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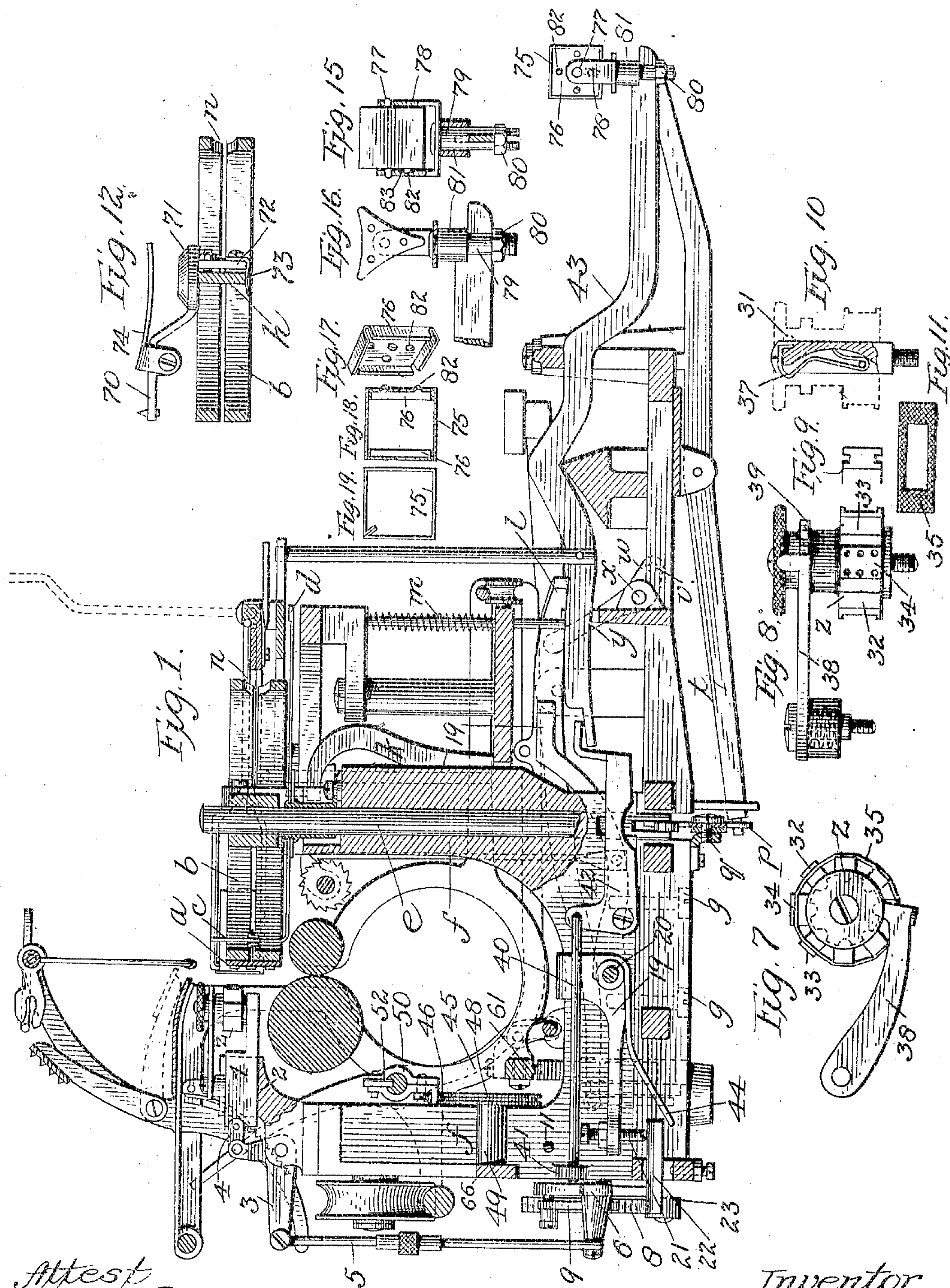
PATENTED JAN. 17, 1905.

J. B. HAMMOND.

PRINTING MECHANISM FOR TYPE WRITERS.

APPLICATION FILED MAY 11, 1901.

5 SHEETS—SHEET 1.



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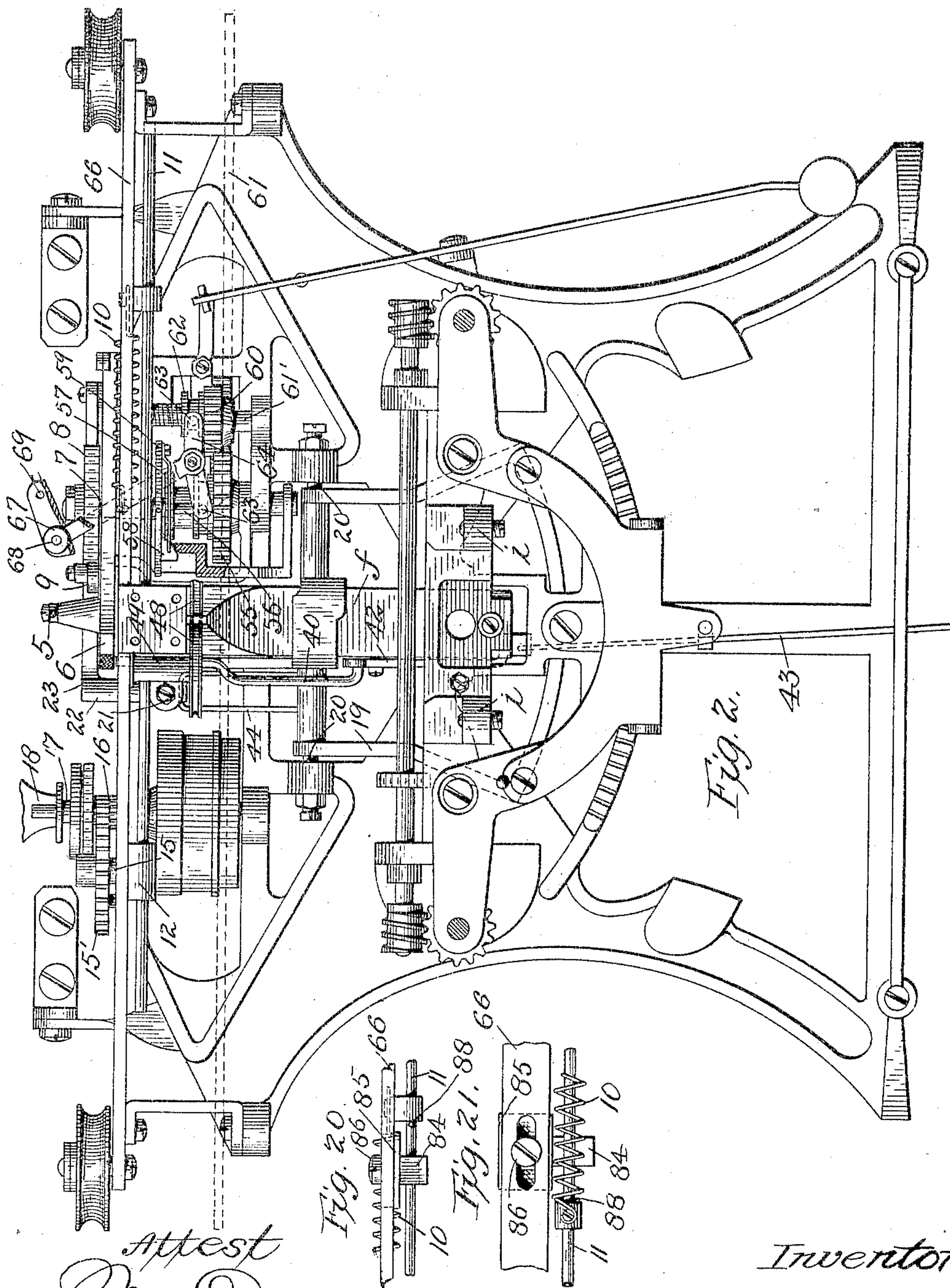
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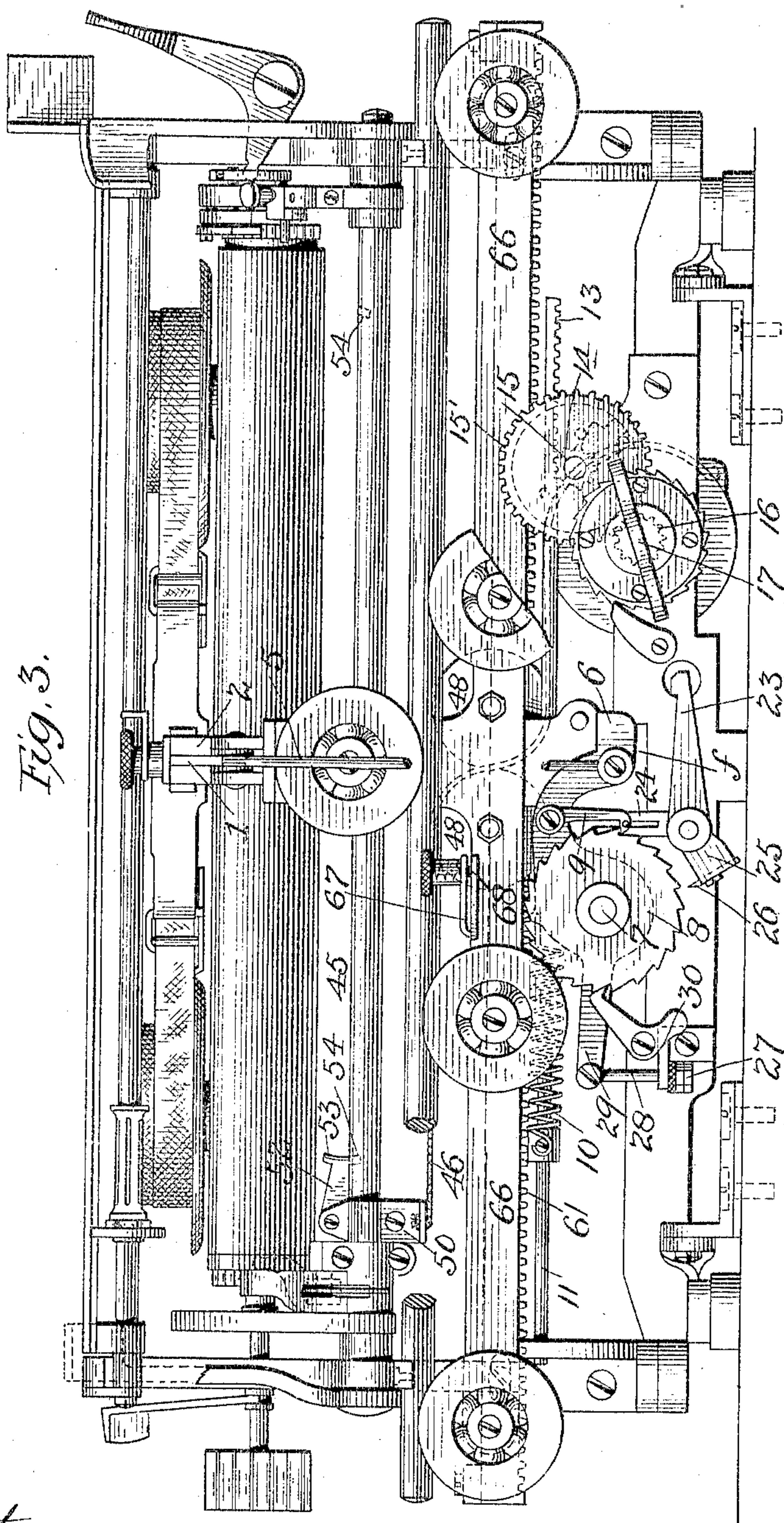
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Fig. 4.

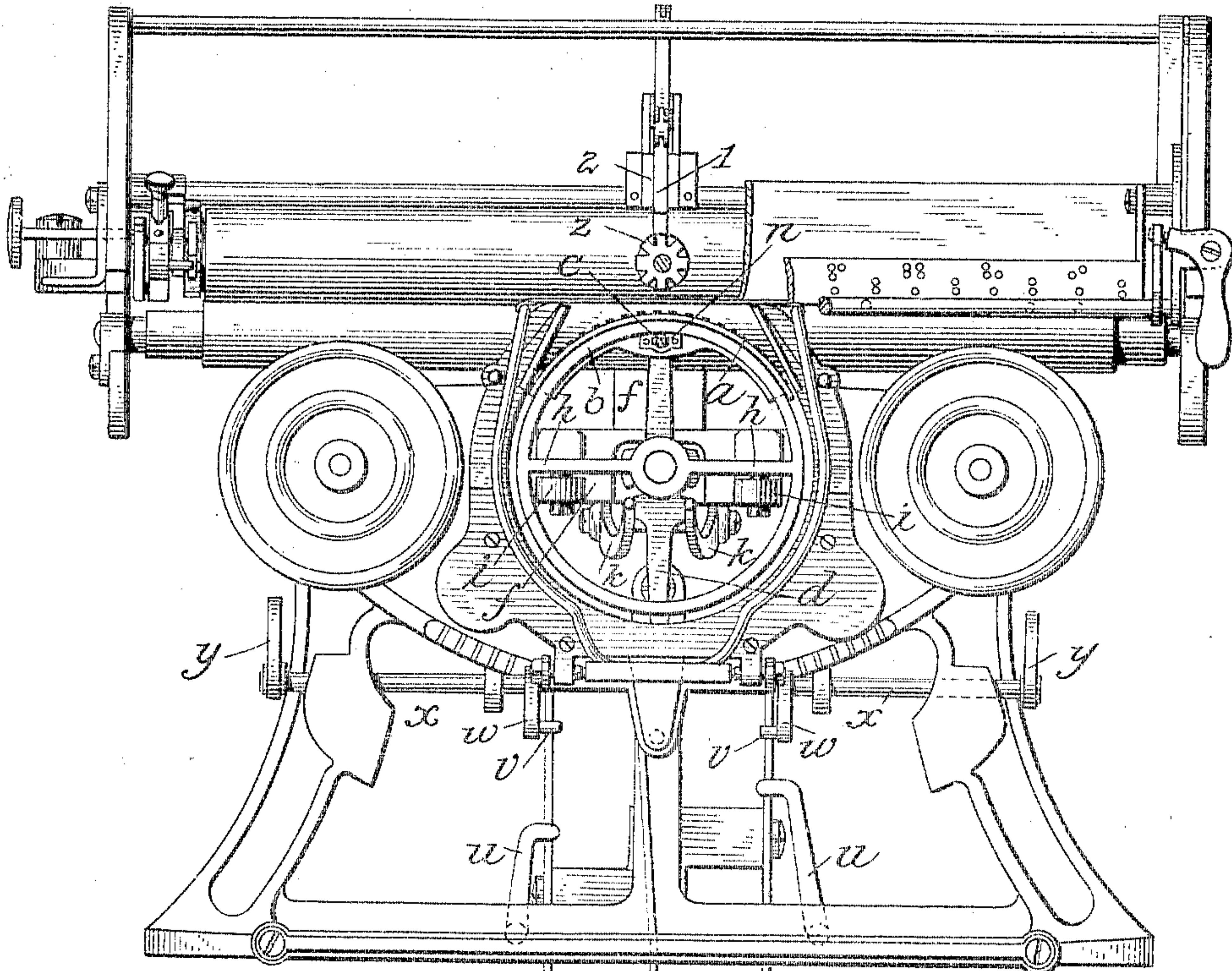


Fig. 5.

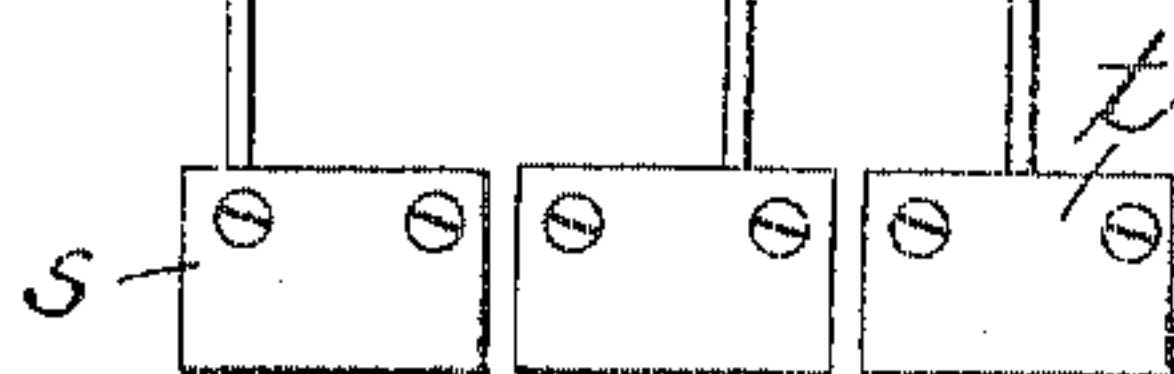
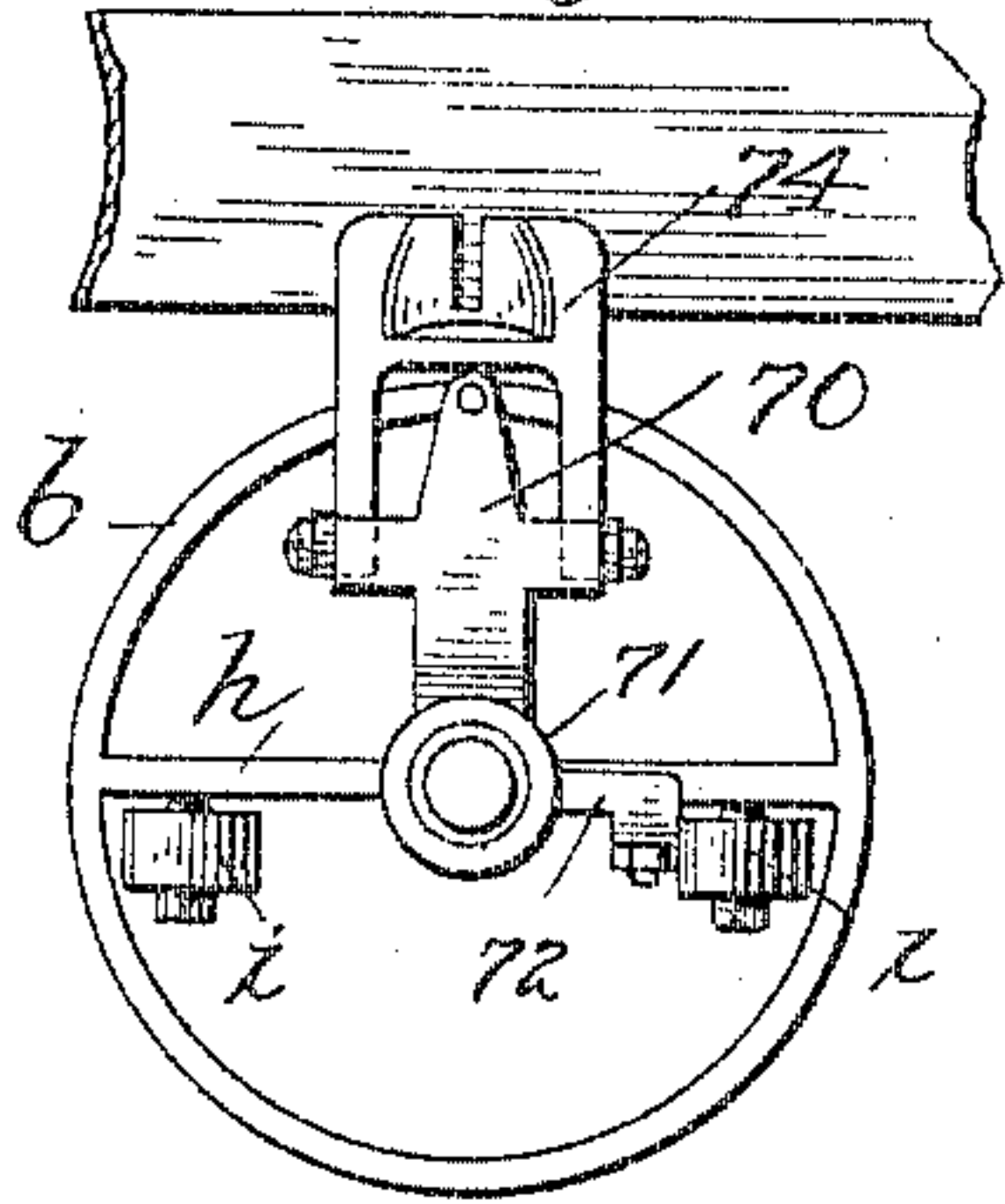
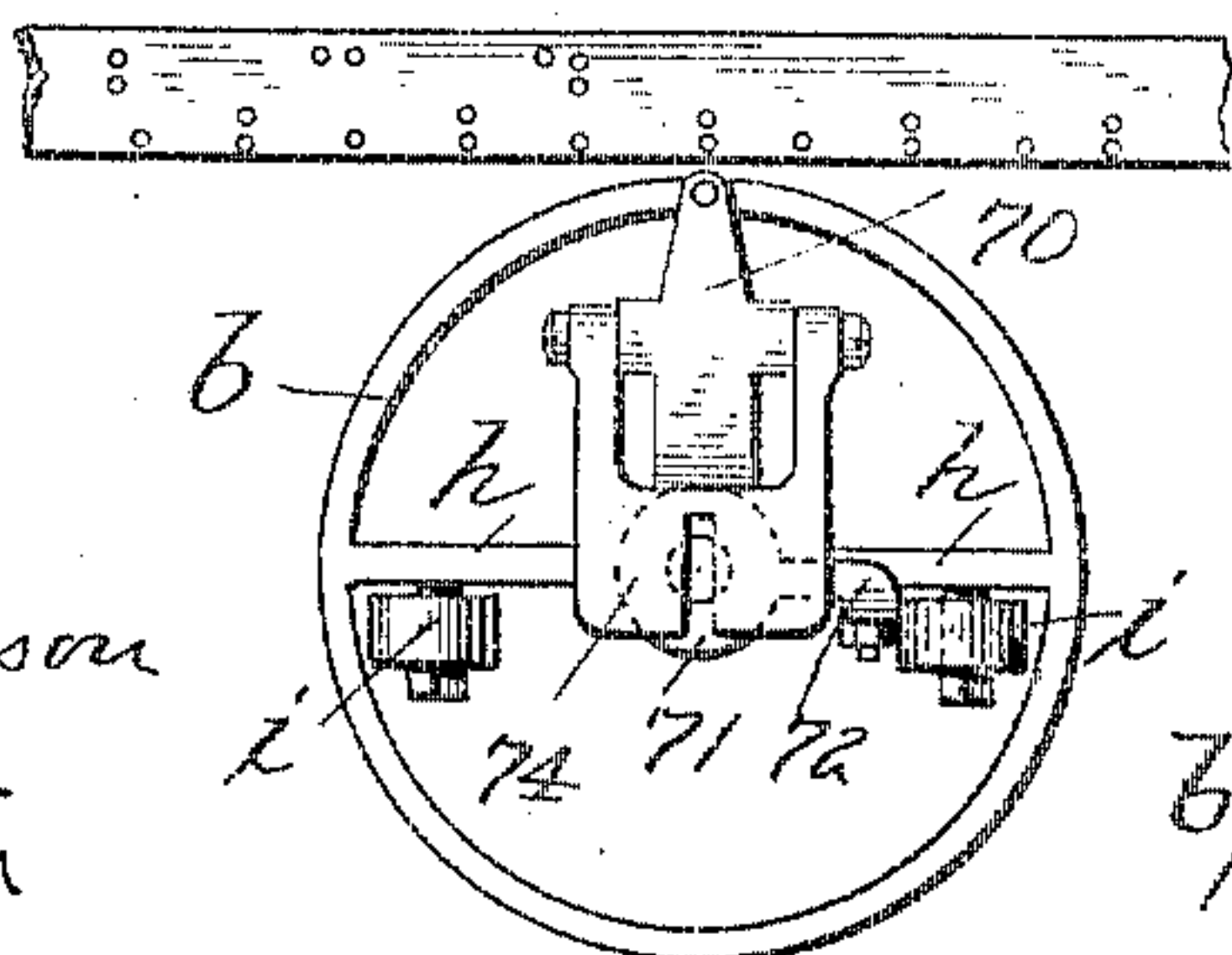


Fig. 6.



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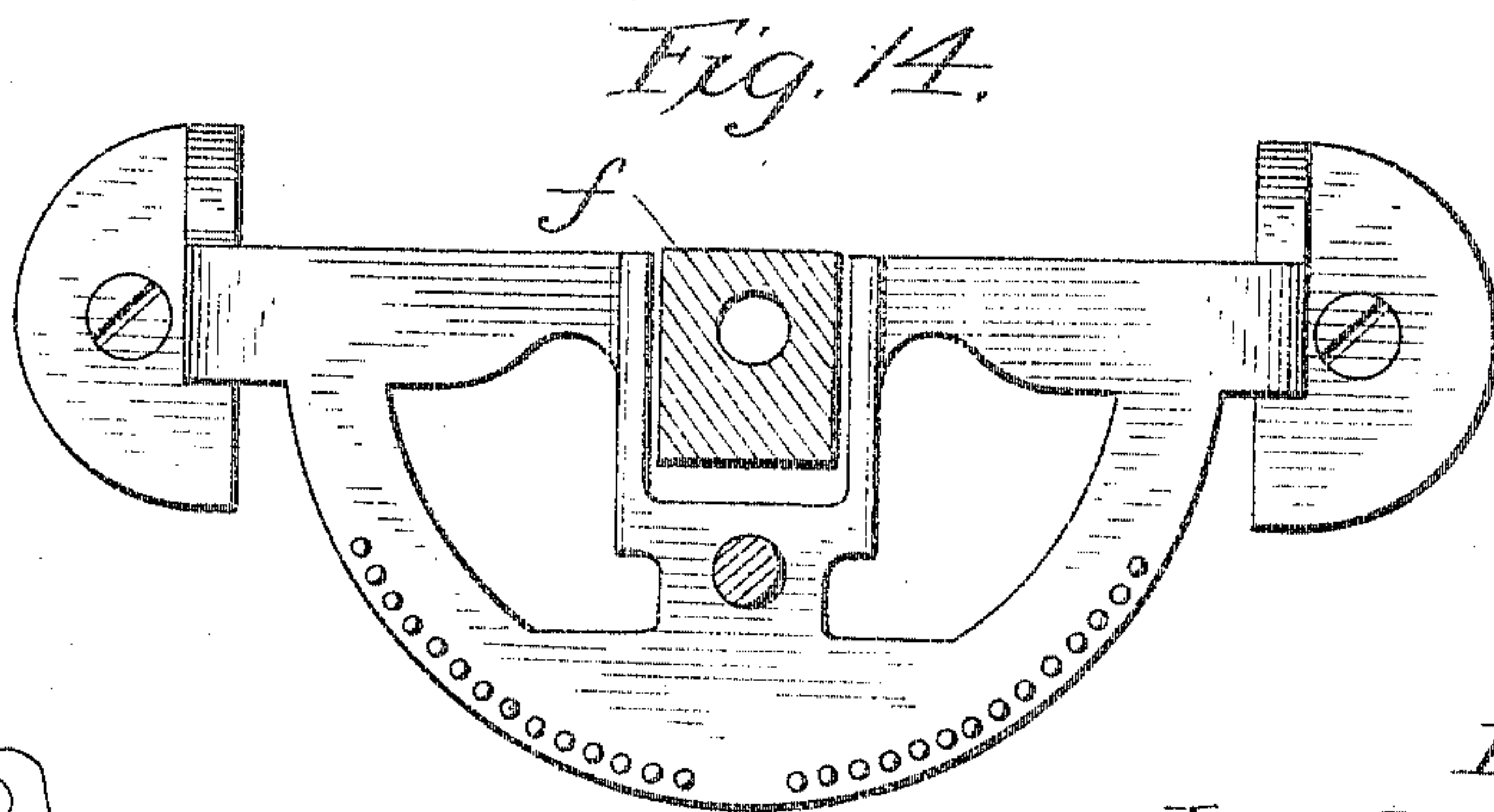
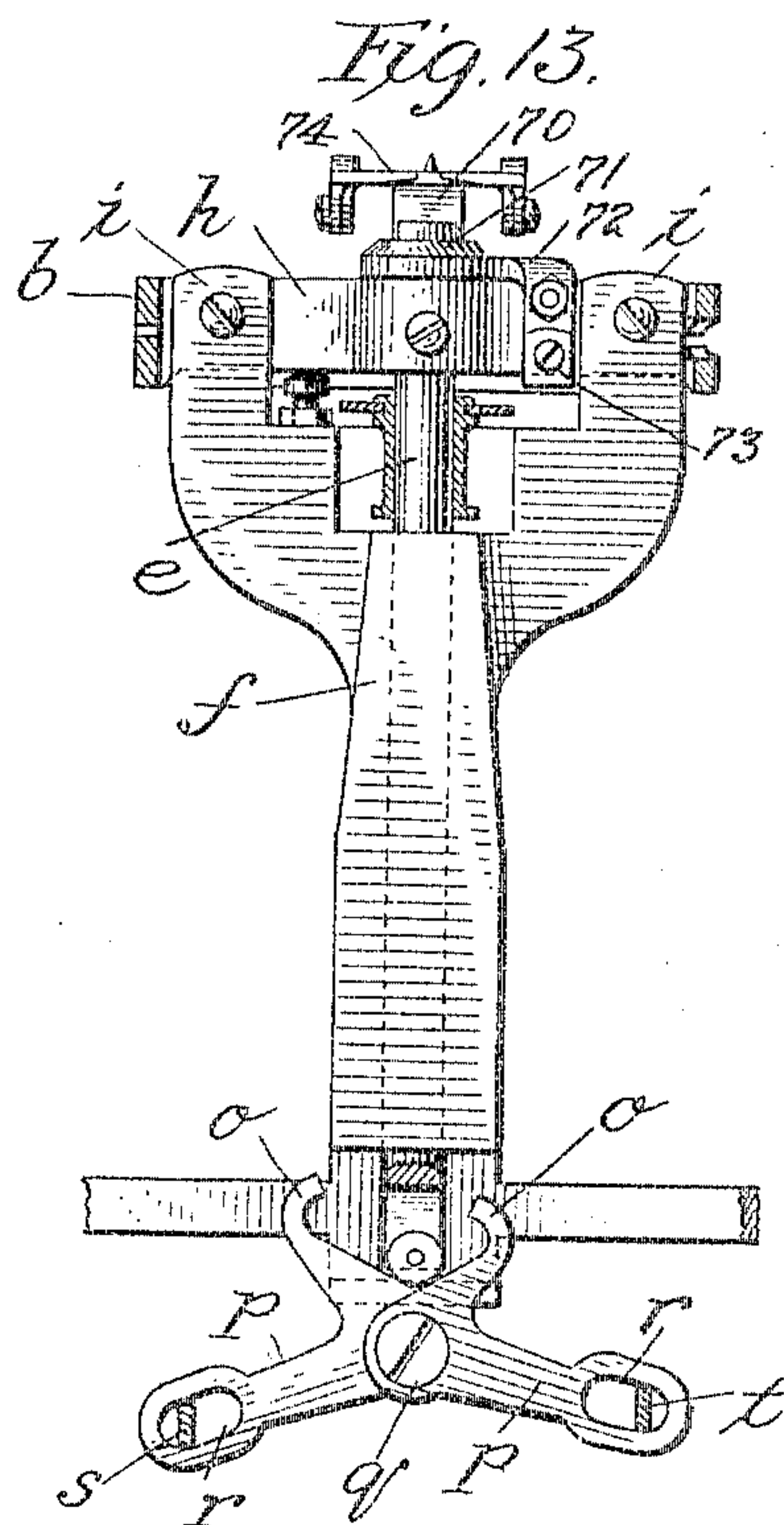
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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

JAMES B. HAMMOND, OF CAMDEN, MAINE.

PRINTING MECHANISM FOR TYPE-WRITERS.

SPECIFICATION forming part of Letters Patent No. 780,102, dated January 17, 1905.

Application filed May 11, 1901. Serial No. 59,797.

To all whom it may concern:

Be it known that I, JAMES B. HAMMOND, a citizen of the United States, residing at Camden, Maine, and temporarily residing at New York, State of New York, have invented certain new and useful Improvements in Printing Mechanism for Type-Writers, of which the following is a specification.

My invention relates to that form of type-writing machine known as the "Hammond," in which the printing is done by a hammer and type-carrying shuttle, the paper and ribbon being interposed between these parts to receive the impression.

It is my object to provide a type-writing machine of a universal character—that is to say, one which is capable of writing any language, whether the same reads from left to right, as in the English, or from right to left, as in Arabic, Turkish, and other oriental languages, or for printing the Braille system for the blind.

In carrying out my invention I have provided means whereby the paper-carriage may be made to move from right to left step by step on its printing stroke, as in printing English, for instance, or whereby it may be given its step-by-step printing stroke from left to right, as in printing either the oriental languages or the Braille system for the blind. With this reversible carriage I employ in combination means whereby the keyboard may be adjusted to suit the language being printed, said means enabling the operator to adjust the keyboard at will without requiring the services of a skilled person.

The reversibility of the printing-hammer and the exchangeable feature of the type-shuttle also form important features of my machine designed to do work of a universal character, the hammer being adapted to be adjusted to bring any one of a series of faces opposite the printing-point for making either the ordinary impression or for printing the Braille system for the blind or for manifold-
ing or doing mimeograph work.

My invention includes, further, an improved printing-hammer action, means whereby the hammer tension and the carriage tension may be adjusted in unison, and an improved frame

for supporting the anvil and hammer and sustaining the blows of the printing mechanism.

The invention also includes a checking device which will automatically prevent the shuttle when raised for printing caps or figures from being thrown up too far.

Another feature of my invention relates to an index or pointer and a shield designed more especially for the use of the blind, but which will be found useful by any person using the machine, the pointer being intended to indicate the printing-point and the shield being intended to aid the operator in making erasures.

The hammer of my present invention is of turret form, having a plurality of faces and being adjustable to bring any desired face into use. Some of the faces are covered with rubber, furnished preferably by a rubber band encircling the hammer, and other faces being exposed without rubber coverings and designed for manifolding, Braille writing, or mimeograph-printing.

Other features forming part of my invention I will describe hereinafter and particularly point out in the claims.

In the accompanying drawings, Figure 1 is a sectional view of the machine from front to rear with parts in elevation and parts broken away; Fig. 2, a plan view with the carriage removed and some of the parts omitted and some broken away. Fig. 3 is a rear view of so much of the carriage, together with the escapement, as is necessary to an understanding of my invention. Fig. 4 is a plan view of the shuttle and anvil and adjacent parts, including a portion of the carriage and a part of the hammer mechanism, some parts being omitted. Fig. 5 is a detail view of the anvil and the pointer and shield arranged in connection therewith. Fig. 6 is a view of the same part with the erasing-shield thrown back out of use. Figs. 7, 8, 9, 10, and 11 are detail views relating to the hammer. Fig. 12 is a detail view relating to the pointer and shield. Fig. 13 is a front view of the U-shaped frame for supporting the anvil and shuttle, this view showing also the operating and locking mechanism for the anvil post or spindle. Fig. 14 is a plan view of the center-

piece frame, showing in section the front standard of the U-shaped frame in its proper relation thereto. Figs. 15 to 19 are details of the key. Figs. 20 and 21 are detail views.

5 *Type-shuttle and anvil.*—The shuttle *a*, carrying the type in three or more rows, moves about the face of the ring-shaped anvil *b*, which is slotted to receive the web of the shuttle. This web is engaged by a vertically-extending finger *c* of the stop-arm *d*, journaled on the post *e*, carrying the anvil. This post passes down through the front standard or horn of a U-shaped frame *f*, which is screwed to the base-frame at *g*. This frame is made
10 in one piece and supports the hammer mechanism upon its rear horn or standard, as will be described hereinafter. The anvil has cross-arms *h*, and in front of these lie fingers *i*, one opposite each arm, and bearing-screws are
20 adjustable through these fingers to engage the arms of the anvil. The fingers form extensions of the front standard of the U-shaped frame, being formed integral therewith. By this arrangement of the anvil, in which its
25 post or standard is supported in the front horn of the integral U-shaped frame and its arms are borne upon on their front sides by the fingers, it will be seen that a strong construction is provided for sustaining the hammer-blows.
30 This bracing of the anvil will permit of a powerful hammer action being employed, such as may be necessary in writing the Braille system, for instance, in which the material is indented to make the raised characters on one
35 side. The tail of the shuttle moves in the slot of the anvil, and the movement to the shuttle is imparted in substantially the same way as in the well-known Hammond machine through the vertical driving-arms *k* and the horizontal
40 driving-arms *l*, which latter are operated directly by the key-levers. The means for arresting the shuttle is also the same as that in the Hammond machine, consisting of the stop-arm before mentioned and the spring stop-
45 pins *m*, which are elevated by the key-levers. The anvil, with the shuttle, can be removed from the machine by simply lifting it from the U-shaped frame. The anvil is screwed to its post, and they are both removable together.
50 For printing caps or figures the shuttle is raised by lifting the anvil, and for this purpose the lower end of the anvil-post is bifurcated, and in the lower part of the opening thus formed a roller is journaled. Bell-crank
55 levers *p* are pivoted to the bed-plate at *q* below the lower end of the post, and these are arranged to engage the roller and lift the post, with its anvil. In this vertical movement the anvil is guided by the fingers formed with the
60 U-shaped frame and reaching up in front of the cross-bars of the anvil. As the anvil completes its upward movement to bring the desired row of characters to the printing-point the hooked end *o* of the bell-crank lever
65 which has just raised the anvil will swing into

the bifurcated end over the roller, and thus limit the upward movement of the anvil and shuttle and stop them when they have been elevated to the proper point. The bell-crank levers have different lengths of arms to raise
70 the post, with the anvil and shuttle, to different degrees for capital letters and figures. In either case the bell-crank levers serve both as elevating devices and as stop means, checking the anvil in its elevated position. The ends *o* of
75 the bell-crank levers act as stops, being movable toward and from operative position by the operation of the means for elevating the shuttle. The bell-crank levers are provided with
80 slotted ends at *r*, and these are engaged by the key-levers *s* and *t* for capital letters and figures, respectively. Springs *u* are provided to return the levers to normal position.

In order to arrest the type-shuttle at points intermediate of the throw of either of the
85 key-levers, I provide stops which may be manipulated by hand, and when these stops are thrown into use by the operator the key will be arrested at an intermediate point in its stroke, and the type-shuttle will thus be
90 raised to a point intermediate of its extreme positions. This stop consists of a pin *v*, arranged to overlie the key-lever, said pin being carried by an arm *w* on a rock-shaft *x*, journaled in the frame and operated by a finger-lever *y*.
95 There may be one of these stop-pins and operating means for each of the cap and figure levers. By means of this supplemental stop just described the type-shuttle may be provided with special rows of type which may be
100 thus brought into use.

It will be noticed that the anvil rests by gravity in its supporting-frame and is freely movable and removable. It may be lifted, together with the shuttle, entirely out of the machine at any time. It has no positive engagement with its operating mechanism at the
105 lower end of its post which would obstruct in any way its free removal. In its movement the anvil is guided and held against circumferential displacement by the fingers bearing on the arms of the anvil, and when replacing the anvil in the machine its proper position is determined by said fingers. By employing
110 the automatic locking means the anvil, with the shuttle, is arrested at the proper elevated point, and no spring restraining means or spring-catch for holding the anvil down need be employed. The key action is rendered
115 light by my present arrangement.

Hammer mechanism.—The hammer *z* is arranged to move in a direct line toward and from the type, said hammer being carried by a slide 1, guided in a box 2, supported on the rear horn or standard of the U-shaped frame.
125 This sliding block is operated by a bell-crank lever 3, pivoted to the standard, the short arm of which is connected by a link 4 with the sliding block and the long arm of which is connected, through an adjustable link 5, with
130

the hammer-lever 6, loosely pivoted on the shaft 7 of the escapement-wheel 8, which is fixed on said shaft. This hammer-lever is controlled by the pawl 9, pivoted thereto, engaging the teeth of the escapement-wheel, and by a spring 10, which is connected thereto and to a rod 11, which is adjustable to alter the tension of this spring. For this purpose the rod slides in bearings 12 on the frame, and it is provided with rack-teeth 13, engaging a pinion 14 on a shaft 15, journaled in the frame. This shaft carries a gear-wheel 15', which meshes with a pinion 16 on the shaft 17 of the carriage-spring drum. The drum is turned to wind the carriage-spring in the ordinary manner by a suitable key-piece 18, and by this connection the hammer-spring will be adjusted as to tension simultaneously with the adjustment of the carriage-spring. The escapement works substantially like that well known in the Hammond machine, the movement of the key-levers being imparted to the escapement mechanism through the space-frame 19, pivoted at 20 to the frame and having a screw 21 at its rear end engaging a projection 22 on the usual escapement-lever 23, pivoted to the base-frame and having a fork 24 to engage a pin in the pawl 9 to operate the same toward and from the escapement-wheel and a detent 25 to engage the escapement-wheel. The detent is formed by an adjustable tooth 26 on the lever. When the pawl is released from the escapement, the hammer-lever is free to operate under the strong pressure of the hammer-spring. By means of the bell-crank lever the power may be multiplied and a heavy blow delivered in printing, and this force is sufficient to print the Braille system. When the key-lever is released, the escapement-lever will withdraw the detent and the pawl of the hammer-lever now engaging the ratchet-wheel. The stronger force of the carriage-spring relative to the hammer-spring acting on the escapement-wheel will turn the same so that the hammer will be retracted, the retracting movement, as well as the letter-space movement, of the carriage being arrested by a stop consisting of the nuts 27, carried by a rod 28, pivoted to the tail-piece 29 of the hammer-lever, said nuts abutting against a stop 30 on the main frame.

The hammer of my improved construction is designed to deliver a short pressing stroke rather than a sharp swinging blow, this being due to the sliding arrangement which is employed in place of the pivoted hammer. By my present arrangement a powerful pressure may be obtained between the hammer and the type, due to the leverage afforded by the connections, as the power of the hammer-spring, which is comparatively weak relatively to the carriage-spring, is multiplied, and at the same time by this arrangement the tension of the carriage-spring need not be so great, as this spring can more easily overcome the tension

of the weaker hammer-spring in returning the hammer to normal position, which office it performs through the rack-bar and escapement, as is well known in this style machine. For this purpose also I form the escapement-gear 55, which is connected with the escapement-wheel by pawl-and-ratchet mechanism, as ordinarily, and which engages the carriage-rack of nearly the same size as the escapement-wheel, so as to get a powerful lever action between the rack and the escapement-wheel, which will perform the function of overcoming the hammer-spring and returning the hammer to normal position when the operated key is released. By this construction I am enabled to employ a strong hammer-spring, and at the same time the carriage-spring need not be of excessive strength, as the increased leverage derived from the enlargement of the escapement-gear will enable a carriage-spring of moderate strength to overcome the hammer-spring and return the hammer to backward position.

The hammer.—The hammer ε is of turret form, being provided with a plurality of faces, one, 32, being a manifolding-face, which is of hard metal, another, 34, being for mimeograph-printing, and another, 33, being for Braille writing and provided with a series of pits which coöperate with suitable points on the shuttle. This face of the hammer is larger than those used in ordinary writing, and with these latter the hammer is also provided. The hammer is of substantially circular form, having the radiating projections carrying the different faces. It is surrounded by a rubber band 35, which takes the place of the rubber band on the carriage heretofore used, the band in the present case extending over the hammer-faces excepting the manifolding, mimeograph, and the Braille faces, the projections for which are provided with notches in which the band lies. The band has an opening through which these faces to be exposed project. The rubber may be made thicker at some of the faces that it covers than at others. This is to get different impression effects from the strokes of the hammer, according to which one of the faces is in action. The turret-hammer is removably held in place by a spring connection 37 between it and its pivot-pin. It is held in any of its adjusted positions by means of a spring-pawl 38 engaging notches in a rim 39 on the turret, said pawl being pivoted to the sliding carrier-block of the hammer. The spring connection between the turret-hammer and its pivot-pin is such as will not prevent the free rotary adjustment of the hammer, the spring engaging a groove 31 in the turret.

The hammer-checking mechanism.—This mechanism consists of a slide-rod 40, movable though a bearing 41 on the U-shaped frame and arranged to be projected over the hammer-lever when the space-key is operated. This rod is connected with a bell-crank lever

42, pivoted on the U-shaped frame, said lever being arranged to be operated by the spacing-lever 43, so that the rear end of the checking-rod will be thrust out over the hammer-lever
 5 to prevent the hammer from operating when the space-key is depressed. The hammer-lever is provided with a cushion to render the action easier. The universal-space frame is provided with an arm 44, which extends under
 10 a portion of the escapement-lever to engage the same.

The carriage-driving mechanism.—The paper-carriage 45 is driven from the mainspring-drum by a flexible connection 46, of cord or
 15 other suitable material. The cord is attached at one end to the spring-drum and passes thence to and up between two guide-rollers 48, journaled in bearings 49, extending from the frame of the machine. The cord is at-
 20 tached at its other end to a clip 50, held on the back bar of the carriage. This clip can be set at either one end or the other of the bar by means of a latch 52, pivoted to the clip and having fingers or latch-pins 53, adapted
 25 to engage openings 54, arranged at or near each end of the bar. In the position shown the pull on the cord from the spring-drum will propel the carriage to print from left to right, as in ordinary English. By simply
 30 raising the latch-piece, pushing the clip to the other end of the bar, and setting the latch again the same pulling force will propel the carriage in the other direction to print from right to left for the oriental languages or for
 35 printing the Braille system. The guide-rollers 48 are arranged centrally of the stroke of the carriage, and the driving band or cord passes around either one or the other of these, extending thence to the end of the carriage.
 40 With this carriage capable of being propelled in either direction by the motor the same escapement mechanism serves. For this purpose I interpose between the escapement-wheel and the carriage rack-bar an additional
 45 gear-wheel to that commonly used in the Hammond type-writer, and by throwing either one or the other of these gears into mesh with the carriage rack-bar while the other is out of gear therewith the step-by-
 50 step movement of the carriage may take place in either direction, being controlled by the same escapement acting in the one direction.

The ordinary escapement gear-wheel is shown at 55 loose on the shaft of the escape-
 55 ment-wheel. In the present instance this gear is adapted to be shifted along said shaft to be thrown into and out of operation with the carriage rack-bar, while, however, maintaining its driving connection with the es-
 60 capement-wheel, which is done by a spline or pin connection 56, extending from a ratchet-wheel 37, loosely arranged on the escapement-shaft and adapted to impart movement to the escapement-shaft from the carriage-spring
 65 through a pawl 58, engaged by the teeth of the

ratchet, which pawl is pivoted to a disk 59, fixed on the escapement-shaft. By this construction the pull of the carriage-spring exerted through its rack and the gear will place a tension on the escapement-wheel tending to move it, and
 70 at the same time the carriage can be run back to start a new line, as is well known, the ratchet-wheel slipping around under the pawl. The gear 55 meshes constantly with another
 75 and smaller shifting-gear, 60, which also is adapted to engage and disengage the carriage rack-bar 61. When this smaller gear 60, which I term the "change-gear," is thrown into mesh with the rack and the escapement
 80 55 is thrown out of connection with the rack, the carriage may move step by step from right to left. The change-gear 60 is supported loosely upon a pin 61', fixed in the frame, and both this gear and the escape-
 85 ment-gear are provided with grooved bosses 62, receiving pins 63 of a lever 64, which is pivoted to a suitable part of the frame, a finger-lever 67 being connected to the lever and having a spring-pin 68, which by
 90 shifting the finger-lever may be made to engage either one of two holes 69 in the bracket to hold the lever in either position. In one position the escapement-gear 55 is in mesh with the rack while the small gear 60
 95 is out of mesh, while in the other position the conditions are reversed; but in both positions the two gears maintain their engagement with each other. It will now be seen that by adjusting the driving-band to connect
 100 with either one end of the carriage or the other and by making a corresponding change in the gear-train by which the carriage-rack is connected with the escapement the step-by-
 105 step action of the carriage may be effected in either direction.

Braille printing.—It is necessary in printing the Braille system to replace the ordinary shuttle with one having points to turn the hammer, so that the face with the pits there-
 110 in will come opposite the printing-point and adjust the keys so that the operator may select the proper characters. It is necessary also to change the direction of the step-by-
 115 step or letter-space movement of the carriage. All these adjustments with the exception of the changing of the shuttle are made by the devices carried directly by the machine and adjustable thereon to bring different parts
 120 into action. It is not necessary to remove either the keys or the hammer to be replaced by other parts, and the change of all the type characters can be done at one operation by simply removing the type-shuttle and replacing it with the one desired. In this way my
 125 machine is adapted for universal use. It is possible for any of the changes to be made without necessitating reshipping the machine to the factory or the services of a skilled person, the only requirement being that the user
 130 be supplied with the proper number of shut-

tles or the shuttle adapted to the language which he may desire to employ.

In the printing of the Braille system it will be noticed that each character has a separate
5 key, and it is not the purpose of my invention to use a nest of keys or to use a combination of keys to form a given character; but in connection with a hammer having a matrix face made up of a plurality of pits and a shuttle having points it is possible to get any of
10 the Braille characters as may be desired by keys arranged to be separately operated, as in the ordinary type-writing machine.

For the use of the blind I provide a pointer
15 and an erasing-shield. The pointer 70 consists of an arm having a single point thereon, said arm being provided with a hub 71, adapted to fit on the end of the anvil-post above the anvil. It is held in position with the pointer extending
20 toward the printing-point by an arm 72, extending from the said hub and having a portion reaching down along the front side of the cross-arm *h* of the anvil, the lower end of said portion being provided with a spring
25 or friction shoe 73, adapted to fit under the lower edge of the said cross-arm, and thus hold the device in place.

The erasing-shield consists of a plate 74, pivoted to the pointer-arm, which may be swung
30 backward, so that it will overlies the erasing-plate of the carriage, upon which the paper will be pressed with the character to be erased exposed through the slot in said plate, so that the operator by erasing the character at the
35 slot can make correction. The shield on its top side is slightly concaved to present a thin portion adjacent to the slot.

Adjustable keyboard.—As before described, one of the objects of my invention is to provide
40 a universal machine which will carry permanently in connection therewith a keyboard capable of being adjusted to expose the characters of different languages, both oriental and occidental, or for printing the Braille system, so that said adjustable keyboard in connection
45 with means for reversing the printing movement of the paper-carriage, for adjusting the hammer, and means for quickly exchanging the type a machine will be provided which may be adjusted by any unskilled person to
50 print languages reading from left to right or the oriental languages, reading from right to left, or for printing the Braille system, in which the carriage moves from left to right. This
55 keyboard comprises keys having a plurality of character-receiving faces, said keys being adapted to be adjusted to bring any one of its characters to view. In the drawings I show the preferred form of this reversible key. It is
60 composed of a sheet-metal body 75 of preferably rectangular form and having sheet-metal ends 76, with flanges thereon fitting within the open ends of the rectangular body portion, said sheet-metal end pieces being suitably
65 secured by its flanges within the body portion

by soldering or in any other suitable way. The sheet-metal ends are provided with bearing-openings for the journal-pin 77 of the key, and the projecting ends of the bearing-pin fit
into openings in the forks 78, which are carried 70 by a post 79, slotted at its lower end to receive the key-lever, upon which it is held by a nut 80, screwed upon the lower end of the post and engaging the lower edge of the key-lever. The post has a flange or head at its top resting
75 upon the forked arm, and a sleeve or ferrule 81 fits about the post to bear against the forked arm and against the upper edge of the key-lever, so that the pressure exerted upon the screw-nut will serve to press the key-
80 lever upwardly, and the ferrule will be pressed so that a friction-tight joint will be obtained between the forked arm and the head of the post, enabling the key to be adjusted circumferentially about the post by
85 exerting sufficient pressure, while at the same time it will be maintained securely in any position to which it may be turned. The end plates of the keys are also provided with projections 82, which are pressed out from the
90 sheet metal, and these projections are arranged at equal distances about the center of rotation. These projections are intended to engage a notch 83, formed in one of the arms of the fork to hold the key against turning. 95 When it is desired to bring a different face of the key to view, sufficient pressure must be exerted to overcome the resistance of the locking projection and to bring another projection opposite the notch in the arm of the
100 fork. In this action the arms of the fork yield sufficiently to allow the unlocking of the key, and when the proper face has been turned to view the fork will spring back into place over the projection, which is then in
105 line with the notch in the arm.

In Fig. 16 I show a different form of key of substantially triangular form providing three faces for the characters instead of four faces, as heretofore described. I do not limit
110 myself to the form of the key, as this may be made to provide as many faces as desired. I make no attempt to claim herein either the details relating to the reversible driving means for the carriage, the carriage itself, or
115 the details relating to the adjustable key; but these elements broadly considered in combination together with the reversible hammer and the exchangeable type-carrier provide a machine having the broad feature of univer-
120 sality of use, and in the combination of more or less of these elements a part of my invention resides.

Figs. 20 and 21 illustrate means relating to the adjustment of the hammer-spring, in
125 which instance the collar to which the spring 10 is connected is loose on the bar 11, and is held adjustably in low-tension position by a finger 84, carried by a block 85, adjustably held by the screw 86 through the frame-bar
130

66. This low tension may be varied within certain limits by adjusting the block 85. For high tension a pin 88 is fixed at a point determined by experiment in the bar 11 and in the adjustment of the carriage-spring for high tension this bar 11 will be moved longitudinally, and the pin 88 thereof will pick up the loose collar to which the spring 10 is attached, and thus adjust the tension of said spring.

10 By this means I secure an independent adjustment of the hammer-spring within certain limits for low tension.

I claim as my invention—

1. A type-writing machine having a carriage with means for giving the same a step-by-step movement in either direction on its printing stroke, an exchangeable shuttle, and an adjustable keyboard comprising keys each having a plurality of character-bearing faces with means permitting adjustment of said key to permit the desired face to be exposed.

2. A type-writing machine having a carriage with means for giving it a step-by-step movement in either direction on its printing stroke, an exchangeable shuttle, a reversible hammer and an adjustable keyboard whereby the key characters may be changed, substantially as described.

3. In combination in a type-writing machine for the blind, a carrier for the points forming the characters, which points are arranged in groups varying in number, a single surface having a single group of pits to receive the points, said pits corresponding in number to the maximum number of points in any one group and mechanism controlled by keys for moving the said carrier to bring the desired group of points to the single group of pits at printing-point, substantially as described.

4. A type-writing machine for the blind having a shuttle carrying the points, a hammer having the pits, said hammer being reversible to bring different striking-faces opposite the printing-point and a reversible carriage with means for driving it step by step in either direction, substantially as described.

5. In combination in a type-writing machine for the blind, means having the points thereon in different groups composed of different numbers of points, means for bringing said points in position to print and a movable hammer having pits in its face with means for operating said hammer, substantially as described.

6. In combination in a type-writing machine, a reversible hammer having a plurality of faces, one face being pitted for printing the Braille system and another face being adapted for ordinary printing and means carrying the characters to coact with the hammer, substantially as described.

7. In a type-writer, a reversible hammer having a plurality of faces and a rubber band encircling said hammer, substantially as described.

8. In a type-writing machine, an adjustable

hammer having a plurality of faces and a band carried by the hammer and extending over said faces, substantially as described.

9. In combination, a type-writing machine, a reversible hammer having a plurality of faces and a band passing over one face and leaving another face exposed, substantially as described.

10. In combination in a type-writing machine, a reversible hammer having a plurality of projections with printing-faces thereon notches formed in the upper and lower sides of one of the projections and an encircling band having an opening and fitting in said notches, substantially as described.

11. In combination with a hammer of turret form, an encircling band of yielding material, substantially as described.

12. In combination in a type-writing machine, a removable reversible hammer, a pivot-pin and a spring for holding the hammer on the pin, said spring being arranged between the pin and the hammer, substantially as described.

13. In combination in a type-writing machine, a shuttle, means for operating the shuttle and a sliding hammer with means for operating the same, said means including a spring and power-multiplying connections between the said spring and the hammer, substantially as described.

14. In combination in a type-writing machine, type-carrying means, a sliding hammer, the lever connection for operating the same, a spring for operating the hammer through said connection, escapement mechanism controlling the action of said spring and the carriage-spring acting through said lever connection to return the sliding hammer, substantially as described.

15. In combination in a type-writing machine, the carriage-rack, a spring-drum connected therewith, an escapement-ratchet, a hammer, a hammer-lever controlled by the escapement-ratchet, a hammer-spring connected with the hammer and an escapement-gear comprised in the connection between the rack-bar and escapement-ratchet, said escapement-gear being of substantially the same diameter as the escapement-ratchet to secure a maximum leverage action in returning the hammer to normal position, substantially as described.

16. In combination with a hammer, a carriage-spring drum, means for winding the same, a hammer-spring, a rod connected with the hammer-spring and extending longitudinally of the machine and a connection between the rod and the winding means, substantially as described.

17. In combination with a hammer, a carriage-spring drum, means for winding the same, a hammer-spring, a rod connected with the spring and a gear connection between the rod and the winding means, substantially as described.

18. In combination with the shuttle, an anvil, the anvil-spindle, a U-shaped frame in which said spindle is sustained and a hammer supported by the U-shaped frame with means for operating the hammer, substantially as described.

19. In combination with a shuttle, an anvil and a supporting-frame having a backing-piece for the anvil to resist the hammer-blows, substantially as described.

20. In combination with a hammer and a shuttle, an anvil having the cross-arm and a supporting-frame in which the anvil is supported, said frame having the backing-finger to engage the said arm and hold the anvil, substantially as described.

21. In combination, a hammer, a shuttle, an anvil and the supporting-frame having fingers extending alongside a part of the anvil to hold the same in position, substantially as described.

22. In combination with a hammer, a shuttle, an anvil for the shuttle having the cross-arms, the U-shaped frame having the fingers reaching up alongside the said arms, said hammer being also supported by the U-shaped frame, substantially as described.

23. In combination, a hammer, a shuttle, a circular anvil having cross-arms and fingers extending from the frame to engage the cross-arms of the anvil, substantially as described.

24. In combination with a type-shuttle, a movable anvil, and means for guiding the anvil in its movement and holding it against rotary displacement consisting of a frame part engaging the anvil, substantially as described.

25. In combination, a type-shuttle, a freely-removable anvil and means for limiting the upward movement of the shuttle when raised, substantially as described.

26. In combination, a type-shuttle, a freely-removable anvil resting in place by gravity and means for arresting the anvil when moved upwardly, said anvil carrying the said shuttle, substantially as described.

27. In combination, a type-shuttle, a freely-removable anvil and the fingers engaging the anvil-arms to guide the same in its movement, substantially as described.

28. In combination, a type-shuttle, a freely-removable anvil carrying the same and resting in place by gravity, and a frame part engaging part of the anvil, substantially as described.

29. In combination, a shuttle, an anvil carrying the same and resting in place by gravity to be freely removable and means for guiding the anvil and holding it against rotary displacement, substantially as described.

30. In combination, a shuttle, a hammer and means for elevating and arresting the upward movement of the shuttle and for locking the shuttle in its raised position, said locking means being normally out of connection with

the shuttle and being thrown into locking position after the shuttle begins to move upwardly, substantially as described.

31. In combination, a shuttle, a hammer, means for raising the shuttle having locking means to arrest the upward movement of the shuttle, said locking means being normally retracted and being thrown into locking position after the shuttle begins to move, substantially as described.

32. In combination, a shuttle, the key-lever for raising the same, and means operated thereby to engage a part connected to and moving with the shuttle to prevent overthrow of the same, substantially as described.

33. In combination, the key-lever, a shuttle, an anvil carrying the same, means for raising the anvil and shuttle and means operated by the key-levers to arrest the upward movement of the anvil and shuttle, substantially as described.

34. In combination, a shuttle and anvil resting in place in the machine by gravity, a key-lever for raising them and arresting means controlled by the key-lever, substantially as described.

35. In combination, a shuttle, a spindle connected thereto, a key-lever for raising the spindle and means for arresting the upward movement of the spindle controlled by the key-lever, substantially as described.

36. In combination, a shuttle, a spindle connected thereto, a hammer, a lifting-lever for the spindle, said lever having a hook for locking the spindle, substantially as described.

37. In combination, a shuttle, a slotted spindle with a roller therein and a lever having a surface to engage the roller and a hook to fit into the slot and engage the roller to lock the shuttle, substantially as described.

38. In combination, a shuttle, a spindle, a combined lifting and locking lever for the spindle and a key-lever for operating the said lifting and locking lever, substantially as described.

39. In combination, a shuttle, key connections for lifting the same and a plurality of normally retracted stops arranged at different points and connected with the key connections to be thrown into stopping position after the shuttle begins to move, substantially as described.

40. In combination, a shuttle, a slotted spindle connected therewith, and a plurality of hooked levers for raising and locking the spindle, substantially as described.

41. In combination in a type-writer, a hammer, a space-key and means for arresting the hammer when the space-key is operated consisting of the sliding rod with connections to the space-frame, substantially as described.

42. In combination in a type-writer, a hammer, means for operating it, a space-key and means for locking the hammer when the space-

key is operated and a bell-crank lever between the said means and the space-key lever, substantially as described.

43. In combination, the shuttle, the anvil held against rotation and a pointer connected with the anvil, substantially as described.

44. In combination with an anvil, an arm connected therewith and extending toward the carriage, and a locking connection for said arm, substantially as described.

45. In combination with the anvil, an arm connected with the anvil and a locking device therefor engaging part of the anvil, substantially as described.

46. In combination, the anvil, an arm swiveled above the same and having a locking device to hold the arm when turned to operative position, substantially as described.

47. In combination with an anvil-spindle, the arm arranged to swivel about the top of said spindle and having a locking connection to hold it when turned to operative position, substantially as described.

48. In combination with the anvil-spindle and anvil, an arm arranged to swivel about the top of the spindle and a lock for said arm engaging a part of the anvil when the arm is turned to operative position, substantially as described.

49. In combination with the anvil-spindle and anvil, an arm fitted to the top of the spindle and a locking device carried by said arm and engaging one of the arms of the anvil, substantially as described.

50. In combination with the anvil-spindle and anvil, an arm swiveled above the anvil and having a locking portion adapted to engage an arm on the anvil when the swiveled arm is turned to operative position, substantially as described.

51. In combination with the anvil, an erasing-shield, and an erasing-plate, substantially as described.

52. In combination with the anvil-spindle and anvil, an erasing-shield supported by the spindle, and an erasing-plate, substantially as described.

53. In combination with the anvil-spindle and anvil, an erasing-shield connected with the spindle and pivotally supported to be thrown out of normal position, and an erasing-plate, substantially as described.

54. In combination with the anvil-spindle and anvil, a pointer pivotally supported on the anvil and pivotally carrying a shield, a locking device connected with the pointer and arranged to engage a part of the anvil, and an erasing-plate, substantially as described.

55. In combination with an anvil, a pointer, an erasing-shield, and an erasing-plate, substantially as described.

56. In combination with an anvil, a pointer,

an erasing-shield pivoted thereto, and an erasing-plate, substantially as described.

57. A type-writing machine having a carriage with means for giving the same a step-by-step movement in either direction on its printing stroke, type-carrying means and a reversible hammer with key mechanism, substantially as described.

58. In combination, a pivot-pin for the hammer, a hammer and a spring for holding the hammer on the pin, said hammer being adapted to have rotary movement on the pin, substantially as described.

59. In combination with a hammer and type-shuttle, an erasing-plate and an erasing-shield arranged to operate above the plane of the hammer and shuttle, substantially as described.

60. In combination, a shuttle, and a pointer swiveled about the axis of the shuttle, substantially as described.

61. In combination, a shuttle, a pointer swiveled about the axis of the shuttle and locking means, substantially as described.

62. In combination, a paper-carriage having a step-by-step movement from left to right to print and a shuttle or like movable carrier and hammer controlled by the keys, said shuttle having points and the hammer having pits, substantially as described.

63. In combination, a hammer having a single group of pits in its face and a pivoted shuttle having characters formed of separate groups of points, substantially as described.

64. In combination, a hammer-spring, means for adjusting the tension of the same and means for adjusting the spring for low tension within certain limits independent of the main adjustment, the main adjustment means being arranged to pick up the spring, substantially as described.

65. In combination, a hammer-spring, a loose collar to which said spring is attached, a bar carrying a pin for engaging and adjusting said collar, and an adjustable piece having a portion to engage said collar to adjust the same for low tension, substantially as described.

66. In combination in a hammer-spring, means for adjusting the same for low tension, and means for adjusting the same for high tension independent of the low-tension means, said high-tension means removing the spring from the control of the low-tension means, substantially as described.

67. In combination, a shuttle, a stop to engage a part connected with the shuttle and means for elevating the shuttle and throwing the stop from a retracted position into position to arrest the upward throw of the shuttle, substantially as described.

68. In combination, a shuttle, a plurality of movable stops to arrest the upward throw of

the shuttle at different degrees of elevation and means for raising the shuttle and operating said stops automatically from the keys, substantially as described.

- 5 69. In combination with a shuttle, a spindle in connection therewith, means for raising the spindle and a movable stop for engaging and limiting the upward throw of the spindle, said stop moving with the elevating means, said

stop being normally retracted and being advanced automatically, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JAS. B. HAMMOND.

Witnesses:

DUNCAN MACGREGOR,

HENRY M. WARBURTON.