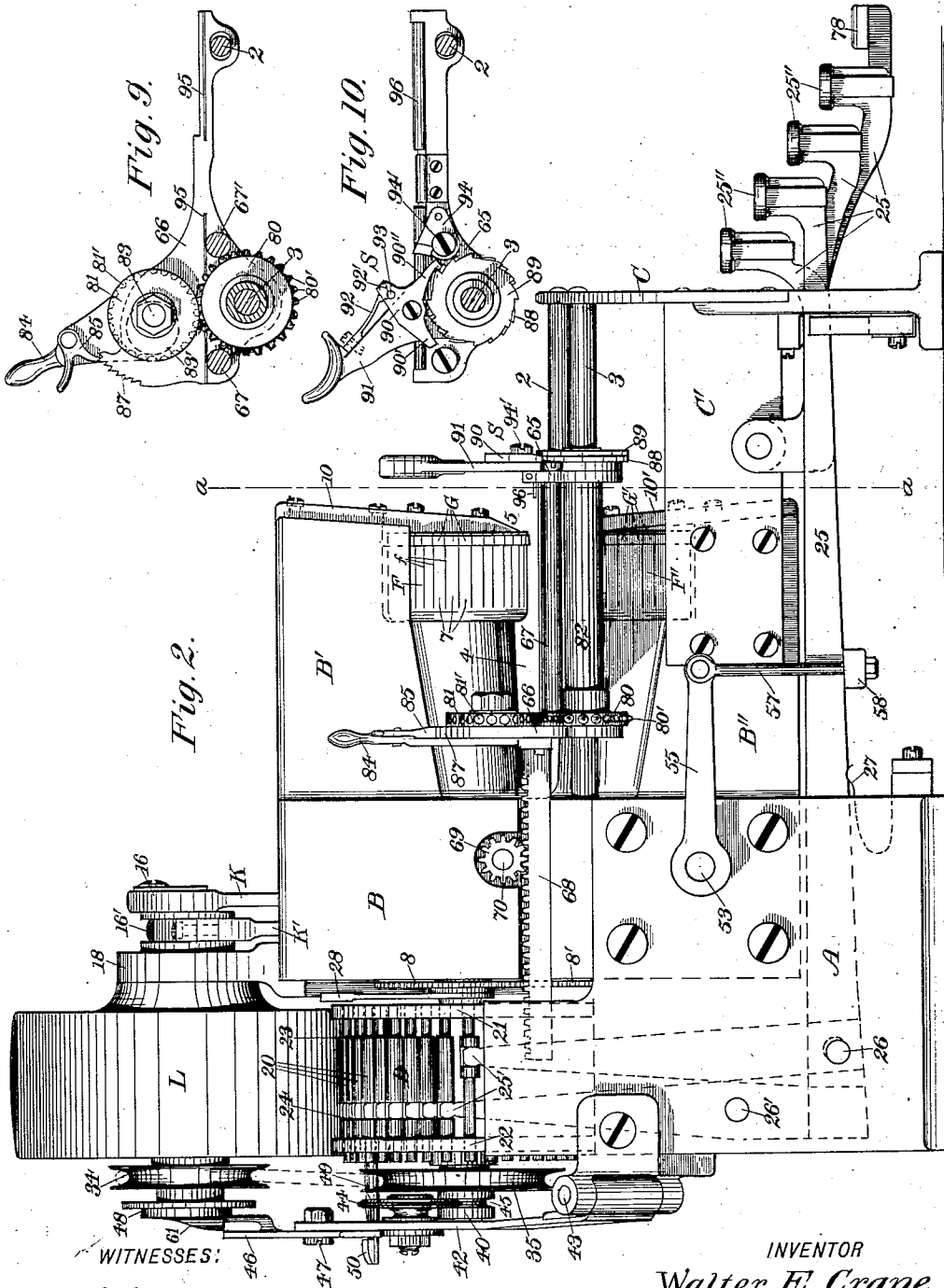
6 Sheets—Sheet 2.

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6 Sheets—Sheet 3.

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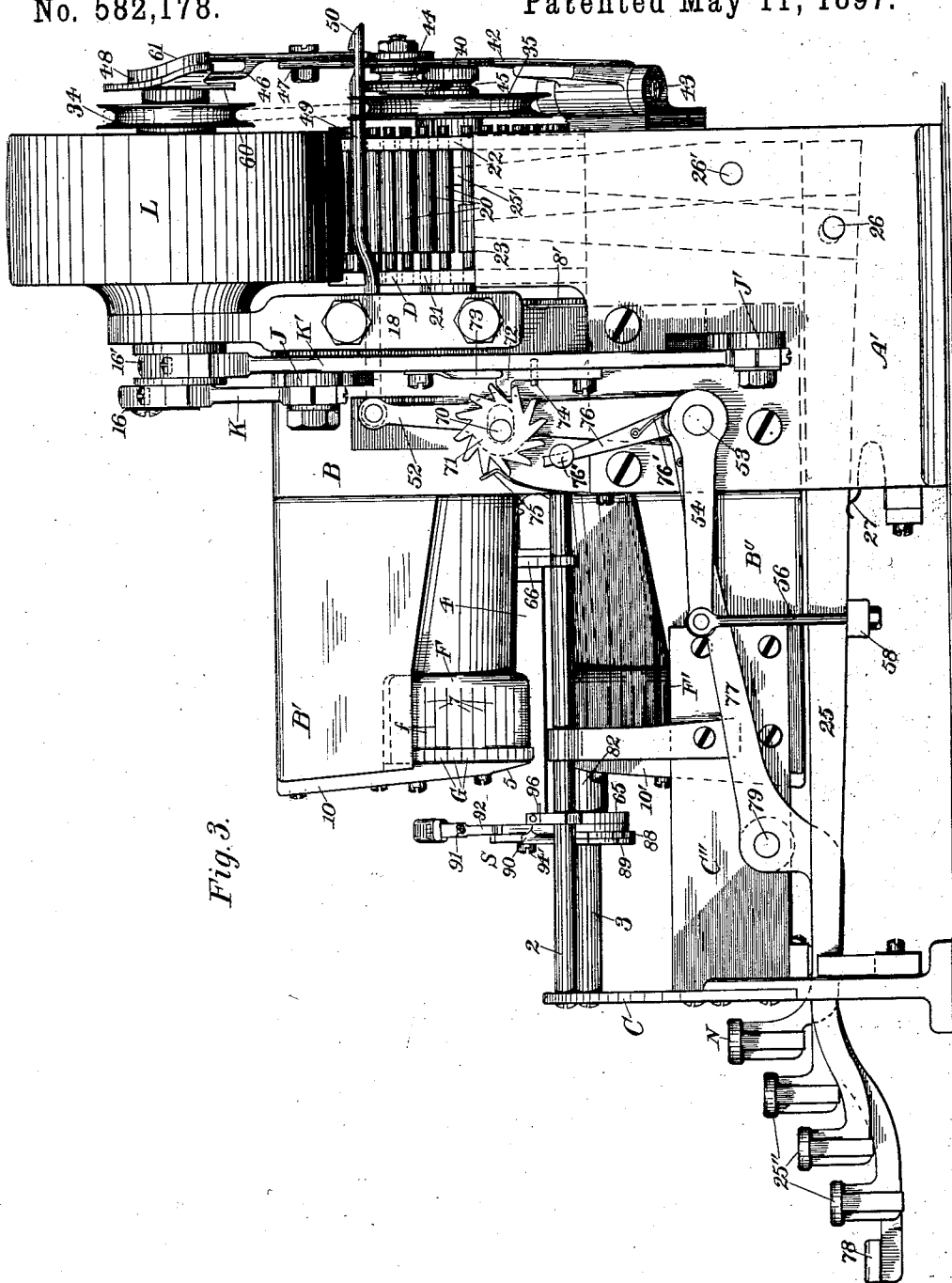


Fig. 3.

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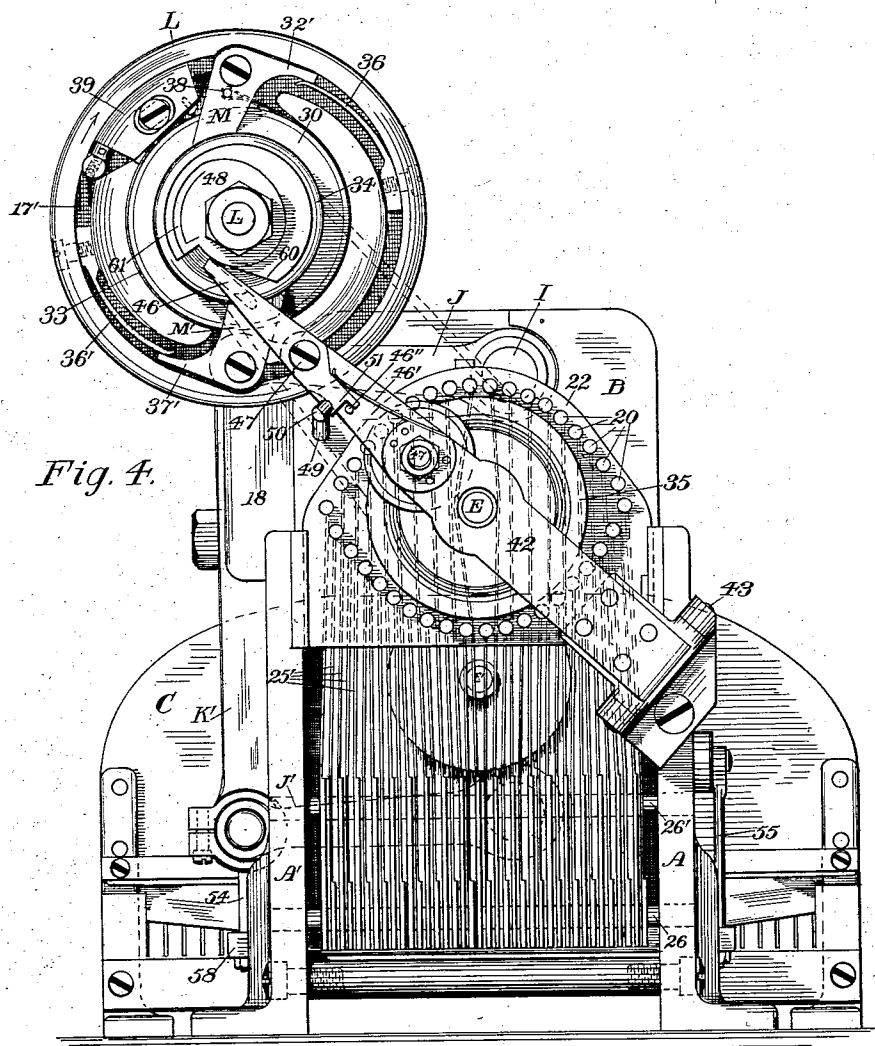
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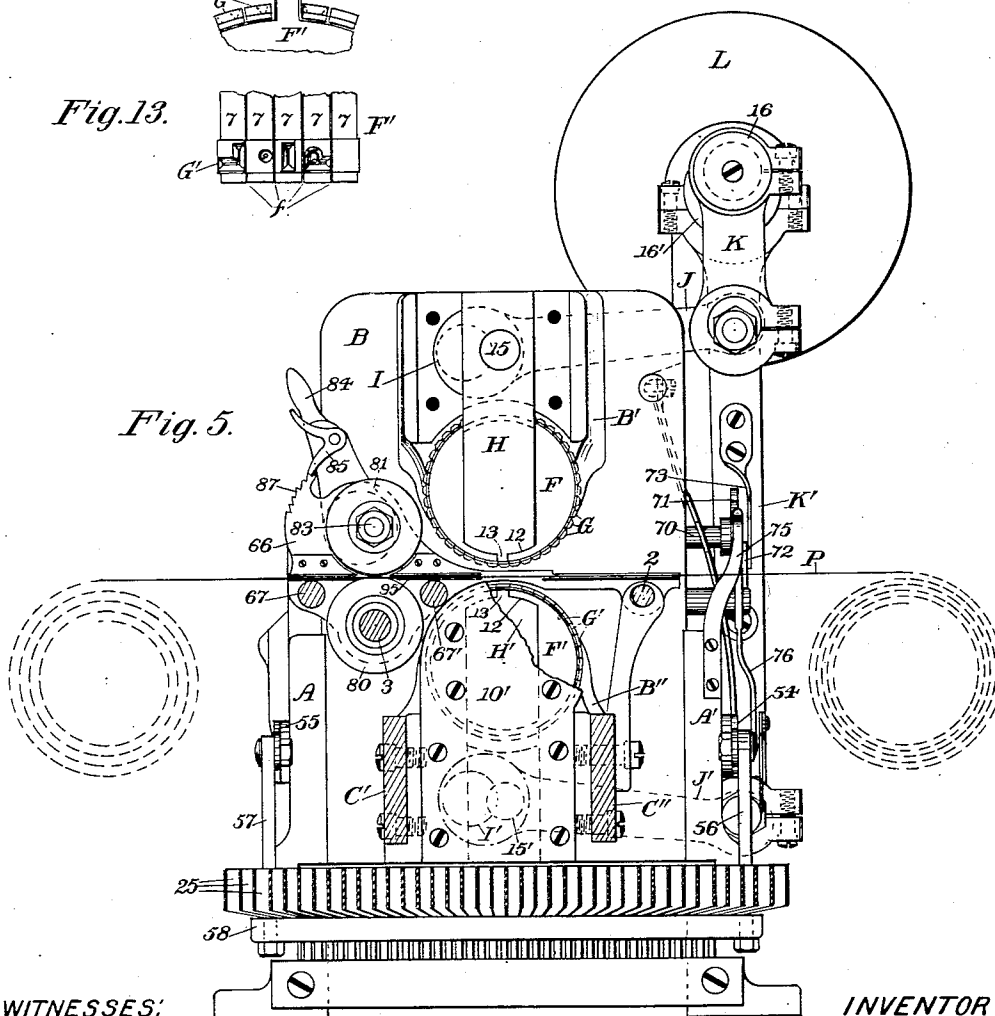
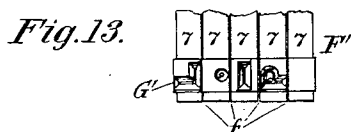
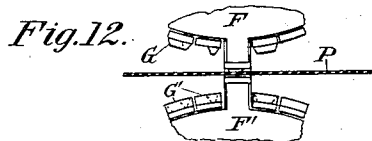
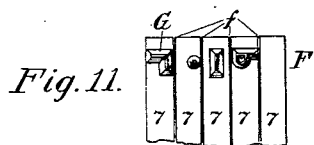
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6 Sheets—Sheet 5.

MACHINE FOR PRODUCING PRINTING SURFACES.

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(No Model.)

6 Sheets—Sheet 6.

W. E. CRANE.

MACHINE FOR PRODUCING PRINTING SURFACES.

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Fig. 7.

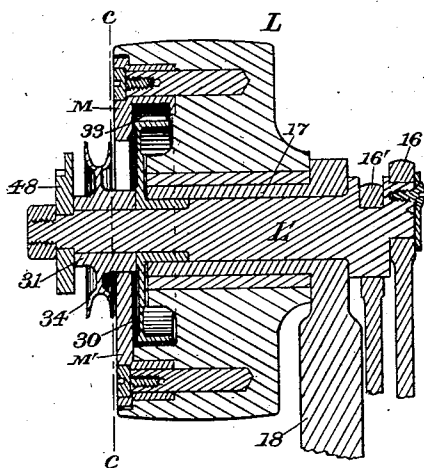


Fig. 8.

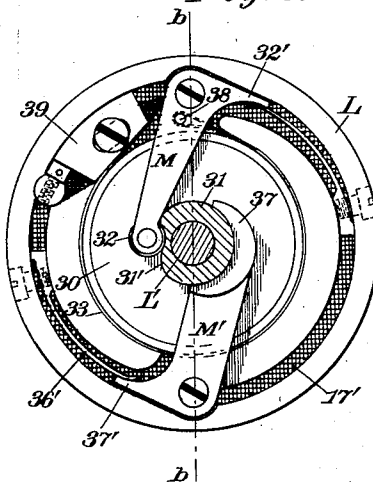
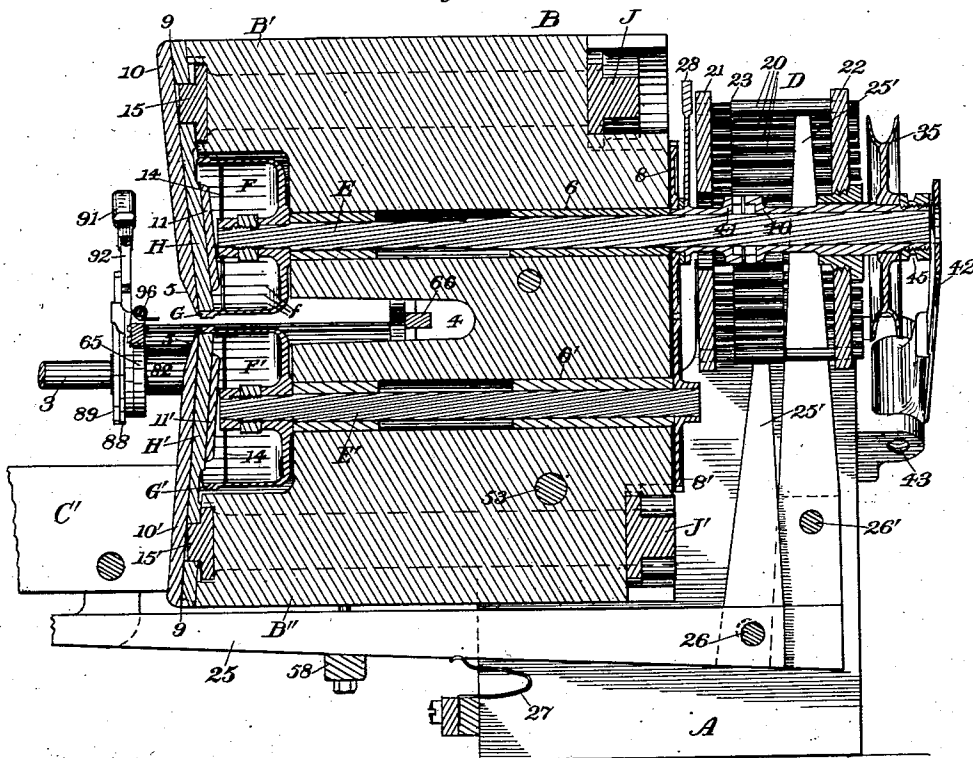


Fig. 6.



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UNITED STATES PATENT OFFICE.

WALTER E. CRANE, OF HARTFORD, CONNECTICUT.

MACHINE FOR PRODUCING PRINTING-SURFACES.

SPECIFICATION forming part of Letters Patent No. 582,178, dated May 11, 1897.

Application filed May 21, 1894. Serial No. 511,910. (No model.)

To all whom it may concern:

Be it known that I, WALTER E. CRANE, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Machines for Producing Printing-Surfaces, of which the following is a specification.

This invention relates to that class of machines for producing printing-surfaces by means of which printing-surfaces are produced upon a sheet of suitable material, such as sheet-brass, by forming characters thereon in relief, one character at a time, this invention being in the nature of an improvement upon the machines shown and described in my prior application for United States Letters Patent, Serial No. 509,985, filed May 3, 1894.

The principal object of my present invention is to provide improved means for successively forming characters in relief upon a printing-strip or other suitable sheet of material, one character at a time, this result being attained by means of coacting complementary dies mounted for independent radial movements upon their carriers and oppositely rotative in synchronism, and having means for radially closing the dies upon the strip from opposite sides thereof when the dies are alined in working position.

Another object of the invention is to so construct and organize the working parts of the machine which control the operation of the dies that in case two key-levers or die-actuators (which are indirectly connected with and which select and determine the movements of the dies to be brought into use) should be depressed or operated almost simultaneously, or one very slightly in advance of the other, the last one so depressed will have no effect unless the operation of the first-selected die shall have been completed.

Another object of the invention is to provide an improved shiftable carriage for supporting the material to be operated upon, whereby a continuous sheet of material of indefinite length may be fed between complementary dies in position for being operated upon, and whereby dots or cavities may be formed in one or both side edges of the strip to enable the same to be fed through the carriage of the machine, and to so form said dots

or cavities that they may be subsequently utilized as guides or gages to facilitate printing from said strip when the same shall be used in connection with a suitable printing-machine for printing purposes; also, to furnish in connection with the carriage of the machine improved line-spacing mechanism, whereby the extent of said spacing may be varied as may be required.

In the drawings accompanying and forming a part of this specification, Figure 1 is a plan view of a machine embodying my present improvements, said machine being provided with two sets of dies arranged for simultaneous rotary movement about fixed axes and having means for carrying the material to be operated upon between the two sets of dies. Fig. 2 is a side elevation of the machine as seen from the left hand in Fig. 1. Fig. 3 is a side elevation of the machine as seen from the right hand in Fig. 1. Fig. 4 is a rear elevation of the machine as seen from the left hand in Fig. 2. Fig. 5 is a sectional front elevation of the machine, taken in line *a a*, Fig. 2, some of the parts at the left hand of said line being removed for more clearly showing the arrangement of certain operative details, a continuous strip of material being shown in position between the two sets of dies. Fig. 6 is a longitudinal vertical section of the die-carrying head and a portion of the framework of the machine, showing the arrangement of the die-carriers and parts of their operating mechanism. Fig. 7 is a vertical section, taken in line *b b*, Fig. 8, of a portion of the driving mechanism which actuates the die-carriers and die-operating slides. Fig. 8 is a sectional rear elevation of the same, taken on the line *c c*, Fig. 7, looking toward the right hand in said figure. Fig. 9 is a sectional front view of a portion of the carriage, showing the feed-wheels for feeding the material between the dies and for forming the "guiding-dots" or depressions therein, said figure also showing the lever for throwing one of the feed-wheels out of engagement with the other one. Fig. 10 is a sectional front elevation of a portion of the frame of the carriage, showing the feed-wheel-actuating mechanism. Fig. 11 is an under side view, on an enlarged scale, of a portion of the upper die-carrier. Fig. 12 is a front view of a portion of the two die-carriers,

showing two complementary dies pressed into engagement with the ductile or flexible strip, said figure showing a portion of the two die-operating slides. Fig. 13 is a plan view of a portion of the lower die-carrier, which is a complement of the die-carrier shown in Fig. 11.

Similar characters designate like parts in all of the figures.

My improved machine for producing printing-surfaces, in the preferred form thereof herein shown and described, comprises two complementary coacting sets of dies of cameo and intaglio type, respectively mounted for independent radial movements upon two revolvable carriers, means for simultaneously rotating said two carriers to bring the successive dies of one carrier into alinement with the complementary successive dies of the adjacent carrier and into position for operation to form a character in a strip of suitable material, means for arresting the movements of the die-carriers at predetermined points in their travel to bring the requisite complementary coacting dies, one on each carrier, into working position each side a printing-strip and to retain the same in said position until an impression has been made, and means in position and adapted for engaging and closing said two coacting complementary dies relatively to their carriers (when in working position) to form a character upon or in the material held between said dies, all of which will be hereinafter more fully described.

The framework of my improved machine may be of any suitable construction for carrying the several operative details, it being herein shown as consisting of the two side plates or uprights A and A', the main frame or head of the machine, (designated in a general way by B,) which is secured between said uprights, the front plate C, connected at its upper end to the head B, near the central portion of said head, by rods 2 and 3, which rods constitute guides for the shiftable carriage, as will be hereinafter described, and connected near its lower end to said head by side plates C' and C'', and a stop-carrying frame (designated in a general way by D) secured between the side plates A and A' in the rear of the head B, as will be hereinafter described.

In the form thereof herein shown the main frame or head B is transversely recessed at its forward end midway of its height, as shown at 4, forming practically two forwardly-projecting parallel arms B' and B'', sufficiently remote from each other to permit the passage between them of the strip of material (designated by P) to be operated upon. The forward ends of these two arms are preferably vertically inclined toward a common center between the adjacent edges thereof, as shown at 5 in Figs. 2, 3, and 6, the purpose of which will be hereinafter described. Formed longitudinally through the head B are two horizontally-parallel journal-bearings 6 and 6', respectively, located one above and the

other below the space 4, as most clearly shown in Fig. 6 of the drawings. In these bearings are journaled two die-carrying shafts E and E', respectively, which shafts have secured to their forward ends (one to each shaft) two complementary revolvable die-carriers F and F', respectively, which carriers have formed thereon or secured thereto the impression-dies G and G', respectively adapted for impressing characters in the strip of material to form printing-surfaces. The two arms B' and B'' of the head B will be transversely and vertically recessed at their forward adjacent edges to receive the die-carriers F and F'. These die-carriers in the preferred form thereof herein shown are, and usually will be, in the nature of wheels or drums, the rims of which will preferably be constructed of resilient metal slit transversely, as shown at f, most clearly in Figs. 11, 12, and 13, to form a series of yielding die-carrying arms 7. Formed upon or secured to the ends of the resilient arms of both carriers or drums F and F' are dies G and G', the ones G upon the carrier F being of cameo construction and the ones G' upon the carrier F' being of intaglio construction, each die of one carrier being complementary to or coinciding with a die arranged in a coinciding position upon the adjacent carrier.

In the drawings, Figs. 6, 11, 12, and 13, I have shown the dies as formed integral with the die-carriers, the resilient arms of said carriers F and F' being enlarged at their free ends and having characters formed upon and in their adjacent faces, respectively. It will be understood, however, that I do not desire to limit myself to the particular construction of dies and die-carriers shown in said figures. These die-carriers are secured to their respective shafts so that two coinciding dies, one of each series, will normally be in direct alinement and in close proximity to each other, sufficient space being left between the dies to permit the free passage of the material to be operated upon. Secured to the rear ends of the two die-carrier shafts E and E', are gear-wheels 8 and 8', respectively, which gear-wheels are in intermeshing engagement and are adapted for intermittently rotating the two shafts, the carriers, and the dies simultaneously in synchronism and at equal speed, so as to insure the constant coincidence in position of complementary dies upon the two die-carriers, so as to bring any two selected complementary dies into working position directly in vertical alinement between the axes of the two shafts, it being understood that the successive dies of each set are radially disposed with relation to the axis of its respective carrier.

As a means for preventing the resilient die-carrying arms of the carriers (which in practice will be tempered in the form shown in Fig. 6) from being bent inward out of alinement owing to frequent vibrations during operation, I have provided in connection

with each carrier a disk 14, which will preferably be secured to the shaft of said carrier and which has a peripheral bearing against the inner faces of the die-carrying arms, thus retaining said arms normally in peripheral alignment and preventing them from being sprung inward beyond their proper normal positions.

As shown in Fig. 6, the die-carriers are cup-shaped, they being open at their forward ends to permit the entrance and operation of the two die-operating members of slides H and H', respectively, which slides are fitted for sliding movement in slideways 9, formed in the rear faces of the two caps 10 and 10', secured to the front ends of the arms B' and B'' of the head B, plates 11 and 11' being secured to the caps 10 and 10' at the rear of the slides H and H' near the inner ends thereof, as shown, to prevent lateral movement of said slides during operation. These slides will preferably be curved at their adjacent ends, as shown at 12, to correspond with the curvature of the interior of the die-carriers, and each slide has a central die-engaging finger or projection 13 of slightly less width than the width of the die it is to operate, which finger terminates adjacent to the inner face of the die located in impression position, which die is the one to be operated.

As a means for actuating the die-operating slides H and H', which extend inward with their operating-faces terminating adjacent to the inner faces of two adjacent dies, as shown in Fig. 6, said slides are carried at their outer ends upon cranks 15 and 15', formed upon the forward ends of rock-shafts I and I', respectively journaled in the head B, one above and the other below the two die-carrier shafts, as shown partially in full and partially in dotted lines in said Fig. 6. Secured to the rear ends of the rock-shafts I and I' are rocker-arms J and J', respectively, which rocker-arms are connected at their outer ends by connecting links or rods K and K' to oppositely-disposed eccentrics or cranks 16 and 16' upon a driving-shaft L', journaled in a bearing 17, formed upon an upright 18, secured to the frame of the machine, as most clearly shown in Figs. 3, 5, and 7 of the drawings.

The driving mechanism for rotating the die-carriers F and F' and for reciprocating the die-operating slides H and H' comprises, in part, a revoluble driver or wheel L, loosely mounted for continuous rotation upon the tubular journal-bearing 17, said driver being operatively connected with one of the die-carrier shafts, as E, by a frictional or yielding driving device, as will be hereinafter more fully described.

As a means for stopping the rotation of the die-carriers at various predetermined points in their travel to insure the positioning of the requisite pair of dies for use I have provided, in connection with one of the die-carriers, a stop mechanism, which, in the pre-

ferred form thereof herein shown, consists of a multiplicity of pin-stops 20, which coincide in number to the number of pairs of dies employed. These pin-stops are herein shown supported for longitudinal movement in the front and back plates 21 and 22 of the stop-carrying frame D and as having their angular positions relative to a common center coincident with the angular positions of the dies upon the die-carrier. These pin-stops are shouldered at their forward ends, as shown at 23, to limit the forward movement thereof, and are each notched, as shown at 24, near their central portions, in which notches 24 of each pin-stop engages the upwardly-projecting end 25' of a key-lever 25. These key-levers are fulcrumed near their lower ends, a portion thereof upon a rod 26 and a portion thereof upon a rod 26', secured at their ends in the side plates A and A' of the machine. Each key-lever is provided at its forward end with a suitable key 25'', having a character thereon to correspond with the character of the pair of dies whose movements said key controls, after the manner of key-levers of ordinary type-writers. It will be understood that the key-lever described constitutes one of a series of key-levers, which correspond in number to the number of pin-stops employed, all of which key-levers are approximately duplicates of one another. Each key-lever is normally held up to its working position by means of a suitable spring 27, bearing against the forward end thereof, and is adapted to independently actuate one of the pin-stops just described, which pin-stop determines the positioning of one pair of dies. These pin-stops are located around the shaft E and are adapted to be shifted independently, with their forward ends intersecting the path of travel of a radial stop-arm 28, secured to the shaft E and adapted to rotate therewith, as most clearly shown in Fig. 4 of the drawings.

In the embodiment of my invention herein shown the driving mechanism consists of the driver L, mounted upon the cylindrical bearing 17 and adapted to be continuously rotated by a belt (not shown) driven from any suitable source of power, a friction-wheel 30, fixed to the die-actuating shaft or crank-shaft L', a cam 31, loosely mounted upon the outer end of the shaft L', driving-levers M and M', pivotally carried by the driver and held in yielding contact with the cam 31, and a friction-band 33, adapted for engaging the wheel 30, as most clearly illustrated in Figs. 7 and 8 of the drawings. The driver L is in the nature of a wheel recessed at one side thereof, as shown at 17', to receive the friction-wheel and driving-levers, as will be understood by reference to said Figs. 7 and 8. Loosely mounted upon the outer end of the die-closing shaft L' and preferably formed integral with the cam 31 is a grooved pulley 34, which is connected by means of a belt (shown in dotted lines in Figs. 2, 3, and 4 of the drawings) to a similar pulley 35, connected with

the die-carrier shaft E, which shaft receives its motion through said belt and pulleys and the driving mechanism hereinbefore mentioned.

5 In the organization herein shown the cam 31, through the medium of which the carrier-shaft E is rotated and which controls the movement of the die-closing shaft L', and consequently the reciprocatory movement of
10 the die-actuating slides, is in the nature of a wheel carried on the shaft L' and having an offset or cam-groove 31' formed in one face thereof, against which a friction-roller 32, pivoted to the working end of the lever M,
15 normally bears, said lever being held with the friction-roller in constant engagement with the cam by means of a spring 36, secured to the driver L and bearing at its free end against a laterally-projecting arm 32' upon
20 the opposite end of the lever M. The lever M', which is oppositely disposed with relation to the lever M, is provided at its inner end with a brake-shoe 37, which bears against the face of the cam 31 opposite the point against
25 which the friction-roller 32 of the lever M bears, said lever M' being also held in contact with the cam 31 by a spring 36', which bears at its free end against a laterally-projecting arm 37' upon the lever M'. This lever M',
30 which is in constant frictional engagement with the cam 31, has a tendency to continue the rotation of the cam, and thereby will prevent any backward movement or rebound of the cam after it has been stopped by the inter-
35 ception of movement of the die-carrier. This construction and arrangement of cam and driving-levers constitutes a frictional driving device or let-off driving connection for rotating the pulley 35, connected with the
40 die-carrier shaft E, and maintains a simultaneous movement between the cam 31 and said pulley 35 until the pulley 35 is stopped in its rotation, which occurs when one of the pin-stops 20 is thrown into the path of movement
45 of the stop-arm 28 by means of one of the key-levers to position a pair of dies for use, as will be hereinafter described. Said stopping of the pulley 35 also stops the pulley 34 and the cam 31, connected therewith, which, owing
50 to the continued rotation of the driver L, causes the friction-roller 32 of the lever M to ride out of the cam-groove 31', at which time the frictional driving-belt 33, which surrounds the friction-wheel 30 and is connected at one
55 end, as at 38, to the lever M and at its opposite end to a block 39, connected, as herein-after described, to said driver, is brought in close impingement by the movement of said lever M with the friction-wheel 30, which,
60 being fixed to the power-shaft L', rotates said driving-shaft and operates, through the connections hereinbefore described, the die-operating slides H and H'. The shaft L' is carried the distance of one revolution at each
65 operation of a key-lever, which brings the cam-groove of the cam again contiguous to the friction-roller of the lever M, when said

lever immediately drops into the said groove, releasing the friction-band from the wheel 30 and permitting the cam to again rotate with
70 the driver. This operation takes place at each depression of a key-lever, as will be hereinafter more fully explained.

By the foregoing it will be seen that the lever M has two functions—that of assisting to
75 rotate the cam that actuates the die-carrier and for intermittently actuating the die-closing mechanism—while the lever M' constantly tends to rotate said cam, which keeps the same, when stopped, up to its last position, to
80 prevent backward movement thereof.

The pulley 35 is fixed to a sliding member 40 of a clutch, herein shown as a pin-clutch, which member 40 is loosely mounted upon
85 the die-carrier shaft E and is adapted for engagement with a similar clutch member 41, fixed to the said shaft.

As a means for throwing the two clutch members into engagement one with the other, so as to periodically rotate the die-carriers F
90 and F', a shifter-lever 42 is provided, which is herein shown as hinged at its lower end at 43 to the frame of the machine and is provided with a friction-roller 44, which enters a groove 45 in a sleeve fixed to the outer end
95 of the clutch member 40. This shifter-lever, in the form herein shown, is provided at its upper end with a bifurcated extension 46, which is pivotally connected therewith, as shown at 47, and operatively engages a cam
100 48, secured to the driving-shaft L, the function of which cam will be hereinafter set forth.

As a means for throwing the shifter-lever or swinging arm 42 inward at each operation
105 of a key-lever to throw the clutch members into engagement and rotate the die-carriers an actuator 49 is provided, which in this instance is in the form of a rod supported for longitudinal movement in the frame and hav-
110 ing at its outer end a hook 50 to engage the lower end or catch 51 of the extension 46 of the shifter-lever. This rod is connected at its forward end with an operating-lever 52, straddling the shaft of the feed ratchet-wheel
115 for the carriage, hereinafter referred to, which in turn is secured at its lower end to a shaft 53, extending transversely through the frame of the machine, and which is actuated by levers 54 and 55, secured to the ends of said
120 rod and connected by straps or rods 56 and 57 to a universal bar 58, extending transversely below the key-levers of the machine in position to be operated by any one of said
125 key-levers, as will be readily understood by a comparison of Figs. 1, 2, and 3 of the drawings. The shifter-lever actuator 49 is normally positioned with its hook in engagement with the transversely-shiftable arm or extension 46 of the shifter-lever, as illustrated in
130 Figs. 3 and 4 of the drawings, the clutch members 40 and 41 being disengaged, but in position to be immediately shifted into engagement upon the depression of a key-lever.

The operation of the machine is as follows: Assuming the driver L and the clutch member 40 as being rotated in unison, the first results accomplished by the depression of a key-lever are to simultaneously throw a pin-stop 20 into the path of travel of the stop-arm 28, secured to the clutch member 41, which is fixed to the die-carrier shaft E, and to throw the clutch member 40 into engagement with the clutch member 41, which starts the rotation of the die-carriers. This rotation is continued until the stop-arm 28 comes in contact with the stop-pin selected and projected into the path of travel thereof, which immediately arrests the rotation of the shaft E, stopping at the same time the pulley 35, the pulley 34, and the cam 31, carried upon the power-shaft L'. This stopping of the parts just described leaves the pair of dies selected in position for forming an impression in the material supported between said dies. The driver L, continuing its rotation, carries the end of the lever M out of the cam-groove in the cam 31, which tightens the friction-band around the friction-wheel 30 and causes said friction-wheel, together with the driving-shaft L', to which it is fixed, to rotate, as before described, which operates the links K and K', which, through the medium of the rocker-arms J and J', rocks the shafts I and I', to which the die-operating slides H and H' are connected, thus causing these slides to move toward each other and operate the dies that have been positioned for use.

The actuating-cam 48 for the clutch-shifting lever is provided with two cam-faces 60 and 61, the one 60 of which is peripherally disposed and first acts to throw the arm or extension 46 transversely of the shifter-lever with its lower end out of engagement with the hook of the actuator 49, after which the cam-face 61, which is in the nature of a transversely-deflected flange, acts to throw the shifting-lever backward, which carries the clutch member 40 out of engagement with the member 41, leaving the parts in position to be rotated when the friction-band 33 is released from the friction-wheel 30, which occurs when the shaft L' has completed a revolution, as before stated. The extension or arm 46 of the shifter-lever is normally held in the position shown in Fig. 4 by a spring 46', secured to said shifter-lever and bearing at its free end against the lower end of the arm 46, the movement of said arm 46 being limited by a stop 46'', as shown in said figure. The cam-faced flange 61 is adapted to enter between the forks of the arm 46, which prevents the accidental outward movement of the shifter-lever until the proper time for disengaging the clutch members 40 and 41 has arrived.

From the foregoing it will be seen that upon the depression of any key-lever the two complementary dies which are governed by the pin-stop connected with the key-lever depressed will be immediately carried into po-

sition for use, stopped, and then immediately pressed together by the operation of the slides H and H', after which they are released, and all parts, excluding the die-carriers, return to their normal position ready for operation when another key-lever is depressed, the dies being left in the position last attained until the die-carriers are again rotated.

After the starting of the shaft L, which actuates the die-operating slides, (the complementary dies being at this time in position for use,) the shifting-lever-actuating cam acts to disengage the shifting-lever from the hook of the actuator 49, this being accomplished by the peripheral cam-face 60, which tips the extension 46 of the shifter-lever laterally, after which the cam-faced flange 61 acts to throw said shifting-lever outward, carrying the clutch member 40 out of engagement with the clutch member 41. The shifter-lever remains in such position after disengagement from the actuator 49 that it cannot be reoperated by the actuator until the crank-shaft or power-shaft L' has completed a revolution. Thus it will be seen that from the time of disengagement of the shifter-lever from the hook of the actuator it cannot be again operated to effect the engagement of the clutch members until the first operation has been entirely completed and the shifter-lever assumes its normal position ready for engagement with the hook of the actuator and the said actuator-hook has attained its normal operative position due to the release of a key-lever, after which said shifter-lever may be again operated to reengage the clutch members.

The construction and organization just described is of material importance, as it insures the completion of the impression movement of the parts and the return movement of said parts independent of the release of the key-lever, also prevents the inauguration of these movements by the operation of another key until the completion of the movements first mentioned and the parts have returned to their normal inoperative position, and also insures the retention of the type-carriers with their selected dies in proper operative position until an impression has been made.

The forward ends of the pin-stops will preferably be beveled or tapered, and the stop-arm 28, which will preferably be in the nature of a "spring-arm," will be likewise beveled at the face adjacent to said stop-arm, so as to prevent any possibility of injurious conflict between the two when the stop is projected forward, which might occur if the stop-arm should at this time happen to be in alignment with the pin projected.

The carriage for supporting and feeding the strip to be operated upon in the form thereof herein shown consists of the front and rear plates 65 and 66, respectively, which are remotely disposed and are connected together by suitable connecting-rods, as 67 and

67', said carriage being shiftably supported upon the guide-rods 2 and 3, which extend through openings formed in the front and rear plates, as most clearly shown in Figs. 9 and 10 of the drawings. Secured to or formed upon the rear plate 66 of the carriage is a horizontally-disposed feed-rack 68, the teeth of which are in mesh with the teeth of a pinion 69, secured to the end of a shaft 70, journaled transversely in the head B. This shaft is provided at its opposite end with a ratchet-wheel 71, adapted to be engaged by a pawl 72, pivotally connected with the link K', which actuates the lower rock-shaft I', that operates the die-operating slide H' and by means of which said shaft 70 is rotated to feed the carriage forward, as will be understood by reference to Figs. 2 and 3 of the drawings.

The ratchet-wheel 71 is shown in Fig. 3 as carried on the end of the shaft 70, and in order to permit the lever 52 to operate properly while maintaining a compact organization of the parts the lever 52 is shown in this figure as having an elliptical opening transversely of said lever, as illustrated in dotted lines, so that as the lever oscillates back and forth it may work in a path from one side to the other of the shaft 70 without interfering with the same.

It will be seen that the connecting-rod K' has approximately an elliptical movement. The downward movement thereof carries the pawl into engagement with the ratchet-wheel, rotates the ratchet-wheel the proper distance—i. e., the distance of one tooth—and carries the pawl out of engagement with said ratchet-wheel, while the upward movement of said connecting-rod carries the pawl from its disengaged position upward at one side of the ratchet-wheel into position for reengagement with the ratchet-wheel upon the downward movement of the connecting-rod. Thus it will be seen that at each complete movement of the connecting-rod or complete revolution of the power-shaft L', which takes place at each depression of a key-lever, the carriage is fed forward the requisite distance for the next letter to be impressed in the material carried thereby.

The ratchet-wheel-actuating pawl 72 is pivotally connected with the connecting-rod K' and is normally held in an operative position by a spring 73, secured to said connecting-rod and bearing at one end against the tooth-engaging end of the pawl, a stop 74 (see Fig. 3) being provided to limit the inward movement of said pawl. This resilient connection also prevents any liability of breakage in case the pawl should accidentally be brought in contact, when moved inward, with the side face of a tooth of the ratchet-wheel. The ratchet-wheel is held against accidental movement and in position to be engaged by the pawl by means of a suitable spring 75, secured to the side plate A' of the machine and bearing at its free end between

two teeth of the ratchet-wheel, said spring constituting a detent-catch therefor.

As a means for actuating the ratchet-wheel independent of the movement of the shaft L and connecting-rod K', as is desirable to feed the carriage for spacing between words, I have provided a ratchet-actuating lever 76, connected at its lower end to a lever 77 of a spacing-bar 78, which lever 77 is fulcrumed upon a shaft 79, journaled in the framework of the machine, the ratchet-wheel-actuating lever 76 being in position for engaging a tooth of and for rotating said ratchet-wheel at each depression of the spacing-bar 78, as will be clearly understood by reference to Fig. 3 of the drawings, the spacing-bar being retracted in any usual manner, as by springs, after each operation.

The pawl 76 is shown herein as having its rearward movement limited by a stop 76'', which is recessed at its forward side to form a guide for the pawl, and said pawl is also illustrated as pivoted to the lever 77 and held up against the stop 76'' by means of a spring 76', so that the pawl will have a slight oscillatory movement.

In connection with the shiftable carriage I have provided an improved line-spacing mechanism for moving the material forward the requisite distance for spacing between lines and have also provided means whereby the spacing may be varied as required. This line-spacing mechanism, in the preferred form thereof herein shown, consists of a pair of feed members connected for rotation in opposite directions and illustrated as two intermeshing feed-wheels 80 and 81 and a pawl-and-ratchet feed-wheel-actuating device (designated in a general way by S) in connection with and adapted for rotating said feed-wheels.

In the construction and organization herein shown one of the feed-wheels, as 80, has a series of peripheral projections 80' and is secured to the rear end of a tubular shaft 82, which has a bearing at its ends in the front and rear plates of the carriage and surrounds the guide-rod 3, while the other feed-wheel 81 has a series of peripheral indentations 81' to coincide with the projections upon the feed-wheel 80 and is revolvably supported upon a crank-pin 83 of a stud 83', journaled in the back plate of the carriage. Secured to the rear end of the stud 83' is a lever 84, by means of which the feed-wheel 81 may be thrown out of engagement with the feed-wheel 80, as is required when inserting or removing a strip of material in said carriage. As a means for holding the feed-wheels in close intermeshing engagement a pawl 85 is provided, which is pivotally carried upon the lever 84 and is adapted for engaging the ratchet-teeth 86, formed in the side edge of an upwardly-projecting curved arm 87 of the back plate 66 of the carriage. When the pawl 85 is released from engagement with these ratchet-teeth and the lever 84 is drawn to the left, as seen in

Fig. 9, the crank-pin 83 will revolve with the rotary stud 83', to which stud the lever is secured and, moving upward, will carry the feed-wheel 81 with it in a substantially vertical direction and thus withdraw said feed-wheel in practically a straight line from engagement with the complementary feed-wheel 80. Secured to the forward end of the tubular shaft 82 are two concentrically and adjacently disposed ratchet-wheels 88 and 89, adapted to be engaged by a pawl 90, pivotally carried upon a feed-lever 91, pivotally supported upon the shaft 82 at one side of said ratchet-wheels. These ratchet-wheels have peripheral teeth to be engaged by the pawl 90; but the teeth of one ratchet-wheel, as 88, which will be herein termed the "short-distance" ratchet-wheel, are a shorter distance apart than those of the ratchet-wheel 89, which will be herein termed the "long-distance" ratchet-wheel. The short-distance ratchet-wheel usually has sixteen teeth, while the long-distance ratchet-wheel has twelve teeth. The pawl for engaging these two ratchet-wheels is herein shown as a double pawl, or a pull-and-push pawl, it having two ratchet-wheel-engaging arms 90' and 90'', one arm of which is adapted for engagement with a tooth of the ratchet-wheel 88, and the other arm of which is adapted for engagement with a tooth of the adjacent ratchet-wheel 89. As a means for holding one or the other of the arms of the pawl 90 in engagement with one or the other of the ratchet-wheels 88 or 89 a spring 92 is provided, which spring is secured to the feed-lever 91 and has an angular bearing-face 92' at its free end, which is adapted to bear at one or the other side of a pin 93 upon the pawl 90 to normally hold one or the other of the arms of said pawl in engagement with one or the other of said ratchet-wheels, as will be clearly understood by reference to Figs. 2 and 10 of the drawings.

In practice the feed-lever 91 will be constructed and organized to have a throw of sufficient length to accommodate for long or short spacing, abutments (not shown) being usually provided for this purpose. As a means for limiting the throw of the feeding-lever to accommodate for short spacing I have provided a stop 94, which is fixed by a screw 94' to the front plate of the carriage in position to be engaged by one end of the pawl 90 when the opposite end of the pawl is in its working position, this stop limiting the retractive movement of the pawl and insuring its engagement with the proper teeth.

In the form thereof herein shown the notches of the ratchet-wheel 88 are divided into four groups of four notches each, there being one long and three short notches in each group, while the one 89 is divided into four groups of three notches each, there being likewise two short notches and one long notch in each group. Hence it will be obvious that I employ a pair of ratchet-wheels having each a plurality of groups of peripheral teeth, each

of which groups embodies teeth of variable ranges of throw, the groups of each wheel being like groups and preferably having a plurality of teeth of one range of throw and a single tooth of a greater range of throw. The object of this arrangement of ratchet-teeth is to permit the requisite spacing between lines, as, for instance, when forming printing-surfaces for printing addresses of two or three lines, and for leaving the requisite space between separate addresses, the short notches controlling the distance between lines of each address, while the long notches control the distance between separate addresses. This will be apparent by reference to Fig. 10, in which it will be seen that the short notches of the ratchet-wheel 88 are of equal length and that two of said notches are of greater length than the one long notch of the group; also, that the two short notches of the ratchet 89 are of equal length and that the two, taken together, are of greater length than the one long notch of their group. The long notches of the wheel 88 and the short notches of said wheel are also of less length than the corresponding long and short notches of the wheel 89, and the two short notches of the wheel 88 are of greater length than one long notch of the ratchet-wheel 89, so that with a given throw of the actuating-pawls for rotating the ratchet-wheels, and which throw is just sufficient to reach the distance of one of the long notches of the ratchet-wheels 89, it will be obvious that it will be impossible to grasp more than one tooth at a time on either ratchet-wheel, and hence the arc through which either ratchet-wheel will be rotated is positively controlled without varying the throw of the pawl for actuating such ratchet-wheel.

In the drawings the feed-wheels are shown as having one of them conical projections and the other conical indentations which form concavo-convex dots in the side edge of the strip of material as it is being fed through the carriage, which dots constitute a traction-surface or feed-rack for engagement with the feed-wheels to insure the advancement of the strip a predetermined distance at each intermittent movement of the feed-wheels, said feed-dots also being adapted for utilization as guides for the strip when the same is used in the carriage of the present machine or as feeding means when used in connection with a printing-machine for printing purposes.

The conical projections and indentations upon the respective feed-wheels are shown in Fig. 9 as complementary, so that the impressions formed in the strip will be in the nature of relieved projections having continuous surfaces, and these projections will not be punctured or perforated, and hence the material of the strip will not be weakened.

If desired, the feed dots or indentations may be formed in the strip before the said strip is inserted in the carriage.

The front and back plates of the carriage

have oppositely and horizontally disposed guiding-strips 95 and 96 connected therewith, the one 95 being preferably permanently fixed to the back plate of the carriage, as shown in Fig. 9 of the drawings, while the one 96 is preferably pivotally connected with the front plate of the carriage, as shown in Figs. 2 and 10. This construction and organization permit the printing-strip to be removed from the carriage or inserted irrespective of its longitudinal position lengthwise of the carriage when the feed-wheel 80 is thrown out of engagement with the said printing-strip, which is very desirable for the purposes of correction or change.

Each die-carrier in the form herein shown is provided with a plurality of pairs of character-forming dies and one pair of blotting-out dies. The pairs of character-dies, as before stated, have each a character formed in relief and a complementary character in indentation adapted for forming a character in relief upon a strip of material, while the blotting-out dies have plane faces and are adapted to be brought into alinement each side the character in the strip it is desired to blot out and to be closed to press the strip into its normal flat condition and in condition to receive a reimpression, if desired, said blotting-out dies being controlled in their movements by a blank key, (designated by N,) which key forms one of the series of keys hereinbefore described, the positioning and operation of the blotting-out dies being substantially the same as the position and operation of the character-forming dies, as will be readily understood by reference to the drawings and as more clearly described in my prior application hereinbefore referred to.

Having thus described my invention, I claim—

1. In a machine for producing printing-surfaces upon a strip of material held therein, a plurality of pairs of coacting complementary dies mounted for independent radial movements upon revoluble carriers; mechanism for rotating said carriers in synchronism to bring any pair of dies into alinement in working position; and means for automatically and radially closing said dies simultaneously upon the strip, and relatively to their carriers to form a raised type-surface when said dies are alined in working position, substantially as described.

2. In a machine for producing printing-surfaces upon a strip of material held therein, a die-carrier having a plurality of character-dies; in combination with a die-carrier having a plurality of radially and independently movable character-dies in complement of the dies of the first-named carrier; means for rotating one of said die-carriers in synchronism to bring two coacting dies into alinement in working position on each side of the strip; and means for automatically and simultaneously closing said dies radially and independently upon the strip to form therein a

raised type-surface when the dies are alined in working position, substantially as described.

3. In a machine for producing printing-surfaces upon a strip of material held therein, a pair of coacting complementary dies supported on resilient carrier-arms; key-actuated devices for rotating said dies in synchronism, and bringing the dies into alinement in working position on each side of the strip; and means for automatically and radially closing said dies upon said strip, to form therein a raised type-surface when the dies are alined in working position, substantially as described.

4. In a machine of the class specified, a die-carrier having one or more cameo-dies and a plane-faced or blotting-out die connected therewith for independent radial movements; in combination with a coacting die-carrier having one or more intaglio-dies and a plane-faced or blotting-out die disposed similarly to the dies of the first-mentioned carrier; key-actuated devices for rotating said die-carriers in synchronism, and for bringing any pair of complementary dies into alinement in working position on each side of a printing-strip, and for automatically and radially closing said dies upon said strip, when the dies are alined in working position, substantially as described.

5. In a machine of the class specified, one or more pairs of dies, each pair having a complementary character in cameo and intaglio, respectively, and a pair of blotting-out or plane-faced dies, and each die mounted for independent radial movement upon a die-carrier; in combination with key-actuated devices for rotating said carriers in synchronism, to bring any pair of mating dies into alinement in working position on each side of a printing-strip; and means for automatically and radially closing said dies upon said strip, when the dies are alined in working position, substantially as described.

6. In a machine of the class specified, a revoluble die-carrier having a plurality of yielding or resilient arms, each of which carries a die at the free end thereof; in combination with a coacting die-carrier having a plurality of similarly-disposed complementary dies; key-actuated devices for rotating said die-carriers in synchronism to bring successive pairs of mating dies, one pair at a time, into alinement in working position on each side of a printing-strip; and means for automatically and radially closing said dies upon said strip when the dies are alined in working position, substantially as described.

7. In a machine of the class specified, two coacting die-carriers supported for rotation in the same plane, and each having a plurality of similarly-disposed peripheral character-dies supported for independent radial movements, the dies of one carrier being in cameo, and those of the adjacent carrier in intaglio; key-actuated devices for rotating said die-

carriers in synchronism, and for bringing two coating dies simultaneously into alinement in working position on each side of a printing-strip, and for automatically and radially closing said dies simultaneously upon said strip, when the dies are alined in working position, substantially as described.

8. In a machine of the class specified, two coating die-carriers supported and connected for synchronous movements in the same plane, and each having a plurality of peripherally-disposed character-dies, one in cameo, and the other in intaglio, and one or more plane-faced or blotting-out dies, all of which are connected with their respective carriers for independent radial movements; means for rotating said carriers in synchronism to simultaneously bring any pair of coating dies into alinement in working position on each side of a printing-strip; and means for automatically and independently closing said dies upon the strip in radial direction, relatively to the carriers, when the dies are alined in working position, substantially as described.

9. In a machine of the class specified, two coating die-carriers, each having a plurality of radially and independently movable complementary character-dies; and means for radially actuating complementary dies in synchronism; substantially as described.

10. In a machine of the class specified, two coating die-carriers, each of which has a character-die complementary to the other, and movable radially independently of its carrier; in combination with key-actuated devices for simultaneously bringing said dies into operative relation with, and closing them upon, each other, substantially as described, and for the purpose set forth.

11. In a machine of the class specified, two coating die-carriers connected together for synchronous oscillation, and each of which has a plurality of radially and independently movable character-dies, the dies of one carrier being in complement of those of the adjacent carrier, substantially as described.

12. In a machine of the class specified, two coating complementary die-carriers connected together for synchronous oscillation, and each of which has a plurality of radially and independently movable character-dies, the dies of one carrier being in complement of those of the adjacent carrier, in combination with key-actuated devices for bringing two mating dies into alinement and working position, and means for closing said dies, substantially as described.

13. In a machine of the class specified, two coating revoluble die-carriers, each having a plurality of radially and independently movable dies; a pair of oppositely-disposed die-operating members, one adjacent to the dies of each carrier, and in position for engaging a selected die of such carrier; in combination with key-actuated mechanism for rotating the die-carriers in synchronism to bring any pair of mating dies into alinement

in working position adjacent to their operating members; and means for simultaneously operating said members to close the positioned dies, substantially as described, and for the purpose set forth.

14. In a machine for producing printing-surfaces upon a strip of material held therein, a plurality of pairs of coating complementary character-dies mounted for independent radial movements upon revoluble die-carriers; in combination with die-operating members, one for each carrier, and located in position for closing one pair of the dies; key-actuated devices for synchronously rotating the two carriers in opposite directions to bring a pair of mating dies into alinement in working position on each side of said strip and adjacent to the operating members; and means for automatically operating said members, to radially close said dies upon the strip when said dies are alined in working position, substantially as described, and for the purpose set forth.

15. In a machine for producing printing-surfaces upon a strip of material held therein, a pair of coating complementary dies supported on the resilient arms of a pair of die-carriers; key-actuated devices for operating said carriers to synchronously bring said dies into alinement in working position on each side of said strip; in combination with a pair of oppositely-disposed die-operating members in position and adapted to radially close said dies upon the strip to form a raised type-surface therein; and means for automatically actuating said die-operating members, when said dies are alined in working position, substantially as described.

16. In a machine of the class specified, a pair of die-carriers carrying a pair of similarly-disposed coating complementary dies radially movable, relatively to said carriers; key-actuated devices for actuating said carriers, to synchronously bring said dies into alinement in the working position on each side of a printing-strip; in combination with a pair of oppositely-disposed die-operating members in position and adapted for radially actuating said dies; and a revoluble driver in connection with and adapted for automatically and simultaneously actuating said die-operating members, to close the dies, when said dies are alined in working position, substantially as described.

17. In a machine for producing printing-surfaces upon a strip of material held therein, the combination of two die-carrier shafts connected for rotation; a die-carrier secured to each shaft, one of which die-carriers has a plurality of independently and radially movable character-dies in cameo, and the other of which carriers has a plurality of similarly-disposed and independently and radially movable character-dies, in intaglio, and revoluble in synchronism with the cameo-dies; a rotatable driver in connection with said die-carrying shaft, and adapted for rotating said

shafts to bring a selected pair of dies into alinement in working position on each side of said strip; and mechanism in position and adapted for automatically and radially closing said pair of dies upon the strip to form a raised type-surface therein, when said dies are alined in working position, substantially as described.

18. In a machine of the class specified, the combination of two die-carrier shafts connected for rotation; a die-carrier secured to each shaft, one of which die-carriers has a plurality of independently and radially movable character-dies in cameo, and the other of which carriers has a plurality of similarly-disposed and independently and radially movable character-dies in intaglio, and revoluble in synchronism with the cameo-dies; a rotatable driver; an intercepting device in connection with the die-carriers for rotating said carriers, and stopping the same at predetermined points in their rotations to bring a selected pair of dies into alinement in working position on each side of a printing-strip; die-operating members in position and adapted for radially closing the positioned pair of dies; and key-actuated devices adapted for operating the intercepting device, and for stopping the carriers at predetermined points in their rotations, and for automatically actuating the die-operating members to close the dies, substantially as described.

19. In a machine of the class specified, a rotating driver; a rotatable die-carrier having a series of dies; and intermittently-operable, successively-acting, disconnecting and reconnecting devices the one automatically operative by the other, between and in operative relation with said driver and die-carrier; substantially as described.

20. In a machine of the class specified, the combination of a rotating driver; a revoluble die-carrier having a series of independently and radially movable dies; intermittently-operable, successively-acting, disconnecting and reconnecting devices the one automatically operative by the other, between and in operative relation with said driver and die-carrier; means for stopping the die-carrier, at predetermined points in its movement; and means for actuating said dies independently; substantially as described, and for the purpose set forth.

21. In a machine of the class specified, the combination of a continuously-rotating driver; two coacting die-carriers connected for rotation in the same plane; a series of dies mounted on each of said die-carriers for rotation in synchronism, and having the dies of one series complementary to those of the other; a yielding driving device operatively connecting the driver and one of the die-carriers; means for simultaneously stopping the rotation of both die-carriers at predetermined points in their movements irrespective of the continued movement of the driver, to bring two complementary dies into position for use;

and die-actuating slides in connection with said driver, and in position and adapted for engaging and actuating the pair of dies so positioned, substantially as described.

22. In a machine of the class specified, the combination with a continuously-rotating driver; of a die-carrier normally rotating in unison with said driver, and having a plurality of independently and radially movable dies; intermittently-operable, successively-acting, disconnecting and reconnecting devices the one automatically operative by the other, between and in operative relation with said driver and die-carrier; a series of stops in position and adapted for selectively engaging the die-carrier to arrest the movement thereof at predetermined points in its rotation; a reciprocatory die-actuating slide in position and adapted for actuating the dies of the carrier one at a time; and operative devices connecting said slide with the rotatable carrier; substantially as set forth.

23. In a machine for producing printing-surfaces, the combination of two die-carriers connected for rotation; a plurality of similarly-disposed independently-operable and radially-movable dies mounted on said carriers for synchronous rotation in the same plane; die-operating slides in position and adapted for actuating two coacting dies toward each other; coacting carrier-rotating mechanism and die-closing mechanism connected, respectively, with the die-carriers and die-actuating slides for reciprocal operation; a continuously-rotating driver in operative connection with said coacting mechanisms; and stopping devices for simultaneously arresting the movements of said carrier mechanisms in successive positions, substantially as described.

24. In a machine of the class specified, the combination of a pair of die-carriers connected for rotation; a plurality of similarly-disposed and radially-movable dies mounted on said carriers for synchronous rotation in the same plane; mechanism for closing the dies; a rotatable driver; and a key-actuated clutch intermediate of, and adapted for operatively connecting, the rotatable driver and the die-carrier, substantially as described.

25. In a machine of the class specified, the combination of a pair of die-carrier shafts connected for rotation and each having a die-carrier; a plurality of similarly-disposed and independently and radially movable dies mounted on said carriers for synchronous rotation in the same plane; die-actuating slides, one for each carrier and in position and adapted for radially actuating the dies of said carriers, one at a time; a key-actuated clutch interposed between the driver and one of the die-carrying shafts; a rotatable driver frictionally connected with one member of said clutch; slide-actuating mechanism in connection with said slides and the driver; and means for actuating said slide-actuating mechanism on the cessation of movement of

the die-carrier shafts, substantially as described.

26. In a machine of the class specified, the combination with a die-carrier shaft and with the revoluble driver, of a key-actuated clutch consisting of a clutch member fixed to said shaft, and a clutch member movably mounted upon said shaft in position to engage the fixed clutch member, and a yielding driving device connecting the movable clutch member with the revoluble driver, substantially as described and for the purpose set forth.

27. In a machine of the class specified, the combination with a die-carrier shaft and with the revoluble driver, of a key-actuated clutch consisting of a clutch member fixed to said shaft, and a clutch member movably mounted upon said shaft in position to engage the fixed clutch member, a yielding driving device connecting the movable clutch member with the revoluble driver, and a cam-actuated retracting device in connection with the movable clutch member, substantially as described and for the purpose set forth.

28. In a machine of the class specified, the combination with a pair of revoluble die-carrier shafts connected together for coincident movements, and with a revoluble driver, of a key-actuated clutch, one member of which is fixed to one of the die-carrier shafts, and the other member of which is frictionally or yieldingly connected with the revoluble driver, a series of stops adjacent to and adapted for intercepting the movement of the die-carrier shaft, and means for disengaging the clutch members after the interception of the movement of said shaft, substantially as described and for the purpose set forth.

29. In a machine of the class specified, the combination with a pair of revoluble die carrier shafts connected together for coincident movements, and with a revoluble driver, of a key-actuated clutch, one member of which is fixed to one of the die-carrier shafts, and the other member of which is frictionally or yieldingly connected with the revoluble driver, a series of stops adjacent to and adapted for intercepting the movement of the die-carrier shaft, a shifting lever in connection with said clutch, and a cam in connection with the revoluble driver for actuating the shifting lever and adapted for disengaging the clutch members after the interception of movement of the die-carrier shafts, substantially as described and for the purpose set forth.

30. In a machine of the class specified, the combination with the two die-carrier shafts having die-carriers with a plurality of coacting dies, and with the die-operating slides, of die-carrier-rotating and die-closing mechanism consisting of a revoluble driver loosely carried upon the die-closing shaft, a key-actuated clutch connected with one of the die-carrying shafts and connected with the revoluble driver by a frictional or yielding driving device, a friction-clutch operatively connect-

ing the revoluble driver with the die-operating shaft, operating devices connecting said die-operating shaft with the die-operating slides, a series of stops for intercepting the movement of the die-carrier shaft, and means for disengaging the key-actuated clutch members, substantially as described and for the purpose set forth.

31. In a machine of the class specified, the combination with the die-carrier shafts, of a fixed and a movable clutch member connected therewith, die-shaft-rotating mechanism consisting of a revoluble driver, a cam connected with the movable clutch member of the die-carrier shaft and frictionally or yieldingly connected with the driver by means of spring-actuated driving members secured to said driver, and a cam-actuated device for disengaging the clutch members, substantially as described and for the purpose set forth.

32. In a machine of the class specified, the combination with a pair of coacting revoluble die-carriers having radially and independently movable complementary character-dies, and with mechanism for rotating the die-carriers in synchronism and in the same plane, and for radially closing complementary dies thereof simultaneously; of a printing-strip-feeding mechanism consisting of a shiftable carriage, key-actuated devices for feeding the carriage with a step-by-step movement, and line-spacing mechanism in connection with said carriage for moving the strip of material forward between the dies, substantially as described.

33. In a machine of the class specified, the combination with a strip-carrying carriage; of two feed-wheels, one of which has a series of peripheral projections, and the other of which has a series of similarly-disposed complementary peripheral indentations between which the strip of material to be operated upon is impinged, to thereby form and engage a series of relieved draft projections in and continuous with the strip, and means for rotating said feed-wheels to move the strip forward in the carriage, substantially as described.

34. In a machine of the class specified, the combination with two remotely-disposed die-carriers connected for rotation; of a strip-feeding carriage embodying two revoluble intermeshing feed-wheels; a pair of ratchet-wheels in operative connection with one of said feed-wheels, and adapted for rotating said feed-wheel a greater or lesser distance as required; and a pull-and-push pawl for actuating either of said ratchet-wheels, substantially as described, and for the purpose set forth.

35. In a machine of the class specified, the combination with a pair of die-carrier shafts connected together for coincident movements, and with the die-closing mechanism and the die-closing shaft, of a revoluble driver, a key-actuated clutch, one member of which is fixed

to one of the die-carrier shafts, and the other member of which is frictionally or yieldingly connected with the revoluble driver, a series of stops adjacent to and adapted for intercepting the movement of the die-carrier shaft, a shifting lever in connection with the clutch of said shaft, and a cam in connection with the die-closing shaft for actuating the shifting lever to disengage the clutch members upon the operation of the die-closing mechanism, substantially as described.

36. In a machine of the class specified, the combination with the die-closing shaft and with the shiftable carriage, of shifting mechanism therefor consisting of a rack secured to the carriage, a pinion meshing with said rack, a ratchet-wheel in connection with said pinion, an elliptically-moving link connected to the die-closing shaft and carrying a pawl adapted for engagement with and disengagement from the ratchet-wheel upon the actuation of said die-closing shaft, and means for operating said die-closing shaft, substantially as described.

37. In a machine of the class specified embodying two remotely-disposed die-carriers, in combination, a strip-supporting carriage provided with two revoluble feed-wheels adapted to be closed upon the strip of material, one wheel at either side thereof, two ratchet-wheels in connection with one of said feed-wheels, each of which has a series of groups of ratchet-teeth, the groups in one ratchet-wheel having a greater number of teeth than the groups in the other ratchet-wheel, substantially as described, a double-ended pawl, one end of which is adapted for engaging the teeth of one of the ratchet-wheels, and the other end of which is adapted for engaging the teeth of the other ratchet-wheel, and means for operating said pawl to rotate one or the other of said ratchet-wheels, substantially as described and for the purpose set forth.

38. In a machine of the class specified, the combination with the strip-feeding carriage having the two strip-impinging feed-wheels, the ratchet-wheels for rotating said feed-wheels, and the double-ended pawl for actuating the respective ratchet-wheels, in the same direction of an abutment or stop in position to be engaged by, and adapted for limiting the movement of said pawl, substantially as described.

39. In a machine of the class specified, the combination with two remotely-disposed die-carriers, of a strip-feeding carriage embodying two revoluble feed-wheels adapted to be thrown into intermeshing engagement, and having, one of them, a plurality of equidistantly-disposed peripheral projections adapted for forming indentations in the strip of material impinged between the two feed-wheels, two ratchet-wheels secured to a shaft connected with one of the feed-wheels, one of which ratchet-wheels has "long-distance" ratchet-teeth, and the other of which ratchet-

wheels has "short-distance" ratchet-teeth, a double-ended pawl, one end of which is adapted for engaging the teeth of one of the ratchet-wheels, and the other end of which is adapted for engaging the teeth of the other ratchet-wheel, a pawl-operating lever, and a spring adapted for retaining one or the other end of the pawl in engagement with the teeth of one or the other ratchet-wheel, substantially as described and for the purpose set forth.

40. In a machine of the class specified, the combination with the revoluble driver and with the die-carriers and die-carrier-actuating cam, of two oppositely-disposed levers pivotally connected with the revoluble driver and yieldingly engaging the cam at opposite sides thereof, substantially as described and for the purpose set forth.

41. In a machine of the class specified, a revoluble driver, a pair of coacting die-carriers, in combination with means for rotating the carriers from the drivers consisting of a cam having an inclined bearing-face, two oppositely-disposed levers pivotally connected at their outer ends to the driver and bearing at their inner ends against opposite faces of the revoluble member, and springs in connection with said levers for holding the same in yielding engagement with said cam, substantially as described.

42. In a machine of the class specified, the combination with the revoluble driver, and with the die-carrier-actuating cam, of two levers, one of which engages and is adapted for intermittently rotating said cam, and the other of which frictionally and oppositely engages the cam and is adapted for preventing a retractive movement of said cam, substantially as described.

43. In a machine of the class specified, the combination with the revoluble driver and with the concentric die-carrier-actuating cam, of two oppositely-disposed levers pivotally connected with the revoluble driver, one of said levers carrying a roller at its inner end in engagement with and adapted for intermittently actuating said cam, and the other of which levers carries a brake-shoe in frictional engagement with said cam and is adapted for preventing a movement of said cam, and means in engagement with and adapted for retaining the levers with their inner ends in constant yielding engagement with the cam, substantially as described.

44. In a machine of the class specified, the combination with the revoluble driver, the die-closing shaft and with the die-carrier and die-carrier-actuating cam, of a lever in connection with the driver and cam and adapted for intermittently actuating the die-closing shaft, and a lever in connection with the driver and cam and adapted for continuously imparting driving force to the die-carrier, substantially as described.

45. In a machine of the class specified, the combination with a rotatable feed member; of a ratchet-wheel connected with said feed

member for rotating the same, and having a plurality of groups of peripheral teeth, each group embodying teeth of variable ranges of throw; and a pawl for engaging said teeth and
5 actuating said ratchet-wheel and feed member, and having a range of throw equal to the throw of any tooth of the ratchet-wheel, but less than the sum of the throws of any two teeth of said wheel, to thereby advance the
10 feed member different distances, substantially as described.

46. In a machine of the class specified, the combination with a rotatable feed member; of a pair of ratchet-wheels connected with said
15 feed member for rotating the same, and each respective wheel having a plurality of similar groups of peripheral teeth, each group comprising a plurality of teeth having one range

of throw and a single tooth having a greater range of throw, the groups of one ratchet- 20 wheel being dissimilar to those of the other; and a pawl for engaging the teeth of either of said ratchet-wheels and actuating such ratchet-wheel and the feed members, and having a range of throw sufficient to cause the 25 actuation of either ratchet-wheel a distance equal to the throw of any one tooth thereof but insufficient to cause the actuation of either ratchet-wheel a distance equal to the sum of the throws of any two teeth thereof, to thereby 30 advance the feed members different distances, substantially as described.

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Witnesses:

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