

No. 751,161.

PATENTED FEB. 2, 1904.

J. GELL.

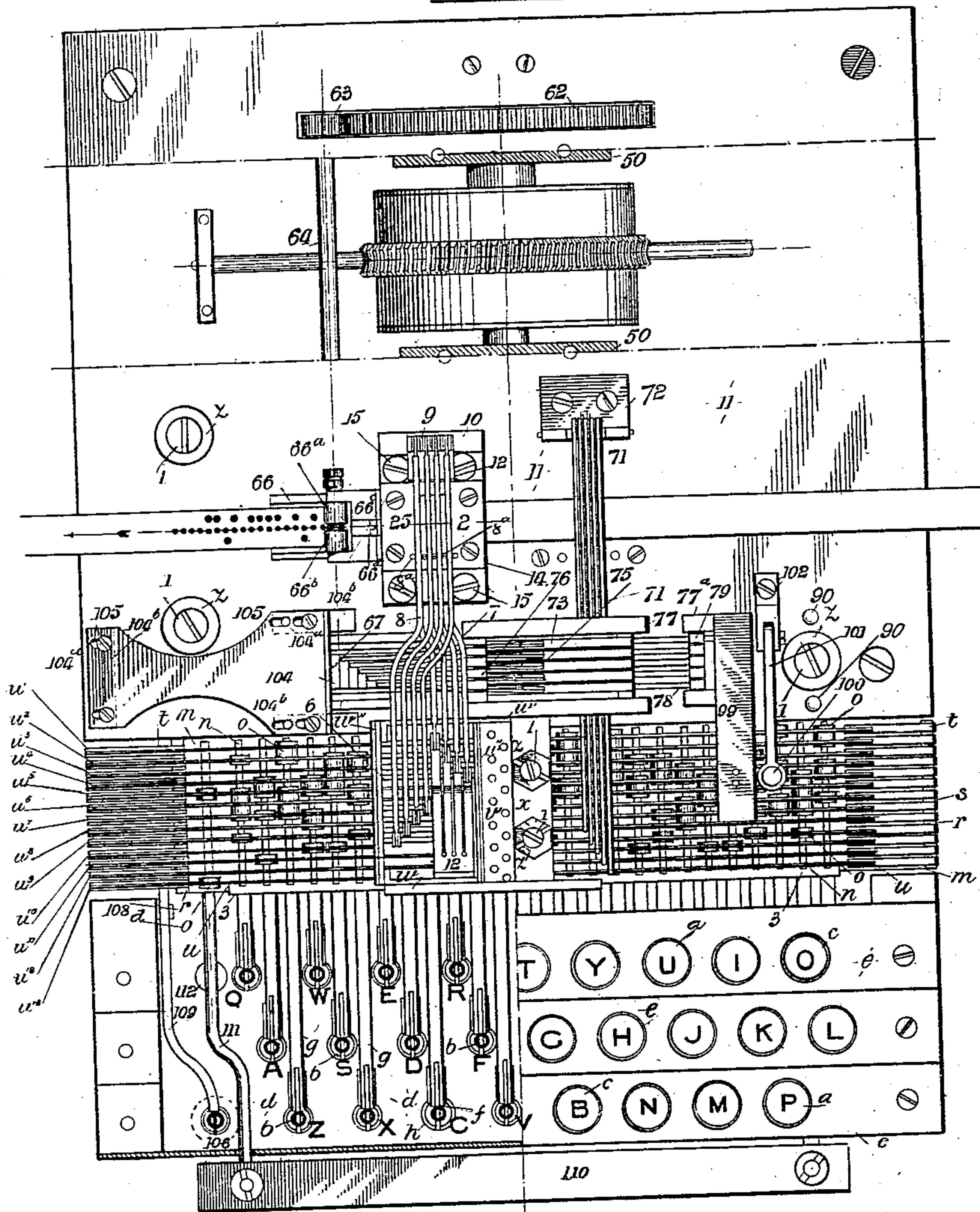
PERFORATOR FOR USE WITH AUTOMATIC TELEGRAPH TRANSMITTERS.

APPLICATION FILED NOV. 3, 1902.

4 SHEETS—SHEET 1.

NO MODEL.

FIG. 1.



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per
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4 SHEETS—SHEET 2.

NO MODEL.

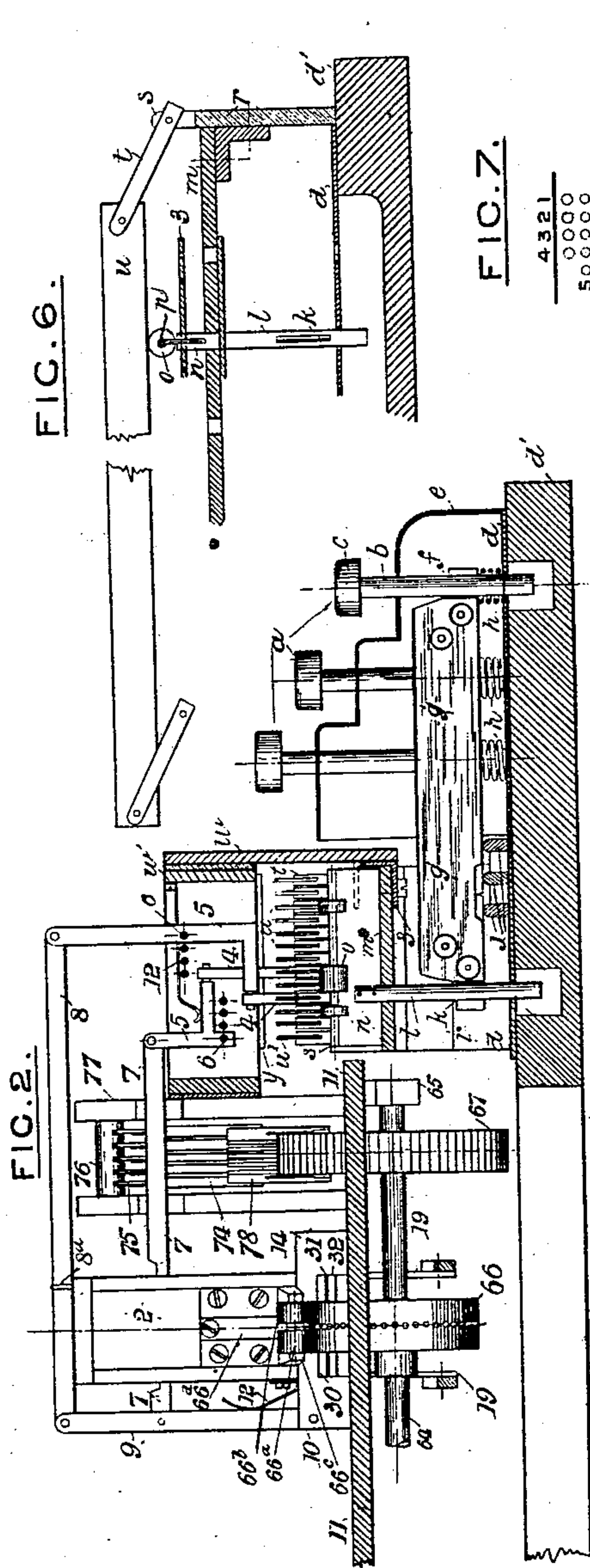


FIG. 2.

FIG. 6.

FIG. 7.

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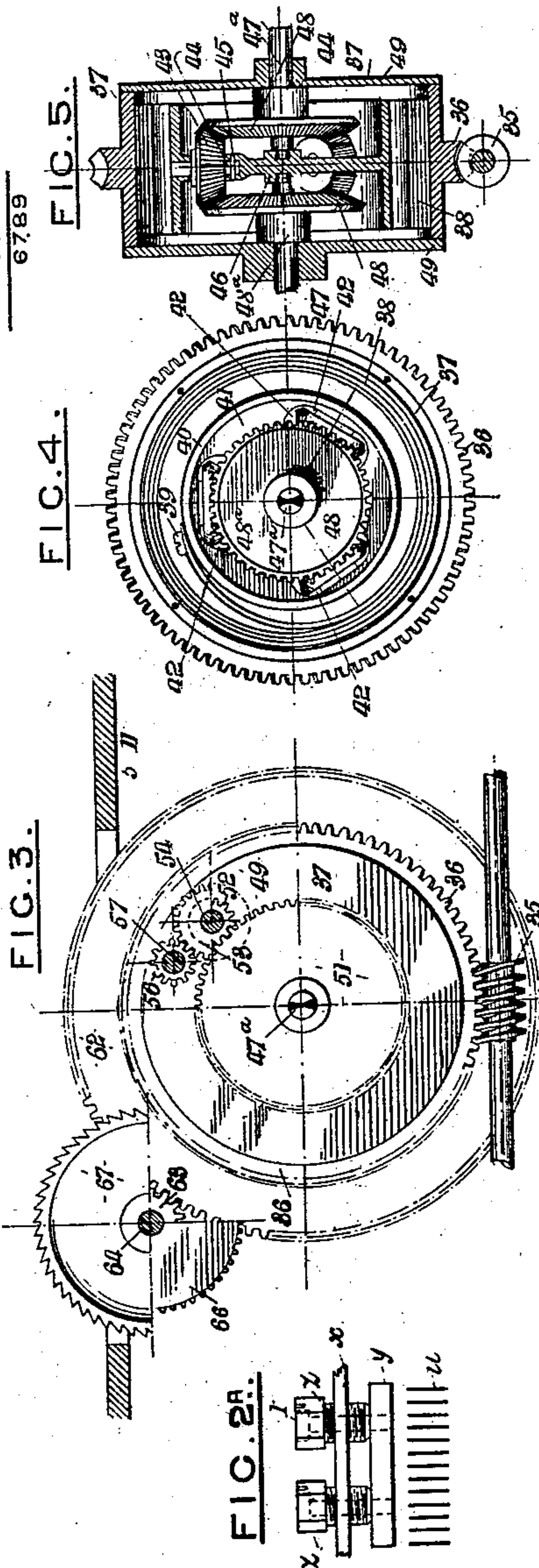


FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 7.

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4 SHEETS—SHEET 3.

NO MODEL.

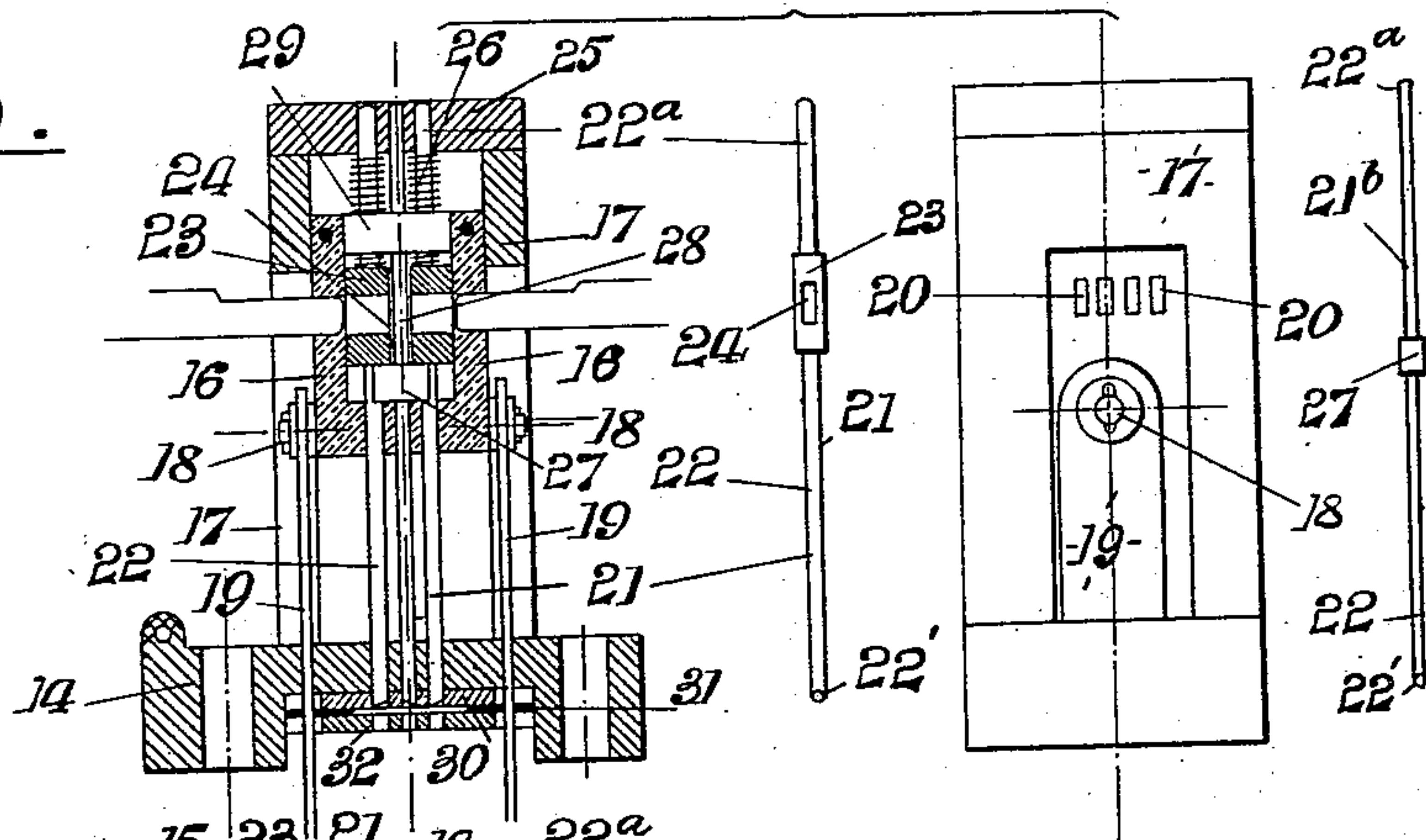
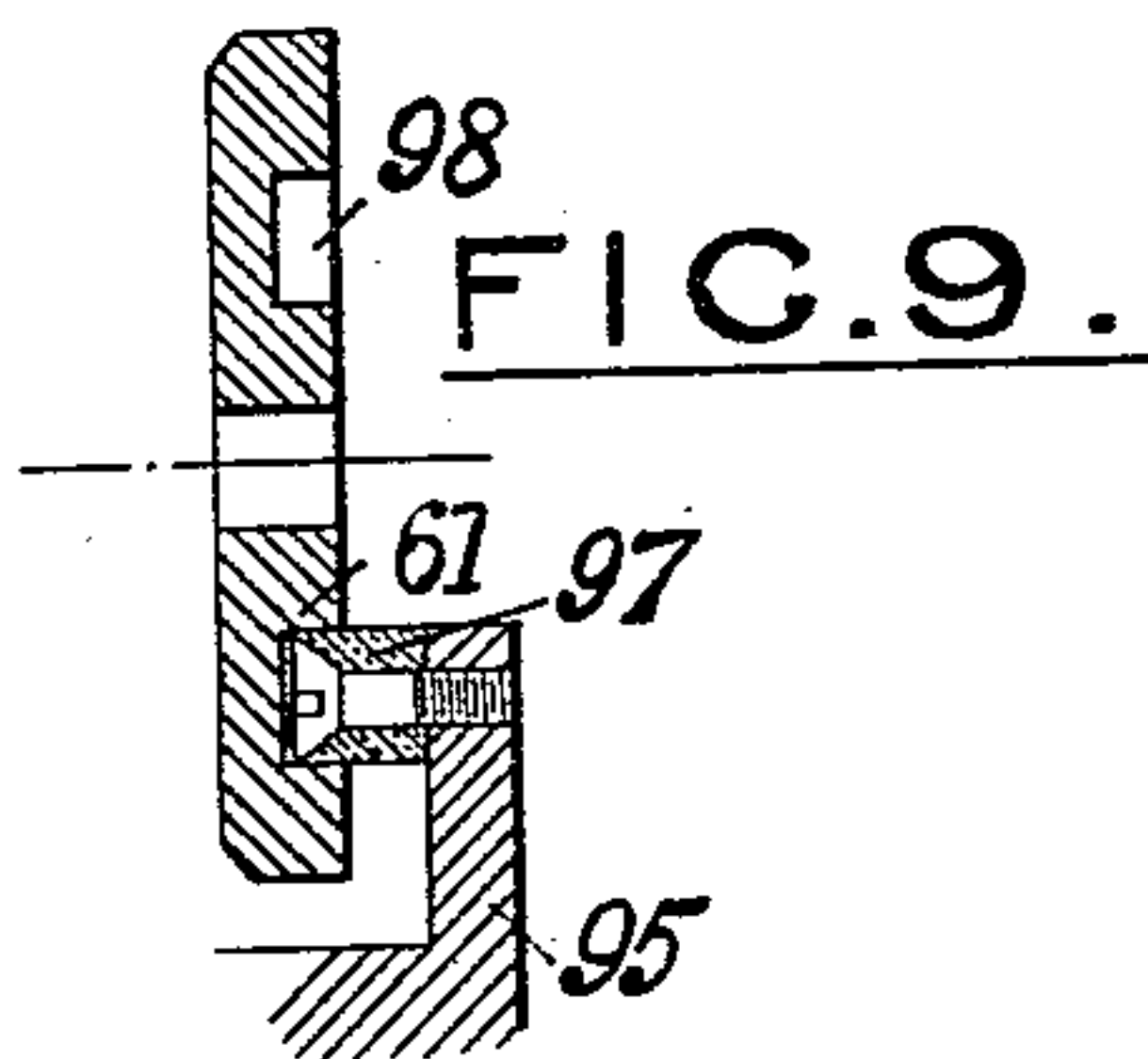
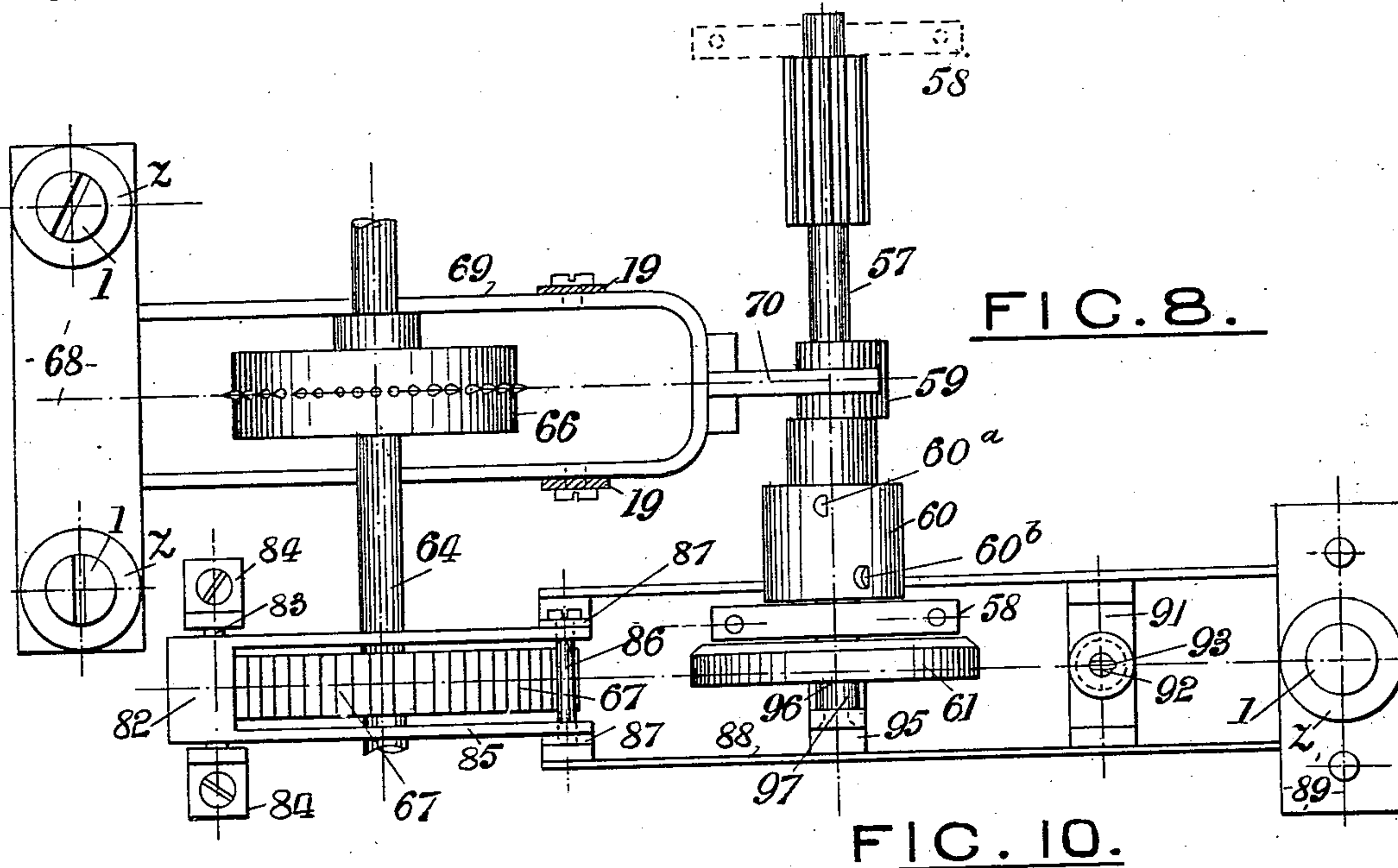
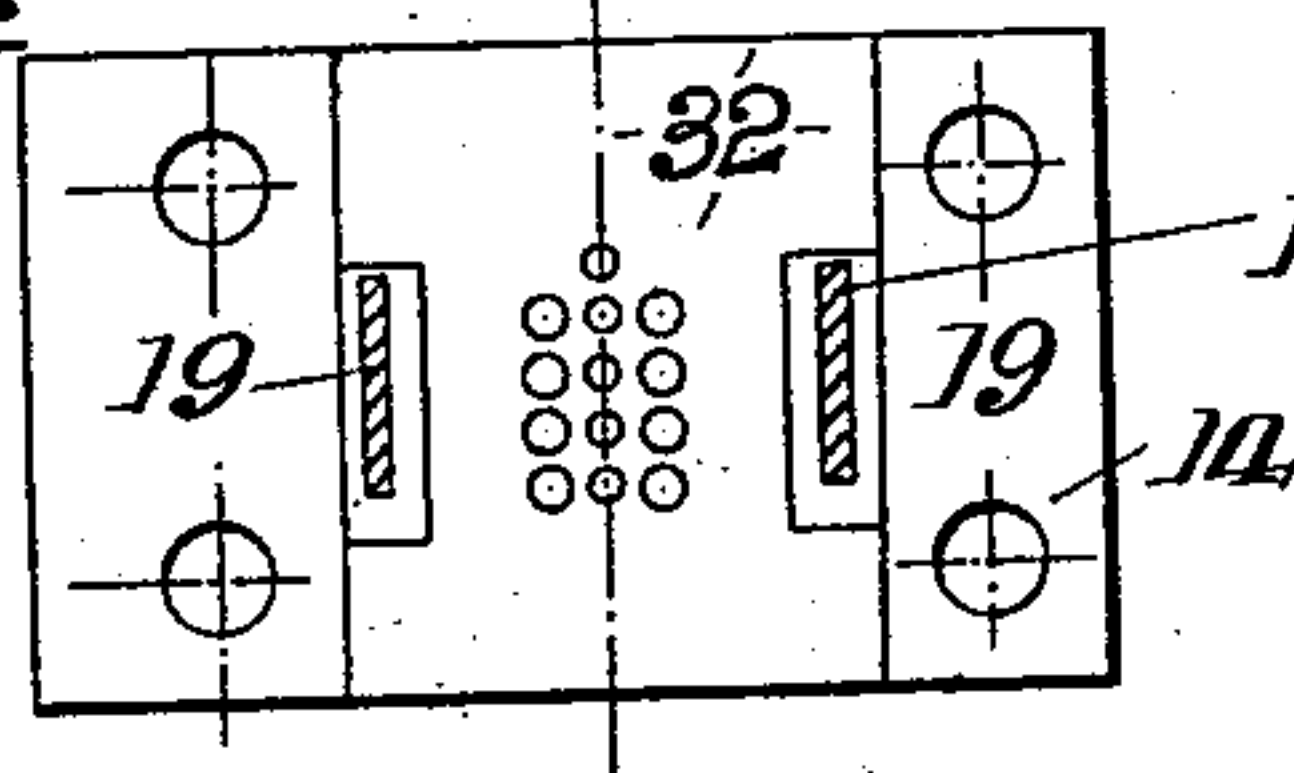


FIG. 11.

FIG. 12.

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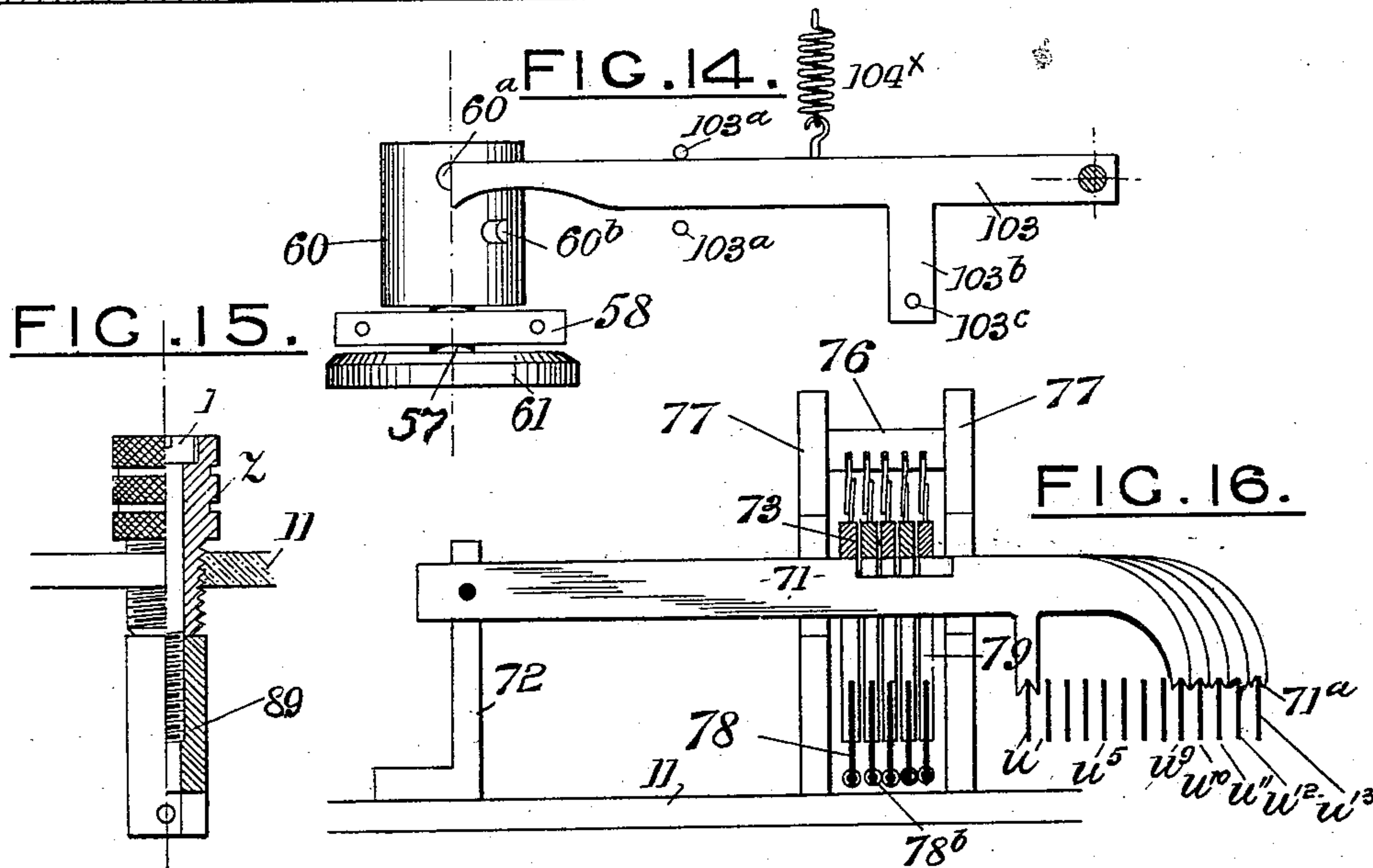
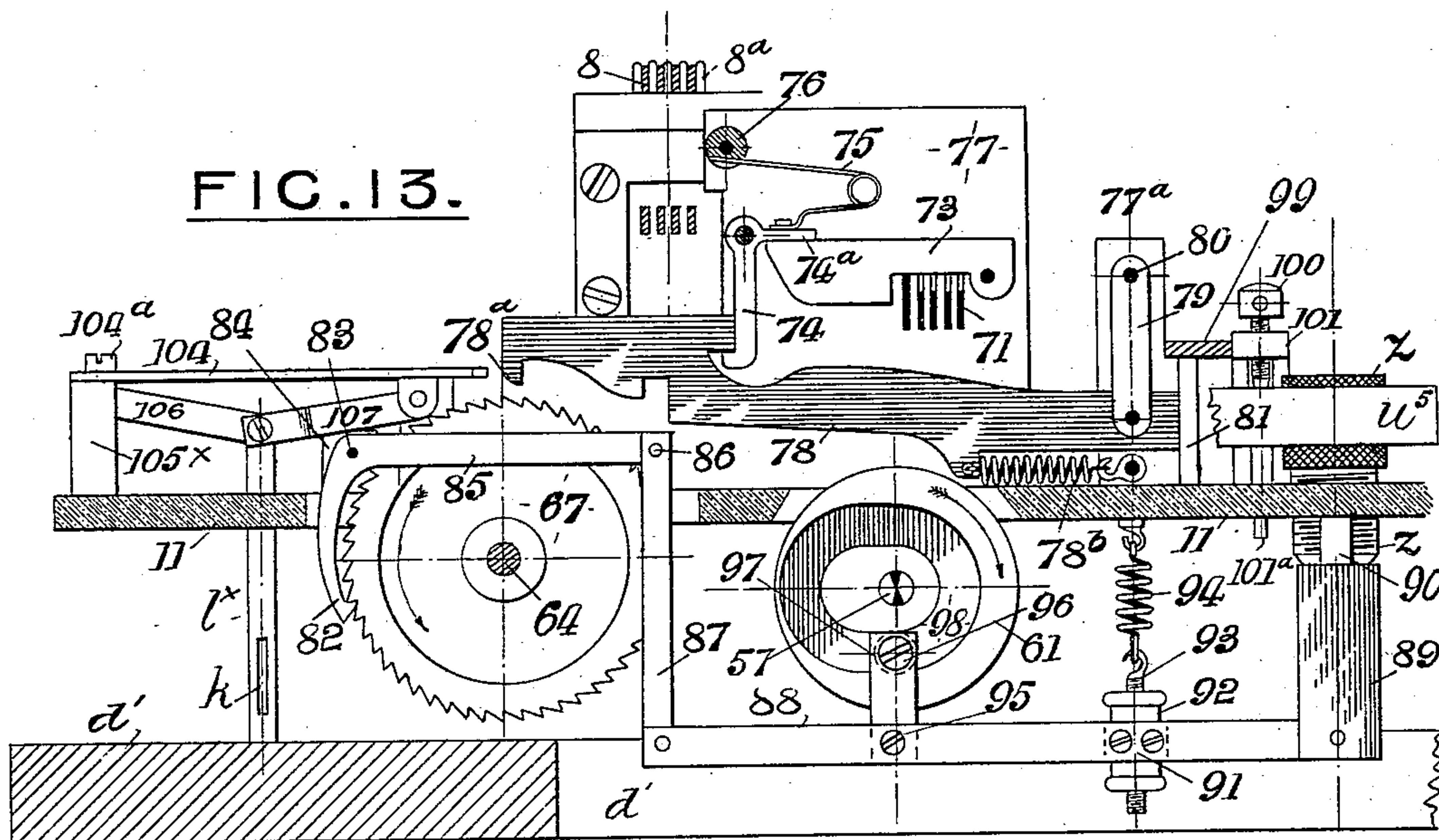
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PERFORATOR FOR USE WITH AUTOMATIC TELEGRAPH TRANSMITTERS.

APPLICATION FILED NOV. 3, 1902.

NO MODEL.

4 SHEETS—SHEET 4.



Witnesses :-

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UNITED STATES PATENT OFFICE.

JOHN GELL, OF LONDON, ENGLAND.

PERFORATOR FOR USE WITH AUTOMATIC TELEGRAPH-TRANSMITTERS.

SPECIFICATION forming part of Letters Patent No. 751,161, dated February 2, 1904.

Application filed November 3, 1902. Serial No. 129,879. (No model.)

To all whom it may concern:

Be it known that I, JOHN GELL, electrical engineer, residing at No. 48 Highbury Hill, London, N., in the county of Middlesex, England, have invented certain Improvements in Perforators More Particularly for Use with Automatic Telegraph-Transmitters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention consists in apparatus whereby symbols or the like are perforated in a length of paper or other tape upon the depression of a key. It is, however, more particularly applicable for the purpose of perforating the paper or like tape used for Wheatstone or other automatic telegraph-transmitters. I attain this end by means of the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a plan. Fig. 2 is a part sectional side elevation of Fig. 1. Fig. 2^a is a checking device for limiting upward travel of parallel bars. Fig. 3 shows detail of worm-drive. Fig. 4 shows detail of epicyclic box. Fig. 5 is a sectional side elevation of Fig. 4. Fig. 6 shows detail of parallel bar. Fig. 7 shows numerically the whole of the integers from which the telegraphic symbols are selected. Fig. 8 shows detail of primary and secondary counter-shafts and attendant gear, the platform removed. Fig. 9 gives detail of roller and cam. Fig. 10 gives detail of punch. Fig. 11 is a section of punch above the punches or perforating - needles. Fig. 12 is a plan looking up of Fig. 10. Fig. 13 is a cross-section Fig. 1, giving detail of differential feed. Fig. 14 shows detail of lever-escapement. Fig. 15 shows detail of adjustable bush and holding-screw. Fig. 16 shows detail of transverse levers for feeding mechanism.

In the following specification I have described my invention as perforating the paper strip usually employed in transmitters for submarine telegraphy. A slight modification adapts the same apparatus for use with land-line transmitters.

In the drawings, *a* represents the keys, preferably similar in pattern to those employed

in standard type-writers. Each of these consists of a shank *b*, covered by an indexed button on head *c*, said shank taking a guide through a brass plate *d*, screwed to the base-board *d'* of the machine at its lower part and through the cover-plate *e* at its upper end. At the point shown in Fig. 2 the shank *b* has a slot *f* cut in it, and into this slot is placed the front steel tail of the key-lever *g*. A compressible spring *h* surrounds the key-shank *b* between the base-plate *d* and the steel tail of key-lever *g*. The key-levers are pivoted at a given point in their length by resting upon fulcrum-bars *j*, (see Fig. 2,) each row of keys being so pivoted that the terminal lift is the same on each key-lever. The key-levers are preferably made of wood, having steel tails riveted at their front and back ends, the back tails of said key-levers being passed into a slot *k*, formed in the length of the vertical rods *l*, which also are guided by passing through base-plate *d* and upper guide-plate *m* and have riveted and soldered at their upper extremity plates *n*, these plates having small rollers *o* or projections arranged and spaced along their length according to the number of elements composing the telegraphic symbol and the character of the key to which each is respectively connected. The roller-plates *n* are formed by bending a thin piece of metal over a former, a piece of wire *p* being inserted at the bend. This is subsequently withdrawn and notches cut out according to the rollers same is intended to carry. The rollers *o* are then inserted and the pin replaced. (See Fig. 6.) The upper guide-plate *m* is secured to side bearers *r*, having a notched extension *s*, which carry a plurality of pivoted links *t*, to the other end of which are pivoted the ends of the parallel bars *u*, normally resting upon the rollers *o*. These parallel bars *u* are so mounted that any vertical movement of the roller-plate *n* gives a vertical motion to the parallel bars. Said parallel bars *u*, although grouped together, may be divided into two classes, each class having its particular function, the one translating the characters on the keys into code, the other determining the amount of feed required by the tape for its corresponding telegraphic symbol and for spacing. For

submarine-cable code these bars are thirteen in number—eight being employed for perforating, one for the escapement release of the punching and feeding mechanism, and four for the differential feed. The parallel bars *u* are guided by means of a comb *v*, bridged across them and attached to the plates *w w'* of the punch-link-pivot cradle. Contiguous to this comb *v* and hung from a plate *x*, supported in the same manner, is the check-piece *y* for limiting the excessive upward travel of the parallel bars *u*. Through the plate *x* are screwed adjusting-bushes *z*, through which are passed screws 1, threaded into the check-piece *y*, the advantage of this being that while the check-piece is rigidly held by the screws 1 its relative height with regard to the parallel bars *u* can be set to a nicety by means of the adjustable bushes *z*. (See Figs. 2^a and 15.)

In a line with the punch 2 and bridging the parallel bars is the cradle containing the pivots for the punch-levers. It is built up box fashion of metal plates *w'*, the ends of the pivots passing through plates *w'* at either side and kept in their place by a cover-plate *w''*. The cradle is secured to a stiff plate *w* in front, which is fastened to a metallic U-piece 3, attached to the upper guide-plate *m*, said U-piece being slotted for the purpose of forming a comb for the roller-plates *n*. (See Fig. 2.) Hinged to parallel bars *u' u'' u''' u'''' u''''' u'''''' u'''''''* are links 4, to which are loosely pivoted the one limb of bell-cranks 5, tilting on pins or pivots 6, (see Fig. 2,) the other limbs of bell-cranks 5, in connection with parallel bars *u'' u''' u'''' u'''''*, being linked to interlocking pins 7. Bell-cranks in connection with parallel bars *u' u'' u''' u''''* are hinged to bent connecting-rods 8, passing over the top of the punch through pin-comb 8^a and attached by pins at their other extremities to upright levers 9, pivoted at their base to cock 10 on punch 2, screwed to platform 11. These upright levers have pivoted intermediate of their length at the point shown interlocking pins 7, entering the punch on the opposite side to the pins first mentioned, but at the same level. Light springs 12 are placed over the crank-levers to overcome any friction and to assist in the disengagement of the interlocking pins when the finger is removed from the key. The punch 2 (see Figs. 10, 11, 12) consists of a shell 14, screwed at 15 to the metallic platform 11. Within this shell 14 is a U-shaped slider 16, guide-plates 17, attached to the side of the shell, keeping same in position. This slider has projecting pins 18, to which are attached the reciprocating pitmen 19. In the upper part of the slider are four slots 20, cut on either side, and into which the interlocking pins 7 at normal position just pass. Through the base of the U-piece pass the punches or perforating-needles 21. These consist of two kinds, those for the marking-holes and those for the cor-

responding necessary spacing or feed holes. (See Figs. 7 and 10.) The punches or perforating-needles 21 are formed with a bottom shank 22, the end of which, 22', is cut obliquely chisel fashion for more easily penetrating the paper, and a top shank 22^a. The marking-punches have an intermediate swell 23, in which is pierced an eye 24, so arranged that same shall come when the punch is at rest opposite the corresponding slot in the U-slider 16. The upper shanks 22^a pass through a top guide-plate of steel 25, screwed into punch-shell 14, a compression-spring 26 being placed between the top guide-plate 25 and swell 23, surrounding the shanks 22^a. At the base they pass the guide-plate 30, attached to the shell 14. The spacing or feed hole punches 21^b are also formed with a lower and upper shank 22 22^a, respectively, but have shoulders 27 so placed in their length that same come beneath the swells 23 of the marking-hole punches. Hence the marking-hole punches from either side on depression will carry down their respective feed-hole punches. The leading spacing-hole punch 28 is either fixed in the slider by screwing or brazing or placed beneath a cross-bar 29, as shown in Figs. 10 and 11. All these punches are guided near the point of penetration by passing through the shell 14. Underneath the bottom guide-plate 30 and separated from the same by distancing-pieces 31 is the cutting-die plate 32, the holes of which are in register with the guide-plate 30, immediately above and slightly chamfered outwardly for clearance of chips.

I have now described the key-action-translating bars and punch and will pass on to the driving, perforating, and feeding mechanism.

Driving.—The epicyclic combination shown in Figs. 3, 4, and 5 is driven by means of a worm 35, gearing with a worm-wheel 36, formed or mounted on the periphery of the circular box 37. The worm may be coupled to any convenient source of power, preferably to an electromotor. Attached to the inside of the circular box 37 is the mainspring 38, the other end of which is attached by a screw 39 to a peripheral flange 40 of a disk 41. The disk is pierced at 42 in three equidistant places, bevel-pinions 43 being placed therein running on shafts 44, cross-pinned, as at 45. The disk has a central boss 46, into which are journaled on either side the respective ends of two different shafts 47^a 47^b, carrying bevel-wheels 48, meshing with bevel-pinions 43, the bosses 48^a of bevel-wheels 48 bearing against the sides 49, which form the sides of the circular box 37, the whole forming an epicyclic combination, enabling the power of the spring to be divided according to the amount required to the independent shafts 47^a 47^b. These shafts 47^a 47^b are supported in bearings 50, (see Fig. 1,) secured by screws to the under side of the platform 11. The shaft 47^a carries a spur-wheel 51, (see Fig. 3,) gearing

into spur-pinion 52 on a small counter-shaft 54, which in turn drives spur-wheel 53 on the same shaft, which latter is mounted in cocks placed at either end screwed to the under side of platform 11. The spur-wheel 53 engages with a spur-pinion 56, fast on the primary counter-shaft 57, said primary counter-shaft being mounted in bearings 58, also bolted (see Fig. 8) to the under side of platform 11, and carrying on its length an eccentric 59, stagger-pin escapement-barrel 60, having stagger-pins 60^a and 60^b, and at its extremity the cam 61. The shaft 47^b carries a large spur-wheel 62, (see Fig. 1,) engaging with spur-pinion 63, mounted on secondary counter-shaft 64, supported in bearings 65. (See Fig. 2.) This shaft carries the sprocketed star feed-wheel 66, mounted in a center line with and a little in advance of the punch-die plate 32, and a ratchet spacing-wheel 67. Over said star feed-wheel 66 is a top roller 66^a, (see Fig. 1,) grooved centrally, as at 66^b, to accommodate the star-pins and mounted in a hinged flap 66^c, pinned to punch-frame 14, a spring 66^d being provided to keep roller down and also to aid in raising same when lifted beyond a certain distance.

Perforating.—Attached to the underneath of platform 11, (see Fig. 8, the platform in this view is removed by means of supporting-screws 1,) passing through adjustable bushes 2, is a block 68, and into this block is pivoted the rocking frame 69. Rigidly attached to the opposite extremity of this rocking frame is a fork 70, engaging with the eccentric 59. The rocking frame is composed of two members conveniently spaced to receive the reciprocating pitmen 19, attached to the slider 16 of punch 2. When the eccentric rotates on the release of the escapement, the rocking frame is first depressed and then carried up to its normal position, thus actuating the slider 16 through the pitmen 19, and thereby perforating the paper. The height of the punches is determined by the adjustable bushes 2 and supporting-screw 1, which also permits of compensation for wear and tear. (See Fig. 15.)

Feed.—Over the parallel bars *u* are placed five transverse levers 71, (see Figs. 1 and 16,) four of which by means of a forked tooth 71^a rest on the feed parallel bars *u*¹⁰ *u*¹¹ *u*¹² *u*¹³, respectively. The fifth representing the fifth-hole feed, the limit in this particular code rests upon parallel bars *u*¹ and *u*⁹. The five transverse levers 71 are hinged at the back to a cock 72, screwed to the platform 11. Each of these transverse bars engages with a separate tilting bar 73. This engages with the under side of the lip 74^a of a hinged tilting hook 74, (see Fig. 13,) the series of hooks 74 having light expanding springs 75, pressing upon the tops of the lips 74^a; the other end of the spring being secured to a distance-piece 76 between the two cheeks 77, carrying

the spacing mechanism. The hooks 74 support toothed spacing or feed bars 78. These feed-bars are pivoted at their rear extremity to swing-links 79, hinged on a pin 80, mounted in the side cheeks 77^a, screwed to the platform 11. The other ends are formed with teeth 78^a, which normally rest in echelon over successive teeth on the feed-ratchet spacing-wheel 67 immediately beneath. The rear ends of the feed-bars are retained against a check-plate 81 in one piece with the side cheeks 77^a, in which the swing-links are pivoted by means of contractile springs 78^b. On depressing any key the lever representing the amount of feed required for that special letter raises its respective tilting bar 73, which withdraws the tilting hook 74 from its tooth engagement with the feed-bar and thus allows it to fall, the terminal tooth of the feed-bar engaging with the tooth of the ratchet spacing-wheel 67, over which it hung suspended. The ratchet spacing-wheel 67, on the secondary counter-shaft 64, is prevented from revolving by means of a pivoted pawl 82, hung on a pin 83, mounted in cocks 84, screwed to platform 11 and having right-angled extensions or limbs 85 on either side of the ratchet spacing-wheel 67. A bar 86 is fixed between the two ends of these limbs immediately beneath the feed-levers, (see Fig. 8 and Fig. 13,) which are notched to prevent same touching the bar when they are at rest upon their respective hooks. From the ends of the bar 86 depend pitmen or connecting rods 86, pivoted to the feed rocking frame 88, which is hinged to a block 89, secured to platform 11, by screw 1, passing through adjustable bush 2, and two steady pins 90, (see Fig. 1,) said frame being provided with a distance-piece 91, upon which is mounted with an adjustable screw 92 a threaded spring-hook 93, carrying one end of a contractile spring 94. The other end of this spring is attached to the base of the platform 11. Secured with screws between the members of the rocking frame 88 is a cock 95, carrying upon a pin 96 a roller 97, which travels in the roller-path 98 of the cam 61. One of the parallel bars *u*⁵ is lifted upon the depression of every key and the space-bar. This parallel bar has an additional guide-comb 99, screwed to the platform 11, (see Figs. 1 and 13,) and close to this comb over the parallel bar *u*⁵ is the adjustable set-screw 100 of the escapement release-crank 101. This is hinged to a cock 102, screwed to the platform 11. Pivoted at the end remote from the primary counter-shaft to the under side of the platform 11 is the escapement-lever 103. (See Fig. 14.) The other end normally rests upon one of the stagger-pins 60^a. The second stagger-pin 60^b is placed a certain distance in advance and at one side, as shown in Fig. 14. Owing to the tail of release-crank 101^a engaging with the hole 103^b of extension 103^c, the escapement-lever on depression of the key is removed

from stagger-pin 60^a, and the toothed end passes behind 60^b. This permits the shaft to revolve until stagger-pin 60^b strikes the toothed end of lever and is there momentarily arrested. On releasing the key the escapement-lever returns to its normal position, owing to effort of contractile spring 104^x, permitting the shaft to further revolve until arrested by the stagger-pin 60^a coming in contact with the escapement-lever 103. Excessive movement is prevented by the employment of limiting-pins 103^a.

The primary counter-shaft 57 in revolving carries around with it the eccentric 59 and the feed-cam 61. In revolving this cam 61 depresses the rocking frame 88, lifting the pawl 82 out of engagement with ratchet-wheel 67. This permits the ratchet-wheel 67 to revolve and advance the tape by means of the sprocket star-wheel 66 on the same shaft therewith. The fallen feed-bar is carried forward with ratchet-toothed wheel 67 until it comes in contact with the steel-faced check-plate 104, mounted on end cheeks 105^x, and thus arrests the motion of the ratchet-wheel. On the further revolution of the cam the pawl 82 reengages with the ratchet-wheel 67 and the feed-bar lifted clear by means of the transverse bar 86 between the limbs of the pawl coming in contact with the heel of the feed-bar 78^a. Said bar is pulled back to its normal position on the tilting hook 74 by the contraction of the spring 78^b.

The check-plate 104 is normally kept hard against screw-shanks 104^a, which pass through elongated slots 105 (see Fig. 1) at either end, due to the upward pressure of spring *h'* under limiting-key 106, Fig. 1. Beneath this check-plate and pivoted against the end cheek 104^b is the thrust-rod 106, toggle-jointed to a vertical rod 1^x and to a rod 107, pinned in lugs on the check-plate, rod 1 being hinged to limiting-key lever 109, pivoted to a cock 108, mounted on the base-plate *d*. On depressing the limiting-key the vertical rod is raised, and by means of the toggle-joint the check-plate is advanced, traveling forward the distance equal to one space, and by so doing the spacing-bars are arrested one tooth earlier than otherwise would be the case. This eliminates the feed-spacing hole between two letters on the tape, enabling the operator to punch two or more signs in undivided sequence, thereby providing for figures, punctuation-marks, or arbitrary signs.

The operation of my invention is as follows: On depressing a character-key *a* the end of the key-lever *g* is lifted, raising the vertical rods *l*, carrying the roller-plates *n*, thereby raising its respective parallel bars *u*, inserting, by means of bell-cranks and connecting-rods, the corresponding interlocking pins 7 into the eyes 24 of the punches or perforating-needles 21. Parallel bar *u*⁵ is also raised, lifting escapement release-crank 101,

drawing escapement-lever 103 off No. 1 stagger-pin 60^a. This permits the primary counter-shaft 57 to rotate, carrying round the eccentric 59 and cam 61. The eccentric 59 moving in the fork 70 actuates the rocking frame 69, thereby pulling down by means of the pitmen 19 the punch-slider 16, the punches selected by the interlocking pins being drawn down as well, perforating the paper tape. One of the feed parallel bars is also raised, lifting the transverse lever 71, thereby upsetting tilting bar 73, causing the tilting hook 74 to drop its spacing-bar 78 onto the feed ratchet-wheel 67 below. The cam 61 now comes into action, releasing the secondary counter-shaft, as before described, giving the tape its required feed. Withdrawing the finger from the key causes the escapement-lever 103 to return to stagger-pin 60^a, completely lifting the punch-slider and withdrawing the interlocking pins from the punch-eyes, also again locking the pawl on the feed ratchet-wheel and leaving the machine ready for the next key to be struck. To provide a space, the spacing-bar key 110 is depressed. This in same manner raises the parallel bars *u*⁵ and *u*¹³ by means of lever 111, pivoted to cock 112, said lever lifting vertical rod and plate-carrying rollers *o*, spaced under parallel bars *u*⁵ and *u*¹³. As a modification I may provide separate springs for each counter-shaft coiled by means of the epicyclic driving-gear, but prevented from backward rotation by means of a suitable pivoted pawl.

It will be understood that while I have shown the interlocking pins as normally out of connection with the punches and arranged to be thrust into connection therewith to select the same I do not wish to limit myself to this arrangement, though I prefer it, it being possible to reverse the arrangement by having the interlocking pins normally engage the punches and withdraw those not needed in selecting the punches.

I claim—

1. The combination in a perforator for telegraphic and like purposes of a plurality of punches or perforating-needles selected and collectively and simultaneously operated, means whereby the corresponding symbol-feed is imparted to the perforated tape upon the depression of any member of a character-keyboard an epicyclic combination normally held out of action but driven through a main-spring by any suitable prime mover, primary and secondary counter-shafts geared to opposite sides of epicyclic combination carrying operative means for power escapement and arrestment punch-actuating, and feed-release and feeding mechanisms, substantially as described and illustrated in the accompanying specification and drawings.

2. In a perforator for telegraphic and like purposes the combination of punches for perforating the tape, with a keyboard, means for

selecting and thereby forming signs or characters from said punches, a series of parallel bars, means for selection and producing a vertical movement in same, said bars actuating interlocking pins working in opposite directions and means for imparting the necessary feed to the perforated tape, substantially as described.

3. In a perforator for telegraphic and like purposes the combination with a keyboard, translating or selecting mechanism and interlocking pins of a punch consisting of a shell having guide and cutting-die plates, a reciprocating slider moving within said shell and having slots within which rest the interlocking pins, perforating-needles or punches passing through said slider, and actuated in the way and manner and by the means herein described.

4. In a perforator for telegraphic and like purposes the combination in a punch of a series of punches or perforating-needles for marking and feed-holes, having oblique cutting ends, said marking-hole punches having compression-springs and eyed swells for engagement with interlocking pins and bearing on shoulders formed on corresponding feed-hole punches; said punches passing through a reciprocating slider and guide-plates and arranged when selected by the interlocking pins from key to perforate a paper strip, passing over the cutting-die substantially as described.

5. In a perforator for telegraphic and like purposes the combination with a reciprocating punch-slider a series of character-punches with means for selecting and locking them to the slider, of a spacing feed-hole punch engaging with a cross-bar in said slider actuated automatically when the spacing or character keys are depressed substantially as described.

6. In a perforator for telegraphic and like purposes the combination with a keyboard of means whereby the perforated tape is advanced according to the length of symbol consisting of transverse bars engaging with vertically-rising parallel bars selected and operated as described from the key and causing on depression of said key and by means of tilting hooks toothed spacing-bars to fall upon a ratchet spacing-wheel beneath said spacing or feed bars being arranged in echelon over said ratchet-wheel and determining by their length the amount of feed substantially as described.

7. In a perforator for telegraphic and like purposes the combination of epicyclic gear driven by a prime mover and governed by a coiled spring whereby power is supplied to the intermittent demands of the shafts but differentially to the secondary shaft, with means for releasing and arresting said power controlled from keyboard and operated with every character-key depressed, substantially as described.

8. The combination in a perforator for tele-

graphic and like purposes of a primary and secondary counter-shaft the former carrying eccentric stagger-pin escapement-barrel cam actuating on release the feeding and punching mechanism, the latter carrying toothed ratchet spacing and feed wheel and sprocketed star feed-wheel substantially as described.

9. The combination in a perforator for telegraphic and like purposes of an escapement-lever actuated from parallel bars and engaging with stagger-pins on escapement-barrel; a hinged rocking frame having fork engaging with eccentric on primary counter-shaft, pitmen attached to said rocking frame and punch-slider; a second pivoted frame spring-hung from platform, carrying roller adapted to engage with cam and carrying pitmen-operating release-pawl on toothed ratchet-wheel; primary counter-shaft released and transverse levers raised on depression of keys; tilting hooks engaging with said transverse levers dropping suspended feed-levers; a check-plate arresting the rotation of secondary counter-shaft by engagement with fallen feed-lever, and transverse bar between limbs of feed ratchet-wheel pivoted pawl, lifting and rehanging on tilting bar said feed-lever, substantially as herein described.

10. In combination in a perforator, punches, tape-feeding mechanism including a check-plate movably supported, and means for adjusting the check-plate including a limiting-key and toggle-levers to vary the action of the tape-feeding mechanism whereby the spacing-hole may be eliminated, substantially as described.

11. In a perforator for telegraphic and like purposes the parallel bar check-plate, punch and cam rocking frame and fulcrum-blocks and means of adjustment for said parts comprising the bushes and attachment-screws, substantially as described.

12. In combination in a perforating apparatus, a central series of feed-hole punches, a series of marking-hole punches on each side of the feed-hole punches, a slider, interlocking pins operating on opposite sides of the said slider for locking the marking-hole punches to the said slider and means for operating the slider, substantially as described.

13. In combination in a perforating apparatus, a central series of feed-hole punches, a series of marking-hole punches on each side of the series of feed-holes punches, a slider for operating the punches, interlocking pins to connect the marking-hole punches with the slider, said marking-hole punches having engagement with the feed-hole punches to carry the same down therewith, substantially as described.

14. In combination, a series of punches having vertical movement, a slider movable vertically, means for connecting the punches with the said slider, a lever with means for operating the same to draw the slider down and a

pitman connection between the said lever and slider, substantially as described.

15. In combination in a perforating apparatus, tape-feed mechanism comprising a
5 ratchet-wheel, a series of feed-levers arranged in echelon to engage the ratchet-wheel, means for releasing the said feed-levers to engage the ratchet-wheel and means for arresting the ratchet-wheel, said means being located in the
10 path of the feed-lever, substantially as described.

16. In combination in a perforating appa-

ratus, tape-feeding mechanism and an adjustable plate controlling the variable feed of the said tape-feeding mechanism and a limiting- 15 key connected to said plate for operating the same, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

JOHN GELL.

Witnesses:

FRANCIS HERON ROGERS,
T. WATSON WALKER.