No. 743,890. PATENTED NOV. 10, 1903.

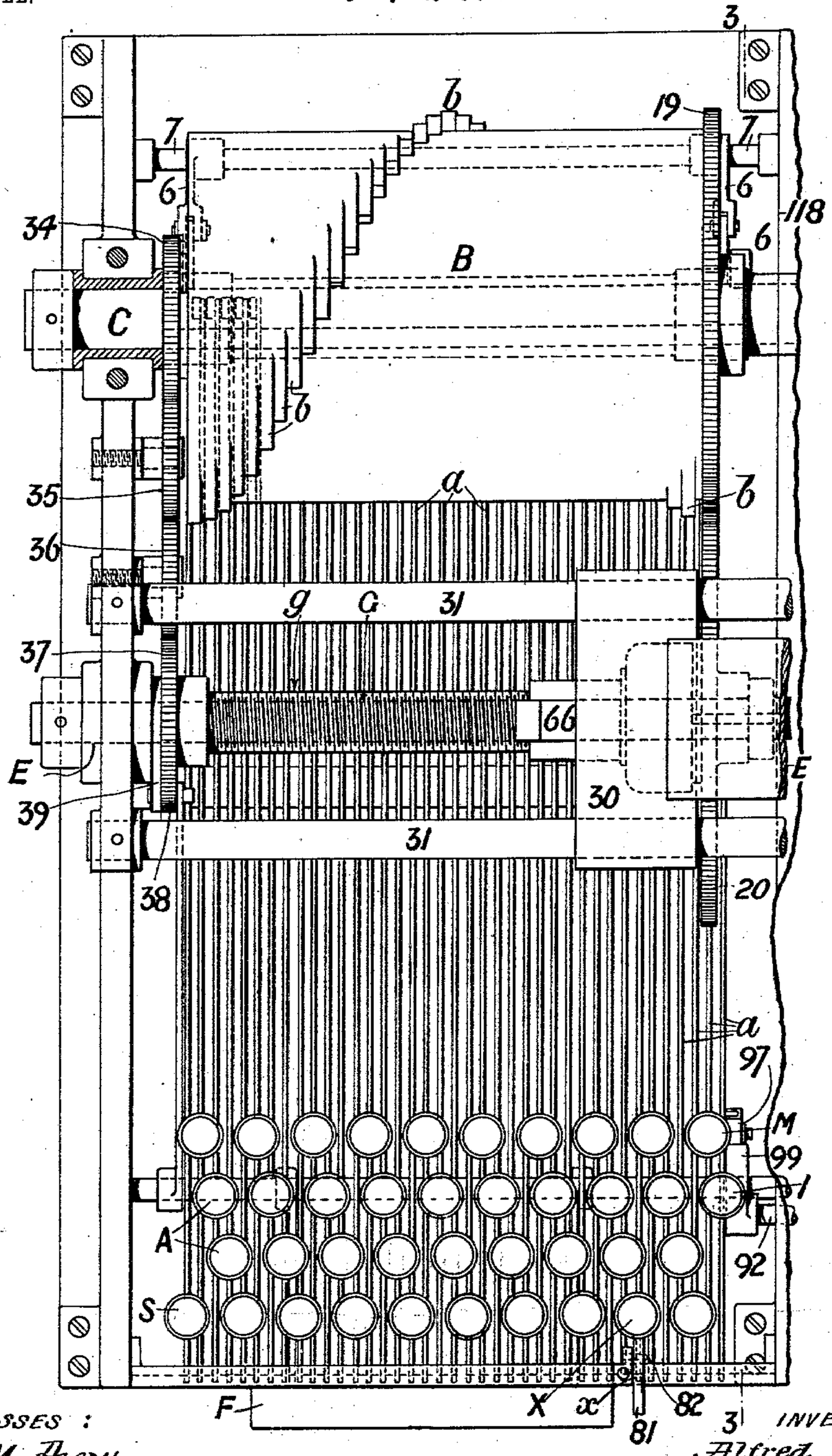
A. KRAUS & N. COLLINS.

MACHINE FOR PRODUCING STEREOTYPE OR ELECTROTYPE MATRICES AND PRINTING BLOCKS.

APPLICATION FILED NOV. 15, 1902.

NO MODEL. 10 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:

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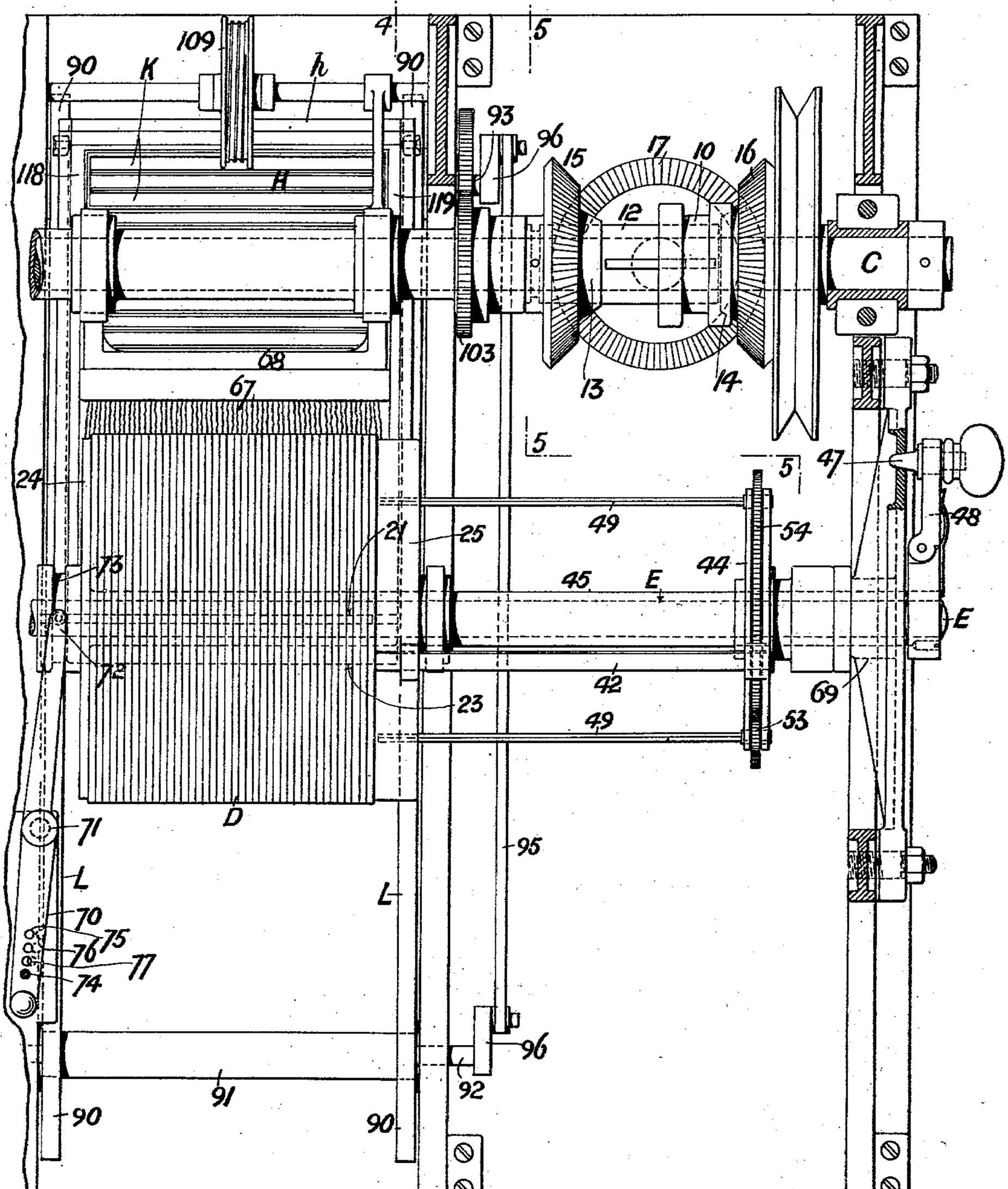
NO MODEL. 10 SHEETS—SHEET 2.

FIG. 1B



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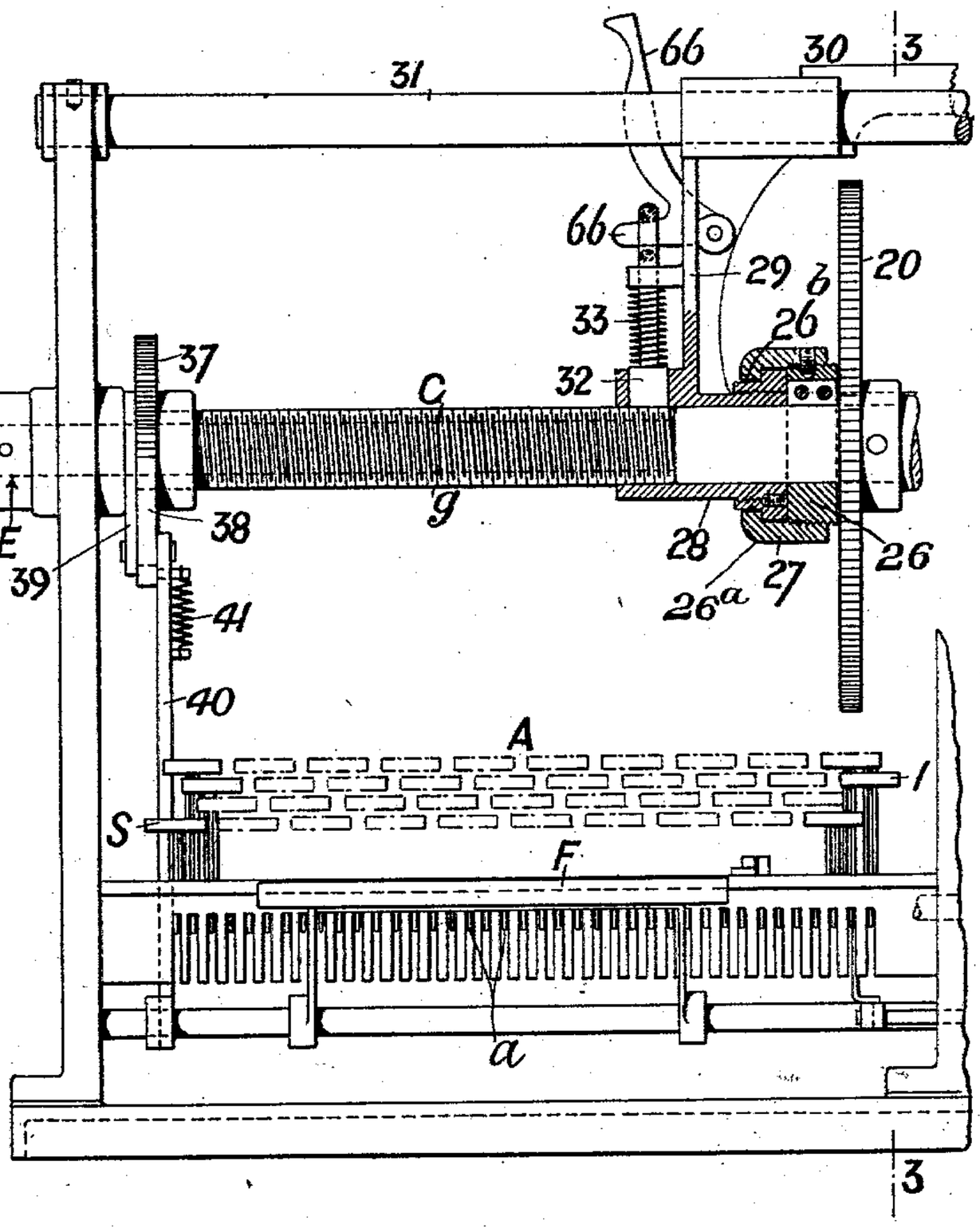
NO MODEL. 10 SHEETS—SHEET 3.

FIG. 2A



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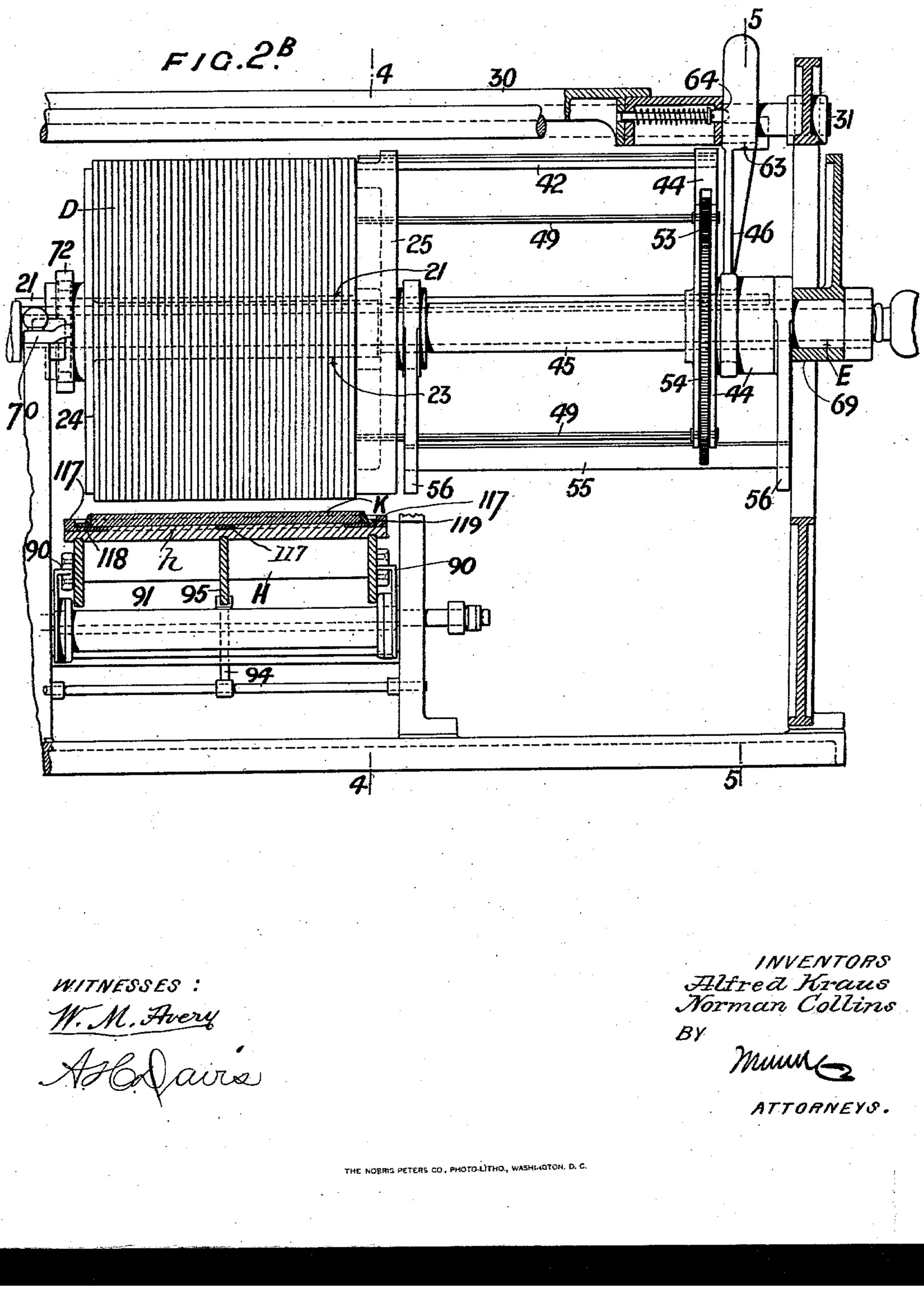
NO MODEL. 10 SHEETS—SHEET 4.

FIG. 2B.



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NO MODEL. 10 SHEETS—SHEET 5.

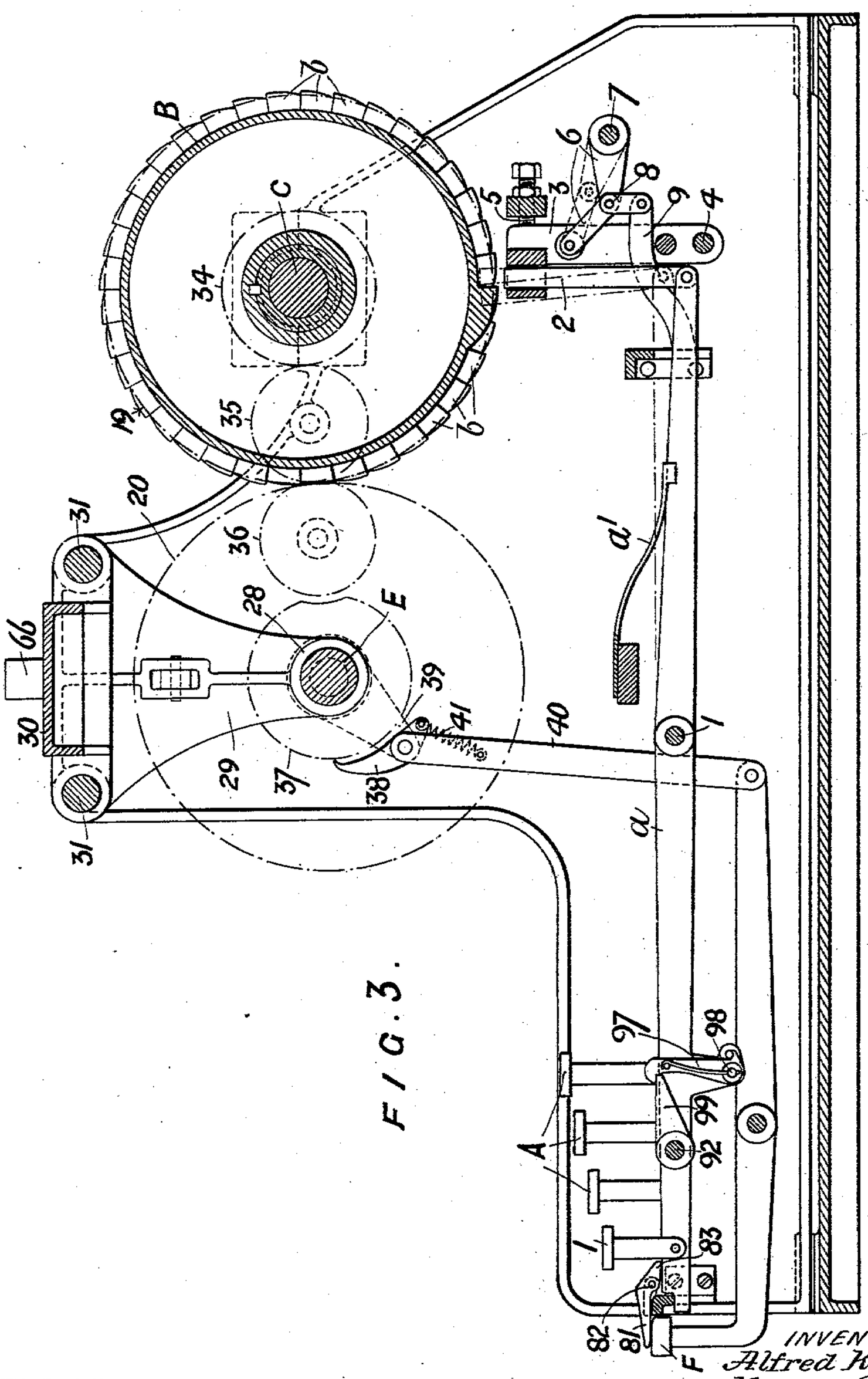

FIG. 3.

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NO MODEL. 10 SHEETS—SHEET 6.

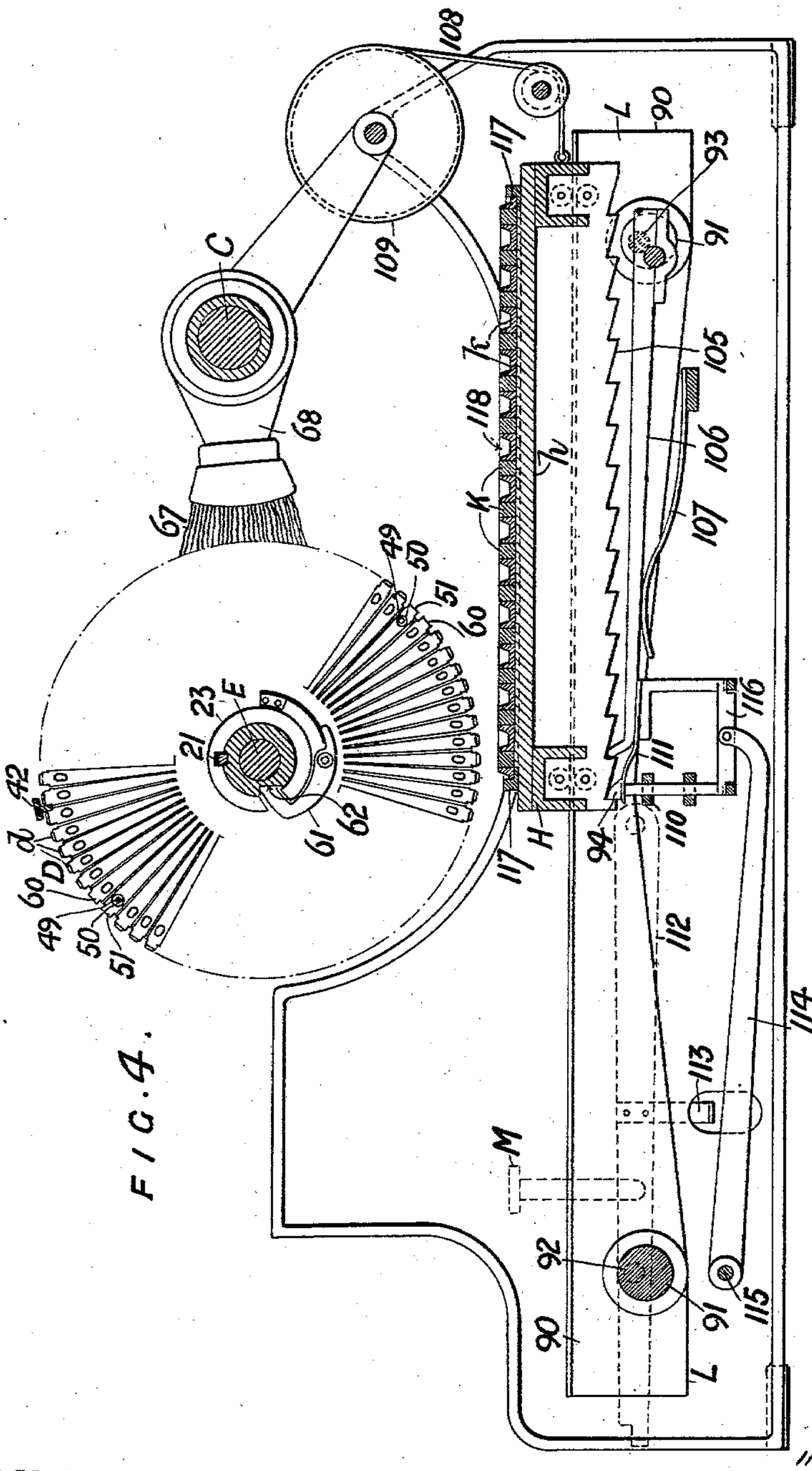

FIG. 4.

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NO MODEL. 10 SHEETS—SHEET 7.

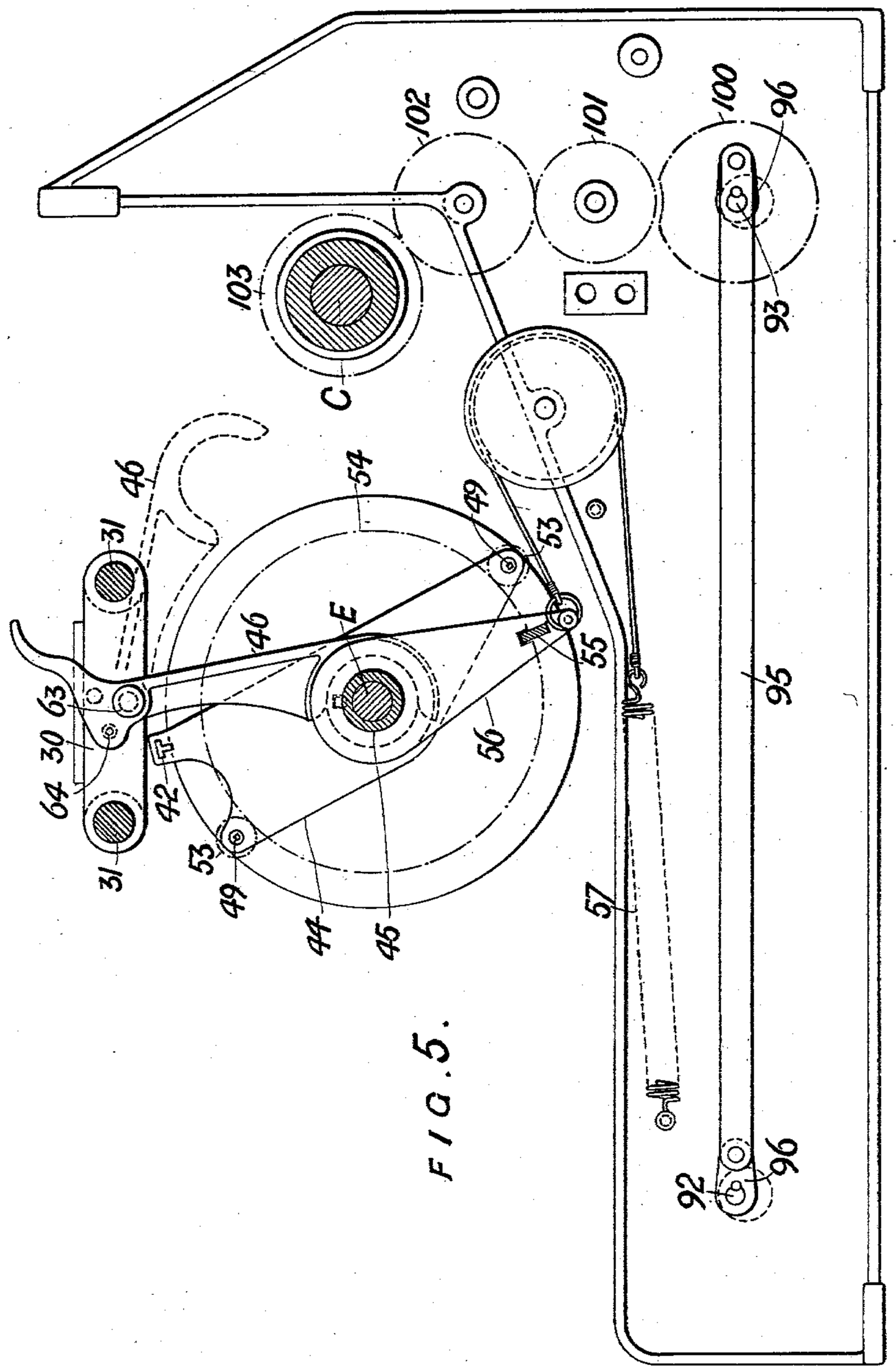

FIG. 5.

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NO MODEL. 10 SHEETS—SHEET 8.

FIG. 6.

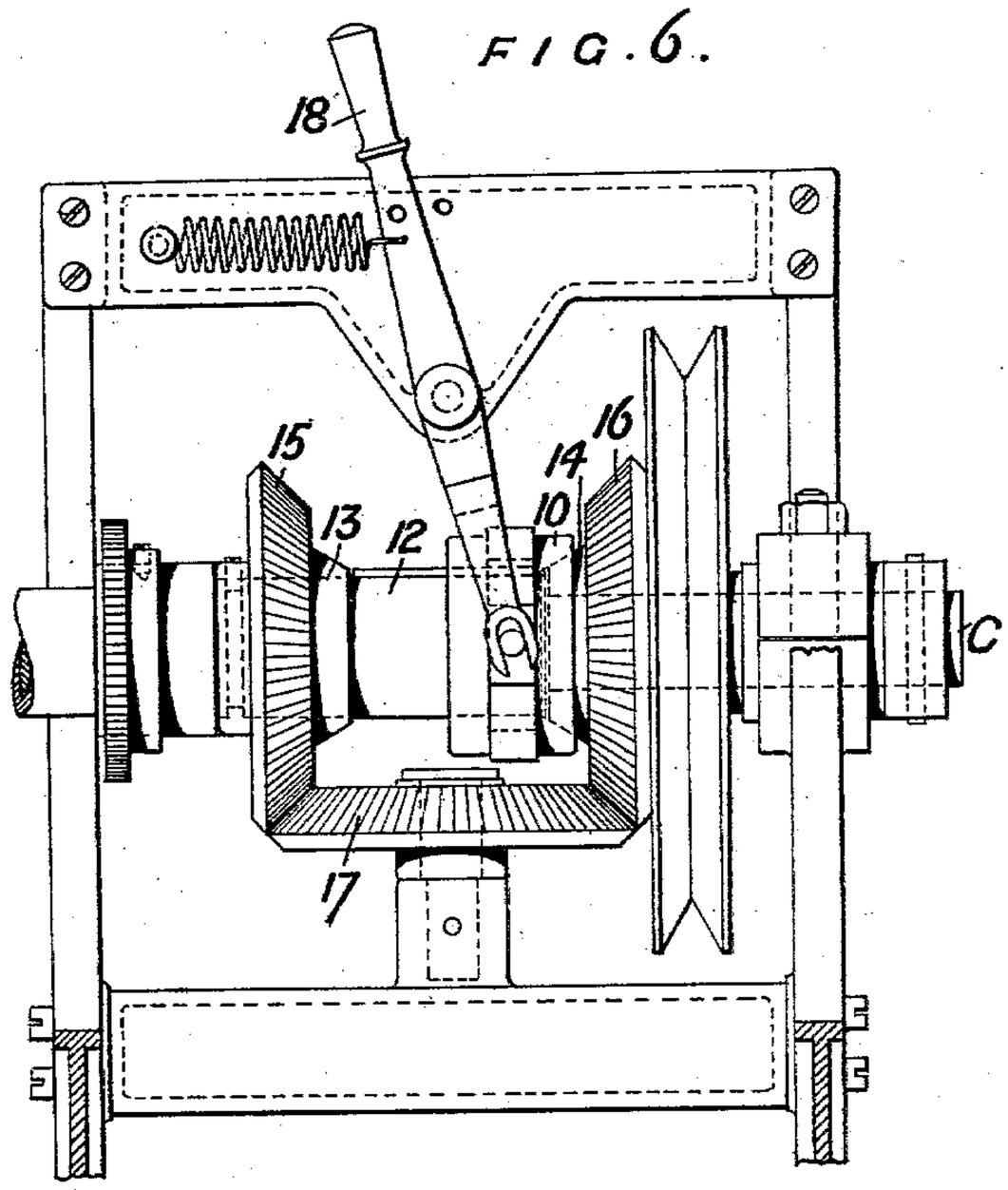

FIG. 12.

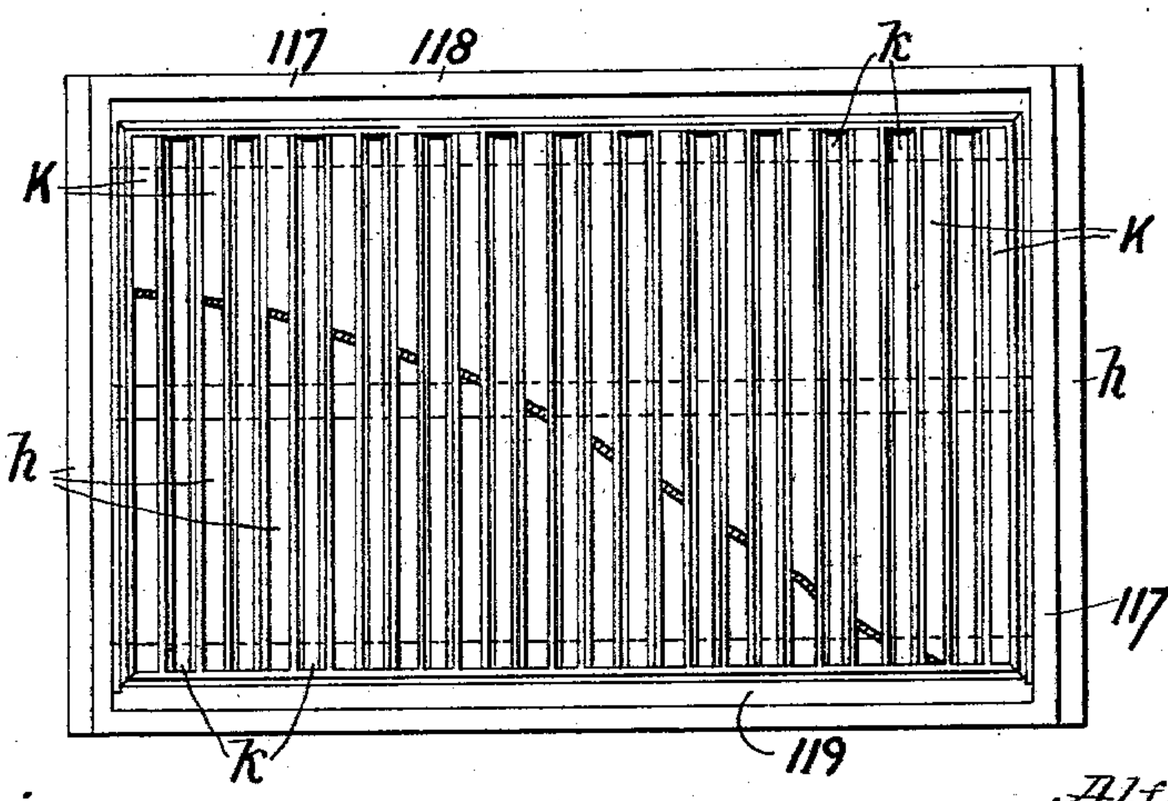

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FIG. 7.

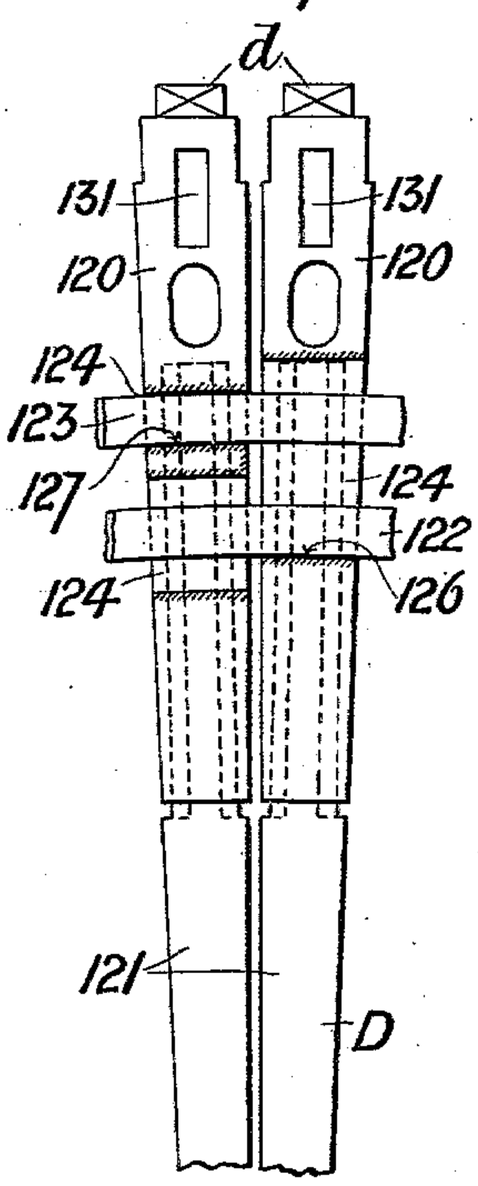

FIG. 8.

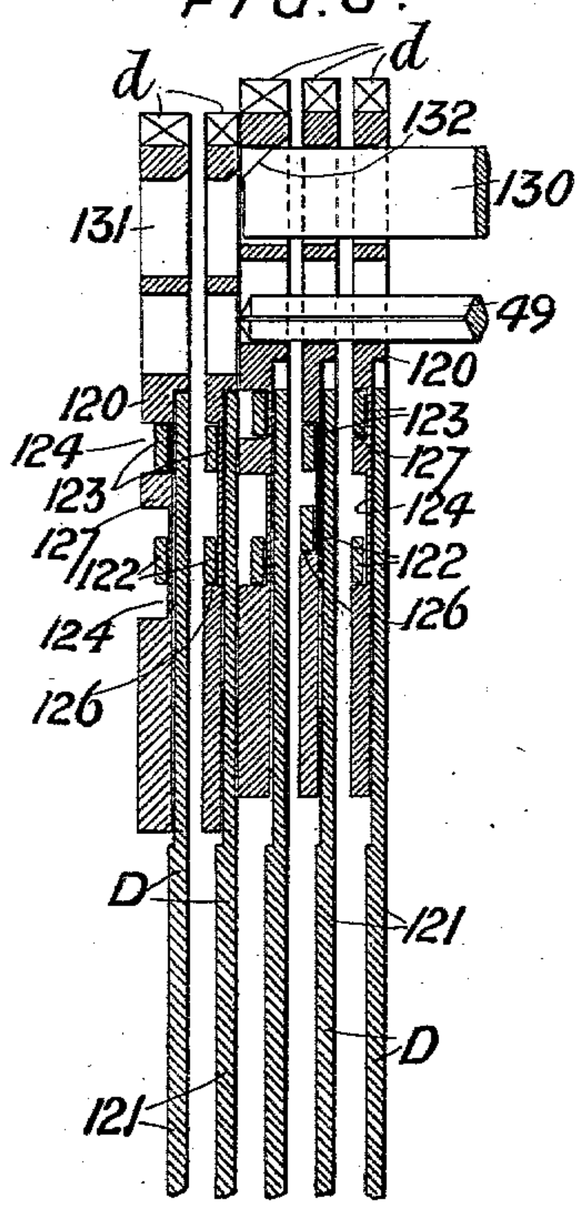

FIG. 10.

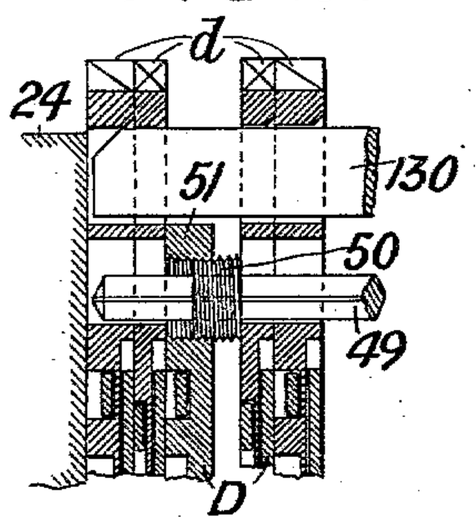

FIG. 11.

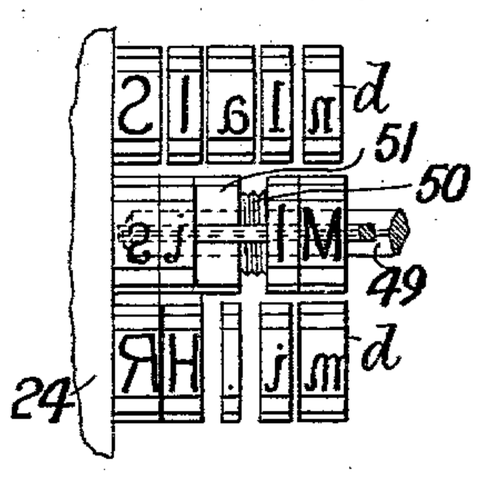

FIG. 9.

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APPLICATION FILED NOV. 15, 1902.

NO MODEL. 10 SHEETS—SHEET 10.

FIG. 13.

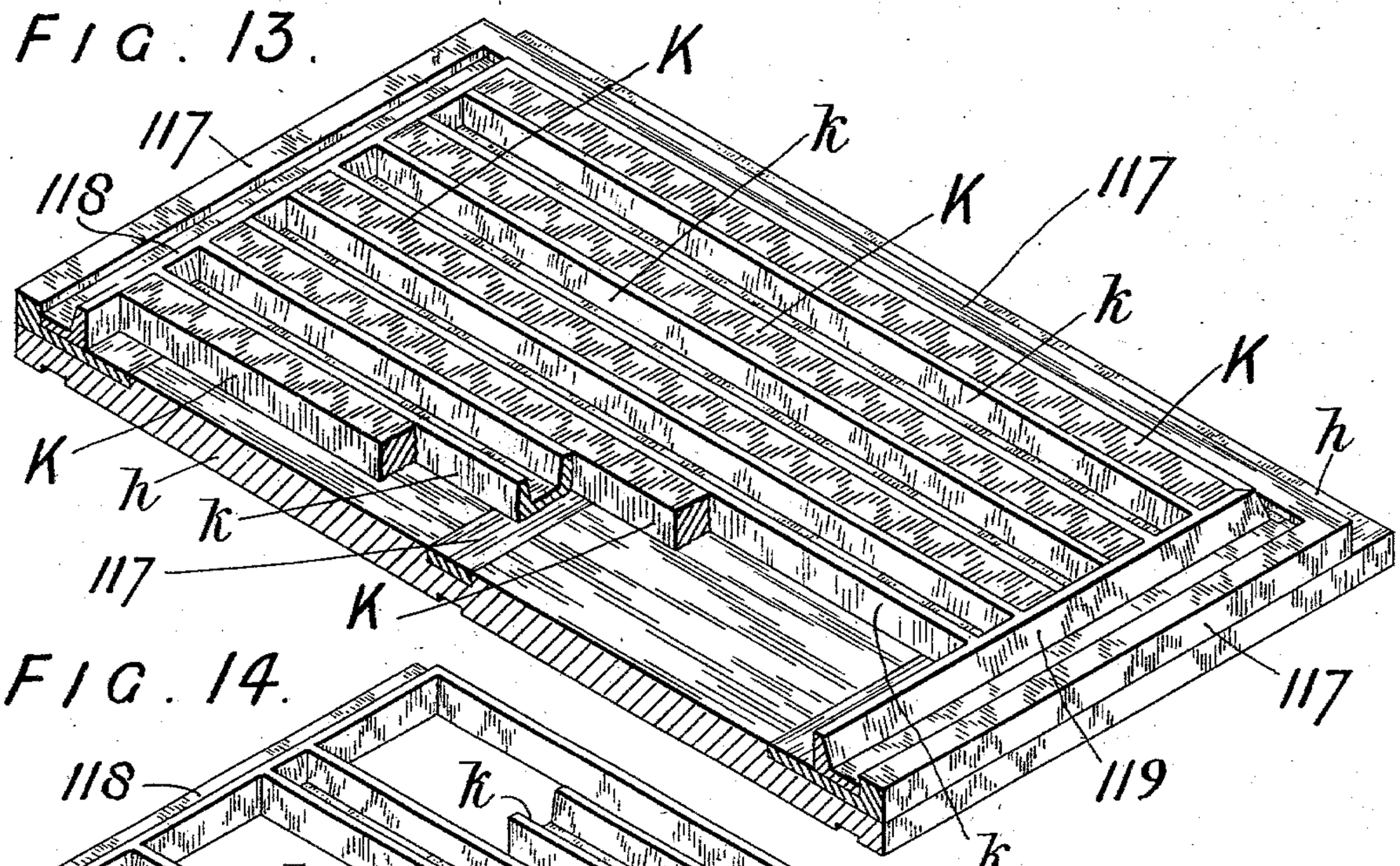


FIG. 14.

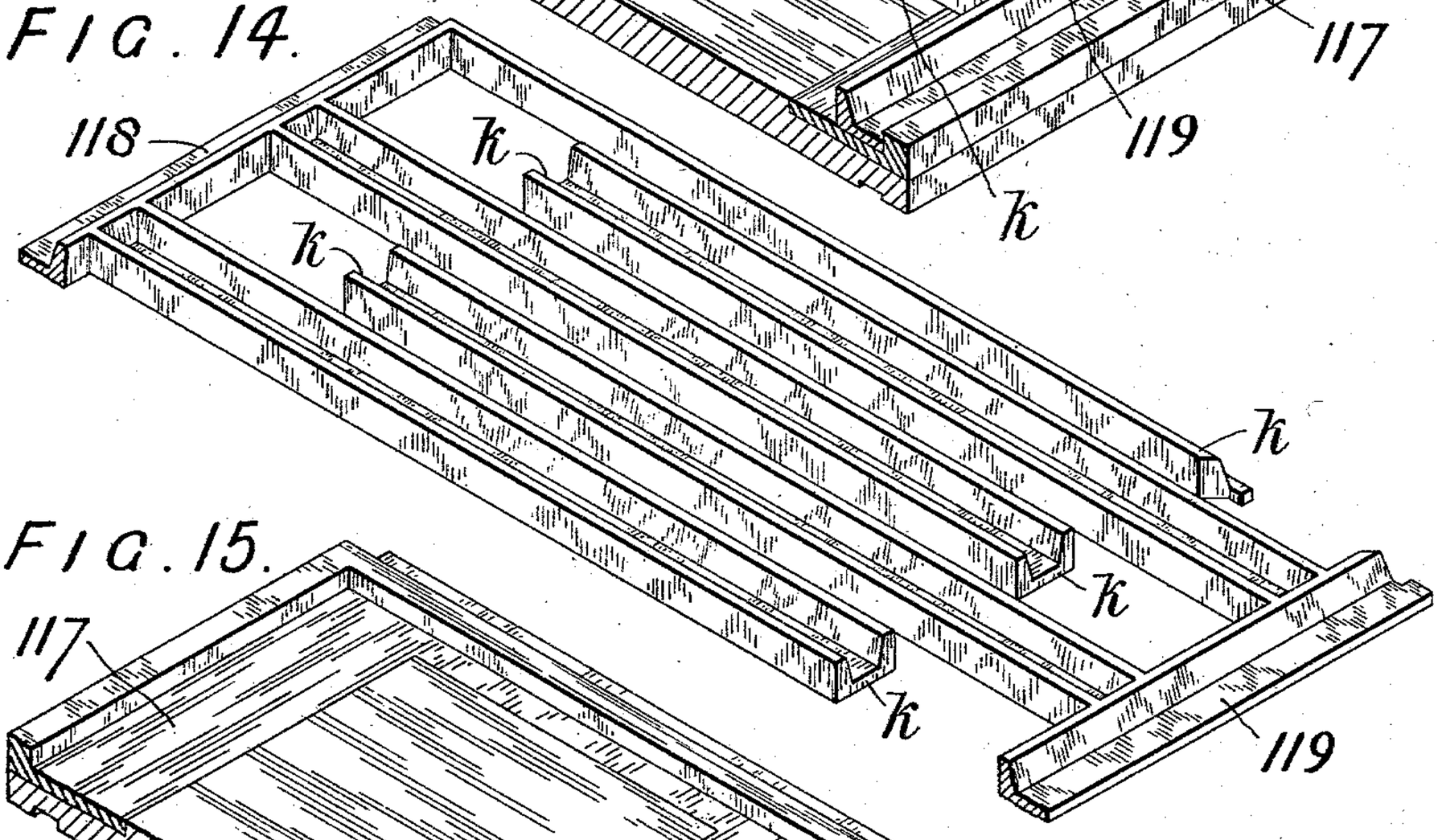
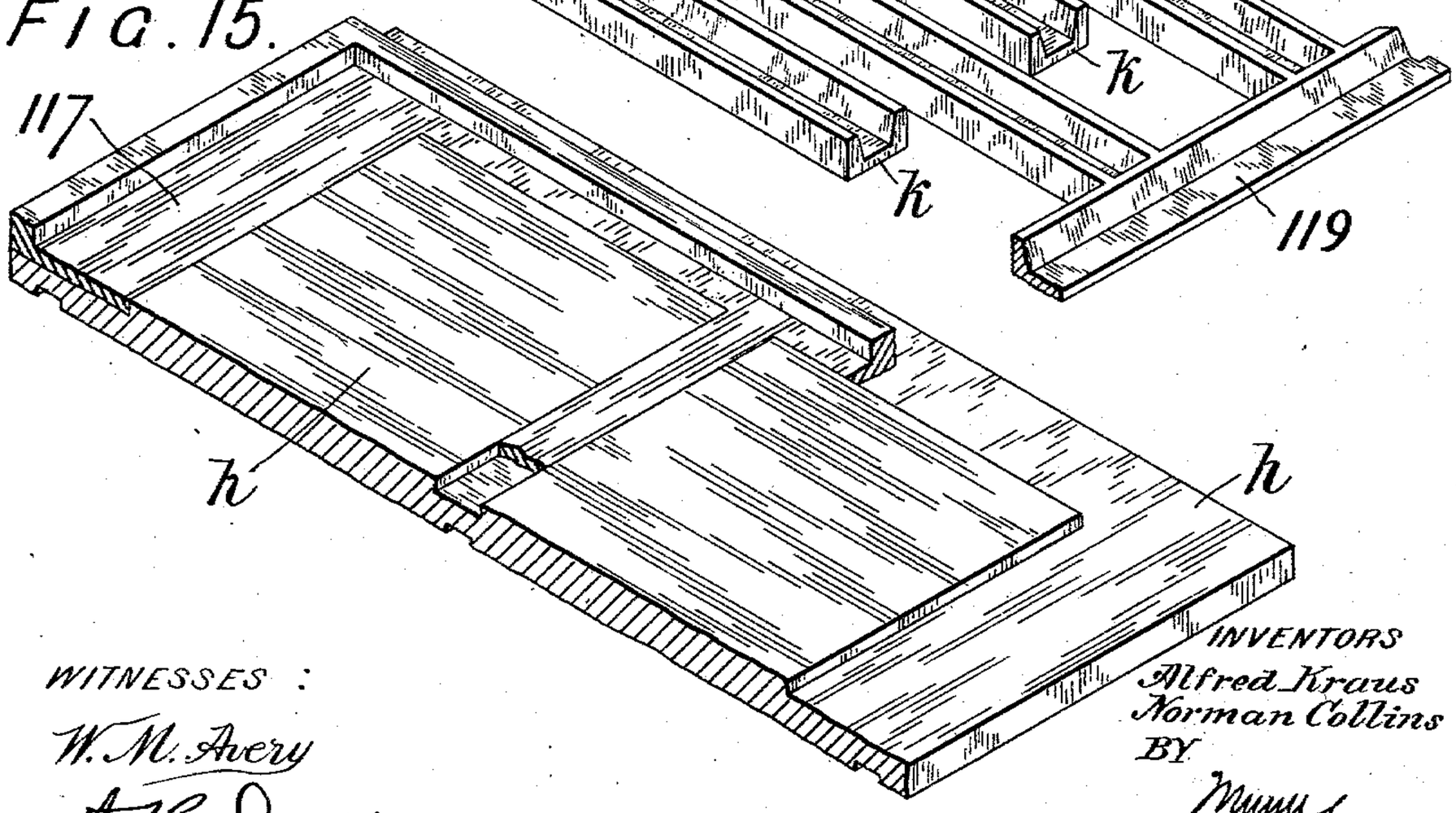


FIG. 15.



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No. 743,890. Patented November 10, 1903.

UNITED STATES PATENT OFFICE.

ALFRED KRAUS, OF PARIS, FRANCE, AND NORMAN COLLINS, OF LONDON, ENGLAND; SAID COLLINS ASSIGNOR TO SAID KRAUS.

MACHINE FOR PRODUCING STEREOTYPE OR ELECTROTYPE MATRICES AND PRINTING-BLOCKS.

SPECIFICATION forming part of Letters Patent No. 743,890, dated November 10, 1903.

Application filed November 15, 1902. Serial No. 131,593. (No model.)

To all whom it may concern:

Be it known that we, ALFRED KRAUS, analytical chemist, a citizen of the French Republic, residing at 10 Rue Marbeuf, Paris, France, and NORMAN COLLINS, engineer, a subject of the King of Great Britain, residing at 2 Grays Inn road, in the city of London, England, have invented certain new and useful Improvements in Machines for Producing Stereotype and Electrotype Matrices and Printing-Blocks, of which the following is a specification.

This invention relates to a machine for composing type and producing therefrom a stereotype-matrix or a printing-surface, according as the type-faces are in relief or are sunk.

For the sake of brevity the word "matrix" as used hereinafter is to be understood as denoting a surface or body of plastic material adapted to be impressed by type for the purpose of providing either a stereotype-mold (or "matrix," properly so-called) or a printing-surface.

The machine comprises a key-controlled rotary barrel, juxtaposed type-disks, and means of adjusting the type-disks and justifying the composed line of matter, also means for producing a matrix by the successive impression of successively-composed lines.

Figures 1^A and 1^B together form a part plan of the machine. Figs. 2^A and 2^B together form a front elevation. Figs. 3, 4, 5 are cross-sections on lines 3 3, 4 4, and 5 5. Fig. 6 shows the reversing-clutch. Figs. 7 to 11 show details on a larger scale. Fig. 12 is a plan of the matrix-carrier. Fig. 13 is a perspective part view of the same, portions being broken out to show the construction. Fig. 14 is a similar view showing the two parts of the matrix-holding grid separated from one another. Fig. 15 is a similar view of part of the matrix-carriage and of the frame or seat for the grid. Figs. 13, 14, and 15 are drawn to a larger scale.

Each key A operates a detent for limiting the rotation of a barrel B by engaging a stud *b* thereon. The pitch of the studs *b* corresponds to that of alternate types on the type-disks, and each detent has two operative positions differing in angular relation to the barrel to an extent equal to half the pitch of the studs *b*, so that each key A will correspond to two adjacent types, the setting of the one or other of those types being determined according as the detent is brought to the one or other of its two operative positions. The barrel B is geared frictionally with a continuously-revolved shaft C and positively with the carrier of the type-disks D, so that the latter will receive successive angular movements corresponding to those of the barrel.

Each disk D has laterally-flexible arms, each carrying a type-body *d* or a space-block. The type-bodies may be fixed or may be readily movable to effect protraction of the composed line beyond the normal radius. Each type-disk comprises capitals, small letters, and other usual characters, also two or more space-blocks and means of justification.

The disks D are independently adjustable and are rotated about a shaft E by means of driving engagement between the disks and the barrel, the said driving means being so retracted after each angular adjustment that each disk in turn is disengaged, the disks being then held by retaining means, which engage with the disks in succession as they are disengaged from the driving means.

Justification is effected concurrently with the movement of the composed line to the impression position. By justification is meant not only spacing the words to fill out the line, but also closing together the letters of a word. As each disk comprises letters of various widths, it requires for its revolution a space equal to the width of the widest type-body, and the type-bodies of adjacent disks must therefore be capable of being moved toward each other in order to obtain proper spacing of the narrow letters. The type-carrying arms are therefore flexible to permit the constituent type-bodies of a word to be moved slightly out of the planes of their disks, such closing together being included under the term "justification."

The impression mechanism comprises a matrix-carriage H, movable toward the type-disks, shifted after each impression line by

line, both movements being imparted from shaft C through mechanism controlled by an "impression-key" I.

The matrix may either be a single block or a plurality of strips of plastic material, each strip for the impression of a single line, the strips being subsequently assembled to form a matrix. In either case the matrix would be adapted to serve for a column of printed matter.

The key-levers *a* rock on an axis 1 and are pressed upon by springs *a'*, and to each is pivoted a dtent 2, guided by a slot in a frame 3, pivoted at 4 and pressed against a stop 5, so that when a detent 2 is raised the corresponding small or "lower-case" letter will be set. To the ends of the frame 3 are connected two sets of toggle-links 6 6, one link of each set being fast on a shaft 7, so that they work in unison. To the joint 8 of one set is coupled the lever 9 of the "capital" or "shift" key S, whereby the frame 3 and detents 2 may be swung forward, so that when a detent is now raised its position will correspond to the setting of a capital letter, the small letters and corresponding capitals alternating on the type-disks. The key-lever 9 is pressed upon by a spring similar to the springs *a'*, whereby the frame 3 is normally held against the stop 5.

The barrel B is loose on shaft C and is geared therewith through friction-gear reversible by means of a clutch 10, splined on a sleeve 12, fast with the barrel, the clutch 10 being controlled by a lever 18 and being capable of frictional engagement with either of two cones 13 14, fast with bevel-wheels 15 16, the one, 15, loose on sleeve 12 and the one, 16, fast on shaft C, both 15 and 16 gearing with a wheel 17, so that the barrel will be rotated in the one or other direction. The barrel B is geared by equal spur-wheels 19 20 with the shaft E, and the disks D are loose on a sleeve 23, having a disk 24, between which and a disk 25 the disks D are confined. The sleeve 23 turns with shaft E, but is slidable thereon for removal of the set of type-wheels.

The type-disks are successively brought to and left in composed position by a spline 21, received in keyways in the disks D in sleeve 23 and in wheel 20. The spline 21 is permanently in driving connection with barrel B, but is slidable longitudinally by a collar 26, loose on shaft E and coupled with a collar 27, fast on the boss 28 of arm 29 on a sliding carriage 30. The spline 21 and sleeve 23 are thus revolved by barrel B to successive angular extents and carry around with them as many of the disks D as are traversed by the spline. The spline 21 is cross-pinned to the collar 26, (as shown at the upper part of the latter in Fig. 2^{A},) and upon the threaded periphery of collar 26 is screwed a coupling-socket 26^{a}, having an internal shoulder 26^{b}, which engages the corresponding external shoulder of the collar 27.

The retraction of the spline 21 from successive disks D is effected by mechanism brought into action by a feed-key F. The boss 28 and the carriage 30 can slide the one along the shaft E and the other upon guide-rods 31. A dog 32 on arm 29 is engaged by a spring 33 with a screw G on a sleeve *g*, loose on shaft E, but prevented from sliding, the pitch of the screw corresponding to the thickness of the hubs of disks D, (which is equal to the width of the widest type-body,) so that at each revolution of the sleeve *g* the spline will be retracted and leave a disk D in the angular position to which it has been brought.

The rotation of those disks D which are engaged by the spline 21 and the disengagement of the spline from successive disks occur alternately, the first when a key A is actuated and the last when the screw G receives one revolution. This is effected through mechanism comprising a spur-wheel 34 on shaft C in gear, through wheels 35 36, with a wheel 37, fast on sleeve *g* and mutilated so that the sleeve will remain at rest when the mutilation meets the wheel 36. The mutilated wheel 37 is caused to gear with wheel 36 by a pawl 38, pressed by a spring 41 and pivoted on a link 39, loose on shaft E and coupled by link 40 with the feed-key F. On actuating key F the pawl 38 turns wheel 37 until it gears with wheel 36, whereupon the screw G receives one revolution, and the spline 21 is withdrawn from one disk D, and so on in succession. The disks D, after being adjusted, are retained by a bar 42, which follows up the retraction of the spline and engages between the arms of the disks D in succession. This retaining-bar is fixed to a frame 44 and passes through a guide-hole in the disk 25, which is fast on a sleeve 45, loose on shaft E, while the frame 44 can slide along the sleeve 45, but turns therewith, the frame 44 and bar 42 moving with the carriage 30, whereof a forked arm 46 engages in the grooved boss of frame 44.

The disk 25 and frame 44 are normally retained by a spring-jointed lever 48, mounted on the sleeve 45 and engaging by a nose 47 in a hole in the machine-frame. To bring the composed line to impression position, the nose 47 is disengaged, and the disk 25, frame 44, and disks D are rotated by lever 48 as a handle, so as to bring the composed line of type face downward. Simultaneously with this movement justification is effected by (preferably three) rods 49, mounted in frame 44, and advanced concurrently with bar 42, the rods passing through revolving guide-bushes in disk 25, through clearance-holes in the type-bodies *d* and space-blocks 60, and through "justification-screws" 50, screwing in tapped holes in the space-blocks 51. These rods 49 are adapted to make rotative connection with corresponding holes in the justification-screws 50, the rods being tapered at the ends, so as to enter freely. The rods 49 are revoluble simultaneously, each about its own axis, by planet-pinions 53, fast on the rods 49, journaled in the frame 44 and gearing with a sun-

wheel 54, loose on frame 44. A bar 55 engages in a notch in the sun-wheel 54 during the sliding movement of the frame 44 and is mounted on a pivoted frame 56, held by a spring 57, so as to permit the bar 55 to yield and the sun-wheel to rotate only when the pinions 53 are prevented from further rotation. When frame 44 is rotated to bring the composed line to impression position, the planet-pinions 53 roll about the sun-wheel 54, whereby the screws 50 are rotated and screwed out from the space-blocks 51 until by the thrust of the screws 50 the line is completely justified, as indicated in Figs. 10 and 11, which show a longitudinal section and a plan of part of several disks.

Each disk D has a spring-pawl 61, and the sleeve 23 has a longitudinal groove 62 to engage therewith, so that the sleeve 23 can revolve in the one direction, while the disks D are retained by the bar 42; but when the bar 42 is withdrawn and the sleeve 23 is rotated in the other direction the disks D will be carried round with the sleeve and returned to normal alinement. This reversal of the sleeve is effected by the clutch 10 after the impression has been taken. To enable the bar 42 to be withdrawn, the forked arm 46 of carriage 30 is pivoted at 63 and engaged with the grooved boss of frame 44 by a spring-bolt 64, which by yielding allows the arm 46 to be swung back, as dotted in Fig. 5, to allow of the frame 44 being slid back. The return of the spline 21 is delayed until the disks D have been returned to normal alinement by disengaging the dog 32 from the screw G by means of a thumb-lever 66, after which the carriage 30 can be slid back to cause the spline 21 to again engage the disks D.

The normal alinement of the disks by the groove 62 is insured by a stationary brush 67 on a frame 68, which both cleans the types and prevents rotation of disks D by mere friction of the sleeve 23.

To permit the replacement of the set of type-disks D by another set, the end bearing 69 for the shaft E is removable, as shown in Figs. 1 and 2.

To avoid a space at the end of the line when the last word is not divisible at or does not end at the last disk of the set, the superfluous disk or disks must be removed entirely beyond the end of the line. The disk 24 and sleeve 23 may accordingly be adjusted along shaft E in one of three positions determined by a lever 70, pivoted at 71, forked at 72 to engage a groove 73 in the boss of disk 24 and secured by a pin 74, entering one of three holes 75 76 77 in the lever and frame. The distance between disks 24 and 25 is thus increased to an extent equal to one, two, or three disks D beyond the length of the line. In justifying the superfluous disk or disks will be moved beyond the end of the line and if adjusted to present a space-block 60 will yield no impression.

To compose a blank, the key X, corresponding to the plain space-blocks 60, may be retained by a latch 81, pivoted at 82 and engaging by a nose 83 with the key-lever x, so that by repeatedly operating the feed-key F the spline 21 will be retracted without rotation of the disks D, and a succession of space-blocks 60 will be left in the composed position.

The carriage H for the matrix K slides upon the side members 90 of a frame in which revolve two pairs of eccentrics 91, fast on shafts 92 93, whereby up-and-down motion is imparted to the frame. To insure true vertical motion, the carriage H is engaged by a vertically-guided detent 94, which acts also as a pawl coöperating with the carriage-feed mechanism. The shafts 92 93 may be geared together by an endless chain, but are preferably coupled by rods working in quadrature, the one rod, 95, being coupled to cranks 96, set at right angles to the radius of the eccentrics 91, and the other coupling-rod being formed by the side members 90, in which the eccentrics turn. The matrix-raising mechanism is set in motion by the impression-key I, acting through a spring-pawl 97, pivoted at 98 to the lever of key I and engaging with an arm 99, fast on the end of the shaft 92, whereby shafts 92 and 93 will be turned sufficiently to put a mutilated spur-wheel 100, fast on the latter, into gear with one of a series of wheels 101 102, in gear with a wheel 103, fast on the shaft C. After a complete revolution of shafts 92 93 the wheel 100 will go out of gear and so remain until key I is again actuated.

The matrix is fed line by line by a pawl 106, pressed by a spring 107 into engagement with rack 105 at the under side of the carriage H, having teeth corresponding in pitch to the distance between successive line impressions, this rack being also engaged by the detent 94. The feed-pawl 106 is pivoted on an eccentric or crank on shaft 93, so as to receive to-and-fro motion, the driving stroke occurring while the matrix-carrier is lowered.

The carriage is pulled rearward by a cord 108 and spring-barrel 109, whereby the carriage after reaching the end of its course may be quickly returned to initial position, with a fresh matrix operating a key M. The detent 94 moves in guides 110 and is forced toward the rack 105 by a spring 111 on the feed-pawl 106, and the lever 112 of key M engages by a lug 113 with a lever 114, pivoted at 115 and connected to a swing-bar 116, which bears upon the tail end of the pawl 94 and upon a lug on the feed-pawl 106 in order that the pawls 94 and 106 may be disengaged simultaneously, leaving the carriage free to be returned by the spring-barrel 109.

Upon the plate h of carriage H fits a frame 117, wherein fits a grid, whereof alternate bars k are attached to its opposite sides 118 119, these sides, with their respective sets of bars, being mutually separable. The plastic strips K rest upon the plate h and fit between

the bars *k* and are removable as a whole along with the frame 117 and the grid. The strips are exposed in the grid to the air at top and bottom to dry, whereupon the parts of the frame may be separated to release the strips, which are then assembled to form a matrix.

Figs. 7, 8, and 9 show radially-protractible types and the means of protraction. Fig. 7 shows a face view of part of a disk, and Fig. 8 shows five juxtaposed disks in section through the composed line of type, of which three are in protracted position. Each type-body *d* has a shank 120 grooved to slide upon the radial arm 121 of dovetailed section, Fig. 9, and is normally retracted by spring action, two springs 122 and 123 of annular form being preferably employed, lying in cross-notches 124 in the shanks 120, the one spring 122 bearing against a shoulder 126 on every alternate type-body of the disk, while spring 123 bears against a shoulder 127 on every intermediate type-body. This division of the type-bodies into alternating series insures that when a type-body is protracted the adjacent type-bodies shall not also be protracted. The composed line of type is protracted by a cam-bar 130, mounted on frame 44 and advanced along with the bar 42. Each type-body *d* has a slot 131, through which the cam-bar 130 passes, the end 132 of the cam-bar being beveled, so as on meeting the bevel at the ends of the slots 131 to cause the type-bodies to be protracted beyond the normal radius of the disk. To permit of this movement, the holes through which the justification-rods 49 pass are elongated. The space-blocks 60 would be fixed and have slots long enough to allow the cam-bar to pass freely through.

We claim—

1. In a type-composing and matrix-impressing machine, the combination of a plurality of type-disks each having radial, laterally-flexible type-body-carrying arms, the disks being closely juxtaposed and independently revoluble upon a revoluble sleeve, and being provided with pawls adapted to engage with the sleeve when turned in one direction so as to cause the disks to be brought to position of initial alinement, as described.

2. In a type-composing and matrix-impressing machine, the combination with a set of juxtaposed type-disks independently revoluble on a central spindle, and with means for effecting driving engagement of the central spindle with the said disks movable out of engagement therewith in succession, of a rotary barrel constantly geared with said disk-driving means so as, while permitting of the successive disengagement of said means from the disks, to cause rotary motion to be imparted thereto by and corresponding in angular extent to the rotation of the barrel, as described.

3. In a type-composing and matrix-impressing machine, the combination of a set of juxtaposed type-disks independently revoluble about a central spindle, means for effecting driving engagement of the central spindle with said disks movable out of engagement therewith in succession, key-operated means of imparting such disengagement, a stud-barrel in gear with the disk-driving means, having studs situated at different angular positions around the barrel corresponding to different type-arms of the disks and at different positions longitudinally of the barrel corresponding to different keys, and detents actuated by said keys and adapted to engage with the studs of the barrel so as to control the angular movements thereof, as described.

4. In a type-composing and matrix-impressing machine, the combination with type-disks juxtaposed on a central spindle and having laterally-flexible type and space carrying arms, of screw-threaded thrust-bushes received in tapped transverse holes in certain of the space-bodies and adapted to be screwed out therefrom so as to be projected from the lateral face of the space-body and thereby virtually increase the thickness thereof for justifying the composed line of type.

5. In a type-composing and matrix-impressing machine, the combination of juxtaposed coaxial type-disks having laterally-flexible type and space carrying arms, screw-threaded tubular thrust-bushes screwing in tapped transverse holes in certain of the space-bodies, rods of angular section adapted to slide through and make turning engagement with the said bushes, and means for imparting sliding and rotary motion to said rods, as described.

6. In a type-composing and matrix-impressing machine, the combination of juxtaposed coaxial type-disks having laterally-flexible type and space carrying arms, screw-threaded tubular thrust-bushes screwing in tapped transverse holes in certain of the type-bodies, rods of angular section adapted to slide through and make turning engagement with the said bushes, means of advancing the rods, and planet-pinions upon the rods, in gear with a stationary sun-wheel coaxial with the type-disks, for causing rotary motion to be imparted to the rods, each upon its own axis, by rotation of the type-disks and simultaneous bodily movement of the planet-pinions about the axis of the disks, as described.

7. In a type-composing and matrix-impressing machine, the combination of a barrel having peripheral studs at different angular and different longitudinal positions, key-operated detents adapted to engage respective studs, and mechanism substantially as described, under the control of a special key, for causing the detent of any key actuated to occupy one or other of two operative positions differing in angular relation to the barrel to an extent equal to half the pitch of the studs, as described.

8. In a type-composing and matrix-impressing machine, the combination of a plurality of type-disks each having radial, laterally-flexible type-body-carrying arms, the disks

being closely juxtaposed and independently revoluble about a common axis, type-bodies fitted to slide radially upon the said arms within certain limits, springs adapted to retract the type-bodies, and a cam-bar adapted to be advanced in a direction parallel with the common axis, and to so act on the constituent type-bodies of the composed line as to cause that line of type-bodies to be projected beyond the adjacent type-bodies of the disks, as described.

9. In a type-composing and matrix-impressing machine, the combination with a set of juxtaposed coaxial type-carrying disks revoluble independently for composing a line of type and collectively about a central spindle for bringing the composed line of type to impression position, of a matrix-supporting carriage adapted to be moved toward the type-disks for the purpose of effecting the impression, and also in a direction tangential to the disks for bringing a fresh portion of the matrix into position to receive the next impression.

10. In a type-composing and matrix-impressing machine, the combination with a constantly-revolving main shaft, of a matrix-carriage adapted to be moved in a direction normal to the plane of the matrix and also in the direction of its own plane, mechanism adapted to be operated from the constantly-revolving shaft and adapted to impart movement to the matrix-carriage in a direction normal to the plane of the matrix for the purpose of bringing about the production of an impression, line-spacing feed mechanism adapted to be operated by the impression-producing mechanism for advancing the matrix in its own plane after each line impression, and key-controlled mechanism for putting the said impression-producing mechanism into gear with the constantly-revolving shaft.

11. In a type-composing and matrix-impressing machine, the combination with a plurality of strips of plastic material spaced to receive respective line impressions and adapted to be subsequently assembled to form a matrix for a column of print, of a plate supported by the matrix-carrier, an open-bottomed frame adapted to fit removably on said plate, and a grid for holding said strips, adapted to fit removably in and upon said frame and having alternate bars attached to the mutually-separable opposite sides of the grid, substantially as specified.

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