

(No Model.)

5 Sheets—Sheet 1.

J. F. HARDY.
STENOGRAPH.

No. 583,620.

Patented June 1, 1897.

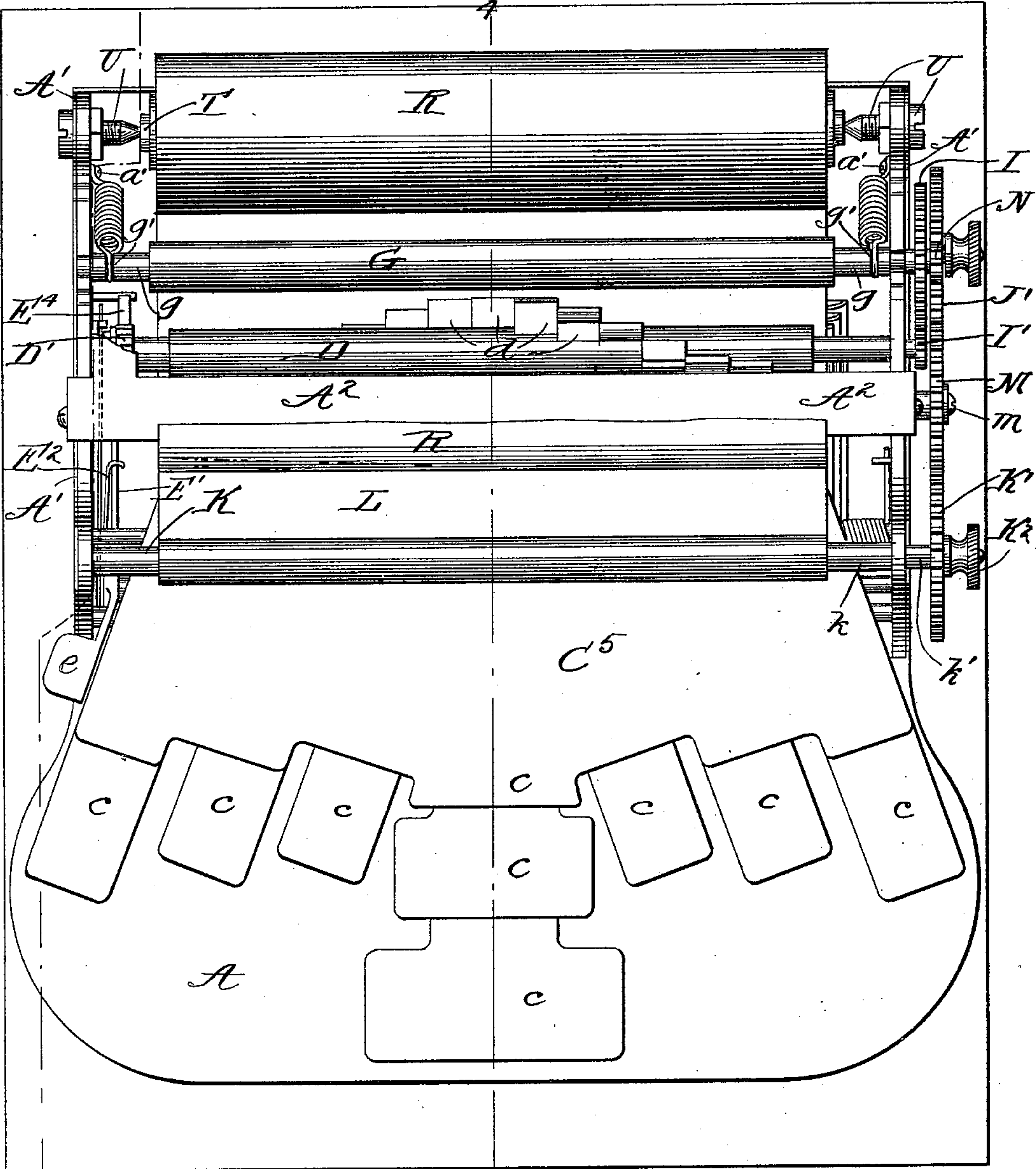


Fig. 1.

Witnesses
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by

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John F. Hardy

Pooler & Browne Attys.

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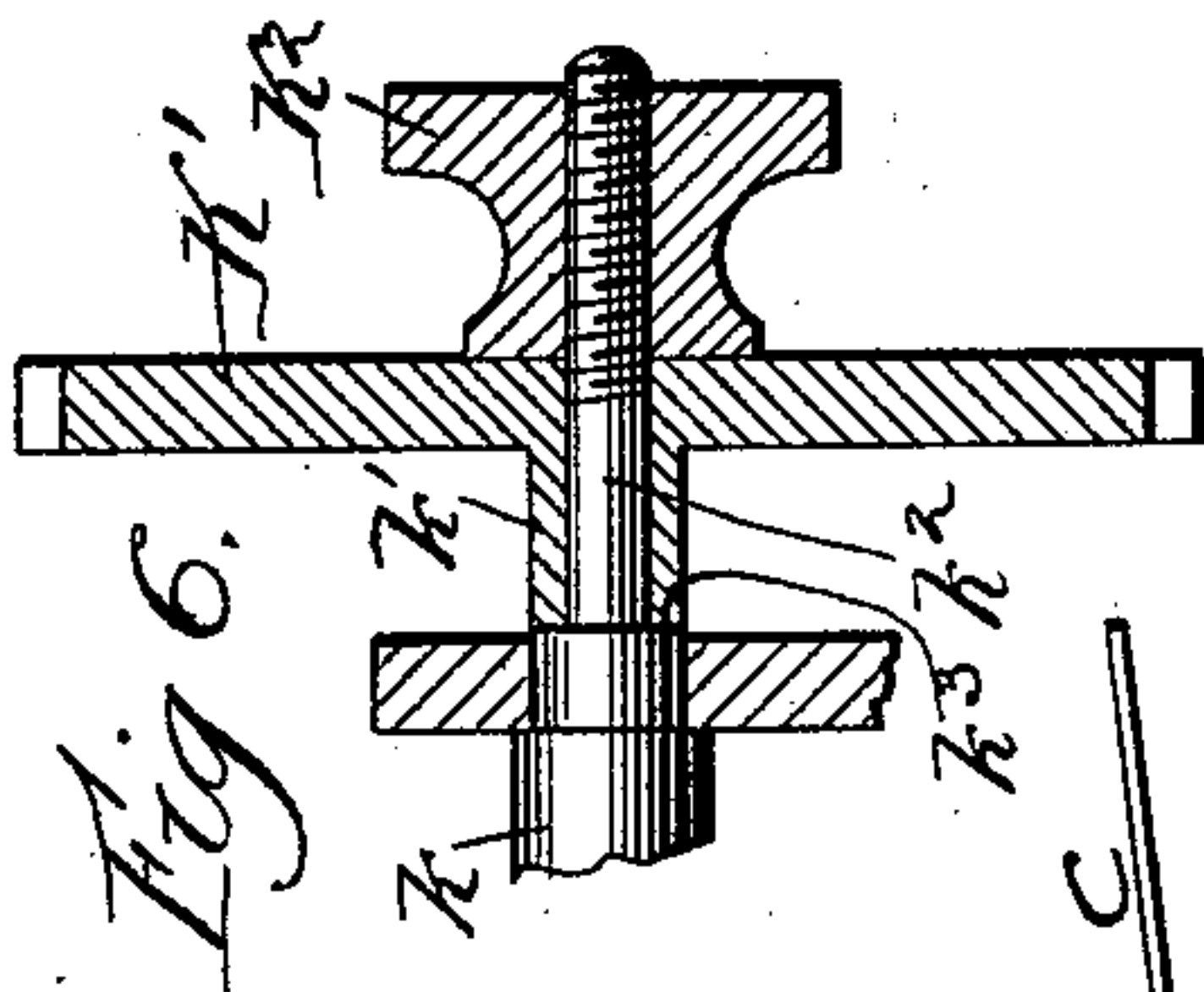
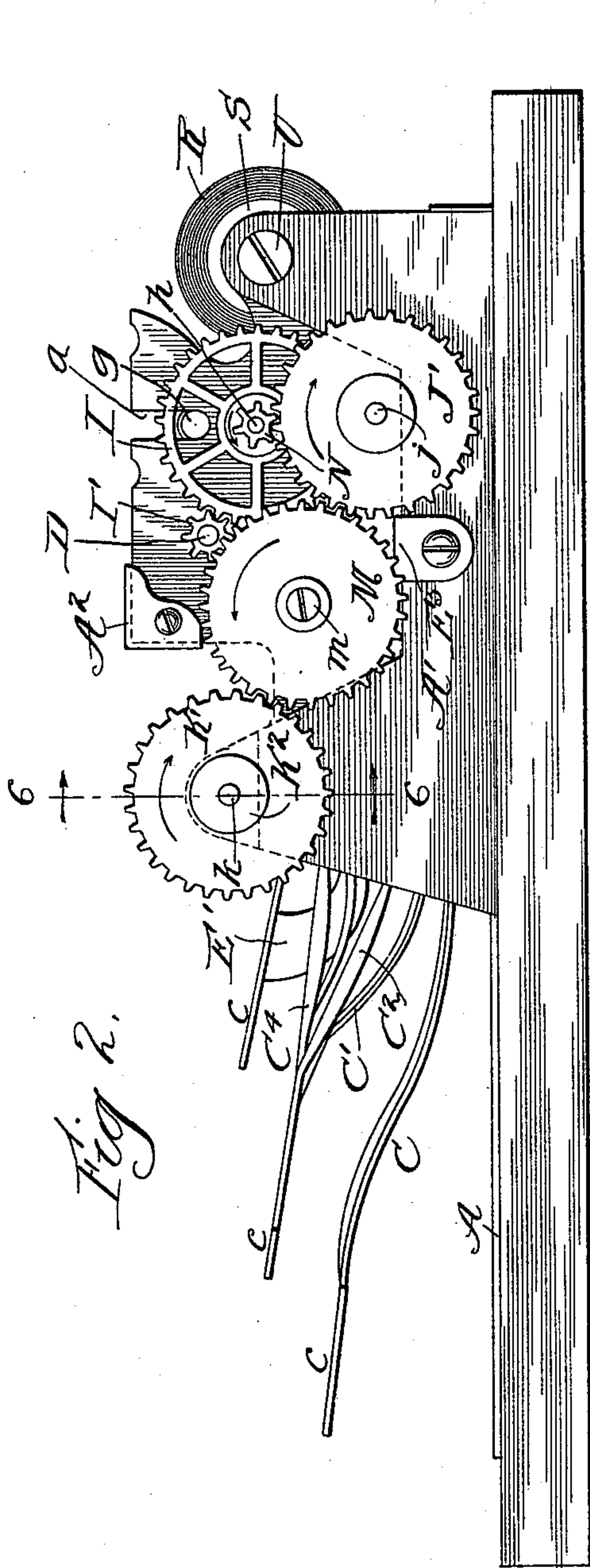
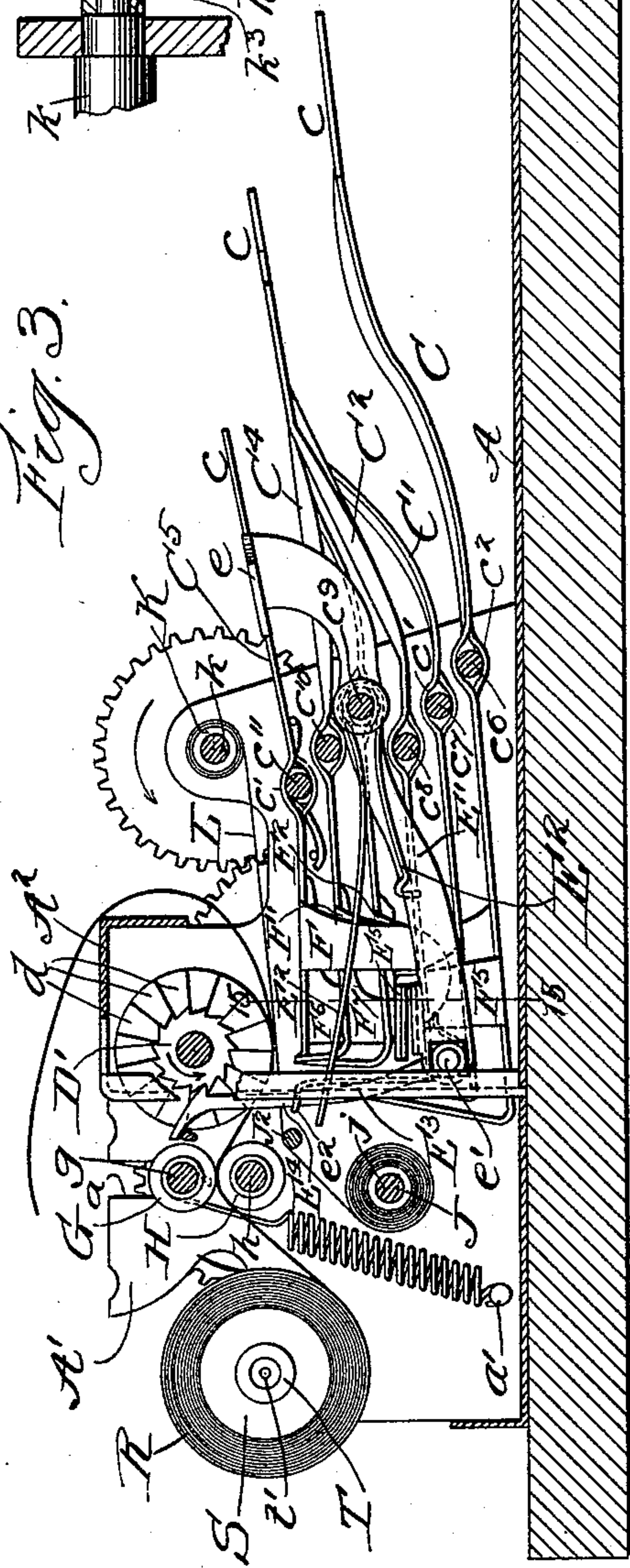


Fig. 3.



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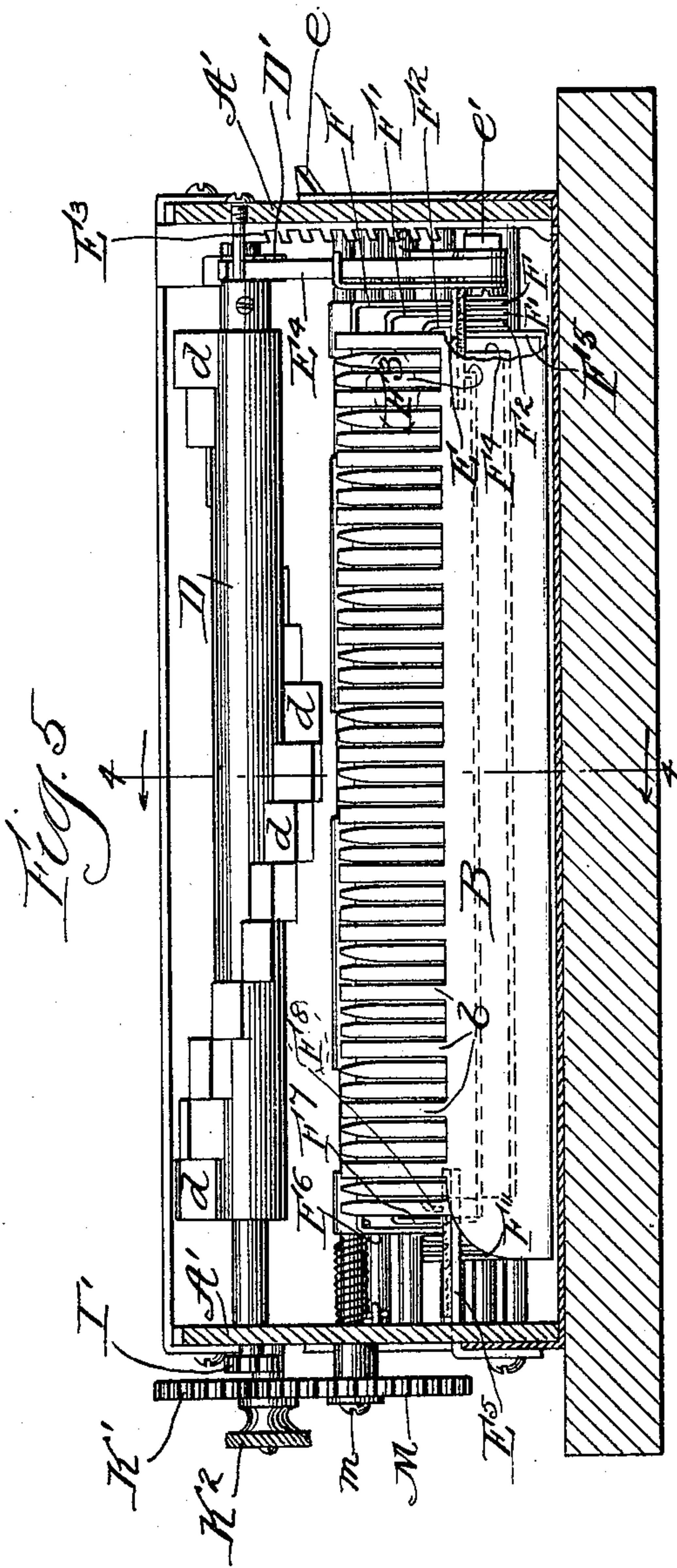
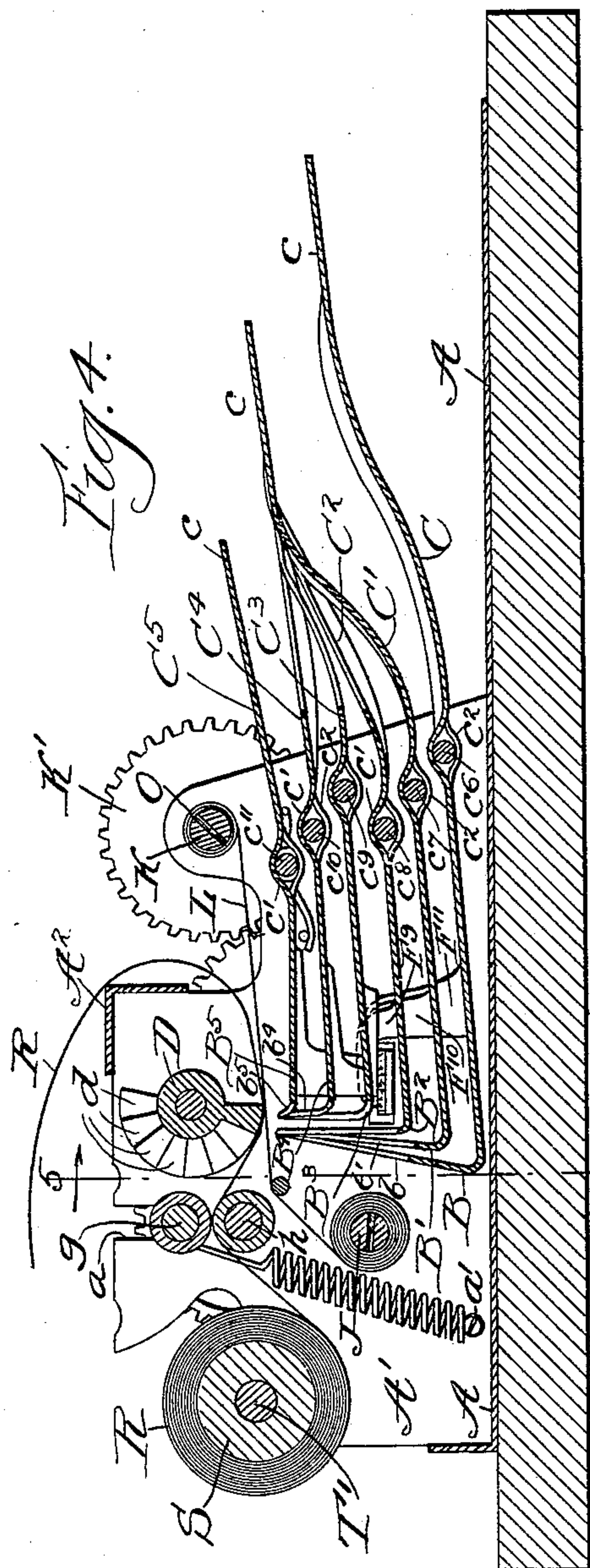
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5 Sheets—Sheet 3.

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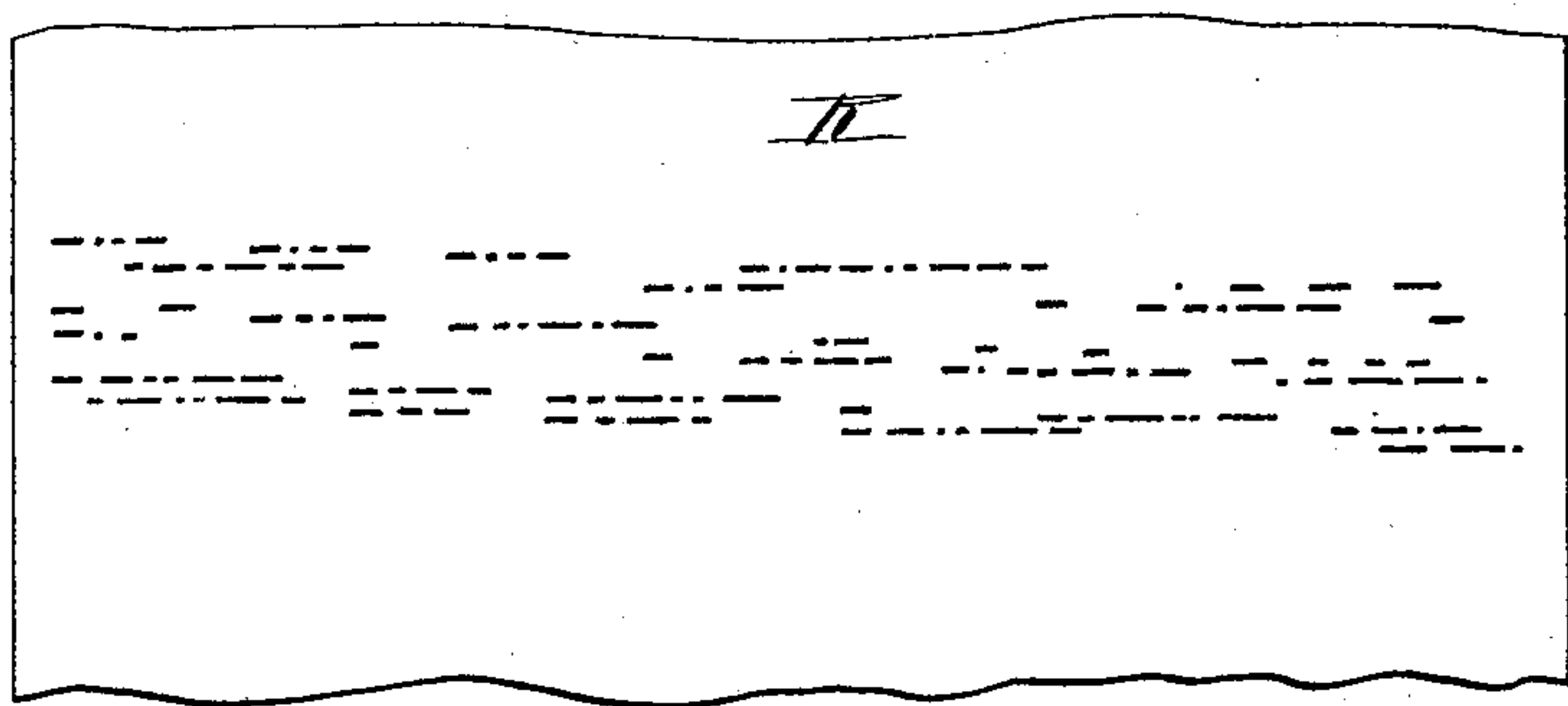
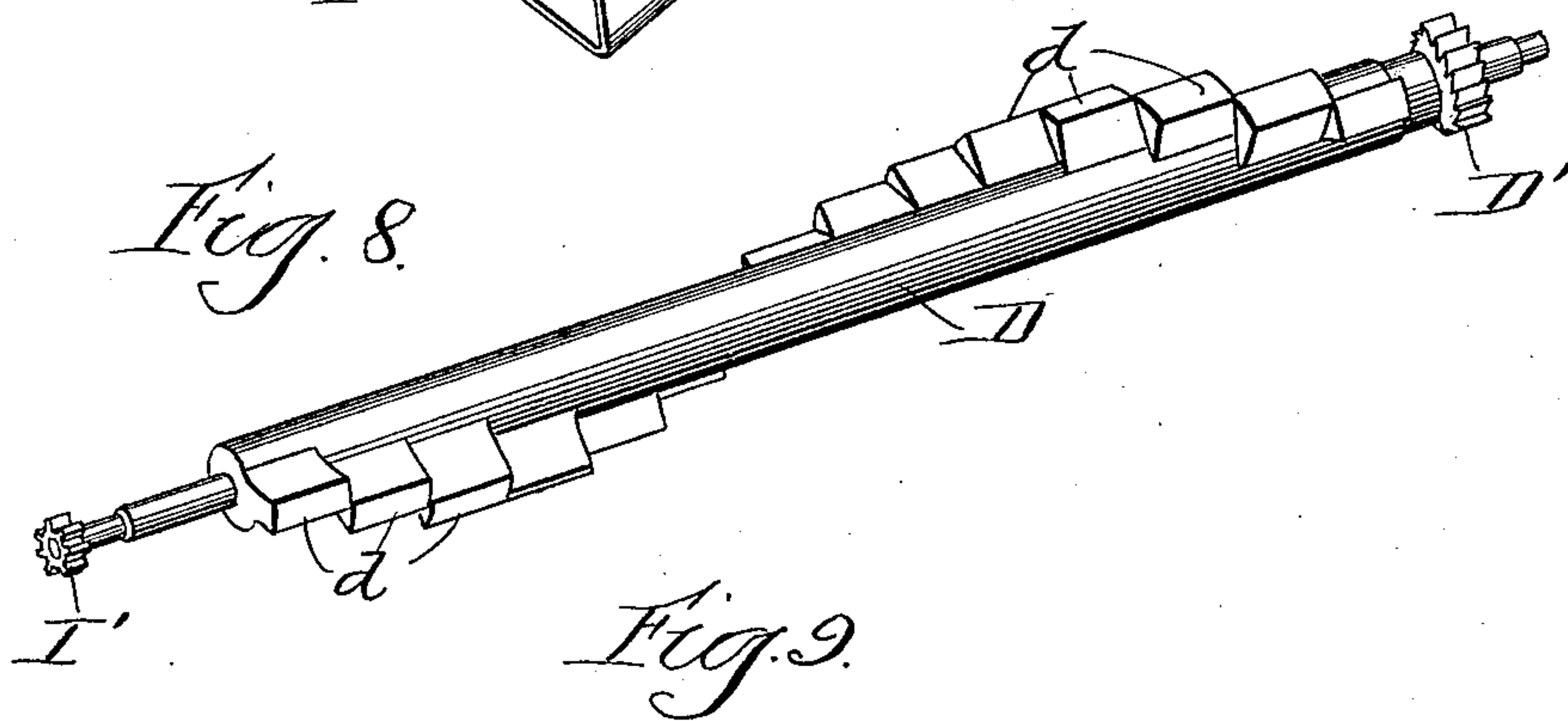
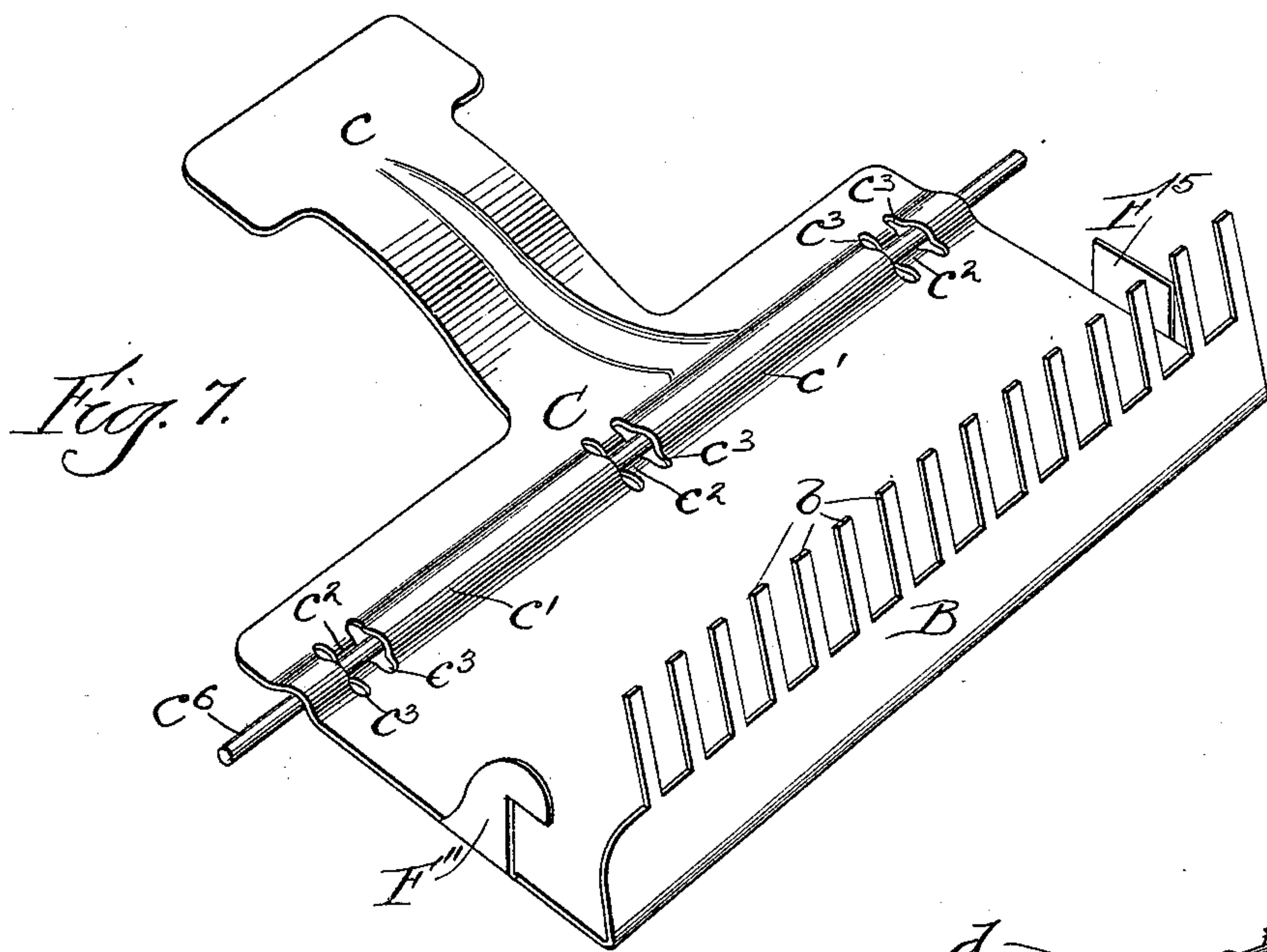
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5 Sheets—Sheet 5.

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Fig. 10

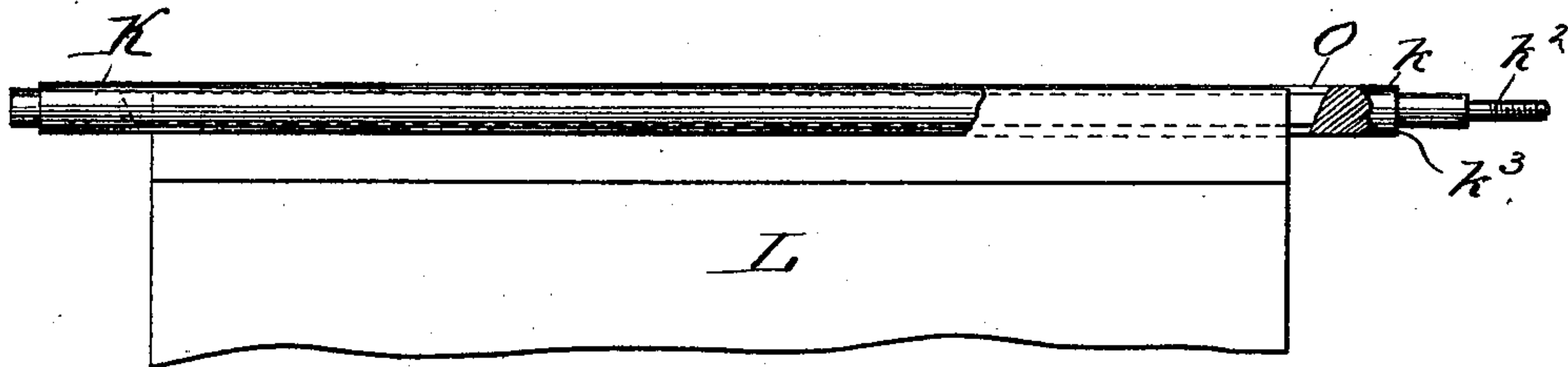


Fig. 11

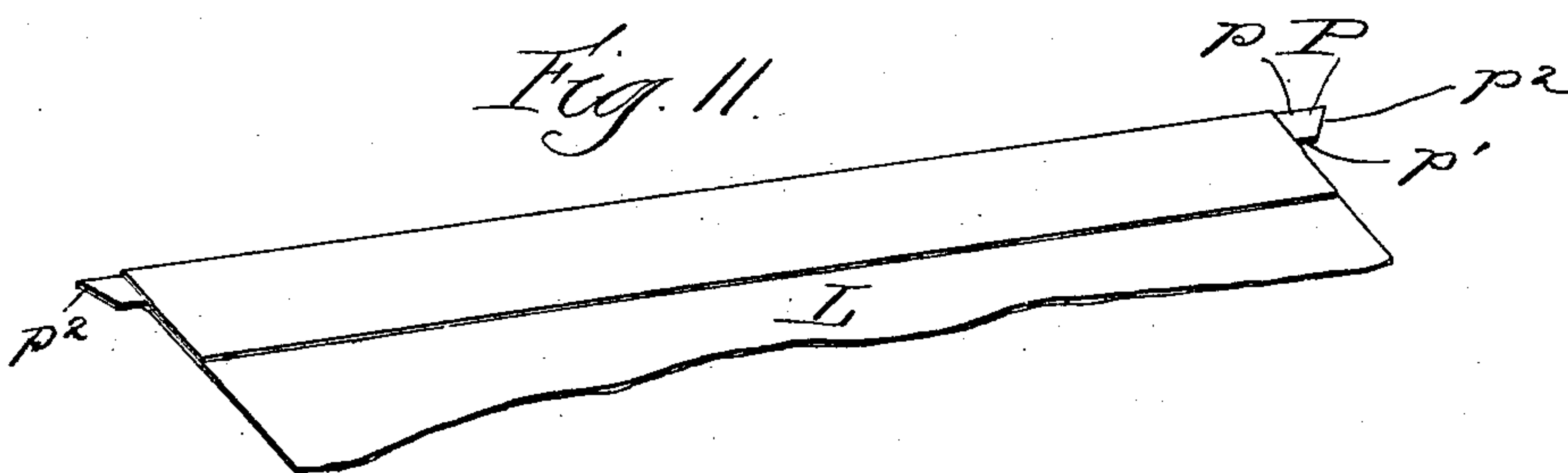


Fig. 12

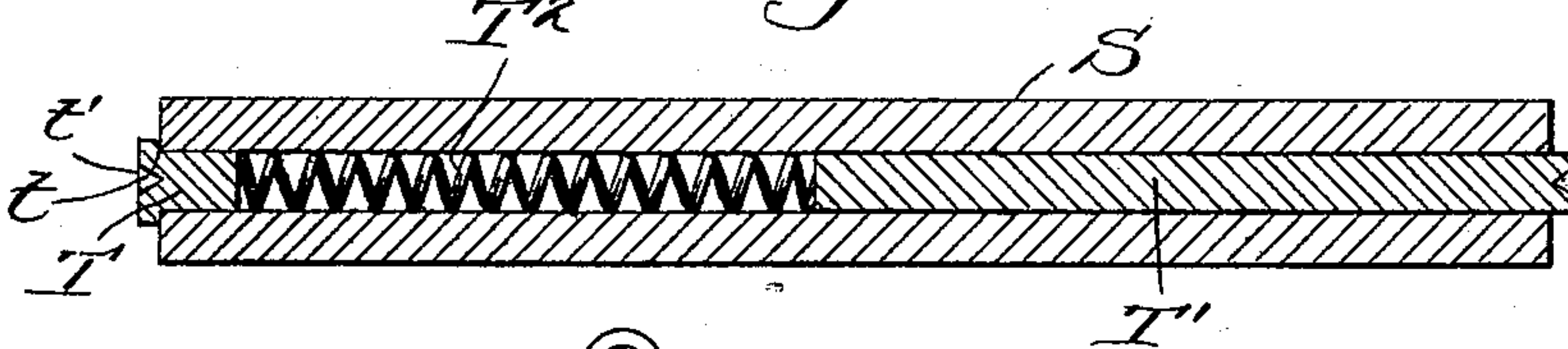


Fig. 13

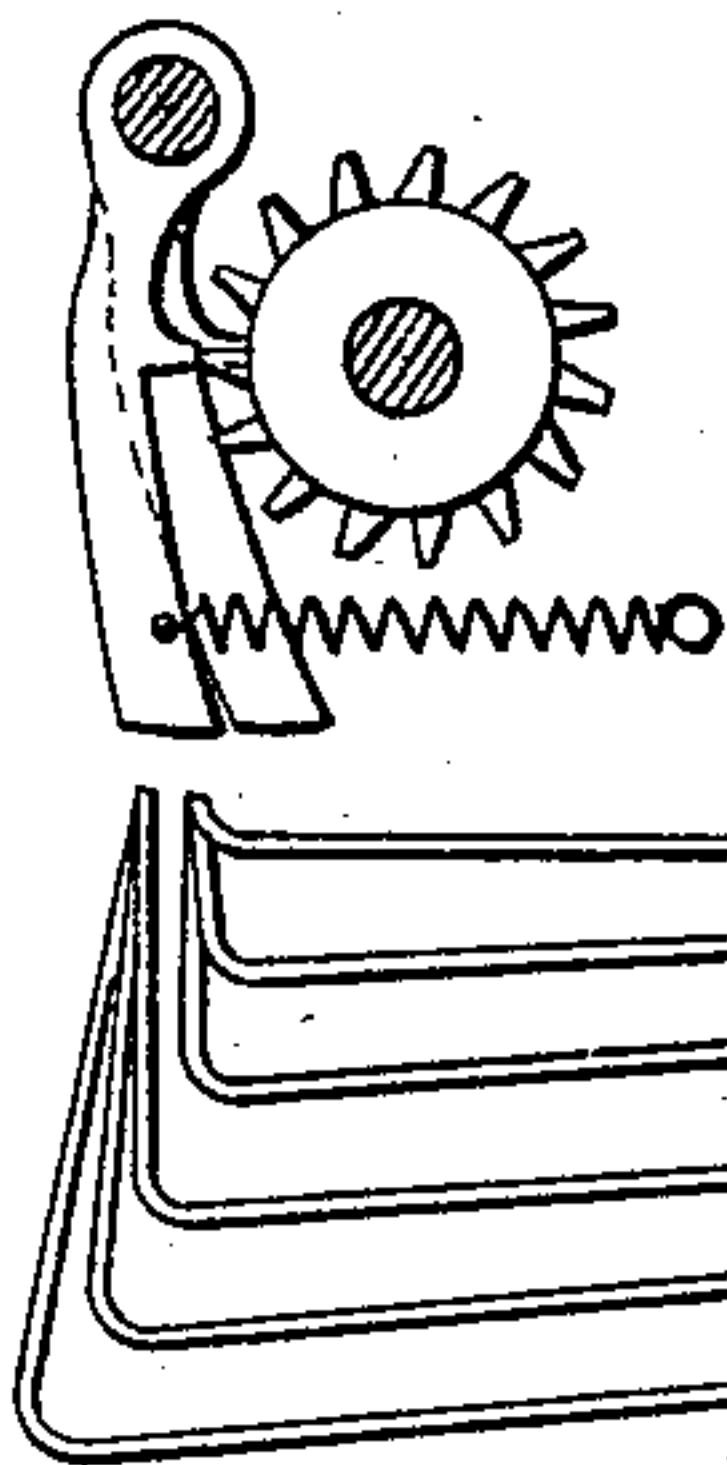


Fig. 14

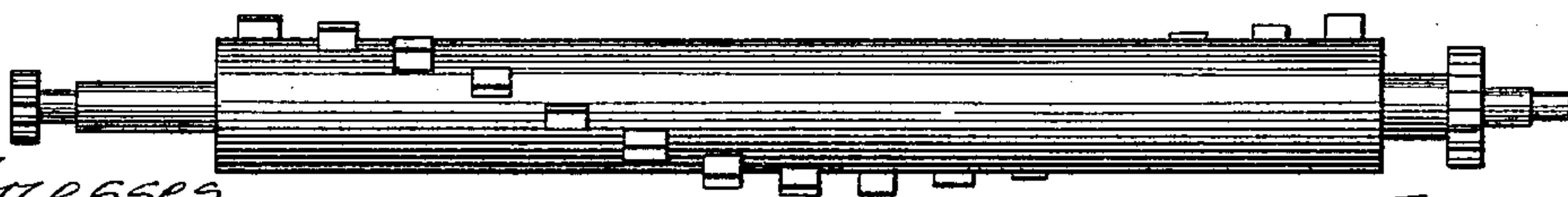
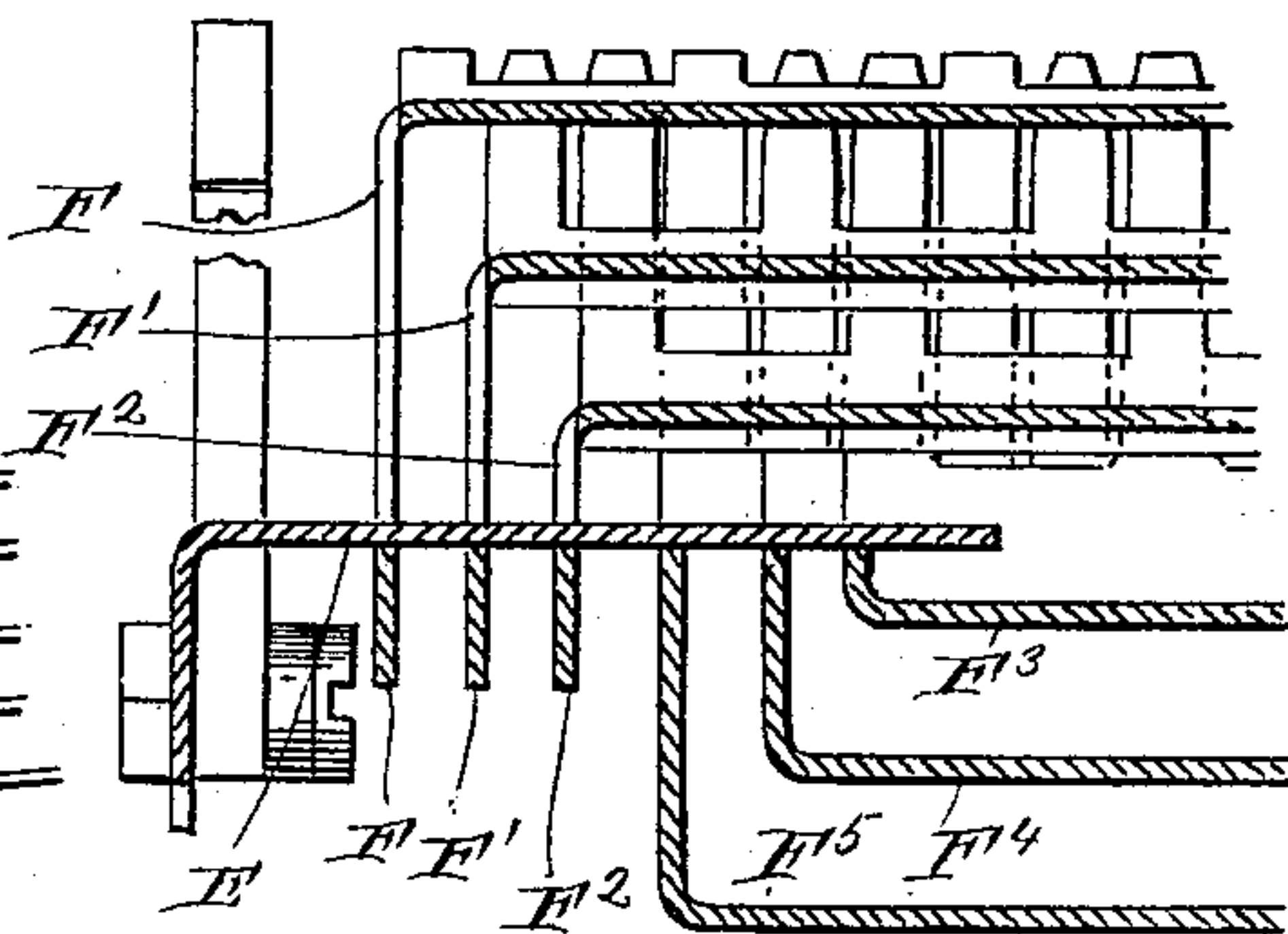


Fig. 15



Witnesses

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UNITED STATES PATENT OFFICE.

JOHN F. HARDY, OF CHICAGO, ILLINOIS.

STENOGRAPH.

SPECIFICATION forming part of Letters Patent No. 583,620, dated June 1, 1897.

Application filed August 10, 1896. Serial No. 602,299. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. HARDY, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful
5 Improvements in Stenographs; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which
10 form a part of this specification.

This invention relates to improvements in hand-operated printing-machines of that class which includes type-writing and stenographic machines and in which a succession
15 of different or differently-located characters or marks may be impressed upon a sheet or strip by the depression of different operating-keys.

The invention relates more particularly to
20 improvements in that class of such machines which are shown in a prior application for a patent, Serial No. 557,668, which was filed by me in the United States Patent Office July 31, 1895, wherein the printing mechanism is so
25 arranged as to effect automatically the printing of the copy in successive transverse lines, reading from left to right of the sheet, without requiring to be moved or shifted to give
30 line-spacing after the completion of each line and before the beginning of the succeeding one, whereby the operator is enabled to print a definite quantity of copy by continuous and uninterrupted operation of the keys without
35 requiring any special movement whatever to accomplish the line-spacing.

The invention is herein shown as applied to a stenographic or shorthand machine having only a few keys, but some features of the invention may be applied to type-writing machines of other kinds.

The invention consists in the matters hereinafter set forth, and pointed out in the appended claims.

In the accompanying drawings, Figure 1 is
45 a top or plan view of a stenographic machine embodying my invention. Fig. 2 is a side elevation thereof. Fig. 3 is a vertical cross-section thereof, taken on line 3 3 of Fig. 1. Fig. 4 is a vertical section taken centrally
50 through the machine on line 4 4 of Figs. 1 and 5. Fig. 5 is a transverse vertical section taken on line 5 5 of Fig. 4. Fig. 6 is a

detail section taken on line 6 6 of Fig. 2. Fig. 7 is a perspective view of one of the printing-bars. Fig. 8 is a perspective view of the re-
55 volving anvil-shaft. Fig. 9 is a view showing a strip of paper with printed lines, such as will be made by a machine of the kind shown. Fig. 10 is a side view of one of the inking-ribbon shafts, showing devices for se-
60 curing the ribbon thereto. Fig. 11 is a perspective view of the end of the ribbon with its attaching-strip. Fig. 12 is a longitudinal section of the paper-roller. Fig. 13 is a view showing a modified construction in the means
65 for operating the shifting anvils. Fig. 14 is a side view of the anvil-actuating shaft shown in Fig. 13. Fig. 15 is a detail sectional view of the universal bar and adjacent parts, taken
70 on line 15 15 of Fig. 3.

In said drawings, A designates the base-plate of the machine, and A' A' vertically-
75 arranged frame-plates which rise from the side margins of the base-plate and support the main operative parts of the machine. The base-plate A is shown as provided with ap-
ertured flanges at its ends, which extend up-
wardly outside of and support the end frame-plates.

A² is a cross-plate at the top of the side
80 frame-plates, which serves to rigidly connect the same and also acts as a support or guide for the paper.

The machine is provided with a plurality of printing or type bars B B' B², &c., which
85 are attached to pivotally-supported key-levers C C' C², &c., said bars and levers being herein shown as each made from a single piece of sheet metal having its rear margins bent upwardly to constitute the printing-bar.
90 The parts of said plates which constitute the bars proper, in other words, have the form of flanges on the rear margins of the sheet-metal levers, said flanges being bent at an angle to the plates to give stiffness to the
95 same. The said printing-bars B B', &c., are provided each with a plurality of prongs b b' b², &c., the extremities or free ends of which form the type or printing surfaces of the bars. The ends of said prongs may be shaped to
100 form any desired characters, but, as herein shown, the same are made to print dots and dashes only, and for this purpose their contact-faces are made of varying lengths, as

clearly seen in Fig. 5. In the machine shown six printing-bars are employed, and these are arranged in two groups, with the several sets of prongs belonging to each group bent at such angle as to be in alinement with each other. The prongs belonging to each group are, moreover, arranged at a short distance apart, so that an impression made by the action of the contact-face of the prong belonging to one group will be parallel with and adjacent to the impression made by the contact-face of a prong belonging to the other group. All of the prongs on each printing-bar will have like contact-faces—that is to say, all of the prongs on one bar may print long dashes, all on another bar of the same group short dashes, and all on the third bar of the same group dots. The two groups being alike, it follows that each group of bars is adapted to print a set of three characters, and both sets together are adapted to print six characters, which by reason of the arrangement of the prongs will be printed in two parallel rows if all of the six characters are printed at once. As will hereinafter appear, the intention is to print from one or more of the prongs in each set at once, employing different combinations to indicate words or letters, somewhat after the manner of the Morse alphabet used in telegraphy. It will of course be practicable to arrange the prongs or printing-points in three groups instead of two, in which case the printed characters will appear in three lines, but I prefer the construction illustrated, for the reason that it readily provides suitable combinations of characters needed for stenographic or shorthand writing, the general object of arranging the printing-points or prongs in two groups arranged to print in parallel lines being to afford a greater number of combinations of dots and dashes for expressing sounds, letters, or words than would be afforded by a single set or group of such prongs or printing-points. The key-levers C are provided at their forward ends with keys or finger-pieces *c*, which in the instance shown are formed by flat extensions on the outer ends of the plates which constitute the key-levers and printing-bars. Some of the key-levers are provided with duplicate finger-pieces, so that nine of such finger-pieces appear in the drawings as belonging to the six key-levers. This duplication of finger-pieces is, however, merely for convenience in manipulating or fingering the keys in rapid work and to facilitate the use of the fingers of both hands in operating the keys. Said key-levers are mounted on pivot-shafts C^6 C^7 , &c., and the rear parts thereof are made of a width practically equal to the full length of the printing-bars, while the forward parts thereof, extending forwardly from the shafts, are made relatively narrow to form forwardly-projecting arms so shaped as to bring the finger-pieces which form the keyboard in orderly relation and in relative positions convenient

for the fingers of the operator, as clearly seen in Fig. 1.

D indicates a revolving platen-shaft arranged above the several type-bars and carrying a series of movable platens or anvils d , which are arranged about the shaft in spiral order and in such relation to the type-bars that when the latter are lifted by depression of one of the key-levers one of the teeth thereof will strike the anvil d which may at the time be in position to receive the blow of the type or printing projection. Said anvils d are arranged at equal intervals along the shaft from end to end thereof, and they reach once around the shaft, so that inasmuch as the shaft is, as each key is struck, intermittingly turned a distance sufficient to bring a new anvil into position for action all of said anvils will be brought separately and successively into action during one complete rotation of the shaft.

The anvil-actuating shaft D, which will be hereinafter termed, for convenience, the "anvil-shaft," is mounted at its ends in suitable bearings in the upper parts of the frame-plates A' , and provision is made for giving rotary motion to said shaft by devices constructed as follows:

E indicates a vertically-movable universal bar which is adapted to be actuated by all of the type-levers through the medium of prongs or projections F F' F^2 , &c., which are formed on or attached to the ends of said bars in position to act upon the said universal bar when each key is depressed, said universal bar being shown as attached to and projecting laterally from a vertically-swinging lever E' , which is pivoted to the inner face of the side frame-plate conveniently by engagement with one of the key-lever shafts or pivot-rods C^9 , Fig. 3. The said lever is extended forward of its pivot and provided with a finger-piece or key *e*, which is located at one side of the keys and forms a space-key, the depression of which feeds forward the paper without printing any character thereon. The said universal bar E is shown as arranged horizontally at a point about midway between the top and bottom key-levers, and the projections F F' F^2 on the uppermost key-levers are shown as extending downward from the said levers and as made of hook form, with arms extending beneath the universal bar, while the corresponding projections F^3 F^4 F^5 on the three lowermost levers rise from the levers and act at their upper ends against the lower surface of said bar. The lever E' is held at the downward limit of its movement by a spring E^2 , which is herein shown as made of U form, with its central bend engaging the pivot-rod C^9 , and having its lower arms provided with a hooked end which engages said lever in the manner shown in the drawings, Fig. 3, while its upper arm is adapted to engage one of the notches in a vertically-arranged rack-bar E^3 , Fig. 5, which affords adjustment of the position of the arms of the spring engaged therewith and thereby enables

the tension of the spring to be varied as desired. The universal bar E carries a pawl-arm E⁴, the upper end of which engages the teeth of a ratchet-wheel D', formed on one end of the anvil-shaft D, Fig. 8. Said pawl-arm E⁴ is shown as pivoted to the rear end of the lever E' by means of a pivot-bolt e' and as held in engagement with the ratchet-wheel D' by means of a spring e². To limit the movement of the key-levers when struck, a device is provided consisting of a stationary horizontal stop-arm E⁵, which projects inwardly from the side frame-plate at the side of the machine opposite that at which the universal bar E is located. Projections F⁶ F⁷ F⁸ are shown as extending downwardly from the three upper key-levers to engage the top of the stop-bar, while similar projections F⁹ F¹⁰ F¹¹, made of hook form, project upwardly from the lowermost three key-levers and engage the upper surface of said stop-bar. These parts are so arranged that by the depression of any one of the key-levers the universal bar and pawl-arm will be actuated to turn the shaft D through a distance equal to the length of one of the ratchet-teeth thereof.

The features above described constitute the main operative parts of the apparatus embodying my invention, it being obvious that the anvil-shaft provided with spirally-arranged anvils will be turned as the keys are successively pressed, so as to carry the printing-points or types against said anvils as the latter are brought by the turning of the shaft successively into position for the action of the types thereon. The result is that impressions are made on the paper successively from left to right as the anvil-shaft is turned, the spiral line of anvils obviously constituting in effect a plurality of moving or shifting anvils which are brought into position for making impressions at a series of points moving from left to right across the paper and thus serve to produce successive impressions on the paper from the contact-faces or types on the several type-bars. It will of course be understood that each type-bar bears the same character, which is repeated at intervals throughout the length of the type-bar and are arranged at the same distance apart as the movable anvils, so that the same impression or character is made every time the type-bar is depressed, the position in which the character is printed on the paper being changed by the movements of the shifting anvils against which the type-bar acts, so that the characters are printed one after another with the same effect as is obtained in an ordinary type-writing machine having a paper-carriage.

It will be further understood that in the operation of the machine one, more than one, or all of the type-levers may be actuated at once, each character which is printed to represent a letter, sound, or word being formed or made up by the combination of impressions from several contact-faces or types on

the type-bars. As before stated, the bars are arranged in two groups, each of which prints a dot and a long and short dash, so that if all the bars be actuated at once a group of six marks will be printed in two rows, one above the other, with three diverse marks in each row. The separate anvils, which, as before stated, are brought successively into position for the action of the types, are made of such length as to receive an impression from all of the prongs or contact-faces belonging to each group or set of the same, so that if all keys be depressed at one time the six marks will be printed by the contact of the printing-faces with that one of the anvils which may at the time be in position to receive an impression.

As an improved means of pivotally supporting the key-levers C, made of a single piece of sheet metal, as described, the pivot-shafts C' are mounted at their ends in the side frame-plates A' and are engaged with the levers by means of oppositely bent or curved parts c' c² in said levers, formed by making a plurality of slots or slits c³ c³ and bending the metal outwardly in opposite directions at either side of the slits, as clearly seen in Fig. 7. This construction affords the necessary pivotal connection of the levers with the shaft without the necessity of any machine-work, such as boring, while at the same time affording a cheap and simple construction of the parts and one which is fully effective for the purpose. It will of course be understood that the shafts C' are fitted closely within the opposite parts or loops thus formed on the sheet-metal key-levers and that the end of said shafts turn in suitable bearing-features in the side frame-plates A'.

In connection with the printing devices, arranged as described, a paper-feeding device is employed, which operates continuously during the movement of the type-bars and which feeds or advances the paper one step each time a character is printed. By the use of such paper-feeding device, in connection with the anvils, which are so moved or actuated as to be brought successively into position for printing, the lines of print are made parallel with each other and extend across the paper in a direction oblique to the side margins thereof, while the use of any special movement of the parts for shifting or moving the paper for producing the line-feed is avoided. The devices herein shown for giving movement to the paper, as described, are constructed as follows:

G H are two feed-rollers mounted above and below the path of the paper at the rear of the platen-shaft D, said feed-rollers being mounted on shafts g and h, which extend through the side frame-plates A' and engage suitable bearings in the same. The upper feed-roller is shown as engaging bearing-slots a a, which are open at their upper ends to permit the insertion of said shaft. For holding the said feed-rollers in contact with each

other suitably-applied spring-pressing devices are provided, those herein shown consisting of contractile coiled springs, which are provided with hooked upper ends that engage grooves $g' g'$ in the ends of said shaft and are attached at their lower ends to the frame-plate A' by means of studs a' , Figs. 1 and 3. For actuating said feed-rollers devices are provided as follows: The lower roller H only is driven in the machine shown, the upper roller consisting merely of a pressure-roller to hold the paper in contact with the lower or driven one. The shaft h of said roller projects outwardly beyond the side frame-plate at one side of the machine, preferably the right-hand side, and upon the projecting end of the shaft is secured a gear-wheel I , which gear-wheel intermeshes with a gear-pinion I' , secured to the end of the anvil-shaft D , which also projects outwardly beyond the frame-plate, Figs. 1 and 8. The said anvil-shaft being turned or rotated intermittently by the action of the several type-bars, as hereinbefore described, it follows that by the gearing which connects the shaft in the manner described a step-by-step motion will be transmitted to the feed-rollers and the paper will be advanced a short distance each time a key is pressed. The gear-wheel I being made much larger than the pinion I' , the advance movement of the paper will be very slight for each impression, so that the movement of the paper during the printing of a line will be equal only to the desired distance between the two adjacent lines, the result as far as the line-spacing is concerned being similar to that illustrated in said prior application for patent hereinbefore referred to.

The machine herein shown is of that kind in which an inking-ribbon is employed, the same being located between the impression-surfaces of the type-bars and the paper. The machine herein shown embraces a special construction in the ribbon-actuating devices, by which the same are made to carry a ribbon equal in width to the full width of the anvil-shaft and by which said ribbon is moved in a direction transversely to said anvil-shaft and the type-bars.

$J K$ are two shafts on which the ribbon is wound and which are mounted transversely of the frame, one at the rear and the other at the front of the anvil-shaft D . The ribbon-shaft J is shown as located below the level of the platen and in the space at the rear of the several printing-bars, while the ribbon-shaft K is located above the key-levers. A guide-rod J^2 is preferably arranged on a level with the bottom of the platen at the rear of the same, over which rod the ribbon passes and which holds the same in position adjacent to the printing-points, the ribbon extending in a straight line and in an approximately horizontal position from the said guide-rod to the shaft K , as indicated by the line L in Figs. 3 and 4. Provision is made for giving rotary

movement to one or the other of said ribbon-shafts to give the necessary ribbon-feed by devices constructed as follows: Said shafts J and K are mounted on shafts j and k , which have bearings in the side plates A' of the frame and are extended at one side of the machine beyond their bearings and are provided outside of the same with gear-wheels $J' K'$, the same being herein shown as located at the right-hand side of the frame. An intermediate gear-wheel or idler M is mounted on a stud m between the wheels J' and K' and intermeshes with both of said wheels, so that the same are turned in the same direction and at the same speed. Motion is given to said wheels $J' K'$ by means of a pinion N , attached to the shaft h of the lower feed-roller, which pinion intermeshes with the gear-wheel J' . It follows from this construction that the said gear-wheels J' and K' , together with the ribbon-shafts J and K , will be moved or turned intermittently as the key-levers are pressed or operated, motion being derived from the universal bar and the rotary anvil-shaft D through the pinion I' , gear-wheel I , and shaft H , as hereinbefore described.

The gear-wheels J' and K' are not affixed to the shafts j and k , but are so mounted thereon that they may be either secured to and thereby made to turn with the shaft or may be released therefrom and thus left free to turn on the same, as desired. For this purpose I employ the construction illustrated in Fig. 6, which shows in detail the gear-wheel K' on the shaft K . In said figure the gear-wheel K' has a sleeve k' , which fits over a reduced part or stem k^2 on the shaft k , and a milled nut K^2 is placed on the screw-threaded outer end of said stem k^2 , so that it may be turned on the stem in a manner to clamp the latter against a shoulder k^3 at the inner end of said stem and thereby hold the wheel from turning with respect to the shaft. In the operation of the machine either one or the other of the wheels $J' K'$ is secured to its shaft, while the other wheel is free to turn thereon, the result being that the ribbon will be wound on the shaft that is positively driven by reason of the attachment of the gear-wheel to the shaft, while the other will turn freely on its shaft as the ribbon is withdrawn. It will be readily understood from the above that when the ribbon has been wound entirely on the shaft it is merely necessary to loosen the gear-wheel belonging to the filled shaft and tighten the one belonging to the empty shaft, when the direction of motion of the ribbon will be reversed and the ribbon will be wound from the filled shaft to the empty one.

It is obviously desirable that the inking-ribbon should be capable of being easily disengaged from and attached to the ribbon-shafts J and K . For this purpose I have provided an improved attaching means constructed as follows:

The ribbon-shaft is provided with a longi-

tudinal slot, such as is indicated at O, Fig. 10, which slot is made as a whole somewhat longer than the width of the ribbon and wider or longer at one side of the shaft than at the other side thereof conveniently by making the end walls of the slot beveled, as clearly seen in said Fig. 10. Attached to the end of the ribbon L, Figs. 10 and 11, is a flat metal fastening-strip P, the ends of which project a short distance from the side walls of the ribbon, and which is adapted for insertion in the slot O of the shaft. The said strip P is made longer at its outer edge or margin p than at its inner edge or margin p' , while its length is such that when inserted in the slot of the ribbon-shaft its ends will engage the end surfaces of said slot. Conveniently and preferably the ends of the said strip are beveled, as indicated at p^2 , so as to fit against the correspondingly-beveled end faces of the slot; but this particular form of the ends of the fastening-strip and slot is not essential, it being only necessary that said parts should be so shaped that the ends of the strip will become engaged or interlocked with the ends of the slot when the strip is inserted within the slot, so as to afford a strong connection of the ribbon with the said shaft. The ribbon may be secured to the fastening-strip in any suitable manner—as, for instance, by folding the ribbon over the strip and securing the folded end by cement to the body of the ribbon. The same result will of course be produced by sewing the folded edge of the ribbon to form a pocket to receive the strip.

A fastening-strip arranged as described may be easily inserted in the slot by first thrusting one end of the strip through the slot in an angular position and then shifting the ribbon sidewise until the opposite end of the strip is free to pass through the slot, so as to bring both ends of the strip at the wider side of the slot, and then drawing the ribbon backward through the slot, so as to bring the fastening-strip within the same with its beveled ends engaging the beveled ends of the slot in an obvious manner. After the strip is thus inserted the shaft will of course present a smooth or cylindric exterior surface to receive the ribbon. The construction described has the advantage of affording a very cheap and simple connection of the ribbon with the ribbon-shafts and one which enables the parts to be quickly and easily disengaged from and reengaged with each other in removing and inserting the ribbon.

Inasmuch as the fastening-strip made as described is very cheap and easy to construct, ribbons provided with such strips may be manufactured and sold to the user in condition for insertion in the machine.

I prefer to supply the paper for the machine in the form of a continuous strip or roll, as indicated at R, and I prefer to place said roll on a hollow rotating cylinder S, which is mounted at the rear of the machine behind the feed-rollers G and H, so that the strip may

be drawn from said roll continuously by the action of the feed-rollers.

As an improved means of removably supporting the paper-roll, so that it may be easily removed from the machine and at the same time will be held against turning with sufficient frictional resistance to keep the paper under a slight tension, I propose to employ devices as follows: Said paper-roller S is made hollow and will be conveniently constructed of wood. Attached to one end of the roller is a metal gudgeon T, having the form of a plug adapted to enter the central opening of the roller and provided with a shoulder t , which bears against the end of the same, and also with a central conical recess t' , adapted to receive the conical end of one of the two supporting-screws U, which are inserted through opposite frame-plates A', Fig. 1. In the opposite end of the paper-roll is arranged a sliding spindle T', against the inner end of which acts a coiled spring T², which is located within the central portion of the paper-roll and bears against the spindle in a manner to force the latter outwardly. The sliding plug or spindle T' is provided with a conical bearing-aperture t^2 , which engages the conical end of the second pivot-screw U. The sliding plug, arranged as described, obviously enables the roll to be easily and quickly removed from the machine and replaced therein, a slight endwise movement of the roll serving to thrust the spindle into the roll and freeing the opposite end of the roll, so that the same may be carried outwardly away from the pivot, thereby releasing the entire roll. A new roll with a new supply of paper will be inserted by a reverse operation in an obvious manner. The gudgeon T serves only as an abutment for the coiled spring T² and is used simply for convenience of manufacture. It may be found more convenient to dispense with this gudgeon or plug and bore the hole in the cylinder only part way through its length, in which case the spring will abut against the bottom of the hole, and the solid end of the cylinder will be countersunk sufficiently to receive the point of the supporting-screw U.

In the operation of the machine constructed as described the combinations of characters or dots and dashes required to indicate the letters and words, according to a system of stenographic or shorthand writing suitable for the purpose, are printed by depressing at one time one or more of the key-levers of the machine. After the key-levers are depressed for writing each sign or character the anvil-shaft D will be turned a short angular distance to bring another one of the anvils opposite the printing-bars and in position to receive the impression from another group of printing-faces or prongs, which are lifted by the actuation of another set of key-levers. At the same time that the anvil-shaft is rotated the paper-feeding devices move the paper along a short distance, the extent of feed

being such that the total movement given to the paper in a complete rotation of the anvil-shaft would equal the distance apart of two lines on the paper, and the result being that the characters printed will appear in stepped order and in slightly oblique lines extending across the paper parallel with each other. The feeding of the paper will of course be continuous and without attention on the part of the operator, the anvil at the left-hand side of the machine coming into action to receive an impression at the beginning of a line immediately after the anvil at the right-hand side of the machine has been carried by the turning of the shaft out of printing position on the completion of the last preceding line.

I claim as my invention—

1. The combination with a plurality of printing-bars, extending across the paper transversely to its path of movement and along the line of writing, each of said bars being constructed to act in making impression at a series of separate points along the bar, of an impression device consisting of a plurality of movable anvils which are brought successively opposite the impression-points on the bars.

2. The combination with a plurality of printing-bars, extending across the paper transversely to its path of movement and along the line of writing, each of said bars being constructed to act in making impressions at a series of separate points along the bar, of an impression device consisting of a plurality of movable anvils, and a rotary anvil-actuating shaft by which said anvils are moved, substantially as described.

3. The combination with a plurality of printing-bars, extending across the paper transversely to its path of movement and along the line of writing, each of said bars being constructed to act in making impressions at a series of separate points along the bar, of a revolving shaft, provided with a plurality of spirally-arranged impression-surfaces or anvils.

4. The combination with a plurality of printing-bars, which extend across the paper transversely to its path of movement and along the line of writing, each of said bars having a plurality of prongs or projections forming printing-points and a plurality of movable anvils which act in connection with the printing-bars to make impressions from the printing-points on said bars, said printing-points on adjacent bars being offset to bring them into the same plane.

5. The combination with a plurality of movably-mounted printing-bars which extend across the path of the paper, of pivotally-supported key-levers sustaining said bars, each of said bars and its key-lever being made from a single piece of sheet metal equal in width to the length of the printing-bar, and having at its end an upwardly-bent flange forming said printing-bar.

6. The combination with a plurality of mov-

ably-mounted printing-bars extending across the path of the paper and each of which is provided with a plurality of printing-points, of flat, horizontally-arranged key-levers to which the printing-bars are attached, said key-levers being located one above the other and pivotally mounted to oscillate about axes located in different horizontal planes.

7. The combination with a plurality of movably-mounted printing-bars extending across the path of the paper and each of which is provided with a plurality of teeth or prongs forming printing-points, key-levers supporting said bars and mounted on pivots which are located in different horizontal planes, the said prongs carrying the printing-points on adjacent bars being bent or offset into the same plane with each other.

8. The combination with a plurality of printing-bars extending across the paper transversely of its path of movement and along the line of writing, each of said bars being constructed to act in making impressions at a series of separate points along the bar, an impression device consisting of a plurality of movable anvils and a rotatable anvil-actuating shaft, of a universal bar acted upon by all of said printing-bars, and pawl-and-ratchet device moved by said bars and acting upon the shaft to turn the same.

9. The combination with a plurality of movably-mounted printing-bars extending across the path of the paper and each of which is provided with a plurality of printing-points, flat horizontally-arranged key-levers to which the printing-bars are attached, said key-levers being located one above the other and pivotally mounted to oscillate about axes located in different horizontal planes, and a rotating anvil-actuating shaft, of means for actuating the shaft embracing a universal bar, arms extending from each of the printing-bars and adapted to engage the universal bar, and means connecting the universal bar with said shaft operating to turn the latter.

10. The combination with a plurality of printing-bars extending across the path of the paper, and each of which is provided with a plurality of printing-points, of flat, horizontally-arranged key-levers to which the printing-bars are attached, said key-levers being located one above the other and pivotally mounted to oscillate about axes located in different horizontal planes, of a stop for limiting the descent of all the printing-bars, and projections on said bars acting on said stop.

11. The combination with a plurality of printing-bars which extend across the paper transversely to its path of movement, each of said bars being constructed to act in making impressions at a series of separate points along the bar, of a plurality of movable anvils which are successively brought opposite the bar, a revolving shaft by which said anvils are actuated, and paper-feeding devices comprising opposing feed-rolls actuated by said revolving shaft.

12. The combination with a plurality of printing-bars extending across the paper transversely of its path of movement, a plurality of movable anvils, a rotating anvil-actuating shaft by which said anvils are moved, of means for turning the said shaft at each impression, and paper-feeding mechanism which is driven by gearing from said shaft.

13. The combination with a plurality of printing-bars extending across the paper transversely of its path of movement, a plurality of movable anvils, a rotating anvil-actuating shaft by which said anvils are moved, of means for turning said shaft at each impression, paper-feeding mechanism which is driven by gears from said shaft, embracing feed-rollers for the paper and gearing by which said rollers are connected with the shaft.

14. The combination with a plurality of printing-bars extending across the paper transversely of its path of movement, a plurality of movable anvils, a rotating anvil-actuating shaft by which said anvils are moved, of means for turning said shaft at each impression, paper-feeding mechanism which is driven by gearing from said shaft, and a ribbon-actuating device also driven from said shaft.

15. The combination with a plurality of printing-bars extending across the paper transversely of its path of movement, a plurality of movable anvils, a rotating anvil-actuating shaft by which said anvils are moved, of means for turning said shaft at each impression, paper-feeding mechanism which is driven by gearing from said shaft, a ribbon-actuating device, embracing rotating ribbon-shafts, and gearing connecting said shafts with the anvil-actuating shaft.

16. The combination with a plurality of printing-bars which extend across the paper transversely to its path of movement, each of said bars being constructed to act in making impressions at a series of separate points along the bar, of a plurality of movable anvils which are successively brought opposite the bar, a revolving shaft by which said anvils are actuated, and paper-feeding devices comprising opposing feed-rolls actuated by said revolving shaft through the medium of a gear-wheel on the anvil-actuating shaft, and a gear-wheel on one of the feed-roller shafts.

17. The combination with a plurality of printing-bars which extend across the paper transversely to its path of movement, each of said bars being constructed to act in making impression at a series of separate points along the bar, of a plurality of movable anvils which are successively brought opposite the bar, a revolving shaft by which said anvils are actuated, and paper-feeding devices comprising opposing feed-rollers actuated by said revolving shaft; the upper one of said feed-rolls being an idler and the lower one being driven by gearing from the anvil-actuating shaft.

18. The combination with a plurality of printing-bars extending across the paper transversely to its path of movement and along the line of writing, each of said bars being constructed to act in making impressions at a series of separate points along the bar, and ribbon-actuating mechanism embracing two ribbon-shafts, a gear-wheel on each shaft, and an intermediate idler.

19. The combination with a plurality of printing-bars extending across the paper transversely to its path of movement and along the line of writing; each of said bars being constructed to act in making impressions at a series of separate points along the bar, and ribbon-actuating mechanism embracing two ribbon-shafts, a gear-wheel on each shaft, and an intermediate idler, said ribbon-actuated device being actuated from the anvil-actuating shaft by means of gearing.

20. The combination with a plurality of printing-bars extending across the paper transversely to its path of movement and a plurality of anvils which are brought successively into position opposite the bars, of feed-rollers for the paper actuated by the movement of the bars, and ribbon-actuating devices comprising two ribbon-shafts, gear-wheels on said shafts, an intermediate idler and a pinion on one of said feed-rollers engaging one of said gear-wheels to drive the ribbon-shafts.

21. The combination with a plurality of printing-bars extending across the paper transversely to its path of movement and key-levers for actuating said bars, of movable anvils which are successively brought into position for action on said printing-bars, a revolving shaft giving movement to said anvils, actuating connections between the key-levers and said shaft, a paper feed-roller connected by gearing with the said anvil-actuating shaft, two ribbon-shafts, gear-wheels on said ribbon-shafts, an intermediate idler, and a pinion on the feed-roller intermeshing with one of said gear-wheels.

22. The combination with a plurality of printing-bars which extend across the paper transversely to its path of movement, key-levers for actuating the bars and a series of anvils which are successively brought into position for the action thereon of said bars, of ribbon-shafts, gear-wheels on said shafts, and an intermediate idler, said gear-wheels on the ribbon-shafts being detachably connected with the same.

23. The combination with a plurality of printing-bars which extend across the paper transversely to its path of movement, key-levers for actuating the said bars and a series of anvils which are successively brought into position for the action thereon of said bars, of ribbon-shafts, gear-wheels on said shafts, and an intermediate idler, said gear-wheels on the ribbon-shafts being detachably connected with the same by means of frictional connections.

24. The combination with a plurality of printing-bars, of key-levers supporting the same consisting of flat pieces of sheet metal, and bearings for the printing-bars consisting
5 of rods which are inserted through oppositely-bent parts of the sheet metal constituting the levers.

25. The combination with a ribbon-shaft having a longitudinal slot, said slot extend-
10 ing through the shaft and being longer at one side of the shaft than at the other, of a ribbon provided with a flat fastening-strip which projects beyond the side margin there-
of and is longer at its outer than at its inner
15 edge whereby when said strip engages the shaft, the ends of the strip and slot will be interlocked and the strip will be contained wholly within the shaft.

26. The combination with a ribbon-shaft
20 having a longitudinal slot, said slot extending through the shaft and being longer at one side of the shaft than at the other, by which an angular surface is formed at each end, of a ribbon provided with a flat fastening-strip
25 which is longer at its outer than at its inner edge and is adapted to enter said slot, and

the angular ends of which are adapted to fit and rest against said angular surfaces at each end of the slot.

27. The combination with a plurality of
30 printing-bars extending across the paper transversely to its path of movement and along the line of writing, each of said bars being constructed to act in making impres-
sions at a series of separate points along the
35 bar, of an impression device which acts successively on the several printing-points of the printing-bars in the act of printing, and an inking-ribbon, the width of which is equal
40 to the length of the line to be printed and which is moved in a direction transverse to the said printing-bars, substantially as de-
scribed.

In testimony that I claim the foregoing as my invention I affix my signature, in presence
45 of two witnesses, this 25th day of July, A. D. 1896.

JOHN F. HARDY.

Witnesses:

FERDINAND J. HOLE,
ALFRED NUTTING.