

903,331.

O. V. SIGURDSSON.
TYPE CASTING AND COMPOSING MACHINE.
APPLICATION FILED JUNE 25, 1906

Patented Nov. 10, 1908.
13 SHEETS—SHEET 1.

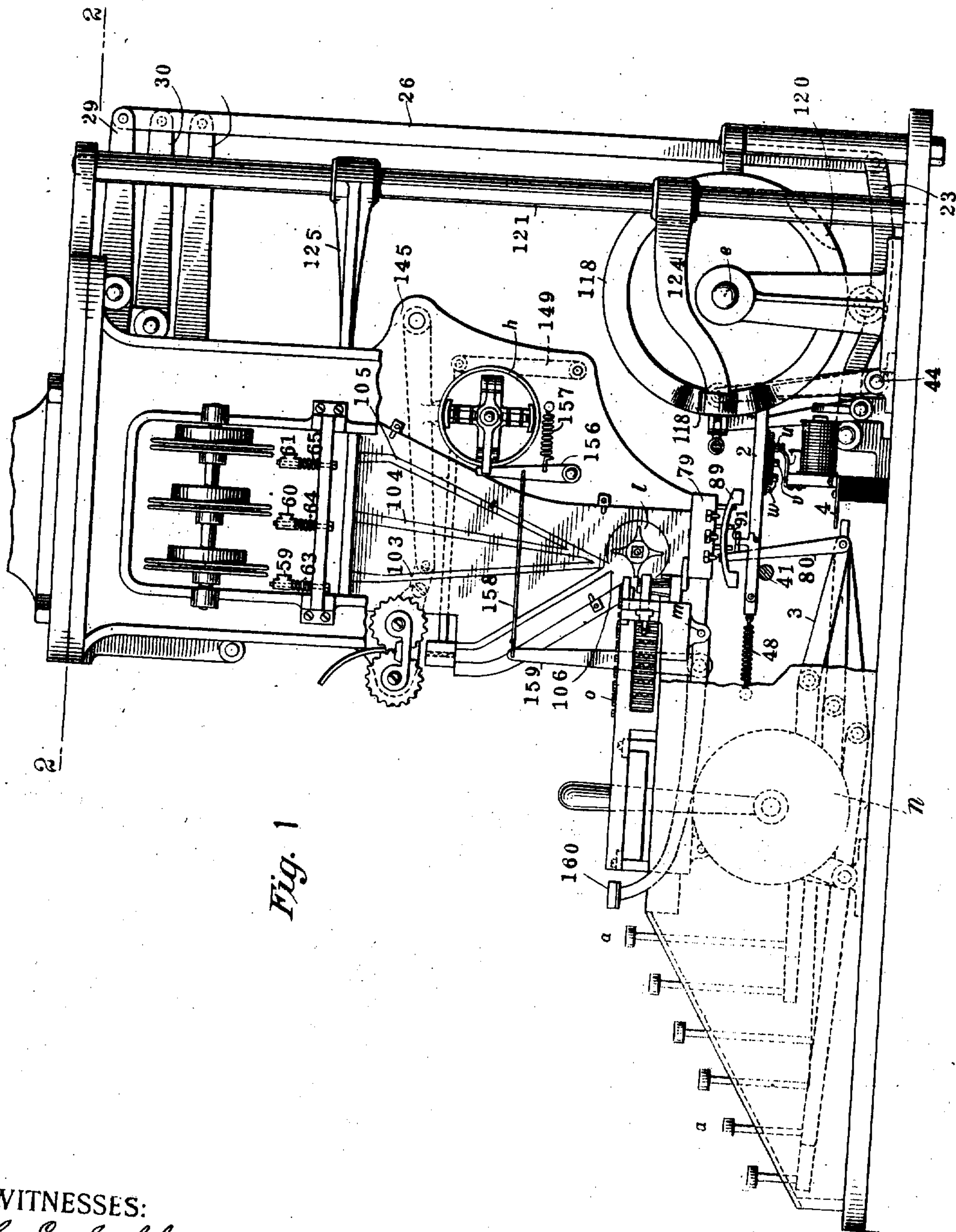


Fig. 1

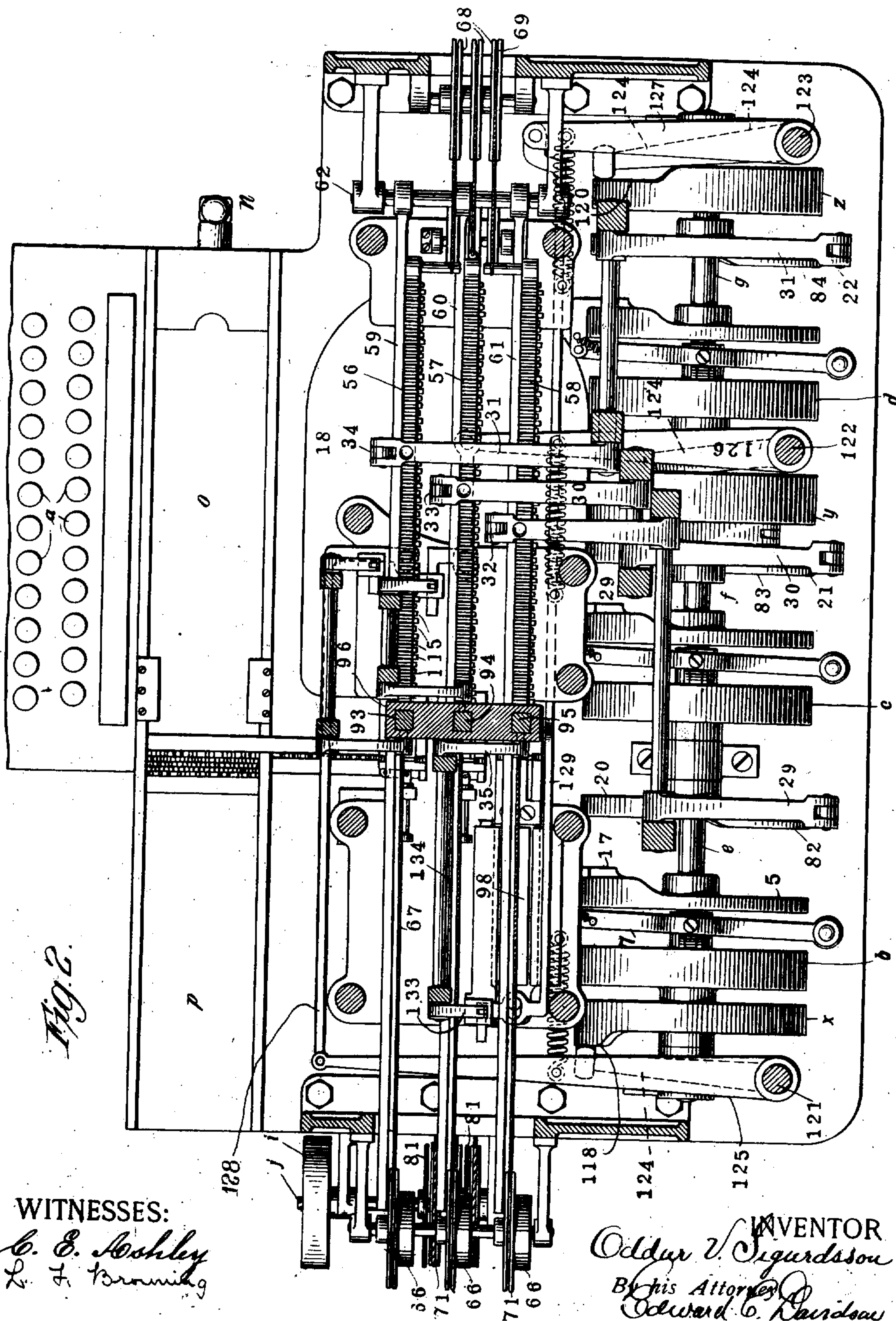
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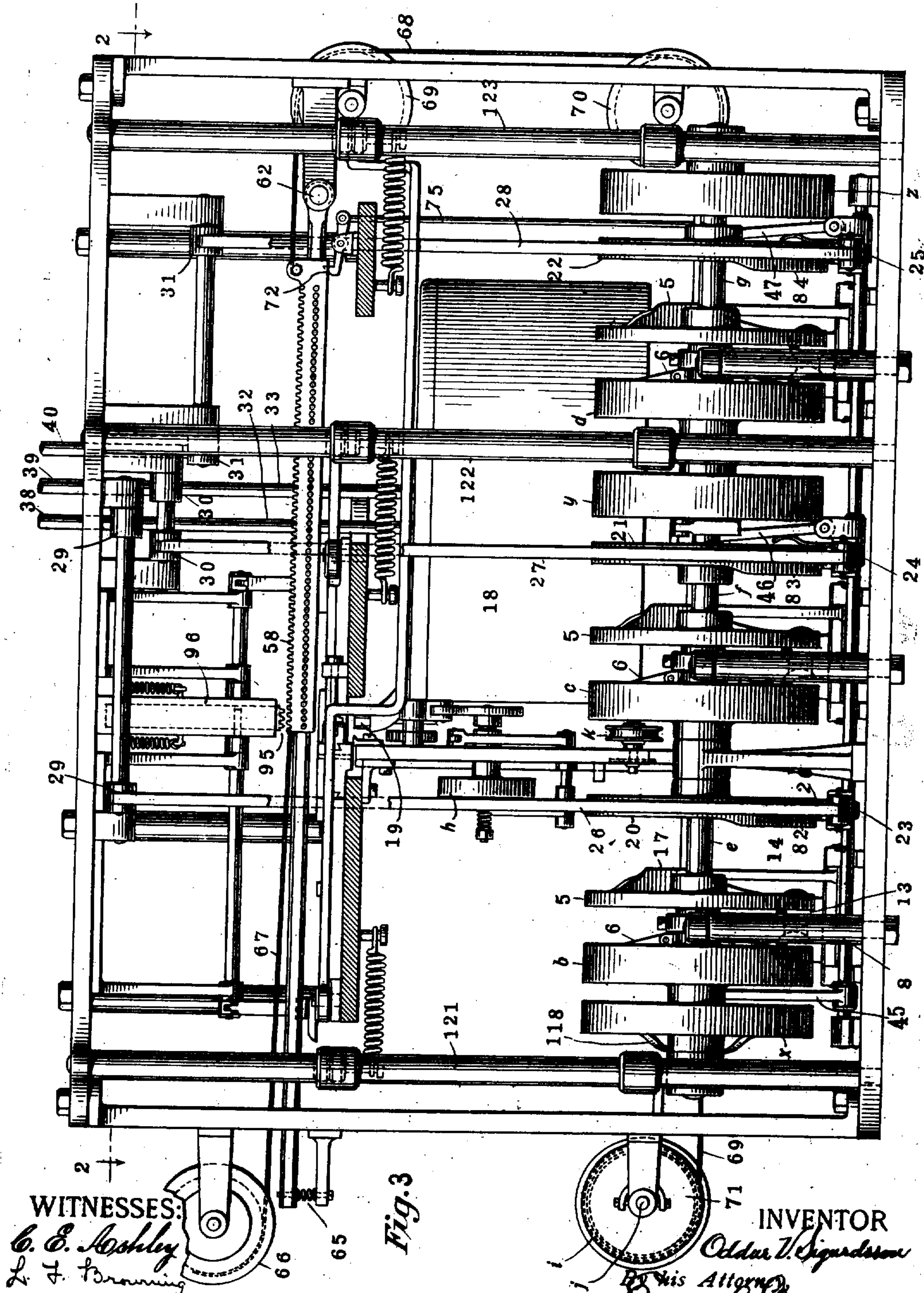


Fig. 3

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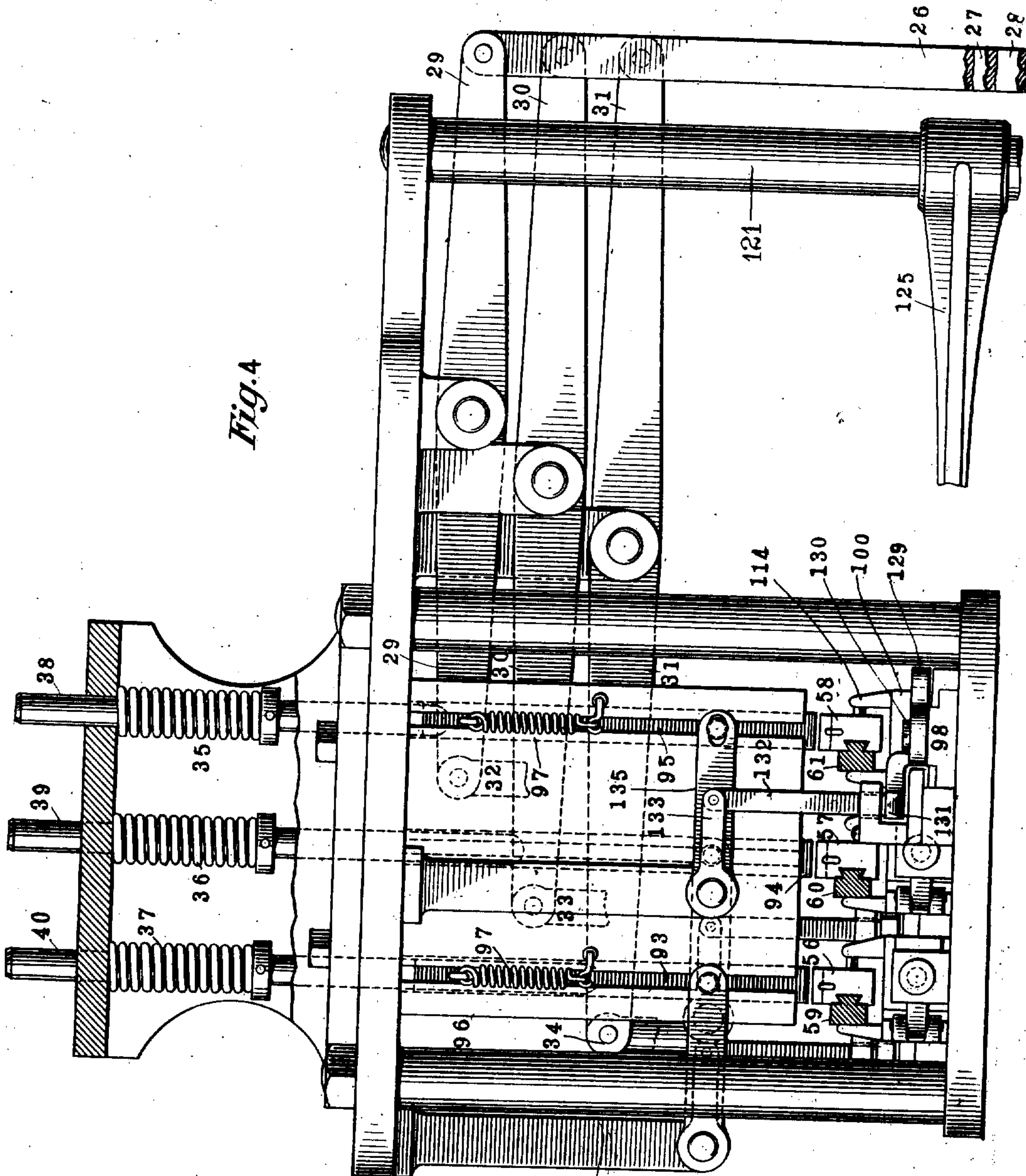
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Fig. 4



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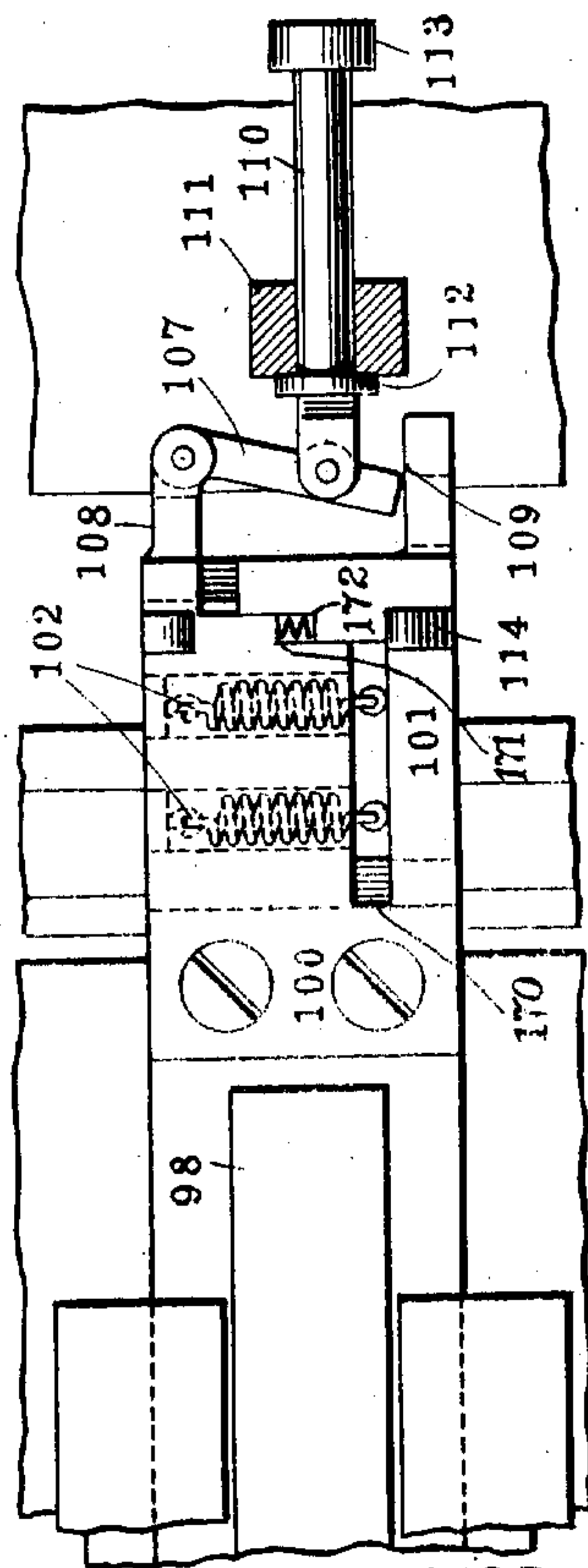
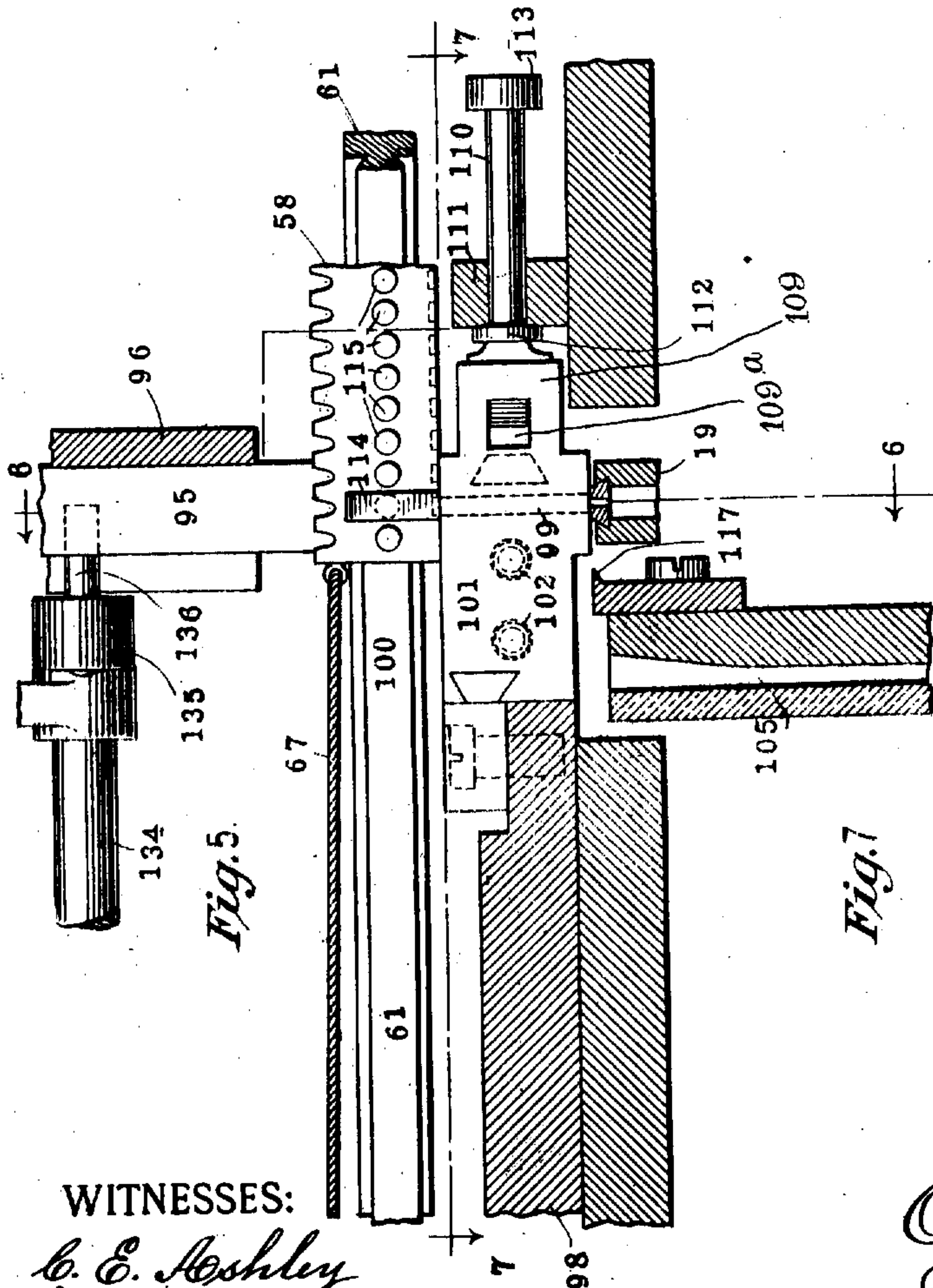
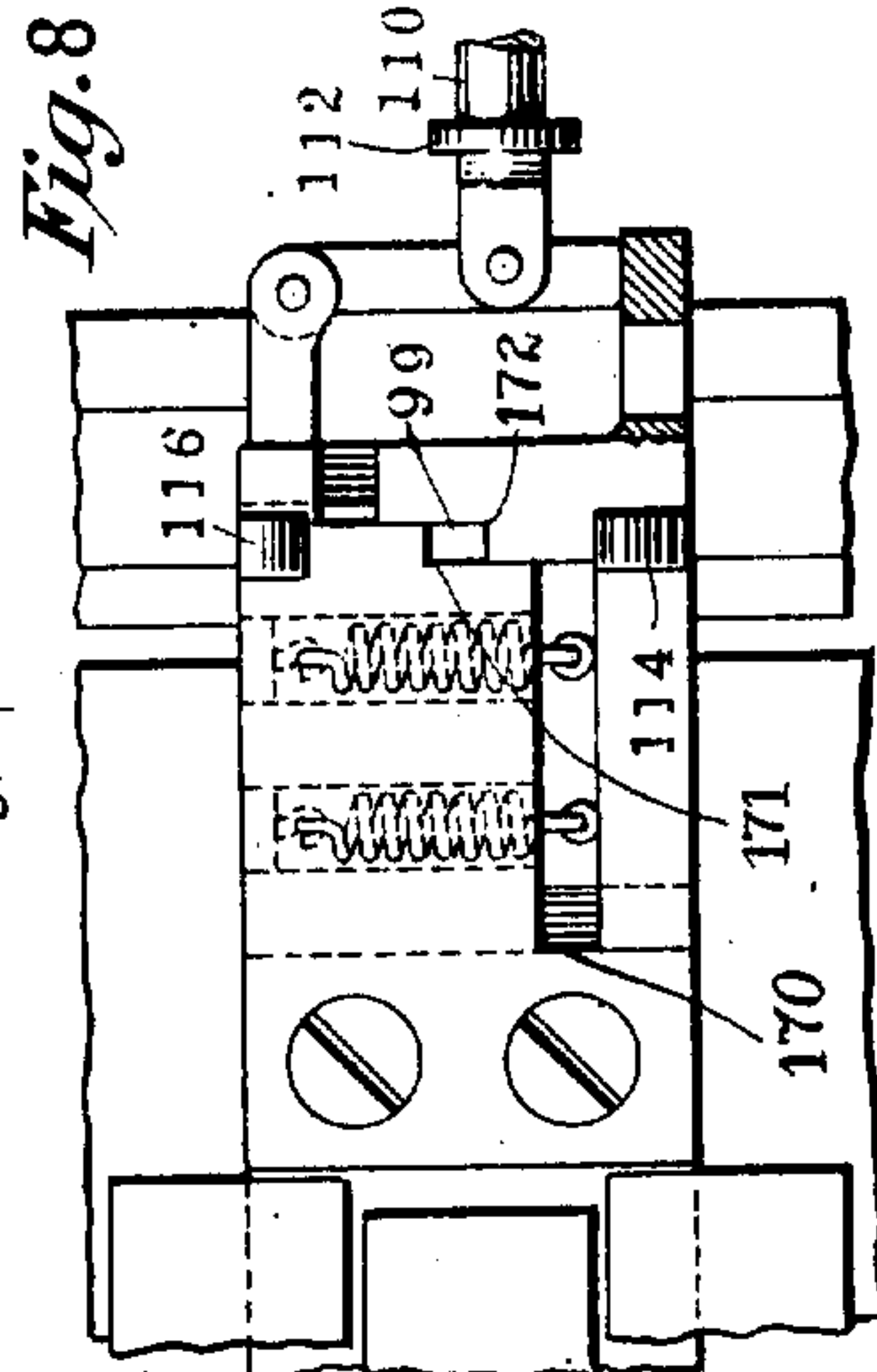
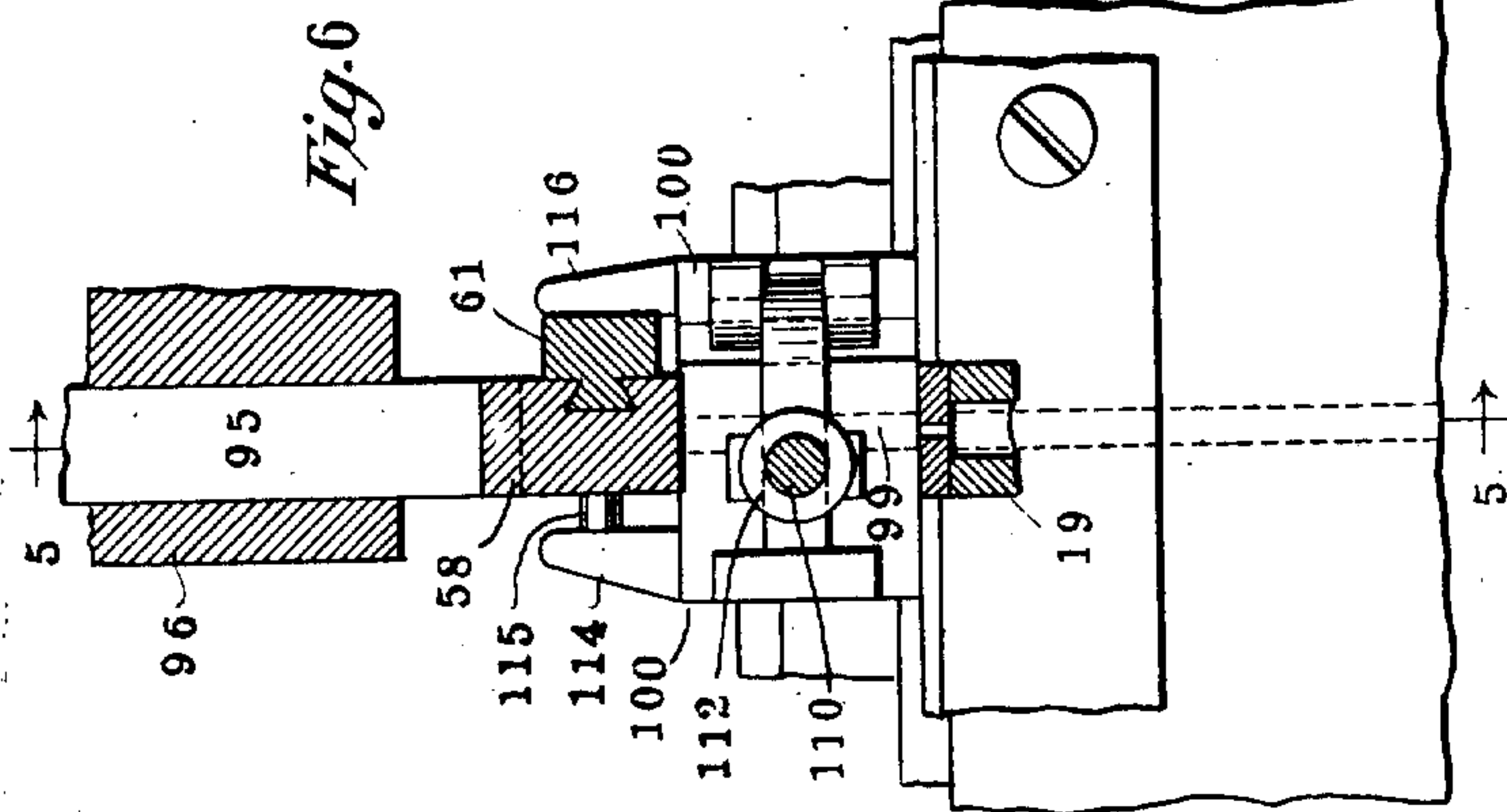
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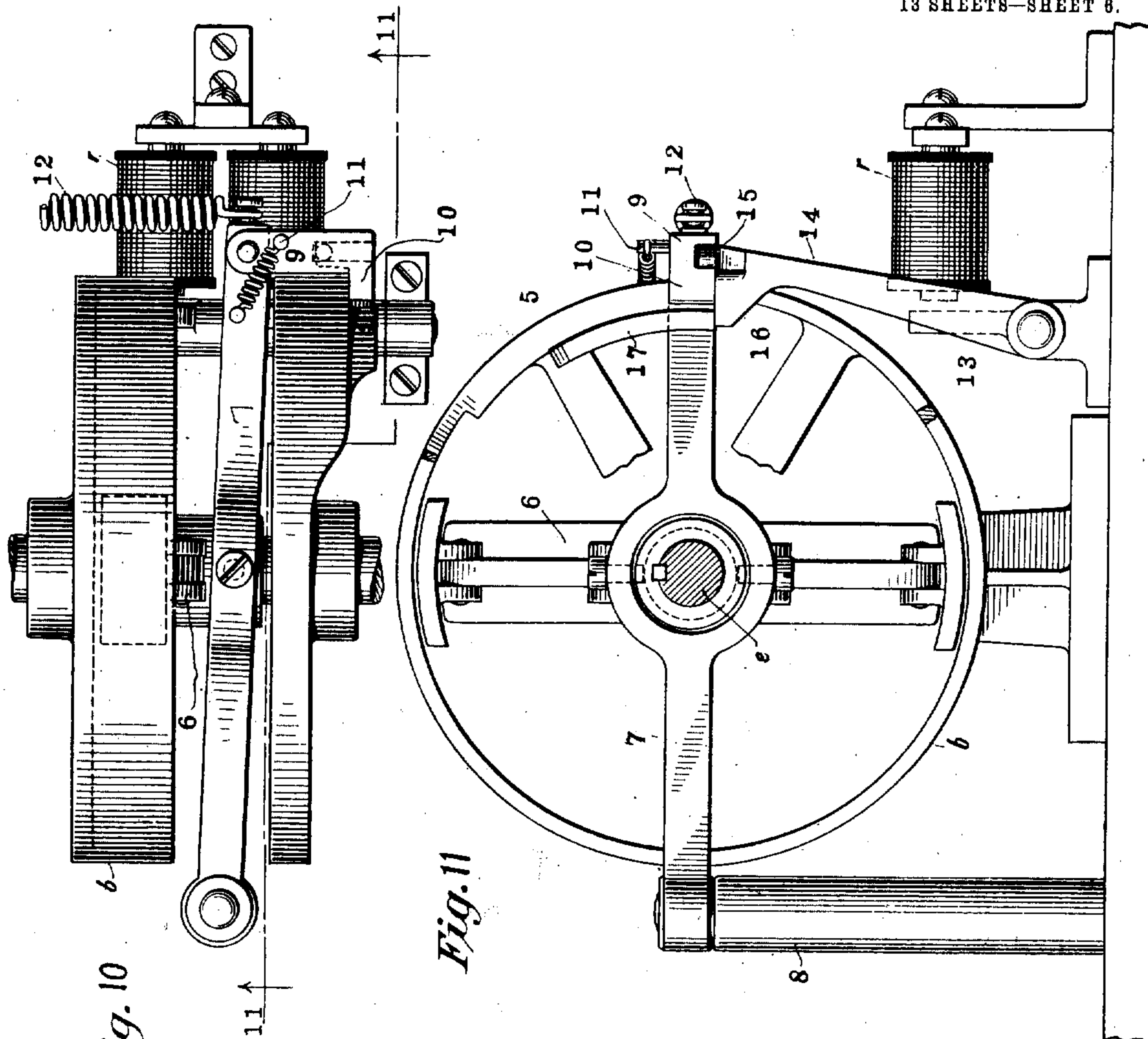


Fig. 10

Fig. 11

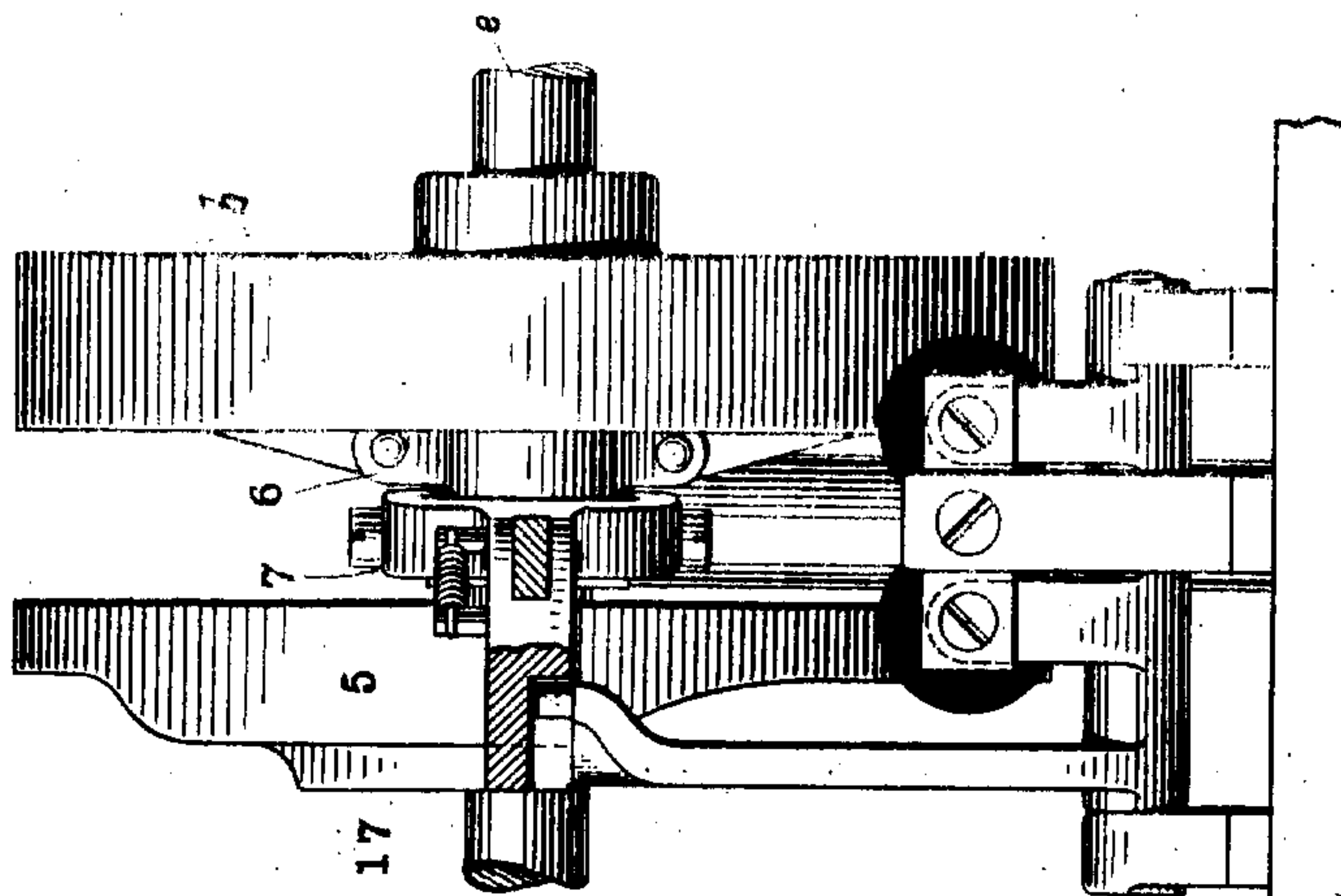


Fig. 9

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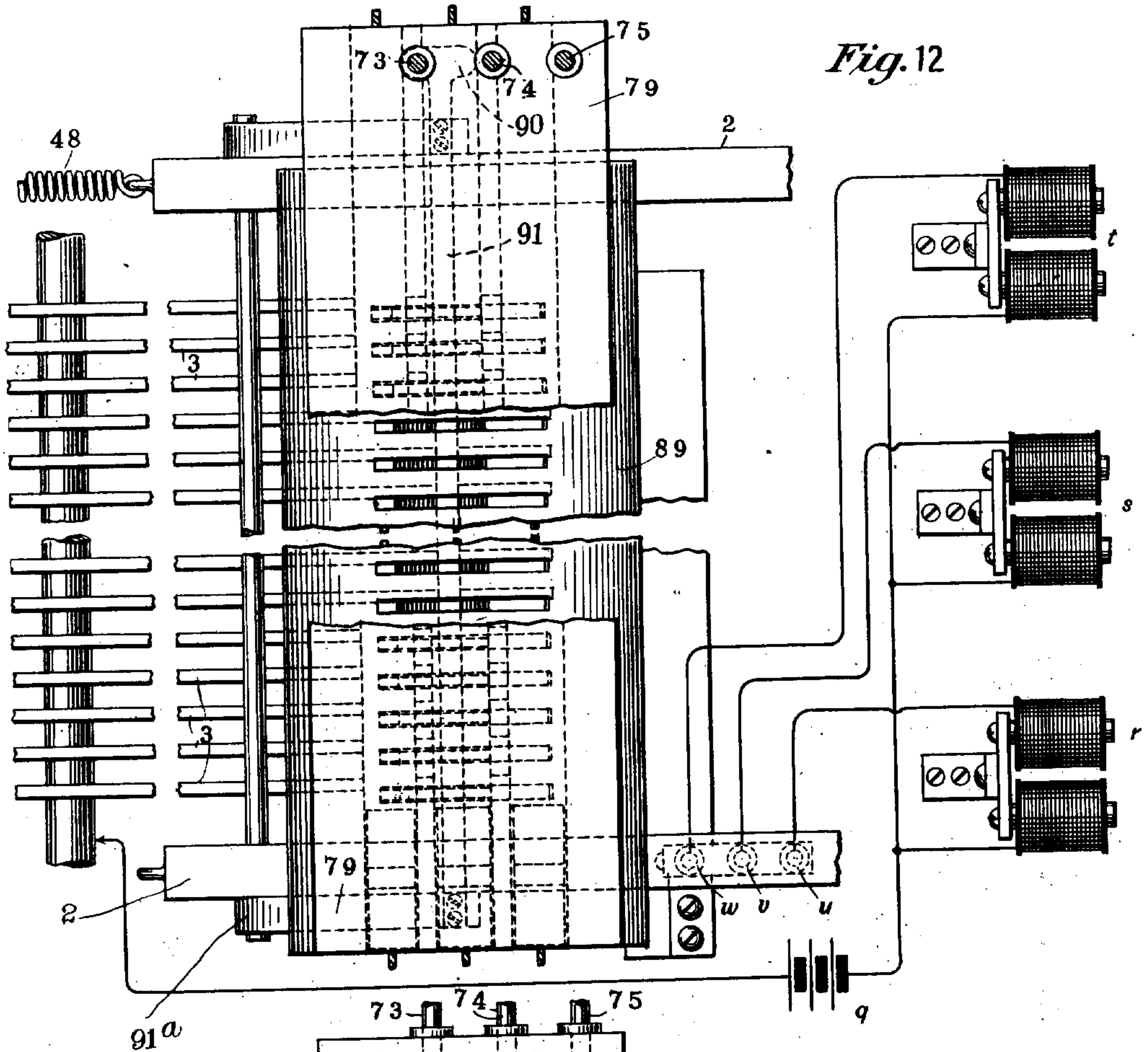
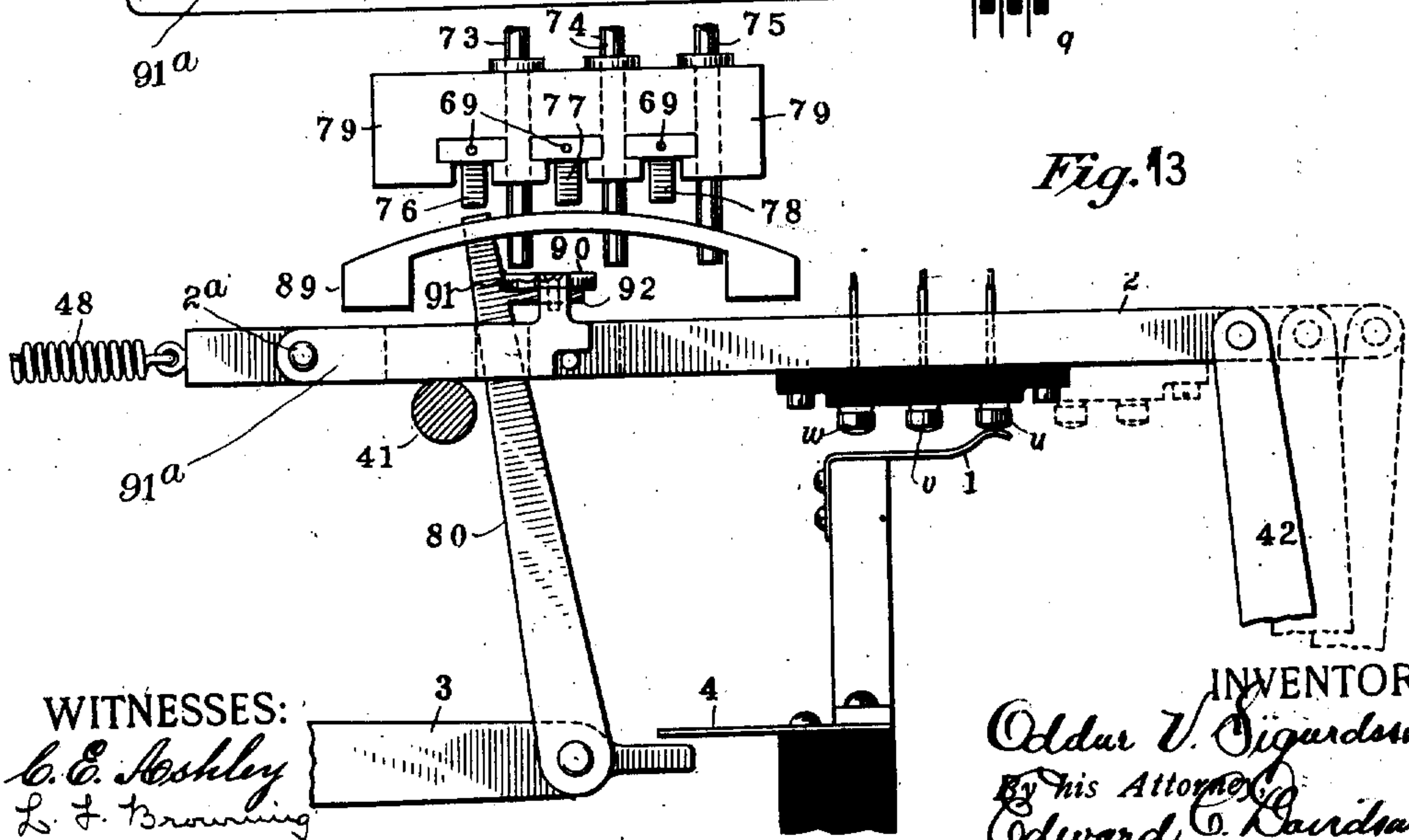


Fig. 13



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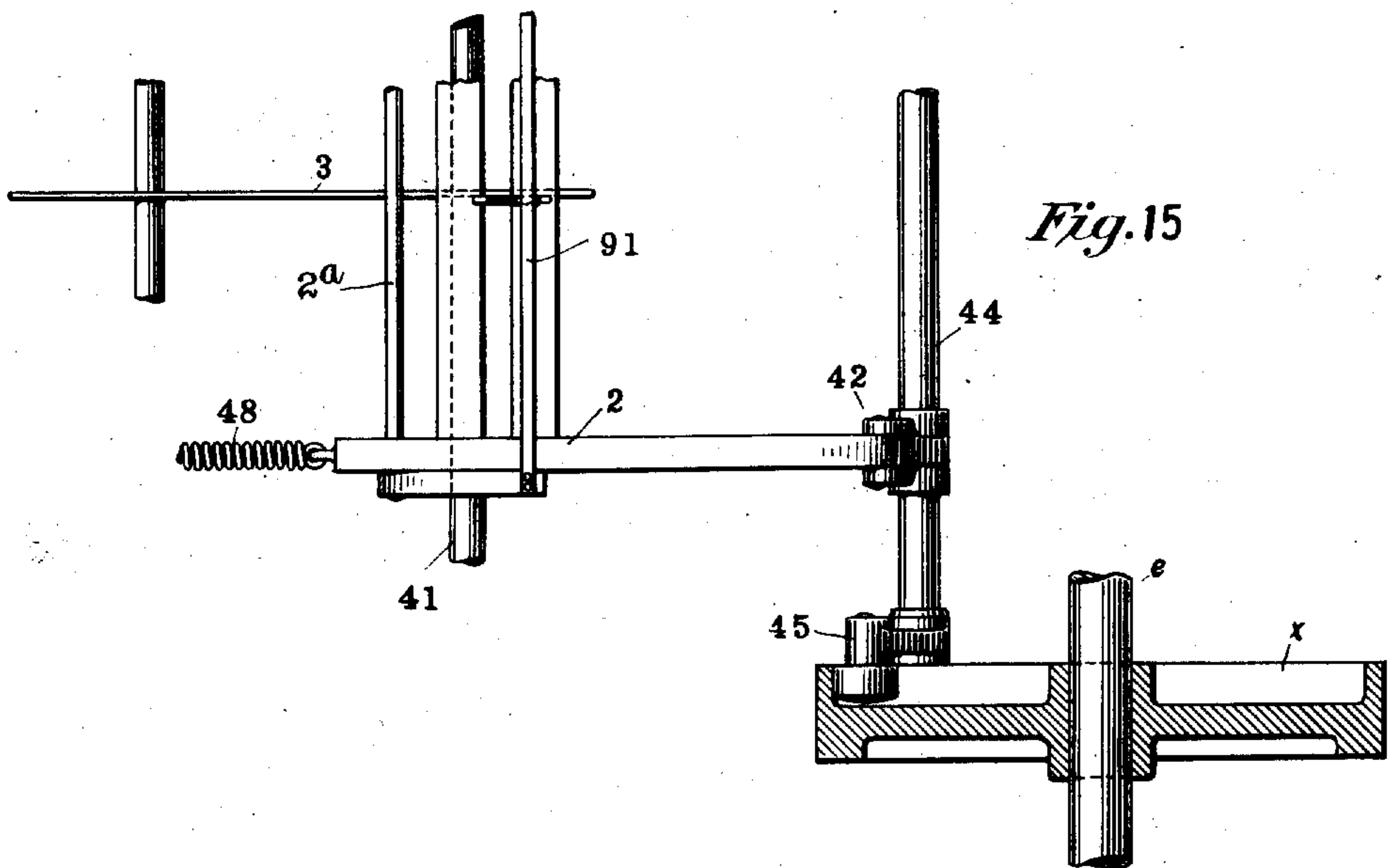
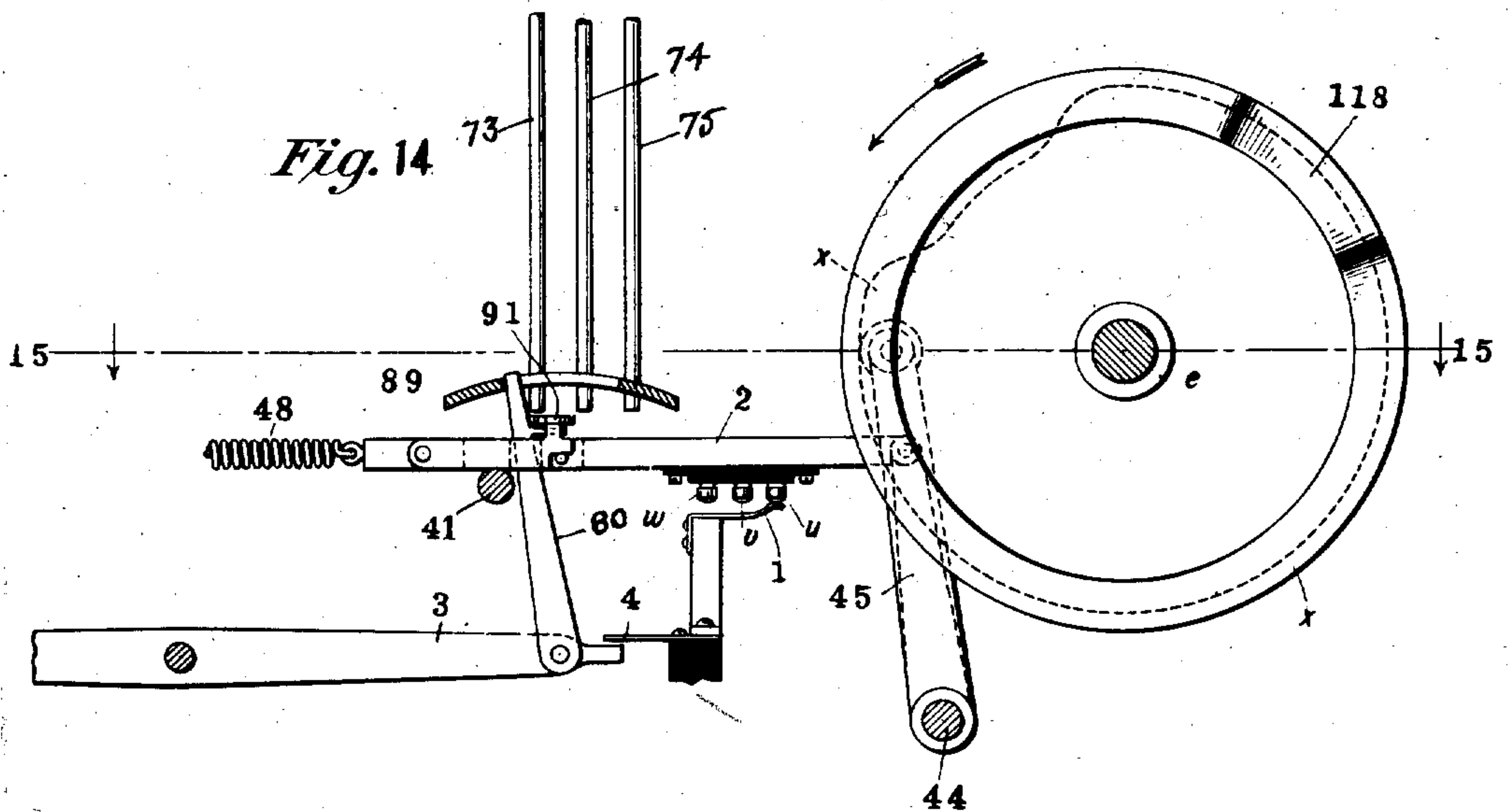
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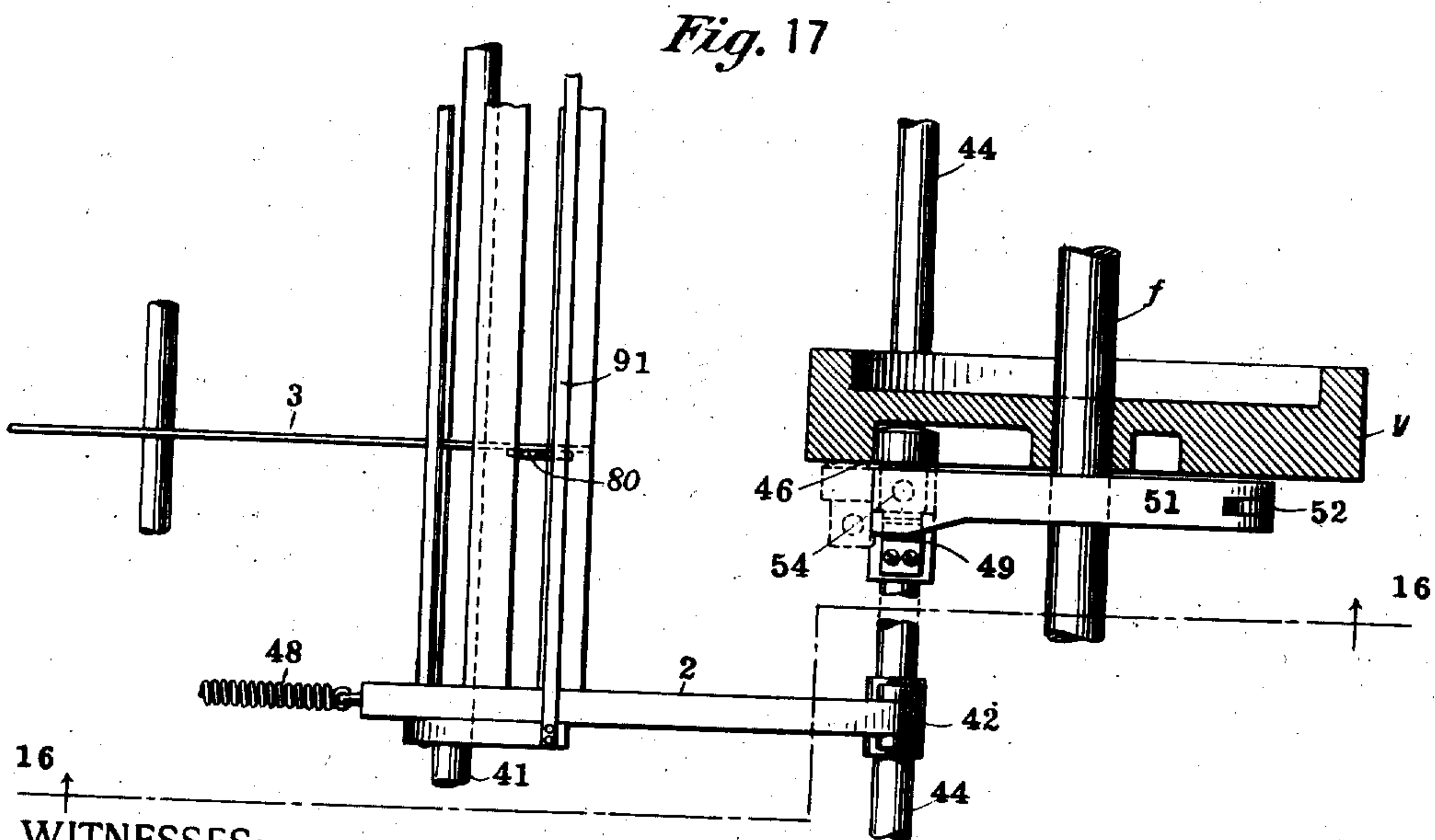
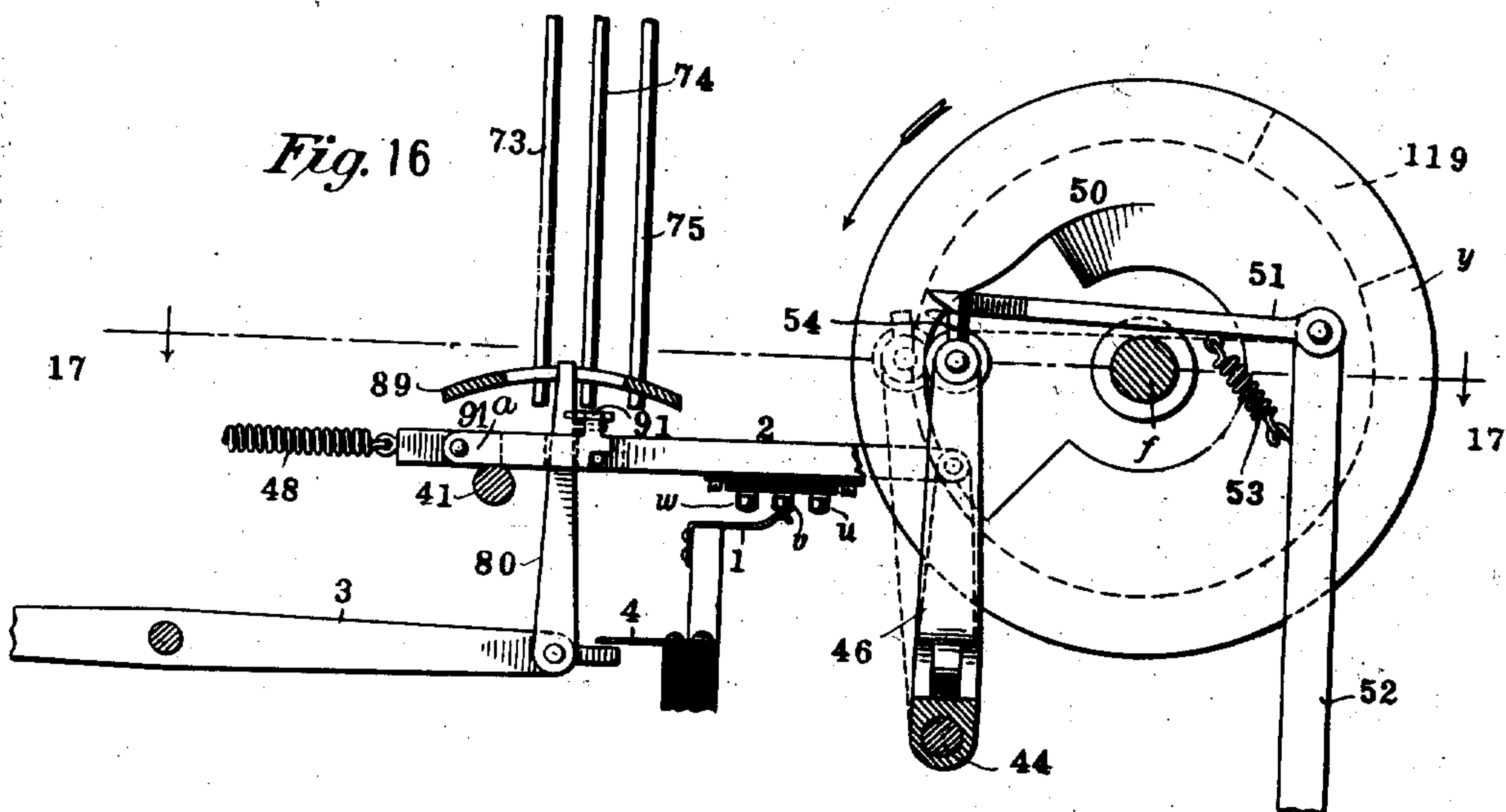
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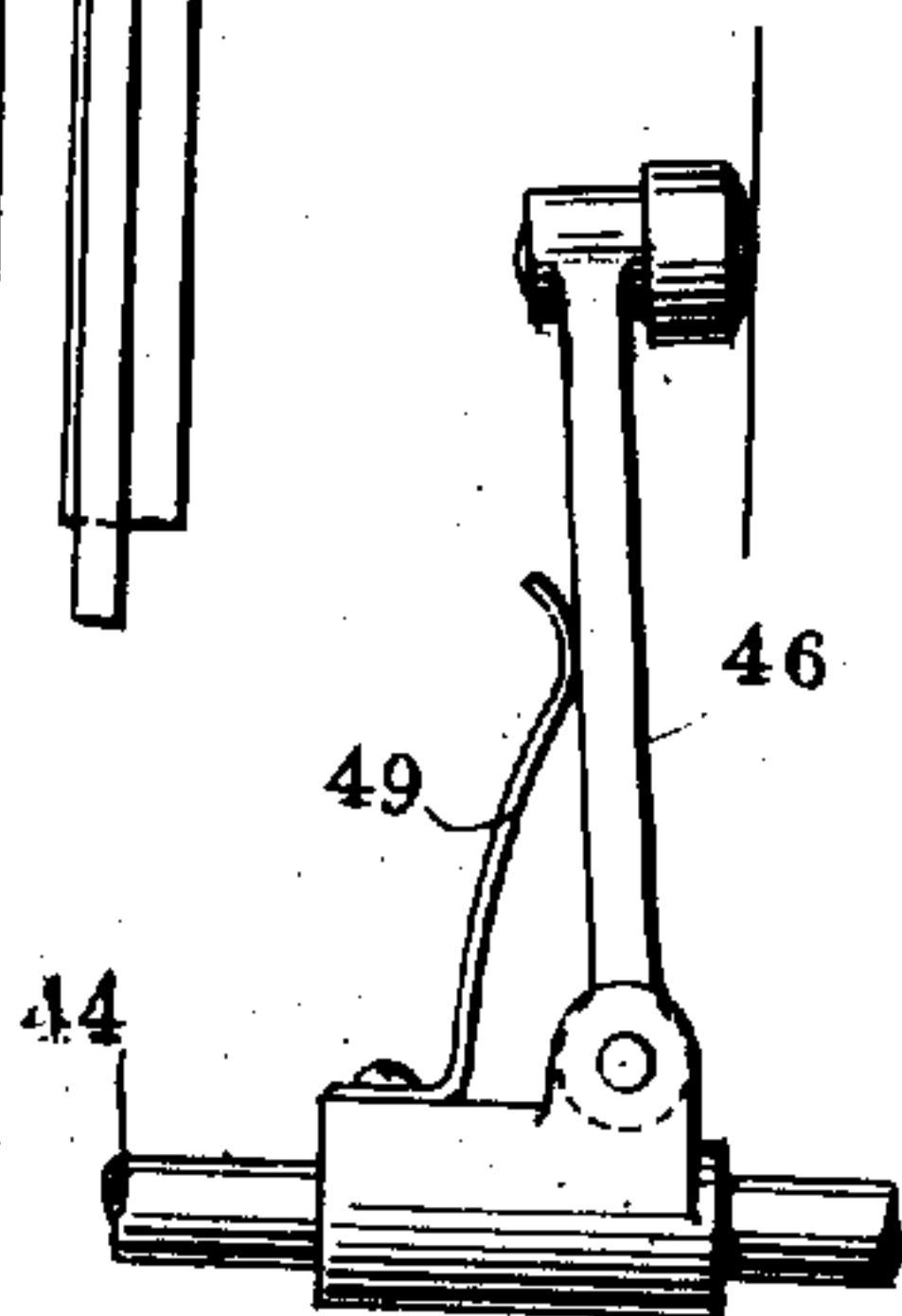
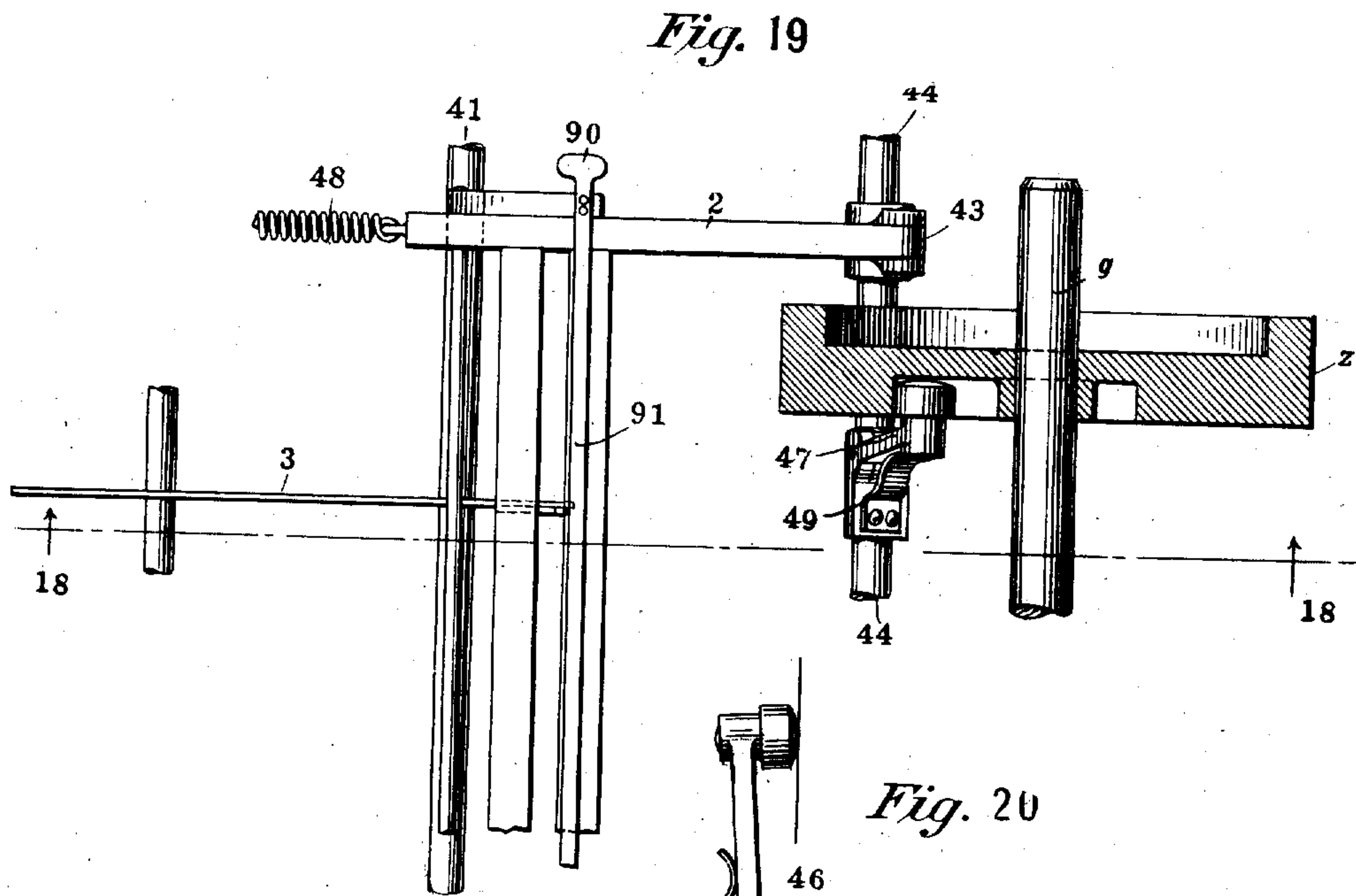
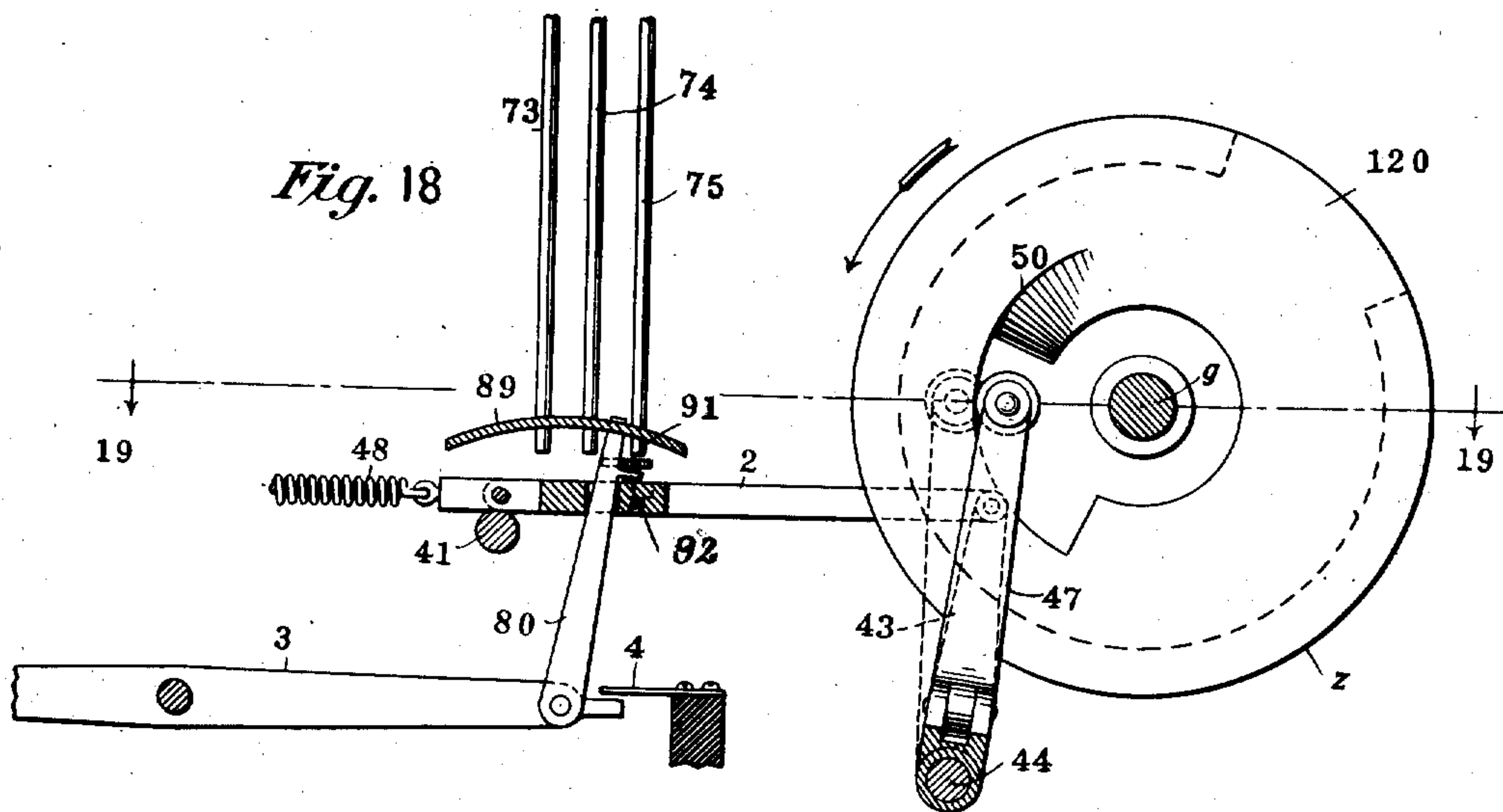
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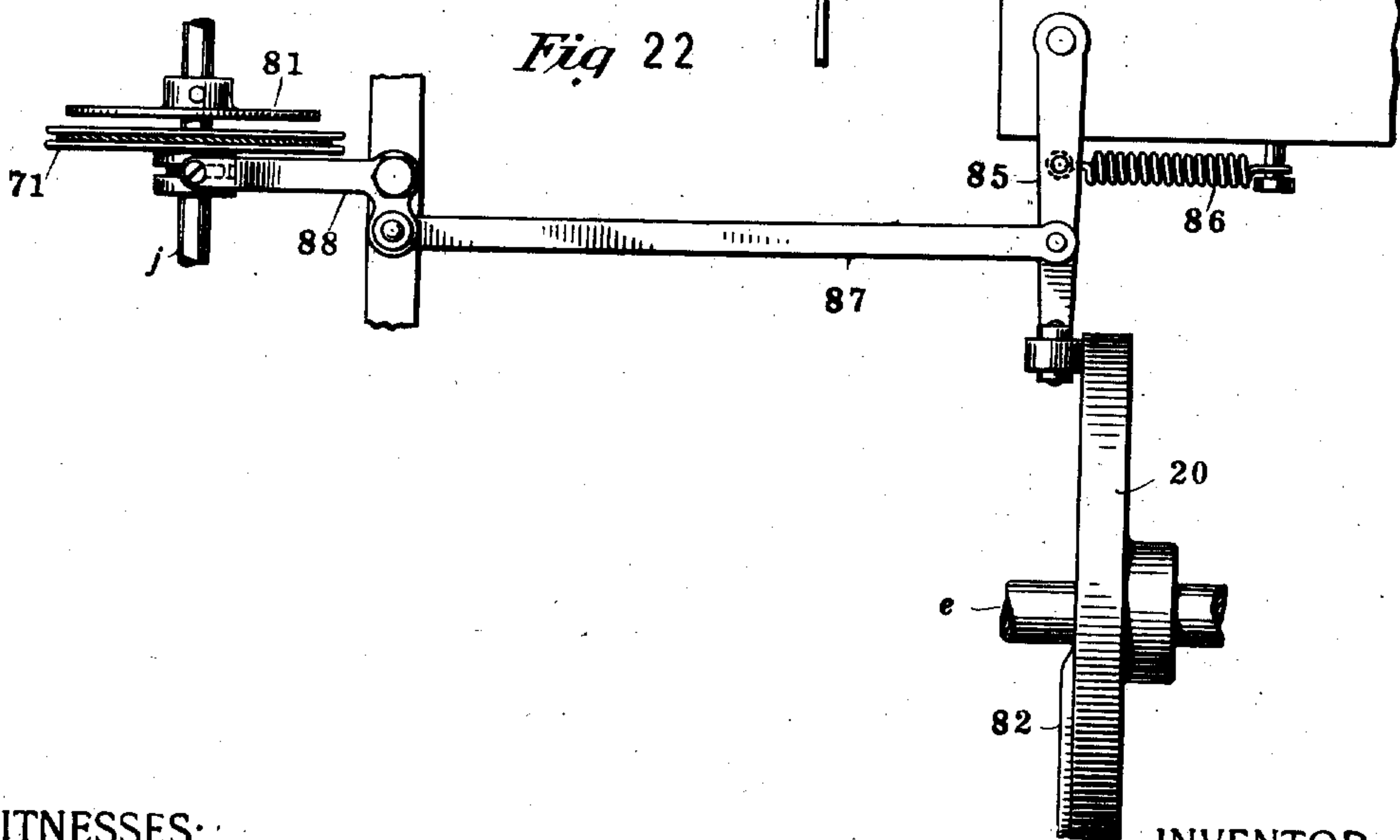
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Fig. 21

Fig 22



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13 SHEETS—SHEET 12.

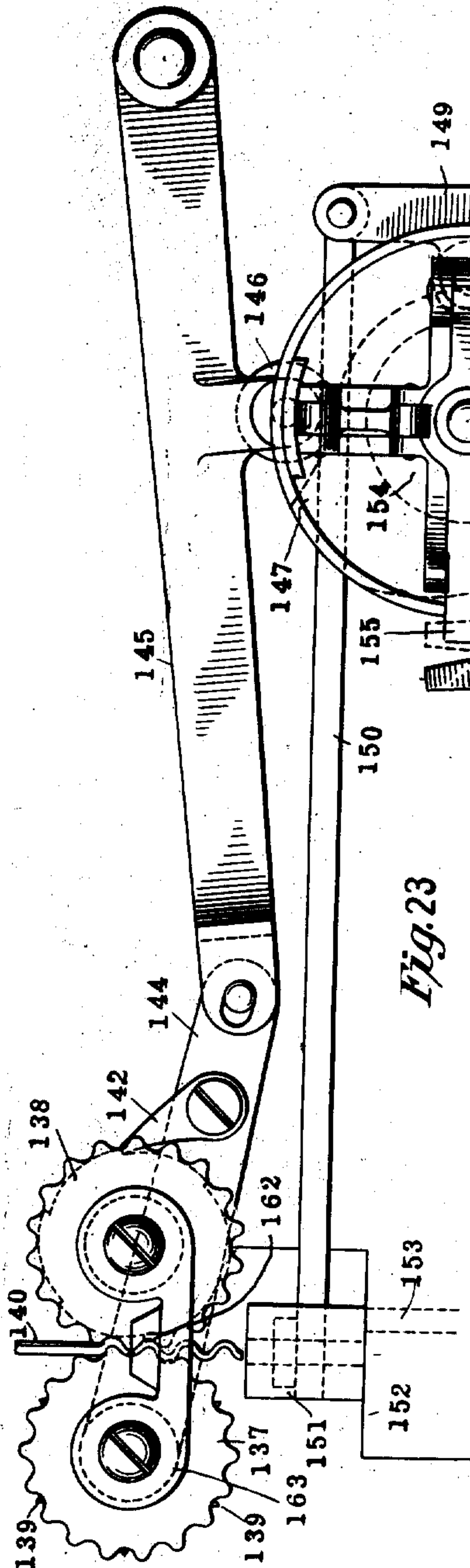


Fig. 23

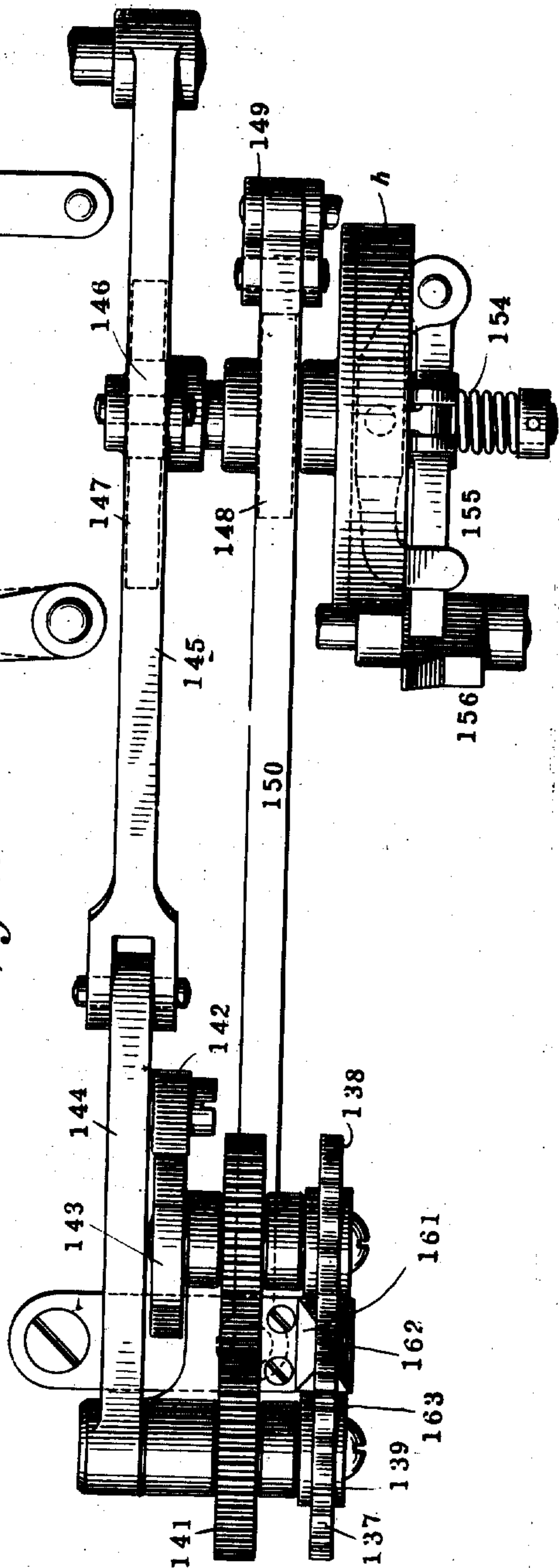


Fig. 24

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FIG. 28

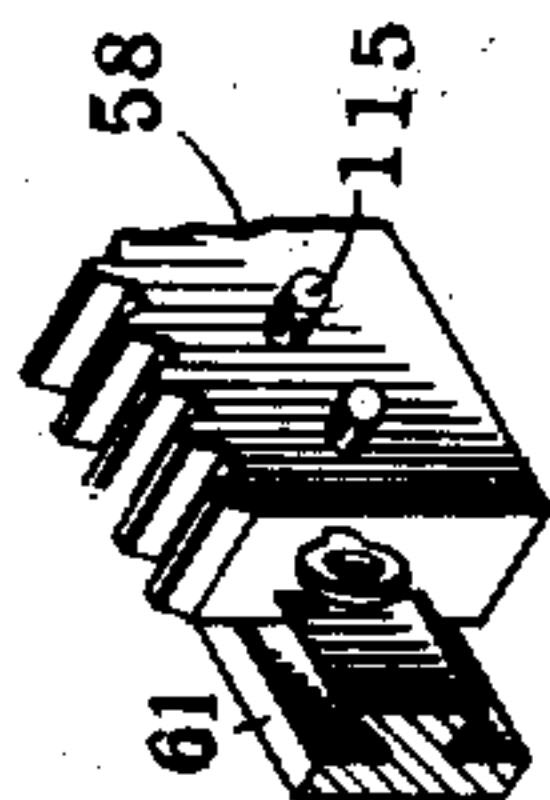
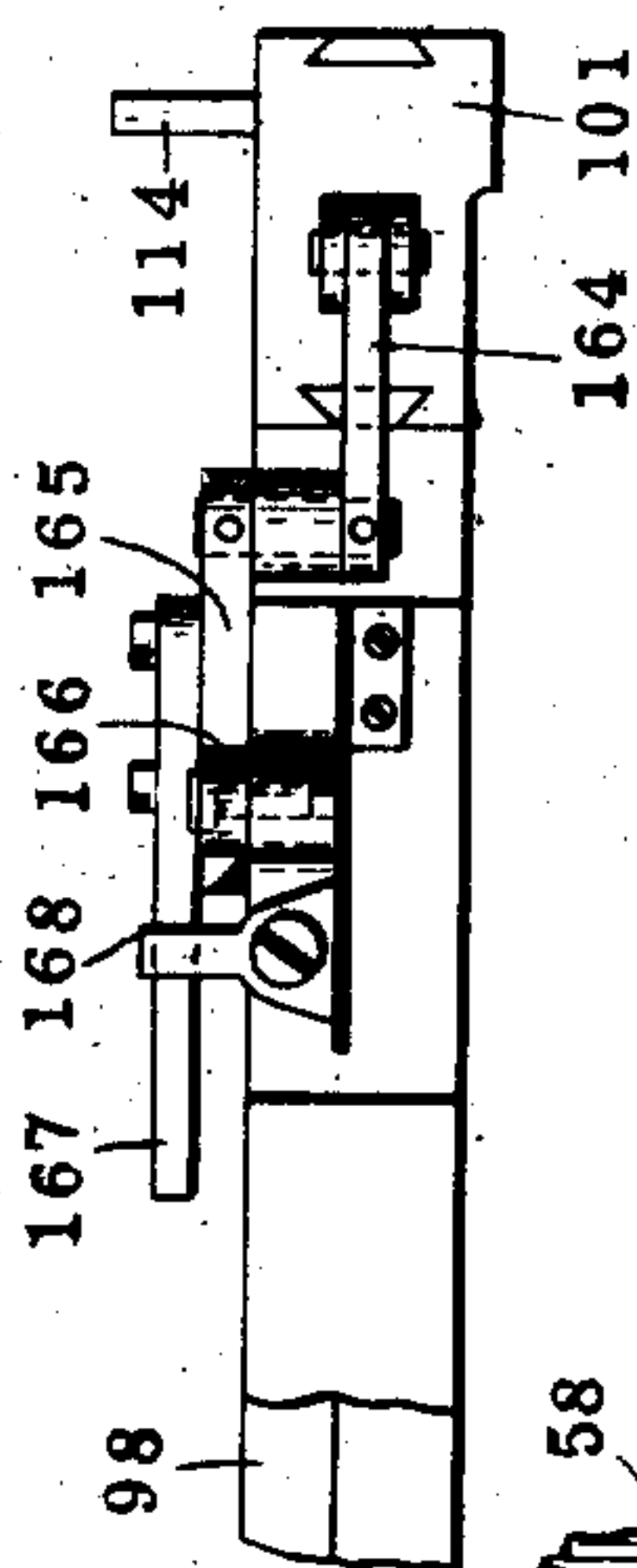


FIG. 26

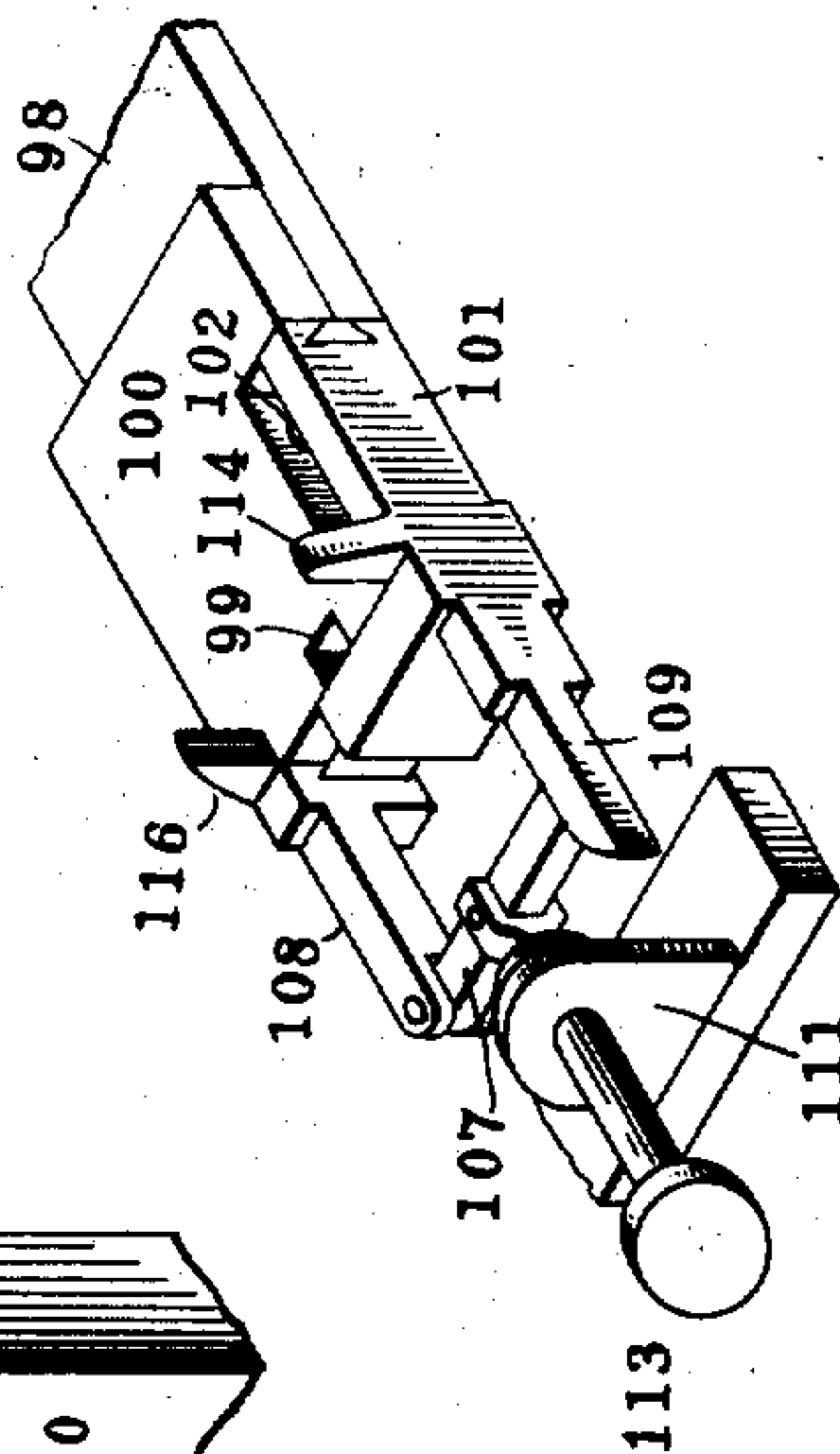


FIG. 25

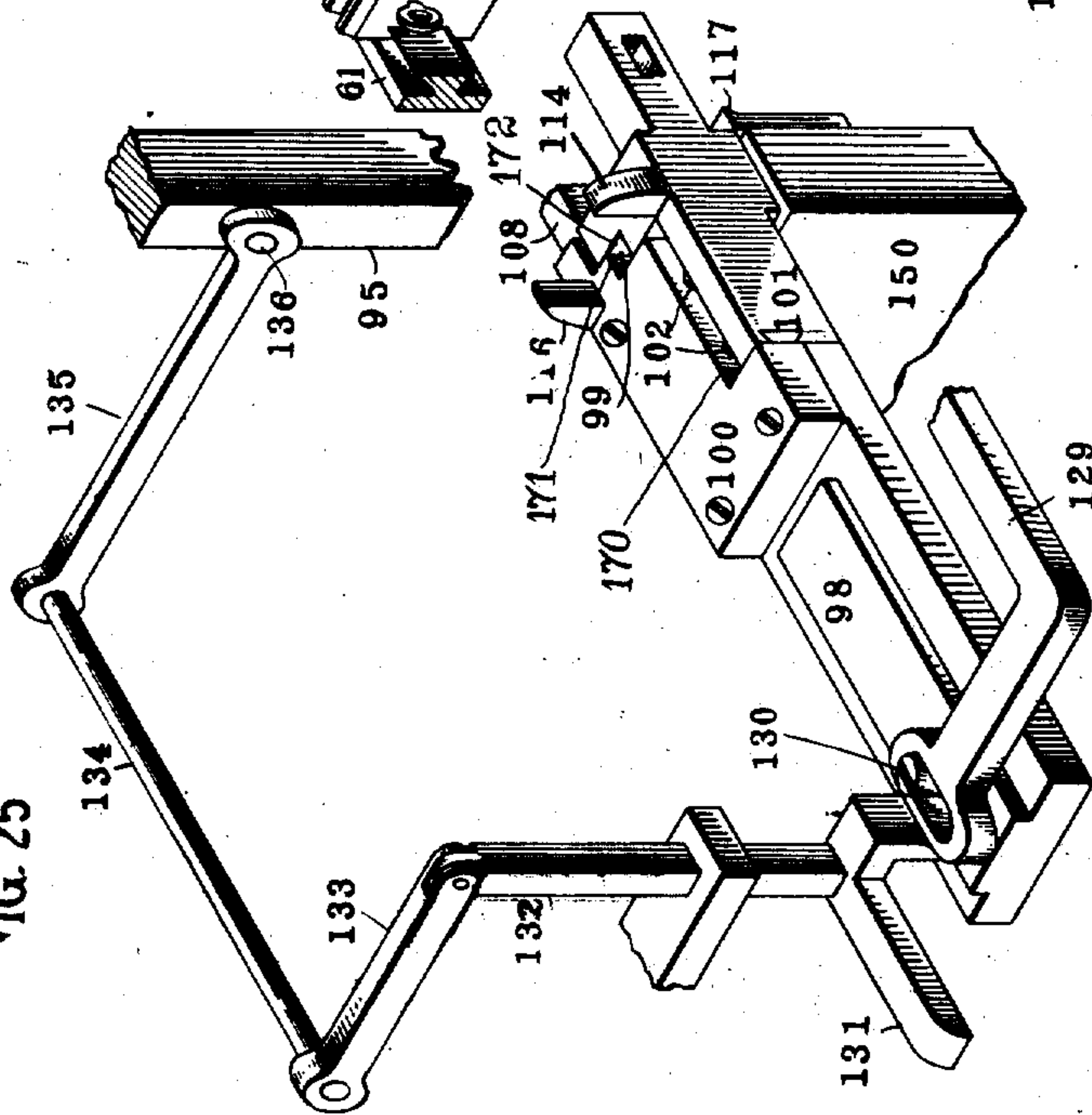
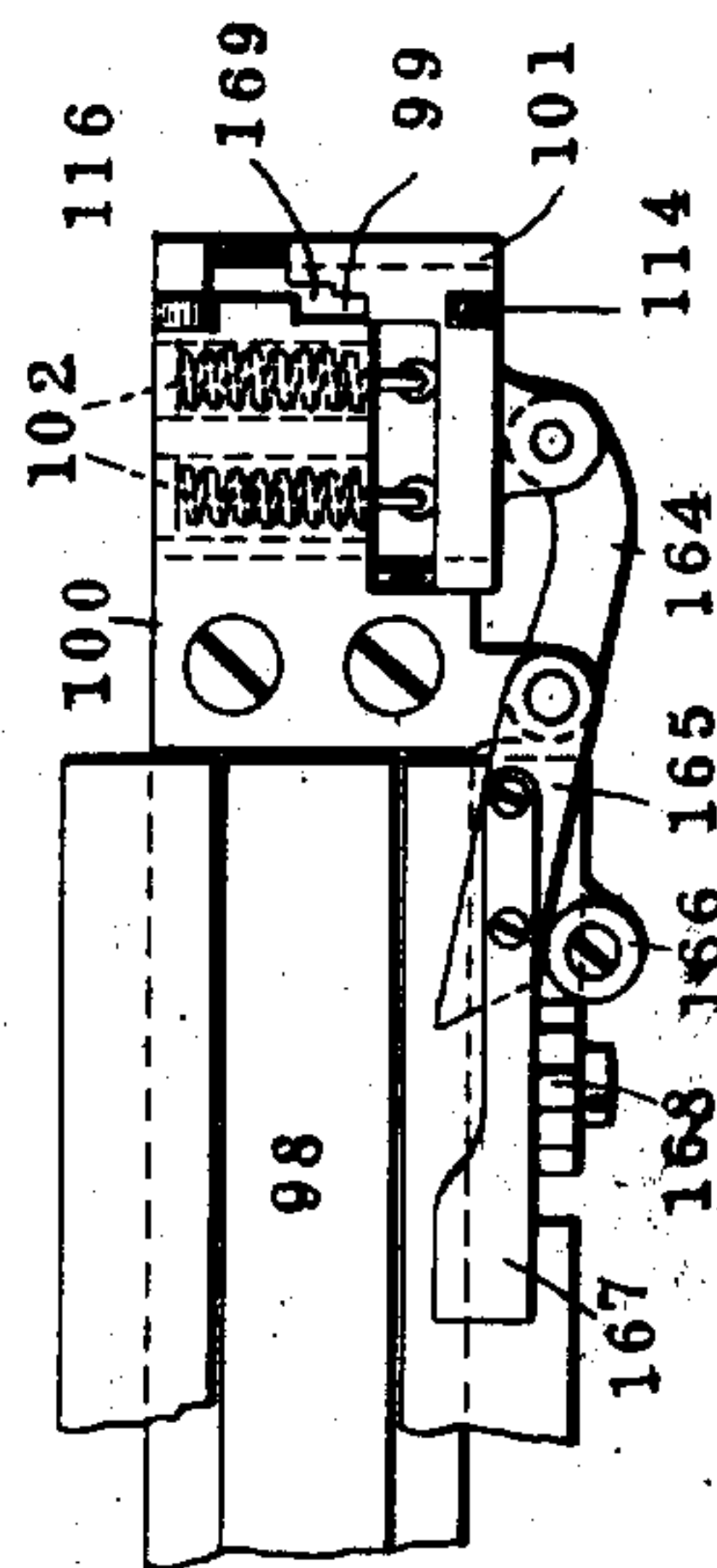


FIG. 27



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UNITED STATES PATENT OFFICE.

ODDUR V. SIGURDSSON, OF NEW YORK, N. Y., ASSIGNOR TO ODDUR MANUFACTURING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF WEST VIRGINIA.

TYPE CASTING AND COMPOSING MACHINE.

No. 903,331.

Specification of Letters Patent.

Patented Nov. 10, 1908.

Application filed June 25, 1906. Serial No. 323,222.

To all whom it may concern:

Be it known that I, ODDUR V. SIGURDSSON, a subject of the King of Denmark, residing in the borough of Brooklyn, city of New York, State of New York, have invented certain Improvements in Type Casting and Composing Machines, of which the following is a specification.

The object of this invention is the production of a machine capable of casting type at the maximum speed at which they can be automatically assembled in words and lines and set up in a galley. To this end a plurality of similar sets of matrices and their attendant operating mechanisms, each constituting a type font casting unit, are combined with and controlled by a single keyboard and, by their driving devices, are caused to move through regular sequences of operation, simultaneously casting type in successive stages of the cycle through which each of the sets of type producing devices and mechanisms passes, the type being successively delivered as fast as they can be automatically set up. This, with other novel features of construction of a machine, devised by me, adapted to produce the results contemplated by this invention are shown in the accompanying drawings, in which;

Figure 1 is an end elevation of the machine showing the general arrangement of the various operating devices, with the frame partly broken away; Fig. 2, a plan view of the same, with the upper plate of the machine removed, on the line 2, 2, Fig. 1; Fig. 3, a rear elevation, with some of the bracket supports of the frame broken away to expose the working parts behind them; Fig. 4, a side elevation of the matrix bars and their operating and controlling mechanisms, on an enlarged scale; Fig. 5, a rear elevation of a portion of one of the matrix bars and its type mold, with parts in section cut on the line 5, 5, Fig. 6; Fig. 6, an end sectional view of the same taken on the line 6, 6, Fig. 5; Fig. 7, a plan view of Fig. 5, taken on the line 7, 7; Fig. 8 represents portions of Fig. 7 with the type mold open; Fig. 9, a front view of one of the driving wheels and its electrically controlled clutch; Fig. 10, a plan view of the same; Fig. 11, a side elevation of Fig. 10, taken on the line 11, 11; Fig. 12 shows some of the key levers, their relation to and connections with the electric controlling

devices, and a diagram of the electric connections; Fig. 13, a side elevation of the same; Fig. 14 illustrates a key lever and its connection with the driving mechanism of the first type forming matrix bar, showing the normal position of the electrical contacting devices; Fig. 15, a plan view of the same, partly in section, taken on line 15, 15; Fig. 16, a view similar to Fig. 14 showing the position of the various parts when the second type forming matrix bar is in operation, taken on the line 16, 16, of Fig. 17; Fig. 17, a plan of Fig. 16, taken on the line 17, 17; Fig. 18, a view, similar to Figs. 14 and 16, of the electrical connections and controlling gear of the third type forming matrix bar taken on the line 18, 18 of Fig. 19; Fig. 19, a plan of the same partly in section taken on the line 19, 19; Fig. 20, illustrates the operating shaft common to the three sections of the machine which successively operate in the formation of the type and a cam arm such as is used in the second and third sections or units; Fig. 21, a detached view of one type matrix bar, its locking and actuating means; Fig. 22, a plan view of the driving shaft for resetting the matrix bars, showing the clutch and its controlling device of one of said matrix bars; Fig. 23, illustrates means for forming compressible type spaces; Fig. 24, a plan view of the same; Fig. 25, a perspective view of the means for operating the locking device of one of the matrix bars; Fig. 26, a perspective view of one of the molds in which the mold opening device is in reverse position to that shown at Figs. 5, 6, 7 and 8; and Figs. 27 and 28 illustrate in plan and elevation, respectively, a modification of the means for opening and closing the type chamber of the mold.

The drawings illustrate three substantially similar type making devices or units assembled in a suitable frame and a single keyboard or set of keys *a*, by the manipulation of which the type making units may be set in action and controlled, and the three units may, under ordinary working of the machine, be in action at the same time, each being controlled by a separate key, or by successive manipulation of one key when any type character is to be repeated.

No attempt is made to show connections between the driving wheels of the various parts of the machine, it being understood of course that they will be positively driven to

insure harmonious operation of the various parts and devices. The driving wheels *b*, *c* and *d* of the three type forming units continuously rotate freely on three short shafts *e*, *f* and *g*, arranged in alinement in suitable bearings. The driving wheel *h* actuates the mechanism for making the space pieces, and the driving wheel *i* secured to a short shaft *j* causes the resetting of the matrix bars of all of the type casting units after they have performed their functions in the formation of the type. Both of these wheels are continuously driven.

The wheel *k* is shown as the actuating means of a device indicated by *l*, *m*, *n* for setting the type *o*, as made, in lines and setting the lines of type in the galley *p*. As this part of the machine may be of any suitable construction as for instance that disclosed in the U. S. Letters Patent No. 528,857, dated November 6, 1894, or others known to this art, it is not fully illustrated and will only be casually referred to hereafter.

To afford quick action and reduce the work of the operator in manipulating the character keys, electrical devices are utilized to cause the driving wheels *b*, *c* and *d* to engage their respective shafts. The connections are shown in the diagram, Fig. 12, in which *q* represents a source of electricity, as a battery, one terminal being in communication with all of the key levers and the other with the electro magnets *r*, *s* and *t* located respectively near the driving wheels *b*, *c* and *d*. The return wires of said magnets end in the insulated plugs *u*, *v* and *w* carried by a sliding frame 2, (Figs. 1 and 13), which is moved and controlled by cams *x*, *y* and *z*, (Figs. 2 and 3) carried by the shafts *e*, *f* and *g* respectively, as hereinafter described. The electric circuit is completed by a spring contact piece 1, insulated from the metal parts of the machine and arranged to bear against any one of the plugs *u*, *v* or *w* according to the position of the frame 2, and any one of the key levers 3 whose inner end contacts, when the key lever is depressed, with a plate 4, preferably spring acting, electrically connected to the spring contact piece 1. This plate 4 extends across the machine and is in the paths of motion of the ends of all of the levers 3 of the finger pieces *a* of the bank of character keys.

The three driving wheels *b*, *c* and *d* are provided with similar clutch mechanism; that for wheel *b* being clearly shown at Figs. 9, 10 and 11. Adjacent the wheel and secured to the shaft *e* is the clutch controlling cam 5 between which and the wheel is located a lever actuated friction clutch 6 of ordinary construction, the horizontally arranged operating lever 7 of which is pivoted at one end to the post 8, and provided at the other end with a pivoted latch 9 having a

lug 10 at its end adapted to bear against the side of the cam 5 against which it is held by a spring 11. A spring 12 applied to the end of lever 7 sets clutch 6 in the wheel *b* as soon as latch 9 is released. This is accomplished by the magnet *r*, which when energized attracts the armature 13, pivoted in bearings on the bed of the machine and having an upwardly extending arm 14, with a pin or lug at its upper end fitted to slide in a groove 15 formed in the underside of the latch 9. This arm 14 also has a bracket extension 16 the end of which is in the path of a ledge 17 on the side of the cam 5 inside its active surface. This cam is broken away in Fig. 11, and shows only the active parts, and in the three views the ledge 17 rests on the top of the bracket 16 thereby holding the shaft *e* in normal inoperative position. Upon energization of magnet *r* arm 14 is moved outwardly, bracket 16 is moved away from ledge 17 and the lug 10 of latch 9 is caused to pass beyond the periphery of the cam 5, permitting the spring 12 to operate the clutch 6 and connect the driving wheel *b* to the shaft *e*. One revolution of the shaft causes a complete operation of all the parts of the type casting unit actuated by it, and just before the termination of a revolution, the magnet *r* having been deenergized by opening of its circuit at plate 4 (Fig. 13) on release of the key lever, the latch 9 is by its spring brought into active position to cause the release of clutch 6, and the bracket 16 being again in the path of ledge 17 arrests further movement of shaft *e*. There is provided a molten metal reservoir 18 for the three type casting units. It has discharge spouts 19 through which the molten metal is injected into the type molds, means for heating the reservoir to keep the metal in molten condition, and means for injecting the metal into the molds. None of these operating parts are shown in the drawings. They may be of any suitable ordinary construction. Each of the type casting units is provided with similar means for actuating the metal injecting devices at proper time. Such means comprise cams 20, 21 and 22 (Figs. 2 and 3) secured to the driving shafts *e*, *f* and *g* respectively; levers 23, 24 and 25 (Figs. 1, 2 and 3) located under the cams, pivoted respectively at one end to the bed of the machine and having a roller at the central part, and connected at the other end by the links 26, 27 and 28 (Figs. 3 and 4) to the levers 29, 30 and 31 respectively. Each of these latter levers consists of two arms and a rock shaft, see Figs. 2 and 3, having bearings in the top plate of the machine. Their inner ends are connected to the rods 32, 33 and 34 which pass into metal reservoir 18 and they actuate the metal injectors of the type casting unit, in the order in which the units are set in action, by the

springs 35, 36 and 37, arranged as shown in the view of the upper part of the machine Fig. 4, to act on the rods 38, 39 and 40 resting on the tops of the inner ends of the levers 29, 30 and 31 and guided by having bearings in the frame and a bearing piece on the top of the frame. The operating parts of the cams 20, 21 and 22 are depressions in their peripheries which allow the springs 35, 36 and 37 to act as quickly as is necessary to cause the molten metal to flow into the molds at the proper times.

The sliding frame 2 is composed of the side bars 2, 2, and cross pieces or rods as 2^a. This frame has the function of setting the electrical controlling means, is supported at the front end by a rod or roller 41 and at the rear end by two arms 42, 43 pivoted to the ends of the side bars 2, 2, and secured to and carried by a rock shaft 44, having bearings on the bed plate of the machine, and having secured to it the three cam levers or arms 45, 46 and 47 of the cams *x*, *y* and *z* respectively. The frame 2 is held in normal forward position by a spring or springs 48. Its step by step movement is accomplished as follows; with the machine at rest it occupies the position shown at Figs. 14 and 15 and in the main views of the drawings, with the contact plug *u* on the spring 1, the other two positions being shown by the dotted lines, Fig. 13. When the circuit is closed by the end of one of the key levers 3 touching the plate 4, the current traverses the electro magnet *r* of the first type casting unit, thereby putting its shaft *e* into action, as described when referring to Figs. 9, 10 and 11; the cam *x*, acting on the roller of the arm 45, see Figs. 14 and 15, sets the frame 2 into the position shown at Figs. 16 and 17 with plug *v* in contact with spring 1; and shaft *e* after making a full revolution during which the cams carried thereby have completed their functions in a cycle of operations to cause a type to be cast by this first unit of the machine, will be stopped as before described. The cam arm 46 of the cam *y* of the second unit is pivoted by its connection with the shaft 44 in such manner that while compelled to rock with the shaft it is free to move towards and from the face of the cam *y*, being pressed toward said face by a spring 49 (Fig. 20). This construction also applies to the cam arm 47 of the cam *z* of the third type casting unit. Fig. 20, showing one such cam arm indicates how the ends of the rollers of the two cam arms bear against the faces of the cams when the machine is in normal condition. Now in the position occupied by the frame 2, Figs. 16 and 17, the roller of the arm 46 is pressed into the cam recessed in the face of *y* and acts as a lock to hold the frame 2 in this set position. Upon the manipulation of a character key, the circuit is closed as before

described but completed by the plug *v*, the current then passes through the electro-magnet *s* of the second unit, and the shaft *f* of this unit is then caused to make a full revolution and a type is produced by its type forming means. The working part of this cam *y* moves the frame 2 into the third position with the spring 1 bearing on the plug *w*, and the roller of arm 47 having now been pressed into the recess of cam *z*, as shown at Figs. 18 and 19, the roller acts as a stop to hold the frame 2 in this third position.

During the rotation of the cam *y* of the second unit, and after it has set the frame 2 into the third position, the roller of the arm 46 is forced beyond the face of the cam by the inclined surface 50, and to hold it in this position while the third type casting unit is going through its cycle of operations, there is provided a latch 51 pivoted to a post 52 and held on or towards the top of the arm 46 by a spring 53. This latch as shown at Fig. 17 has a widened end and an incline joining this end to the narrow part where a pin 54 on the end of the arm 46 will slip beyond the edge of the narrow part as the arm is pushed away from the face of the cam by the incline 50, and the latch will fall down behind the pin, which will ride up to the widened end of the latch and so prevent the roller of the arm 46 catching into the cam recess during the retrograde movement of the sliding frame 2 by the springs 48, after said frame has been released from the action of the third cam *z*. With these parts as now arranged, Figs. 18 and 19, on closing of the circuit by contact of a key lever 3 with plate 4, current will pass by plug *w* to the electro magnet *t* and set the third type casting unit into action to produce another type from its type forming devices. During the rotation of the shaft *g* of this unit the incline 55 of the cam *z* will release the roller of arm 47 from the cam and permit the spring 48 to set the frame 2 in its original position with the spring 1 bearing against the plug *u*.

The next operation of the first described unit follows that of the third unit. By this construction and arrangement of the starting and operating gear of the type casting units the latter may be manipulated by the character keys, be successively put into operation and be caused to work at the same time each producing a different type, the various operations of the units following one another in proper sequence, so that type will be produced from each of the units at regular intervals and as fast as they can be set up. The operations of the type casting units will follow in regular order, whether the same key, or different keys, is manipulated to set the type casting units into action. The type matrices of all of the type casting units are

adapted to form complete similar fonts, they are carried on the under surfaces of the matrix bars 56, 57 and 58 that are fitted to slide longitudinally on the guide bars 59, 60 and 61 respectively (Figs. 2 and 3). The guide bars are formed at one end to rock on the rod 62 held in brackets at one end of the upper part of the frame and are at their other ends supported by springs 63, 64 and 65 (Fig. 1), which rest on a bracket at the other end of the frame; this construction permits the molding faces of the matrix bars to be pressed firmly against and raised away from the type casting molds, as hereafter described.

The matrix bars and their attendant devices and operating mechanism are similar in all essential features, the differences in the construction of some of the parts being only changes of positions or reversals of levers &c. to meet the requirements of practical working, as one of them (in the special construction illustrated) is operated from the right hand side and the other two from the left hand side of the machine, so a description of one will be readily understood as applying to all. Figs. 21 and 22 illustrate the means employed for moving the matrix bars 56, 57 and 58 along their respective guide bars, the same consisting of spring actuated drums or pulleys 66, cords or chains 67 connecting these pulleys to one of the ends of the matrix bars, cords or chains 68 extending from the other ends of the matrix bars over guide pulleys 69 and 70 and longitudinally through the lower part of the machine a little above the sliding frame 2 to winding up pulleys or drums 71 fitted freely on the short shaft j , which is continually driven by the wheel i . The matrix bars are normally held in the positions shown in the main views of the drawings by the pivoted latches 72 engaged in notches formed in the underside at one end of the bars, the springs of the drums 66 then being under tension. The latches 72 are released by the connected vertical rods 73, 74 and 75, of the units respectively, being pushed upwardly as hereafter described; the springs of the drums 66 then being free to draw the matrix bars along their guide bars and at the same time move the stop slides 76, 77, 78 (Fig. 13), that are secured to the cords or chains 68, along the guide ways formed in the plate 79 located above the inner ends of the key levers 3. The key levers have extending upwardly from their inner ends pivoted fingers 80, that are moved into the paths of the stops 76, 77 and 78 to arrest the forward or setting movement of each of the matrix bars to bring into operative relation to the mold that one of the type matrices thereon corresponding to the character on the finger piece a of the lever actuated. To move the matrix bars back to nor-

mal position after the type are formed, the drums 71 are pressed against friction disks 81, secured to the shaft j . This is accomplished by cams 82, 83 and 84 (Figs. 2, 21 and 22) of the type casting units, levers 85 pivoted at one end to a suitable part of the frame work and having rollers at their outer ends and drawn against the cams by springs 86, and rods 87 connecting the levers 85 to the short arms of bell cranks 88 whose long arms are yoked and embrace grooved hubs of the drums 71. At the right times the cams 82, 83 and 84 cause the drums 71 to be pressed against the friction disks 81, which quickly, through the power applied to the wheel i , draw the matrix bars back into normal position to be again locked by the latches 72.

Between the plate 79 (which holds and guides the stop slides 76, 77 and 78) and the sliding bar 2 is a curved plate or bridge piece 89 (Figs. 12 and 13) having a series of transverse guide slots through which extend the upper parts of the fingers 80 of the key levers 3. The lower ends of the latch rods 73, 74 and 75 of the matrix bars also pass through one end of this bridge piece. The fingers 80 extend through a longitudinal opening (Figs. 12, 13 16 and 17) in the sliding frame 2 and are thereby caused to move with this frame as it is set in the different operative positions by the cams x , y , z of the type casting units, so that the upper ends of the fingers 80 will be located in the path of the stop slide 76, 77 or 78 of the unit brought into action. To release the corresponding matrix bar a lifting plate 90, is located beneath the rods 73, 74, 75. This plate is attached to the end of a bar 91, having end arms 91^a pivoted to the sides of the sliding frame 2. Beneath this bar 91 extend projections 92 from the edges of the key lever fingers 80. When a key lever 3 is moved the electric circuit is closed at plate 4 as before described, the end of the lever 80 is in the path of one of the matrix bar stop slides 76, 77 or 78, and the latch 72 of the matrix bar, of the unit just started, is disengaged from the bar by the lifting action of plate 90 on the corresponding rod 73, 74 or 75, this operation being accomplished by the projection 92 on the key lever finger 80 lifting the bar 91. The matrix of the selected character is arrested in molding position by engagement of the stop slide 76, 77 or 78 with the key lever finger 80 (Fig. 21), where it is locked and rigidly held, the mold set and the casting operation performed by mechanism now to be described.

The matrix bars 56, 57 and 58 have formed in their upper surfaces alining or locking teeth throughout their length which are engaged by correspondingly formed teeth (Figs. 4, 21 and 25) on the lower ends of vertical bars 93, 94 and 95 fitted to slide in

a plate 96 attached to or forming part of the upper frame of the machine. These locking bars are actuated by springs 97 in a downward direction to press the bars down on to the matrix bars and to force the matrix faces of said bars firmly against the tops of the molds; the springs 97 being strong enough to insure a tight-joint between the matrix bars and tops of the molds and to overcome the resilience of the springs 63, 64 and 65, which latter springs raise the guide bars 59, 60, 61 and lift the matrix bars 56, 57 and 58 away from the molds after the types are formed therein. Two of the locking bars 93 and 95 slide in grooves on one side of the plate 96 with their springs 97 arranged to force them down, see Fig. 4, and the other bar 94 with its spring is in a groove on the other side of the plate. One of the molding devices, that at the right hand side of the machine, is shown at Figs. 5, 6, 7 and 8. It is carried on a slide 98 fitted in suitable guide ways on the frame, and comprises two main parts constructed to slide relative to one another to provide for variations in the size of the molding chamber for casting type of different width and for opening the mold to discharge the type when cast. The molding chamber 99 is formed in the recessed sliding surfaces of the two parts of the mold, as shown in the plan views, Figs. 7 and 8. A type letter W is shown in the mold in Fig. 7. One part of the mold 100 is securely attached to the slide 98 and the other part 101 is by dovetail guides fitted to slide on the part 100 and drawn towards it by the springs 102, seated in holes formed in the part 100, their action being to contract the casting chamber 99. The mold part 100 has in its side a recess 170 in which is fitted to slide (at right angles to the direction in which the part 100 is moved by the slide 98) the mold part 101, and in its end a right angle recess 171 the walls of which form adjacent side walls of the vertical casting chamber or mold 99, the remaining side walls of the mold being formed by a like recess 172 in the laterally extending portion of the mold part 101 sliding across the end face of the part 100. The construction is clearly shown in Fig. 25.

In normal position the casting chamber 99 is over a type discharge chute or passage 103, 104 or 105, there being one for each unit. The several chutes converge or merge into a single discharge 106 opening into the type assembling device *l, m* before referred to. As shown in the views now under consideration the devices are in casting position, the matrix bar 58 having been set with the matrix of the type to be cast over the metal discharge spout 19 with the mold chamber 99 located between them. The mold is provided at its end with a short lever 107 pivoted to a bracket extension 108. Oppo-

site the end of this lever is an extension 109, of the mold part 101, provided with an opening 109^a into which the end of the lever 107, when in one position, is free to enter, and when in the other position it bears against the face of the extension 109 and holds the chamber 99 open when the mold is at rest in normal position.

To the lever 107 is connected a rod 110, fitted to slide freely in a bearing in the lug 111 extending from a suitable part of the frame, and having two stop collars 112 and 113. As the mold is pushed into operative position the collar 112 strikes the lug 111 and pushes the end of the lever 107 over the hole in the extension 109, thus allowing the springs 102 to act to close or form the casting chamber 99 by moving up the mold part 101. This movement of the part 101 is controlled by a projection 114, extending upwardly from the part 101, and by short pins 115 on the side of the matrix bar 58, in line with the matrices on the under side of the bar, the lengths of the pins being such as to accord with the proper width, runningwise of the type being cast. Another projection 116 from the part 100 of the mold behind the matrix bar guide bar 61 causes the matrix to be firmly and accurately held in relation to the mold. As soon as the parts assume the position, Figs. 5 and 6, molten metal is injected through the spout 19 into the mold chamber 99, then the locking bar 95 is raised allowing the matrix to be lifted by the spring 65 from the face of the cast type, and the mold is moved back, as hereinafter described, to bring the mold chamber 99 over the type chute 105, the rod 110 being arrested by contact of its collar 113 with the lug 111, which causes the end of the lever 107 to ride up the rounded or inclined edge of the hole in the extension 109 on to the face of the extension, and so open the mold to its full extent and permit the type that has been cast to drop into chute 105. During the passage of the mold to this discharge position it passes over the knife 117 which cleans off the bottom of the type to make them all of uniform height or length.

The means for moving the type molds consists of cams 118, 119 and 120 on the shafts *e, f, g* respectively of the operating units: vertical rock shafts 121, 122 and 123 each having an arm 124 provided with a cam roller on its end; and arms 125, 126, 127 respectively arranged on the shafts 121, 122 and 123 about in line of the plane of sliding movements of the type molds. The arm 125 of the unit first set in action extends towards the front of the machine and is by the link 128 (Fig. 2) connected to the sliding block 98 of the mold of the matrix bar 56; the arm 126 of the second unit connects with the sliding block 98 of the matrix bar 57; and the arm 127 of the third unit con-

nects by link 129 the sliding block 98 of the matrix bar 58. The connecting links of the arms 125, 126 and 127 also operate the locking bars 93, 94 and 95 of the matrix bars, and the one which controls the mold shown in the views just referred to is, with the mechanism of the casting devices, illustrated perspectively at Fig. 25. This link 129 is shaped to extend over the top of the sliding block 98 and engages a pin 130 thereon by a slotted opening in its end to provide for a certain amount of lost motion between them. From the end of this link extends a branch 131 having its end beveled or rounded as shown, and on this branch rests a rod 132 fitted at its lower end in a bracket of the frame and having pivoted to its upper end an arm 133 secured to the end of a rock shaft 134 fitted in suitable bearings and having at its other end another arm 135 the outer end of which engages a pin 136 projecting from the locking bar 95. This view, Fig. 25, shows these parts in normal inoperative position, the pin 130 being at the end of the slot of the link 129 by which the type mold is moved away from the matrix. When the lever 129 is started to bring the mold into operation the lost motion of the slot of the link is first taken up and then the mold is pushed under the matrix and over the metal discharge spout, and by the time it arrives in this position the end of the rod 132 slips off the extension of the link, allowing the locking bar 95, when forced down by its spring, to lock the matrix bar 58, which by this time has arrived in operative position. After a type has been cast the retrograde movement of the link 129 first causes the rod 132 to rise up on the extension of the link, thereby lifting the locking bar 95 and freeing the matrix bar 58 from the mold, which is then moved back when the link has moved a distance equal to the lost motion of the slot of link 129.

The space pieces forming mechanism shown detached at Figs. 23 and 24 and also as applied to the machine at Fig. 1, is adapted to make and feed space pieces of the corrugated compressible kind. It comprises a pair of corrugating rollers 137, 138, one of which, at suitable regular intervals, forms the space pieces of the length required, and is provided in the corrugations with cutters 139, which sever the pieces from a strip 140, as they are formed, by acting against the outer parts of the corrugations of the other wheel 138. The wheels are connected to run together by a pair of gear wheels 141, one of which is intermittently driven by the pawl 142 acting on the ratchet wheel 143, and carried by an arm 144, pivoted at one end and connected to the end of a lever 145 pivoted at its other end to the frame and having a roller 146 arranged to bear on a cam 147 carried by a short shaft on which the driv-

ing wheel h is placed. This shaft also carries another cam 148 which actuates a lever 149 connected to a bar 150 attached to a space piece carrier 151. This carrier rests on a ledge or table 152 and has a chamber into which the space pieces drop as they are formed and severed from the strip by the corrugated rollers 137 and 138, and the space pieces are, at the right time, moved by the carrier, through the action of the cam 148, over the chute or passage 153 down which they fall to the discharge opening into the type collecting and setting mechanism. The driving wheel h is connected to the shaft when a space piece is to be made by the automatic spring clutch 154, the operating lever 155 of which, with the clutch out of action, rests on a ledge of the lever 156 which is drawn towards the shaft by a spring 157, this spring also serving to hold the roller of the lever 149 against the cam 148. The lever 156 is, by a link 158 (Fig. 1), connected to an arm 159 extending upwardly from a shaft carried by the space operating key or bar 160 located in or near the bank of operating keys. When this spacing bar 160 is depressed, the lever 156 is moved away from the end of the clutch lever 155 thereby permitting the clutch, by its spring, to connect the driving wheel to its shaft, and this shaft during one revolution causes the devices just described to be actuated and form and deliver a space piece; but, before the completion of a revolution, the lever 156 is brought forward by the spring 157, the space bar 160 having been released, and the lever 155, striking the incline on the top of lever 156, disengages the clutch 154 and is stopped by the ledge of the lever 156, thereby holding the shaft and its cams stationary, the clutch being secured to the shaft.

At the sides of the corrugated rollers 137 and 138 are located trimming knives for shaving the edges of the space pieces as they are formed, the cutting edges of the knives being about on the center line of the rollers. One of the knives 161 is secured to the bracket of the frame carrying the bearings of the rollers and the other one 162 is on a yoke 163 supported by the shafts of the rollers 137 and 138 and held against the outer faces thereof.

The differences in the construction of the operating parts of the molds located in the right hand part of the machine and the mold shown at Figs. 5, 6, 7 and 8, due to the mold opening device being at the other end of the mold, (see Fig. 26) is the extension 109 is rounded at its end, instead of having an opening for the lever 107 to pass therein, and the lever 107 acts against said rounded end of the extension to open the mold when the mold is set in position to drop the type into the discharge chute, by the inner collar

of the sliding rod contacting with the lug 111; and the lever 107 is moved to slip beyond the end of the extension of the mold to permit the mold to close when the mold is moved into operative position under the matrix bar by the collar 113 of the controlling lever 107 contacting with the lug 111. The actions of these parts are the reverse of those previously described but all of the molds are similarly constructed and are similarly operated. The device for operating the mold to open the sliding part 101 and permit it to be closed at the right time (shown at Figs. 27 and 28) is in some respects preferable to the corresponding device shown in the other views, and consists of a lever having a bearing in the part 100 of the mold, one arm 164 of which is connected to and moves the sliding part 101 about in line midway between the closing springs 102, thereby applying the power most advantageously to the part 101 to open the mold. The other arm 165 has its end beveled or inclined adapting it to ride over the stud or roller 166, secured to a stationary part of the frame of the machine, when the mold reaches its backward position to bring the mold chamber over the discharge chute and so open the mold to its fullest extent, as clearly shown at Fig. 27.

As it is desirable that the mold be held open until it again is in type casting position, an arm or bar 167 extends from the arm 165 of the lever in such manner that its front edge bears against and slides along the face of the spring latch 168 during the forward movement of the mold, and its end slips off the face of the latch as the mold reaches its casting position thereby leaving the springs 102 free to act to close the mold as before described. The end of the arm 167 pushes the latch 168 out of its path as the mold moves back; and the latch springs up in front of the edge of the bar 168 as soon as the mold is fully opened by the end of the arm 165 acting on the stud of roller 166. Another modification relates to the formation of the type chamber of the mold and consists of a jog 169 in the side wall of the chamber on the sliding part 101, as shown at Fig. 27, to afford an increase in the width of the type chamber when the mold is opened and thereby leave the type clear on all sides to drop freely from the mold.

It is to be understood that any suitable number of type casting units may be united with and controlled by a single key board, and that it is not desired to limit the number to three, although it is thought by using this number of units ample time will be afforded to enable type to be properly cast, and type, as cast, will follow one another as fast as they can be assembled. It is evident that variations in the construction and arrangement of the type casting

units, their connecting parts and means of operation may be made without departing from the spirit of the invention, so a strict adherence to what is shown in the drawing is not to be considered requisite in practicing this invention.

I claim as my invention:

1. In a typecasting and composing machine, a plurality of typecasting units including carriers of matrices of similar fonts of type, in combination with a set of operating keys each having pivoted upon it an adjustable finger adapted to set any of the matrix carriers, means for actuating the matrix carriers and means subserved by the keys for starting and operating the casting units consecutively and for adjusting the manipulated key finger to set the matrix carrier of the respective typecasting unit set in action.

2. In a type casting and composing machine, in combination, a plurality of type casting units; a set of operating character keys; means whereby the type casting units are caused to be started successively and controlled by the manipulation of one or more of the keys and move through different stages of their operation at the same time, and means for making space pieces adapted to be set in action and operated between the operations of any two of the successively acting type casting units.

3. In combination, a plurality of type casting units; a set or bank of operating keys; an electro magnet starting device for each unit; a circuit closer under the influence of all of the keys; and means for including the electro magnets in circuit in succession to be energized by the key then closing the circuit.

4. In combination, a plurality of type casting units each provided with an electric magnet starter; an electric circuit in which the electro-magnets may be successively included; a circuit closer adapted to be set to include the magnets one at a time in the circuit; means forming parts of each unit whereby the magnet circuit closer of the unit next to be actuated is closed; and a set of operating keys, any of which when manipulated is adapted to complete the electric circuit.

5. In a type casting and setting machine, a plurality of type casting units each including matrices of similar fonts of type, in combination with a set of operating character keys; means for starting and controlling the type casting units from any of the operating keys to cause type of the same character to be formed by each unit corresponding to the character on the operating key manipulated; a passage or chute for each unit uniting in a discharge opening down which the type fall in order of their completion to be assembled; means for mak-

ing space pieces; and a passage or chute therefrom entering the discharge opening of the type chutes.

6. In a type casting and setting machine in combination, a plurality of type casting units; a set of operating character keys; means whereby the type casting units are caused to be started successively and controlled by the manipulation of one or more of the keys and move through different stages of their operation at the same time; means for making space pieces adapted to be set in action and operated between the operations of any two of successively acting type casting units; and chutes for guiding the type from the type casting units and the spaces from the space making device as made to a common discharge opening whereby they may be assembled in a galley.

7. In a typecasting and composing machine, in combination, a plurality of typecasting units including matrix carriers each provided with similar matrices to form type of a complete font, a set of operating keys each having pivoted upon it an adjustable finger adapted to set any of the matrix carriers, means subserved by any one of the keys for setting in action the typecasting units consecutively and for releasing the matrix carrier of the typecasting unit set in action by the manipulated key, and means for actuating the matrix carrier.

8. In a type casting and composing machine, in combination, a plurality of type casting units, each including a matrix carrier adapted to form a similar font of type; a set of operating keys; means whereby the type casting units are consecutively started by the manipulation of one or more of the keys to move through different stages of the operation at the same time; and means for setting in operative position the type matrices of the carriers of the respective units corresponding to the character or characters on the key or keys that are manipulated to set the units in action; and means for making space pieces adapted by the manipulation of its operating key or bar to be set in action and form a space piece between the operation of any two successively acting type casting units.

9. In a typecasting and composing machine, in combination, a plurality of typecasting units, including matrix carriers each provided with similar matrices to form type of a complete font; a set of operating keys each having pivoted upon it an adjustable finger adapted to set any of the matrix carriers; means for setting in action any of the typecasting units from any of the operating keys; and means for adjusting in operative position the pivoted finger of the manipulated key to set the type matrix of the carrier of the unit in action corresponding to the character on the key manipulated; a

type mold for each unit; a molten metal reservoir and means for injecting the metal into the molds.

10. In a typecasting and composing machine, in combination, a plurality of typecasting units, including matrix carriers each provided with similar matrices to form type of a complete font; a set of operating keys each having pivoted upon it an adjustable finger for setting the matrix carrier; means for setting in action any of the typecasting units from any of the operating keys; means for setting in operative position the finger of the manipulated key to set the type matrix of the carrier of the unit in action corresponding to the character on the key manipulated; a type mold for each unit; a chute for each unit into which the type are delivered when cast; and means for setting the type molds in normal positions over the chutes and moving them in line with the matrices of the carriers set to form the desired type.

11. In a typecasting and composing machine, in combination, a plurality of type casting units, including matrix carriers each provided with similar matrices to form type of a complete font; a set of operating keys each having pivoted upon it an adjustable finger for setting the matrix carrier; means for setting in action any of the typecasting units from any of the operating keys; means for setting in operative position the finger of the manipulated key to set the type matrix of the carrier of the unit in action corresponding to the character on the key manipulated; a type mold for each unit, a chute for each unit into which the type are delivered when cast; means for setting the type molds in normal positions over the chutes and moving them in line with the matrices of the carriers set to form the desired type; and type assembling devices in which all of the chutes discharge.

12. In a type casting and composing machine, in combination, a plurality of type casting units, each including a matrix carrier adapted to form a similar font of type; a set of operating keys; means whereby the type casting units are consecutively started by the manipulation of one or more of the keys to move through different stages of the operation at the same time; and means for setting in operative position the type matrices of the carrier of the respective units corresponding to the character or characters on the key or keys that are manipulated to set the units in action; and means for making space pieces adapted by the manipulation of its operating key or bar to be set in action and form a space piece between the operation of any two successively acting type casting units; a chute for each type forming device down which the type, when made, fall, and a chute for the reception of the

space pieces, all of said chutes opening into a single discharge.

13. In a type casting and composing machine, in combination, a plurality of type casting units; a set of operating character keys; and means whereby the type casting units are caused to be started successively, controlled by the manipulation of one or more of the keys and moved through different stages of their operation at the same time; and means actuated by each unit mechanism for setting the operative means of the unit next to be operated.

14. In a type casting and composing machine, in combination, a plurality of type casting units, each adapted to form the type of a given font; means for actuating the units at uniform speeds; a set of operating keys; and means whereby the manipulation of the keys, in the order in which the type are required, will cause as many types as there are type casting units to be under process of formation and to be delivered in the order in which the keys are manipulated; a sliding frame provided with means for putting each unit into action; and connections between this frame and each unit whereby it is set to place the acting means of the unit next to be operated into operative position.

15. In a type casting and composing machine, in combination, a plurality of type casting units, each adapted to form the type of a given font; means for actuating the units at uniform speeds; a set of operating keys; and means whereby the manipulation of the keys, in the order in which the type are required, will cause as many types as there are type casting units to be under process of formation and to be delivered in the order in which the keys are manipulated; and means forming a part of a succeeding unit to lock the frame in position to cause said unit to be next put in action by a manipulation of a character key.

16. In a machine of the character described, a starting mechanism, comprising a continuously rotated wheel, a friction clutch attached to a shaft on which the wheel rotates, a spring actuated lever controlling the clutch, a side cam secured to the shaft, a latch pivoted to the lever and engaged by the side cam to hold the clutch out of engagement with the wheel, and means for moving the latch beyond the periphery of the cam, thereby permitting the clutch, by the action of the spring of its lever, to engage with the wheel.

17. In a machine of the character described, a starting mechanism, comprising a continuously rotated wheel, a friction clutch attached to a shaft on which the wheel rotates, a spring actuated lever controlling the clutch, a side cam secured to the shaft, a latch pivoted to the lever and engaged by

the side cam to hold the clutch out of engagement with the wheel, a vertical rocking arm engaged at its upper end with the latch, a bracket on this arm and a ledge on the side of the cam resting thereon with the parts in normal position and means for moving the rocking arm, whereby the latch is moved beyond the periphery of the cam and the bracket away from the ledge.

18. In a machine of the character described, a starting mechanism, comprising a continuously rotated wheel, a friction clutch attached to a shaft on which the wheel rotates, a spring actuated lever controlling the clutch, a side cam secured to the shaft, a latch pivoted to the lever and engaged by the side cam to hold the clutch out of engagement with the wheel, a vertical rocking arm engaged at its upper end with the latch, a bracket on this arm and a ledge on the side of the cam resting thereon with the parts in normal position, an armature connected to the rocking arm, an electric circuit and a magnet included therein located in front of the armature, a bank or set of character keys and means by which the circuit is closed by them.

19. In a machine of the character described, a plurality of starting mechanisms for separate type casting devices, each including a continuously rotating wheel, a spring actuated friction clutch attached to a shaft on which the wheel rotates, a cam secured to the shaft, a spring latch controlled by the cam to hold the clutch away from the wheel, an electro-magnet and means actuated thereby to release the latches from the cams, in combination with a bank or set of character keys, and means for successively closing the circuits of the electro magnets.

20. In a machine of the character described, in combination, a plurality of type casting units, an electro-magnetic starter for each unit, a sliding frame carrying circuit closers in connection with the magnets, a cam on the driving shaft of each unit, a cam arm for each cam connected to the sliding frame, said cams being so formed that the one of the first unit sets the sliding frame with the circuit closer of the second unit in operative position, and the cam of the second unit sets the sliding frame with the circuit closer of the third unit in operative position.

21. In a machine of the character described, in combination, a plurality of type casting units, an electro-magnetic starter for each unit, a sliding frame carrying circuit closers in connection with the magnets, a cam on the driving shaft of each unit, a cam arm for each cam connected to the sliding frame, said cams being so formed that the one of the first unit sets the sliding frame with the circuit closer of the second unit in operative position with the arm of the second unit engaged with its cam to lock the frame

in this position, a similar action occurring between cams of the second and third units when the second unit is set in action.

22. In a type casting and composing machine, in combination, a starting mechanism, a cam formed in the face of a cam disk, an arm having a roller at its end secured to a rocking shaft and pivoted to move towards and from the face of the cam, a sliding frame connected to the arm, means for moving the frame to bring the cam roller over the cam recess into which it falls, thereby locking the frame in this position, and a side rise on the cam which pushes the cam roller out of the cam recess, to permit of the retrograde movement of the frame.

23. In a type casting and composing machine, in combination, a starting mechanism, a cam formed in the face of a cam disk, an arm having a roller at its end secured to a rocking shaft and pivoted to move towards and from the face of the cam, a sliding frame connected to the arm, means for moving the frame to bring the cam roller over the cam recess into which it falls, thereby locking the frame in this position, and a side rise on the cam which pushes the cam roller out of the cam recess to permit of the retrograde movement of the frame, and a latch lying across the face of the cam to move between the arm and the cam face to hold the cam roller out of the cam recess.

24. In a machine of the character described, a plurality of type casting units provided with independent driving mechanism; means for starting the units consecutively, so arranged and combined that the first unit when started operatively sets the starting means of the second unit, and the second unit when started operatively sets the starting means of the third unit, and so on, and the last unit during its operation operatively sets the starting means of the first unit.

25. In a machine of the character described, a plurality of type casting units comprising a starting mechanism operating cam for each unit, a shaft having arms adapted to be actuated by the cams, and a starting controlling device also connected to and actuated by the shaft in such manner that the consecutive operation of the units sets the arm of the succeeding unit in operative position to its cam.

26. In a machine of the character described, a plurality of type casting units comprising a starting mechanism operating cam for each unit, a shaft having arms adapted to be actuated by the cams, a starting controlling device also connected to and actuated by the shaft in such manner that the consecutive operation of the units sets the arm of the succeeding unit in operative position to its cam and means for causing the cam arms of the units to act in conjunction with their cams as locks for holding the

starting controlling device in its different set positions.

27. In a machine of the character described, a plurality of type casting units comprising a starting mechanism operating cam for each unit, a shaft having arms adapted to be actuated by the cams, a starting controlling device also connected to and actuated by the shaft in such manner that the consecutive operation of the units sets the arm of the succeeding unit in operative position to its cam, means for causing the cam arms of the units to act in conjunction with their cams as locks for holding the starting controlling device in its different set positions and means for holding the cam arms of the units between the first and last unit out of locking position as the last type casting unit is operated.

28. In a machine of the character described, a plurality of type casting units comprising a starting mechanism operating cam for each unit, a shaft having arms adapted to be actuated by the cams; a starting controlling device also connected to and actuated by the shaft; means, as springs, for moving the arms of the units succeeding the first unit into operative positions with their respective cams, and inclines formed in said cams to force the arms away from the active parts thereof.

29. In a machine of the character described, a plurality of type casting units comprising a starting mechanism operating cam for each unit; a shaft having arms adapted to be actuated by the cams; a starting controlling device also connected to and actuated by the shaft; means, as springs, for moving the arms of the units succeeding the first unit into operative positions with their respective cams, and inclines formed in said cams to force the arms away from the active parts thereof; and a latch for holding each of the arms of the units between the first and last unit out of operative positions with their cams when a succeeding unit is in operation.

30. In a machine of the character described, a plurality of type casting units comprising a starting mechanism operating cam for each unit; a shaft having arms adapted to be actuated by the cams; a starting controlling device also connected to and actuated by the shaft in such manner that the consecutive operation of the units sets the arm of the succeeding unit in operative position to its cam; a set of key levers; a matrix carrier for each unit and means for moving the carriers into operative positions; means for starting the units from the key levers; and means actuated by the key levers to release the matrix carriers and to cause them to be set to form type corresponding to the character on the key levers manipulated.

31. In a machine of the character described, a plurality of type casting units comprising a starting mechanism operating cam for each unit; a shaft having arms adapted to be actuated by the cams; a starting controlling device also connected to and actuated by the shaft in such manner that the consecutive operation of the units sets the arm of the succeeding unit in operative position to its cam; a set of key levers; a matrix carrier for each unit and means for moving the carriers into operative position; means for starting the units from the key levers; means actuated by the key levers to release the matrix carriers and to cause them to be set to form type corresponding to the character on the key levers manipulated; a mold for each unit; means for setting the molds in operative positions relative to the matrix carriers; and means for injecting molten metal into the molds when so set.

32. In a machine of the character described, a plurality of type casting units comprising a starting mechanism operating cam for each unit; a shaft having arms adapted to be actuated by the cams; a starting controlling device also connected to and actuated by the shaft in such manner that the consecutive operation of the units sets the arm of the succeeding unit in operative position to its cam; a set of key levers; a matrix carrier for each unit and means for moving the carriers into operative positions; means for starting the units from the key levers; means actuated by the key levers to release the matrix carriers and to cause them to be set to form type corresponding to the characters on the key levers manipulated; a mold for each unit; means for setting the molds in operative positions relative to the matrix carriers; means for injecting molten metal into the molds when so set; a discharge chute for each mold; means for setting the molds over their respective chutes; and means for opening the molds when so set.

33. In a machine of the character described, a plurality of type casting units comprising a starting mechanism operating cam for each unit; a shaft having arms adapted to be actuated by the cams; a starting controlling device also connected to and actuated by the shaft in such manner that the consecutive operation of the units sets the arm of the succeeding unit in operative position to its cam; a set of key levers each having a finger pivoted thereto and controlled by the starting controlling device; a matrix carrier in each unit provided with a stop lug and means for operating the matrix carriers, the stop lug of the matrix carrier of the type casting unit in operation being in the path of and arrested by the end of the finger of the key lever which sets the unit into action.

34. In a machine of the character described, a plurality of type casting units comprising a starting mechanism operating cam for each unit; a shaft having arms adapted to be actuated by the cams; a starting controlling device also connected to and actuated by the shaft in such manner that the consecutive operation of the units sets the arm of the succeeding unit in operative position to its cam; a set of key levers each having a finger pivoted thereto and controlled by the starting controlling device; a matrix carrier in each unit provided with a stop lug; means for operating the matrix carriers; the stop lug of the matrix carrier of the type casting unit in operation being in the path of and arrested by the end of the finger of the key lever which sets the unit into action; and an operative connection carried by the starting controlling device adapted to be acted upon by each of the fingers of the key levers to release the matrix carriers as their respective units are operated.

35. In a type casting and composing machine, in combination, a plurality of type casting units, a set of operating key levers, a molten metal reservoir having a discharge spout for each unit, each type casting unit having a mold into which the metal is injected, and comprising a starting mechanism actuated by the key levers, a cam for setting the actuating parts of the key levers and of the mechanism, a cam and lever connections for operating the injecting device of the metal reservoir; a cam for setting the mold and its operative levers, a matrix carrier; and a cam and connections for resetting the matrix carrier in inoperative position.

36. In a type casting and composing machine, in combination, a plurality of type casting units, a space piece forming device; means for operating it; and means for setting it in action; a matrix carrier and a mold for each unit; a molten metal reservoir having a discharge spout for each mold; a set of key levers; a starting mechanism controlling an operating part of the key lever; each type casting unit comprising a cam and lever connections for setting the starting mechanism, a cam and lever connections for operating the injection device of the metal reservoir, a cam for setting and operating the mold, a matrix carrier, means for setting it in operative position and a cam for operating the matrix carrier resetting device.

37. In a machine of the character described, in combination, a pair of corrugated rollers adapted to crimp a strip of metal to form space pieces and provided with cutters arranged at regular intervals to sever the space pieces of uniform length from the strip, and means for intermittently actuating the rollers, a sliding carrier into which the

space pieces fall as cut by the rollers, a passage or chute and means for moving the carrier from beneath the rollers to the chute.

38. In a machine of the character described, in combination, a pair of space forming crimping rollers, cutters located on one of the rollers to act against the other roller, gears connecting the rollers, a ratchet wheel attached to one of them, an arm provided with a pawl arranged to act on the ratchet, means for rocking the arm, a chute down which the space piece falls and a carrier for conveying the pieces as formed and cut from the rollers to the chute.

39. In a machine of the character described, in combination, a pair of rollers formed to corrugate a strip of metal and provided with cutters to sever space pieces of uniform length from the corrugated strip; means for intermittently rotating the rollers; a continuously revolving drive wheel; an operating lever for connecting the wheel to the rollers' operating means; and means for stopping the device when a space piece is formed.

40. In a machine of the character described, in combination, a pair of rollers formed to corrugate a strip of metal and provided with cutters to sever space pieces of uniform length from the corrugated strip; means for intermittently rotating the rollers; a continuously revolving drive wheel; an operating lever for connecting the wheel to the rollers' operating means; means for stopping the device when a space piece is formed; a carrier having a vertical opening through it and sliding on a table; a chute extending downwardly from the table; and means for moving the carrier to bring its opening from beneath the rollers over the mouth of the chute.

41. In a machine of the character described, in combination, a pair of connected corrugated rollers; cutters carried by one of them at regular intervals in the corrugations to bear against the other roller; a ratchet and pawl for intermittently driving one of the rollers; a continuously rotating drive wheel; a stop clutch on the wheel shaft; an operating finger piece or bar and connections to start and stop the shaft; a cam on the shaft; and a lever operated thereby to actuate the pawl.

42. In a machine of the character described, in combination, a pair of connected corrugated rollers; cutters carried by one of them at regular intervals in the corrugations to bear against the other roller; a ratchet and pawl for intermittently driving one of the rollers; a continuously rotating drive wheel; a stop clutch on the wheel shaft; an operating finger piece or bar and connections to start and stop the shaft; a cam on the shaft; a lever operated thereby to actuate the pawl; a type assembling device; and

a chute extending thereto from the space piece forming device.

43. In a machine of the character described, in combination, a pair of connected corrugated rollers; cutters carried by one of them at regular intervals in the corrugations to bear against the other roller; a ratchet and pawl for intermittently driving one of the rollers; a continuously rotating drive wheel; a stop clutch on the wheel shaft; an operating finger piece or bar and connections to start and stop the shaft; a cam on the shaft; a lever operated thereby to actuate the pawl; a type assembling device; a chute extending thereto from the space piece forming device; a carrier adapted to slide on a table from which the chute extends and having a vertical opening through it; a cam on the clutch shaft; and a lever actuated thereby to reciprocate the carrier to bring its opening from beneath the discharge of the rollers over the chute.

44. In a machine of the character described, in combination, a type casting mold having a sliding part and springs for contracting the molding chamber; a matrix bar having the type matrices at its under side; means for moving the mold in two positions; a chute under the mold chamber when in one position; a metal discharge spout under it when in the other position, and means for setting the matrix bar to bring any of the matrices in line over the metal discharge spout.

45. In a machine of the character described, in combination, a type casting mold having a sliding part and springs for contracting the molding chamber; a matrix bar having the type matrices at its under side; means for moving the mold in two positions; a chute under the mold chamber when in one position; a metal discharge spout under it when in the other position; means for setting the matrix bar to bring any of the matrices in line over the metal discharge spout; means for opening the chamber of the mold as it comes over the chute and to allow it to be contracted when over the metal discharge spout; and means on the matrix bar for controlling the contraction of the mold chamber when over the metal discharge spout.

46. In a machine of the character described, in combination, a type matrix bar fitted to slide on a guide bar; a mold carried by a sliding block; an operating link with a pin and slot connection to the sliding block; a locking bar for holding the matrix bar in set position; a lever for controlling the locking bar; and an extension or ledge on the sliding block operating link controlling one end of the locking bar lever in such manner that when the mold is moved into operative position, with the matrix bar set, the extension of the link moves away from

the locking bar lever to permit the matrix bar to be locked thereby, and by reason of the lost motion of the slot and pin connection of the link and block the locking bar is raised before the mold is moved away from casting position; and a spring acting support for the guide of the matrix bar, whereby the matrix face of the bar is pressed firmly against the mold by the locking bar and is raised from the mold before it commences its retrograde movement.

47. In a machine of the general character described, in combination, a pair of space pieces forming rollers; knives located at the sides of the rollers for trimming the edges of the space pieces as they are formed; and means for intermittently rotating the rollers.

48. In a machine of the character described, in combination, a pair of corrugated rollers adapted to crimp a strip of metal to form space pieces and provided with cutters arranged at regular intervals to sever the space pieces of uniform length from the strip, means for intermittently actuating the rollers and a knife at each side of the rollers located at their active parts to trim the space pieces as they are formed.

49. In a machine of the character described, in combination, a pair of rollers formed to corrugate a strip of metal and provided with cutters to sever space pieces of uniform length from the corrugated strip; trimming knives located at the sides of the rollers for shaving the edges of the space pieces as they are formed; means for intermittently rotating the rollers; a continuously revolving drive wheel; an operating lever for connecting the wheel to the rollers' operating means; and means for stopping the device when a space piece is formed.

50. In a machine of the general character described, in combination, a pair of rollers adapted to form space pieces from a strip of metal; cutters for severing the space pieces from the strip; trimming knives located at the sides of the rollers for shaving the edges of space pieces as they are formed; and means adapted to be set in action at will to rotate the rollers sufficiently to make a space piece.

51. In a machine of the general character described, in combination, a pair of space pieces forming rollers; knives located at the sides of the rollers for trimming the edges of the space pieces as they are formed; means for intermittently rotating the rollers; a chute for delivering the space pieces to composing devices; and a carrier for conveying the space pieces from the rollers to the chute.

52. In a machine of the general character described, in combination, a pair of rollers adapted to form space pieces from a strip of metal; cutters for severing the space pieces from the strip; trimming knives located at

the sides of the rollers for shaving the edges of space pieces as they are formed; means adapted to be set in action at will to rotate the rollers sufficiently to make a space piece; a chute down which the space pieces fall to composing devices; and a carrier adapted to receive the space pieces as they discharge from the forming rollers and convey them separately to the chute.

53. In a type casting and composing machine, in combination, a plurality of type casting units, a drive wheel and a clutch for each unit and means for successively operating the clutches.

54. In a type casting and composing machine, in combination, a plurality of type casting units, each adapted to form the type of a given font; means for actuating the units at uniform speeds; a set of operating keys; and means whereby the manipulation of the keys, in the order in which the type are required, will cause as many types as there are type casting units to be under process of formation and be delivered in the order in which the keys are manipulated; means for making space pieces; and means for setting the space making means in action at will to make a space piece between the operations of successively acting type casting units.

55. In a type casting and composing machine, in combination, a plurality of type casting units; a set of operating character keys; means whereby the type casting units are caused to be started successively and controlled by the manipulation of one or more of the keys and move through different stages of their operation at the same time; means for making space pieces adapted to be set in action and operated between the operations of any two of successively acting type casting units; and means for delivering the type and space pieces in the order of their completion to composing devices.

56. In a machine of the character described, the combination with a type mold comprising a spring actuated sliding part; of a lever pivoted in the main portion of the mold and connected to the sliding part; a stationary stud or roller against which the free end of the lever acts to open the mold when it is moved into its backward position; and means for bodily moving the mold.

57. In a machine of the character described, the combination with a type mold comprising a spring actuated sliding part, means for setting the mold in two positions; a lever pivoted to the main portion of the mold and connected to the sliding part; a stationary stud or roller against which the free end of the lever acts to open the mold when moved into its backward position; and a spring latch arranged to bear on a bar or arm of the lever to hold the mold open during its forward movement and to release the

bar or arm as the mold reaches its forward position permitting the springs of the sliding part to act to close the mold.

58. In a machine of the character described, a type casting mold consisting of two parts, one sliding in relation to the other, with a type chamber formed by recesses in the sliding faces of the two parts, one of said recesses having a widened portion which forms a part of the type chamber enlarged when the mold is fully opened, and means for opening and closing the mold.

59. In a machine of the character described, the combination with a type mold comprising a spring actuated sliding part and a type chamber formed in the sliding surfaces of the mold of a width equal to the thickness of the type when the mold is closed and increased in width when the mold is opened; of a lever pivoted in the main portion of the mold and connected to the sliding part; a stationary stud or roller against which the free end of the lever acts to open the mold when it is moved into its backward position and means for bodily moving the mold.

60. In a machine of the character described, the combination with a type mold comprising a spring actuated sliding part and a type chamber formed in the sliding surfaces of the mold of a width equal to the thickness of the type when the mold is closed and of increased width when the mold is opened; means for setting the mold in two positions; a lever pivoted to the main portion of the mold and connected to the sliding part; a stationary stud or roller against which the free end of the lever acts to open the mold when moved into its backward position; and a spring latch arranged to bear on a bar or arm of the lever to hold the mold open during its forward movement and to release the bar or arm as the mold reaches its forward position permitting the springs of the sliding part to act to close the mold.

In testimony whereof, I have hereunto subscribed my name.

ODDUR V. SIGURDSSON.

Witnesses:

M. P. WHITAKER,
M. W. CLEPHANE.