

No. 774,718.

PATENTED NOV. 8, 1904.

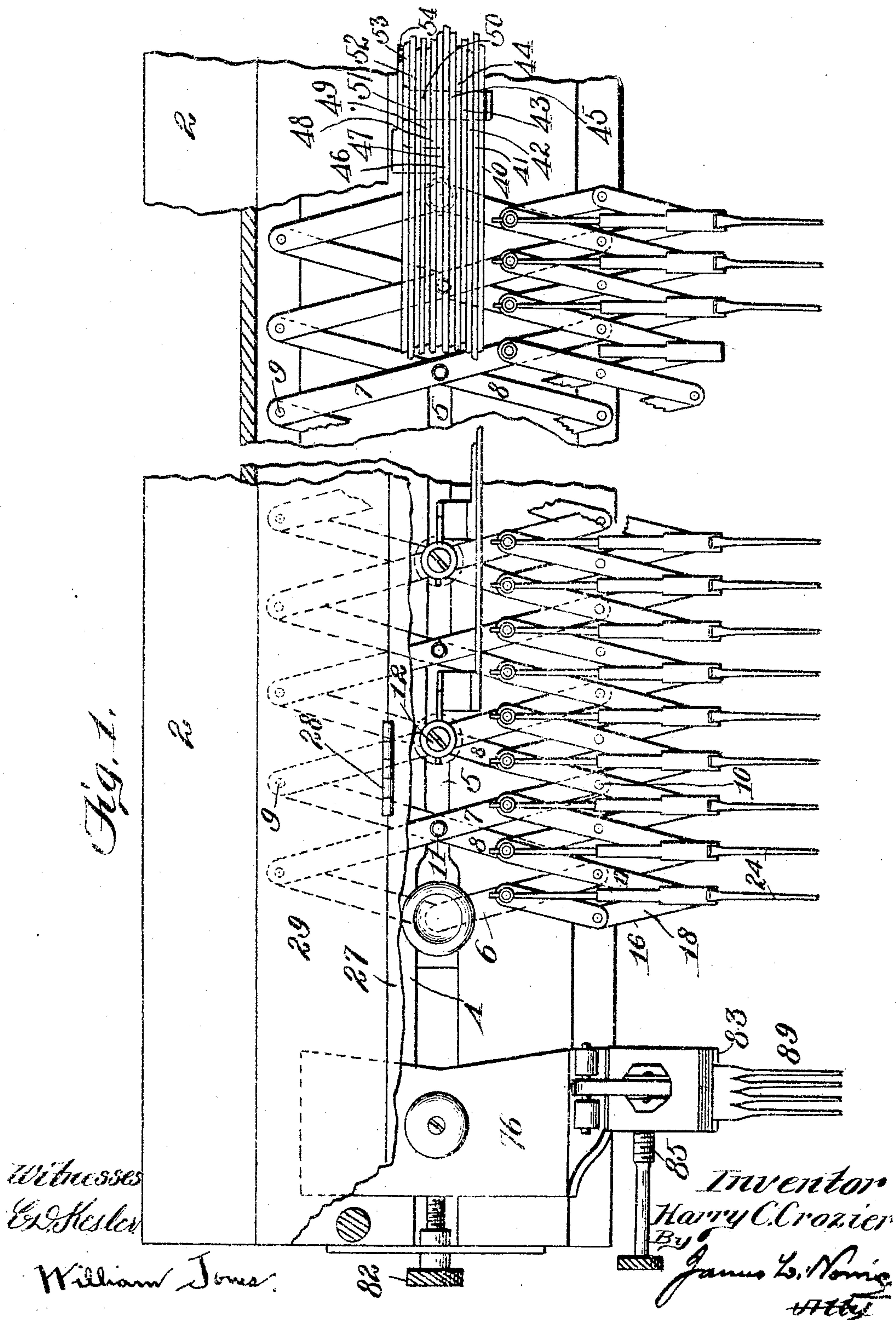
H. C. CROZIER.  
RULING MACHINE.

APPLICATION FILED MAR. 5, 1904.

NO MODEL.

4 SHEETS—SHEET 1.

Fig. 1.



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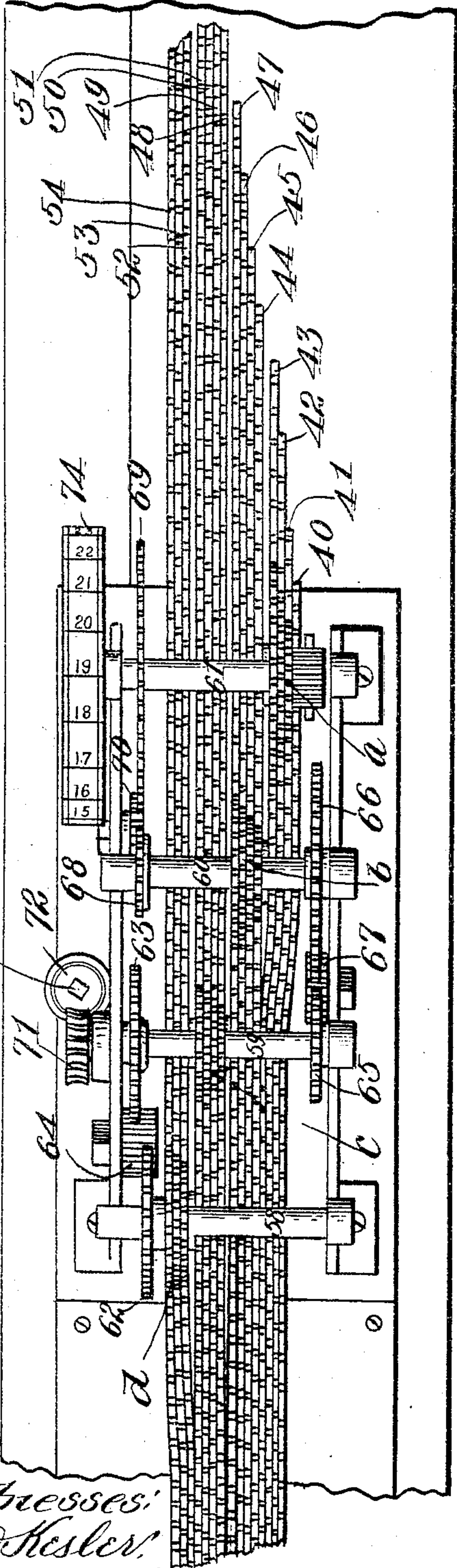
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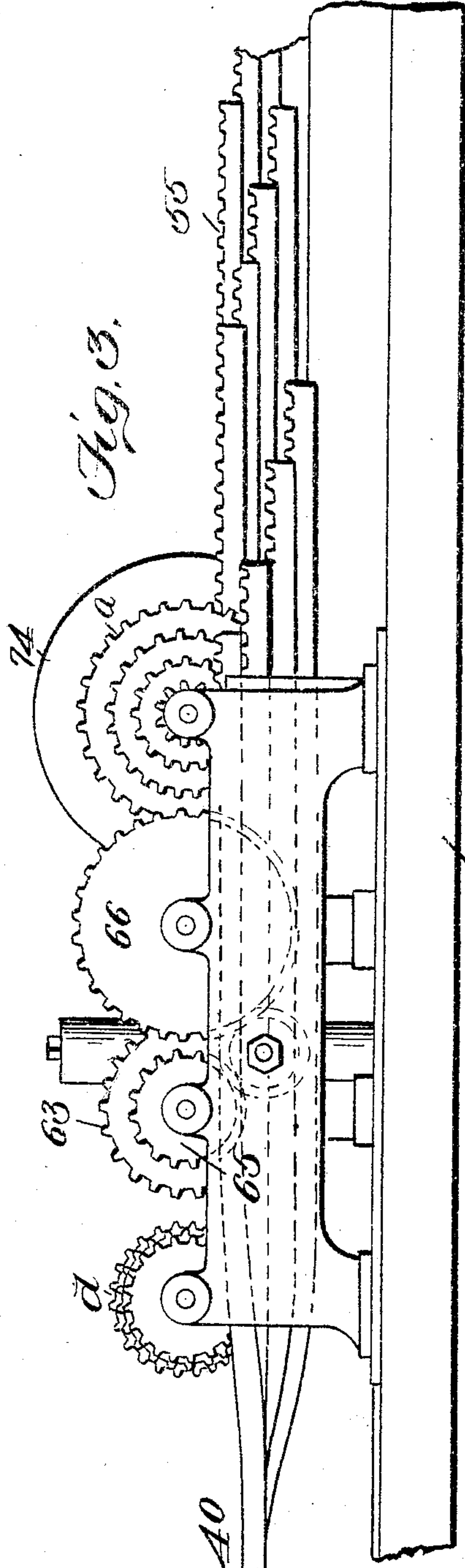
4 SHEETS—SHEET 2.

Fig. 2



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Fig. 3.



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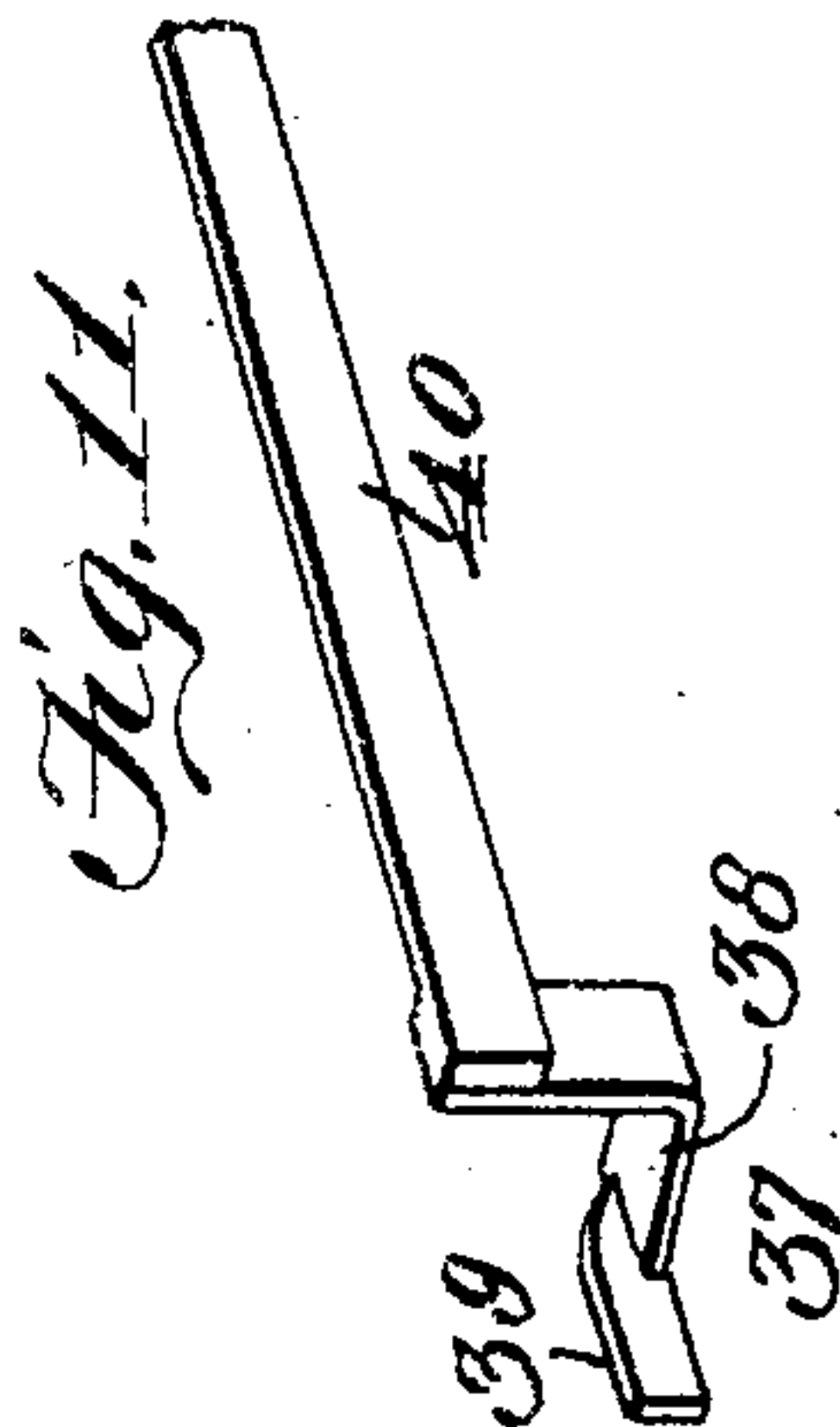
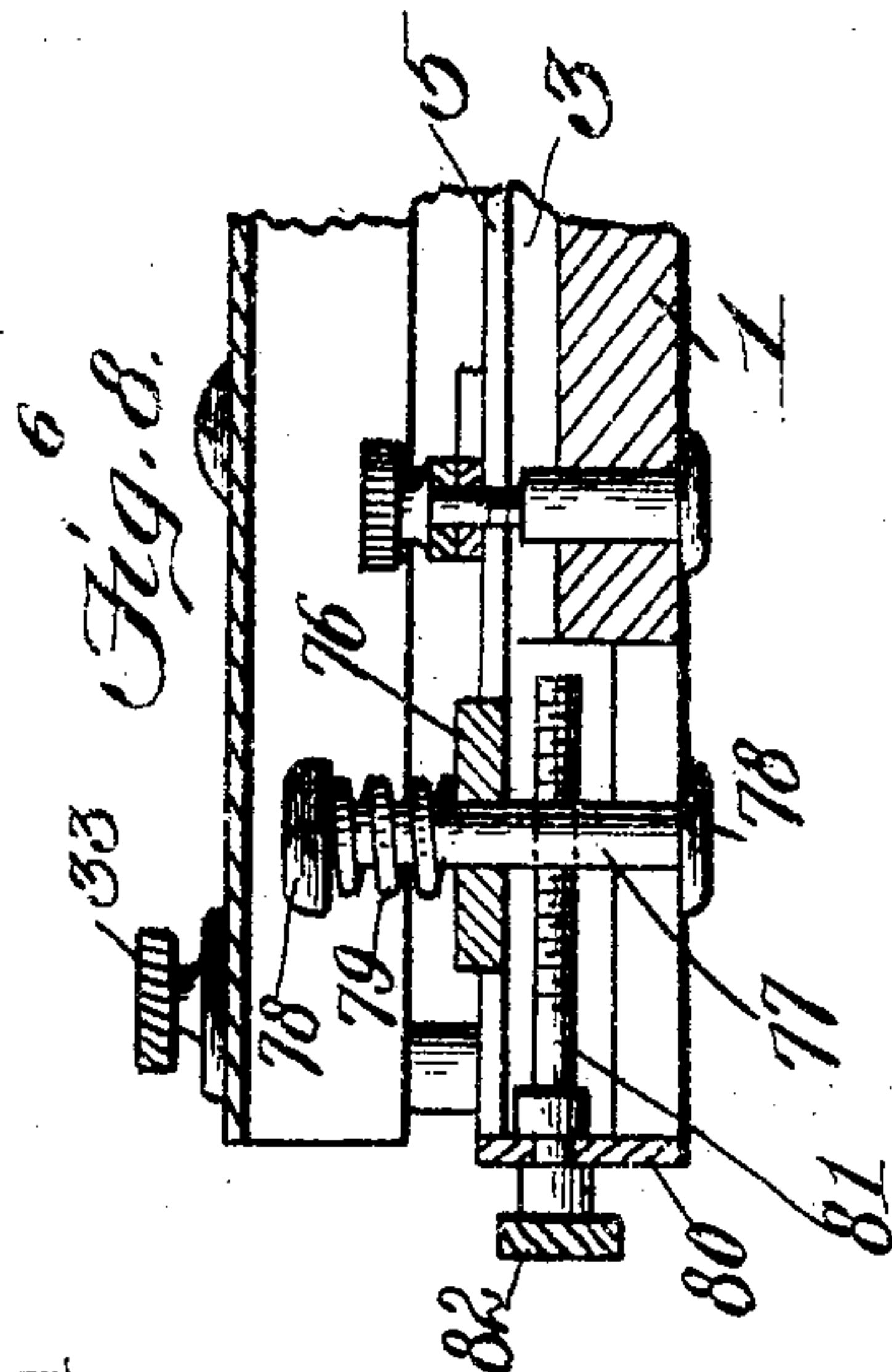
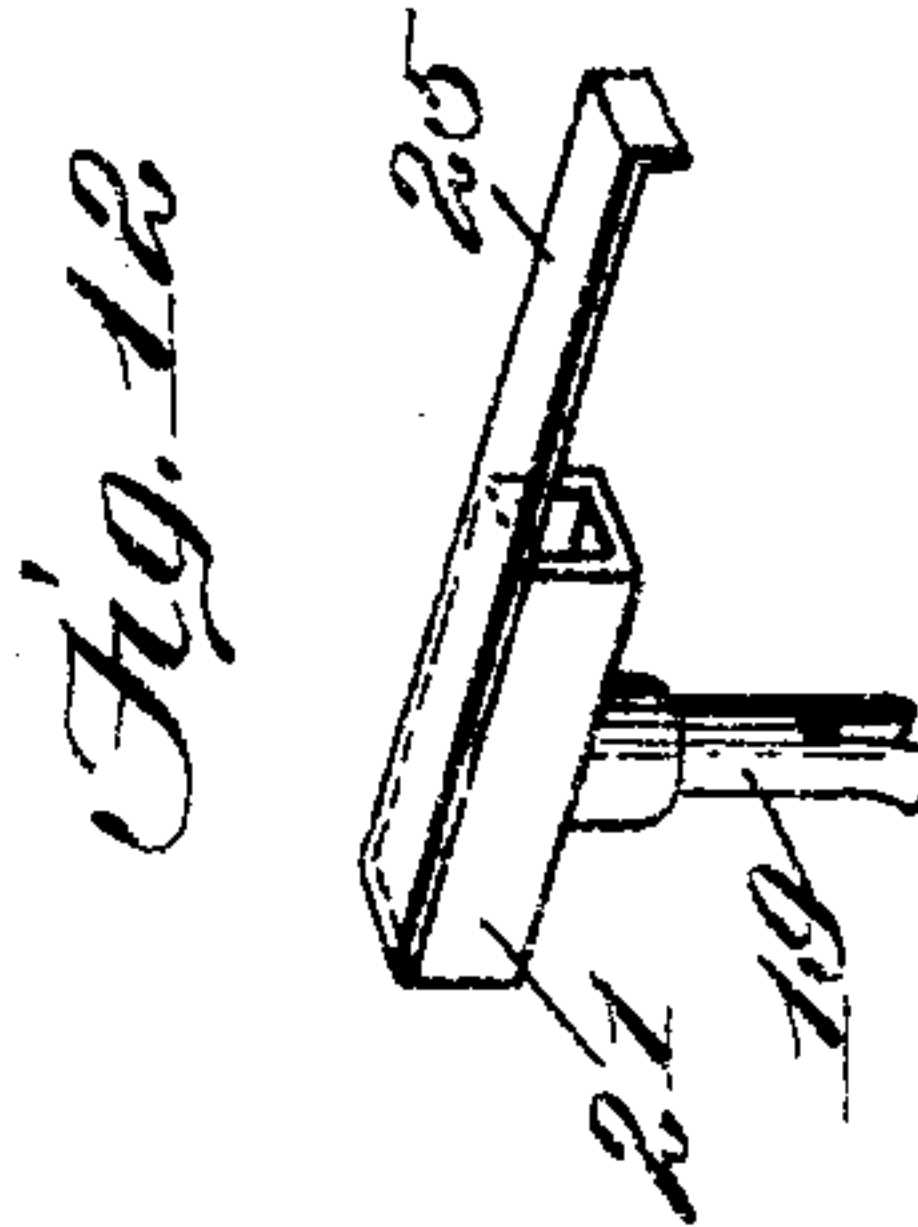
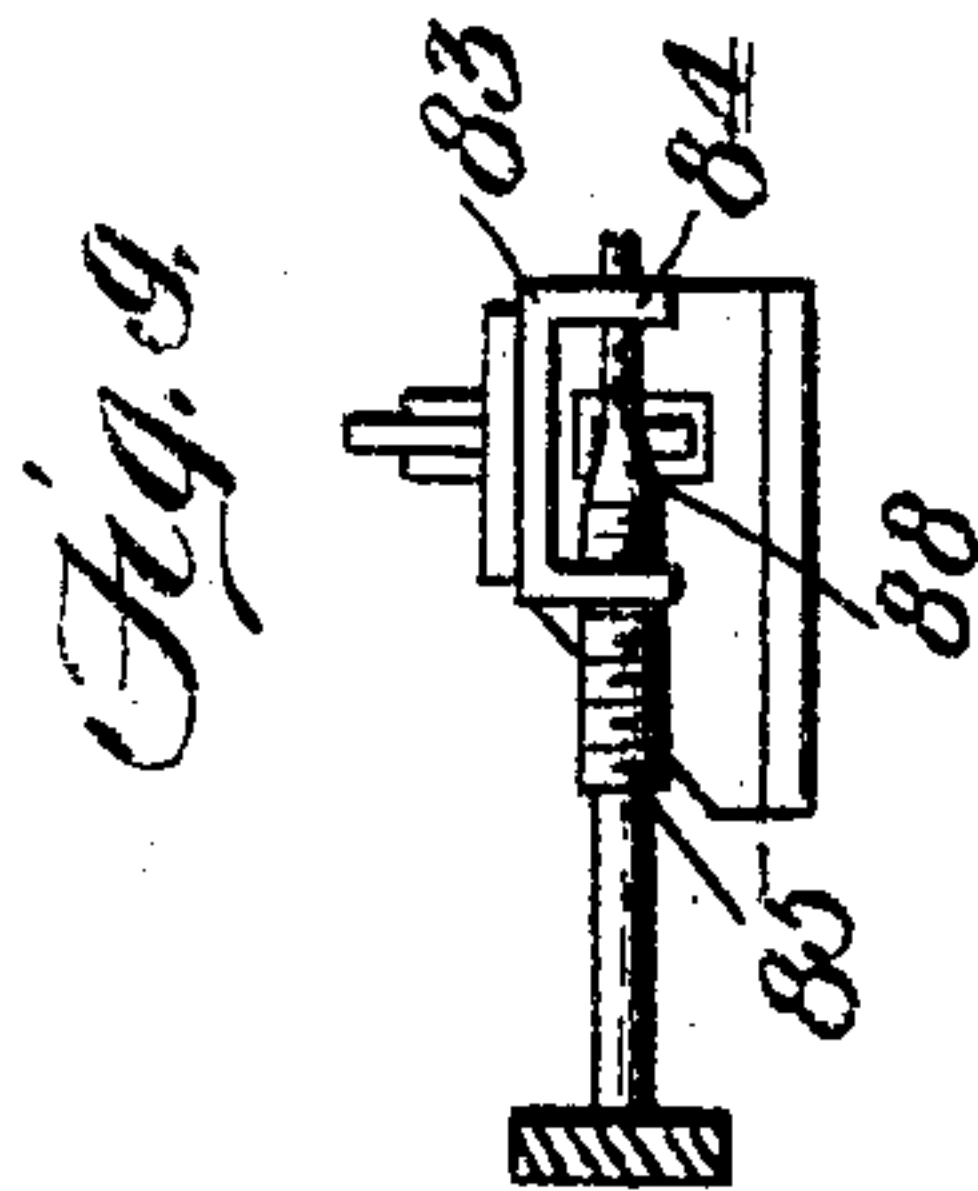
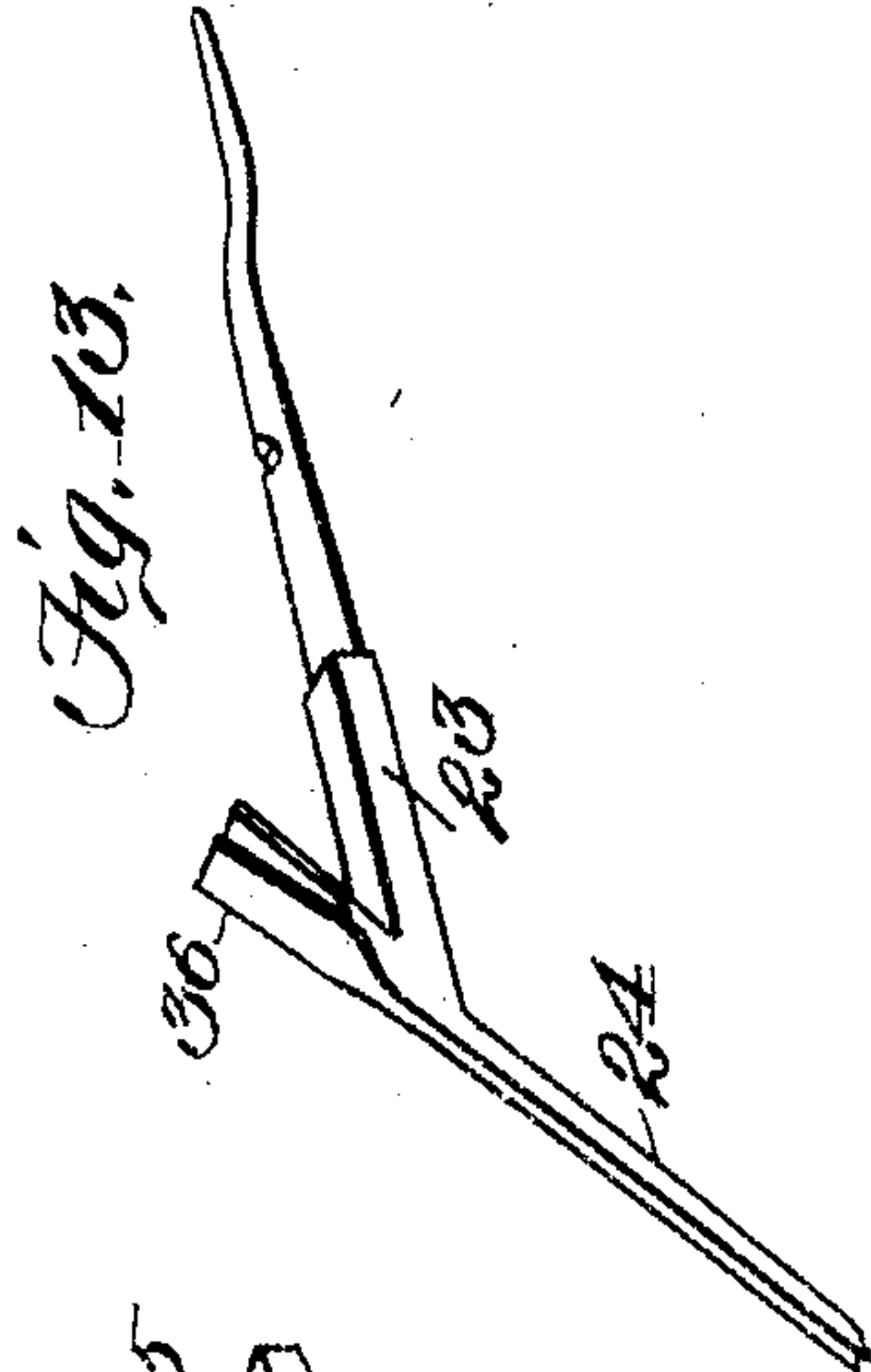
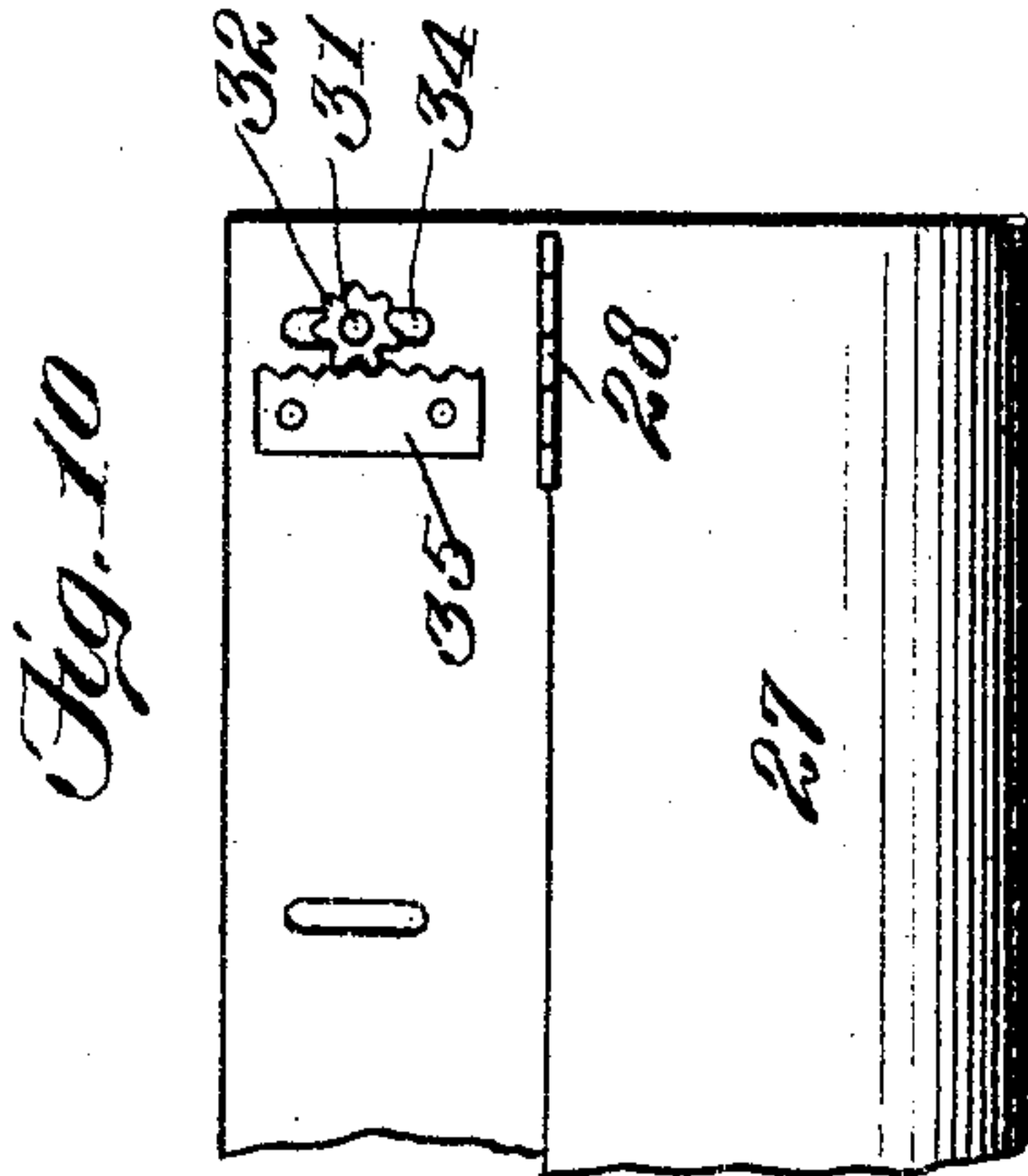
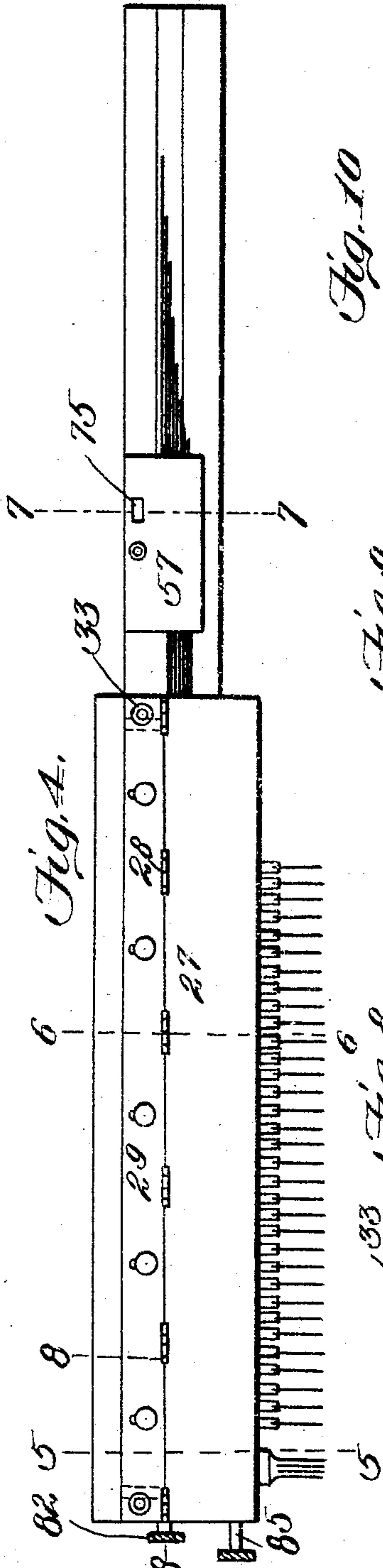
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NO MODEL.

4 SHEETS—SHEET 3.



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No. 774,718.

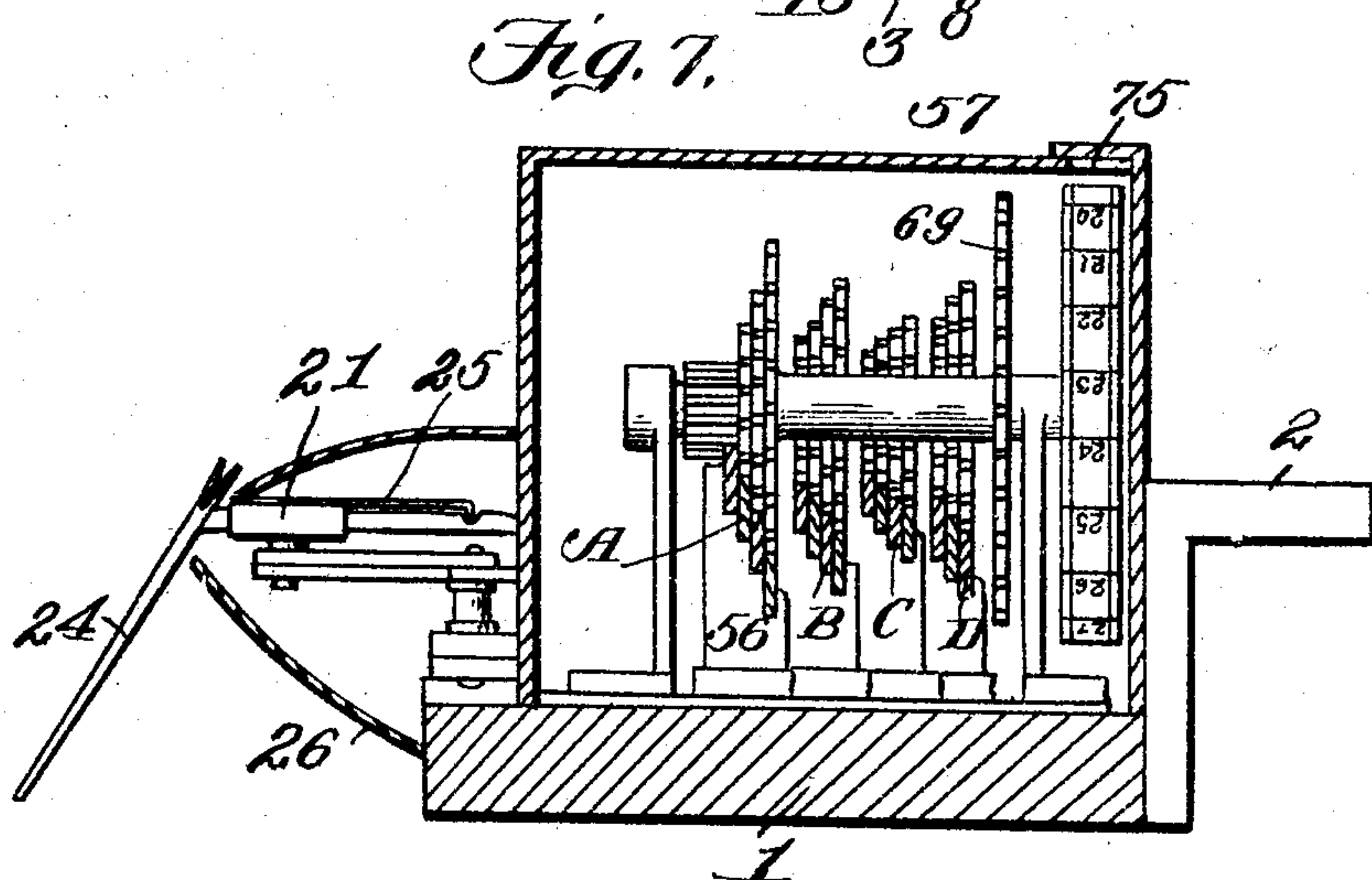
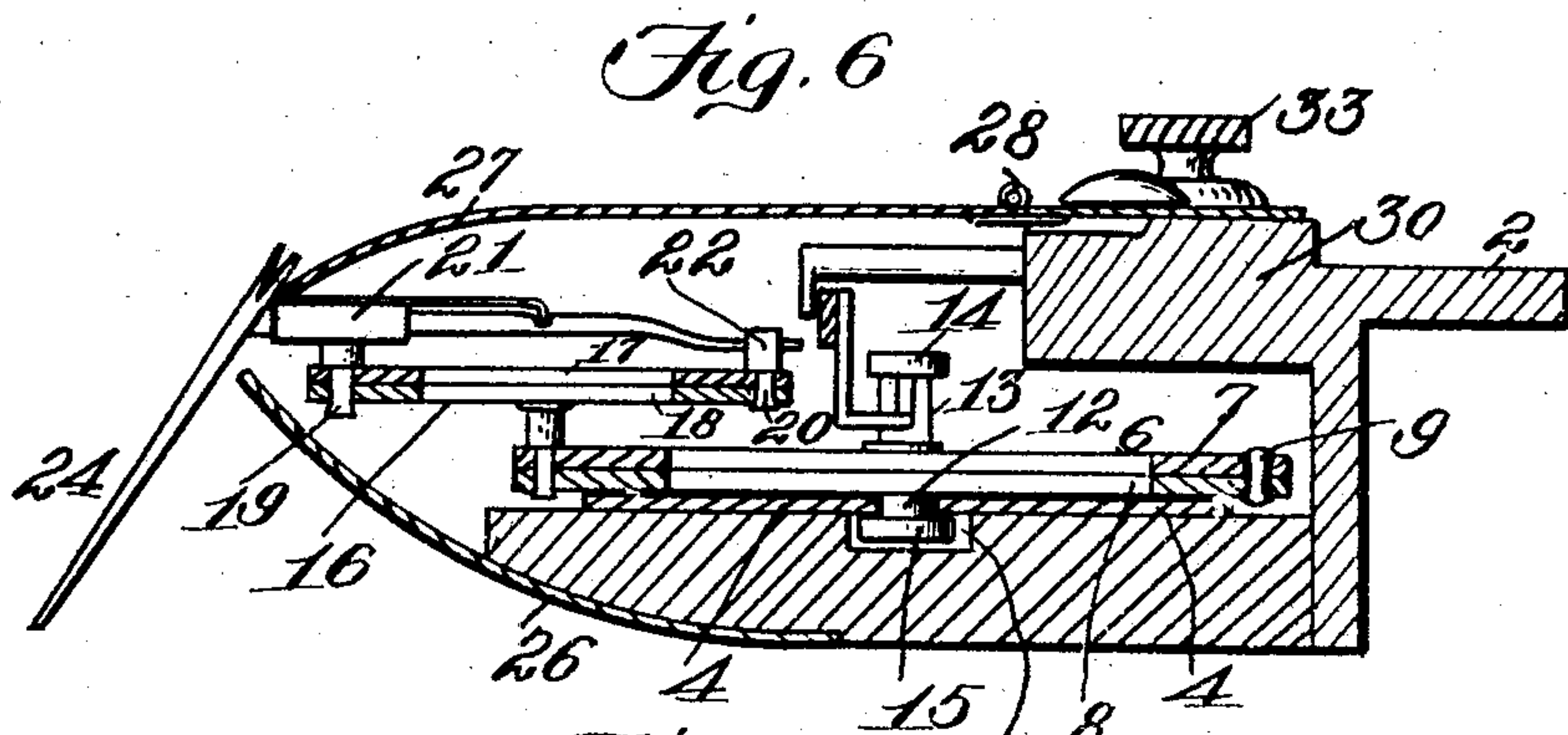
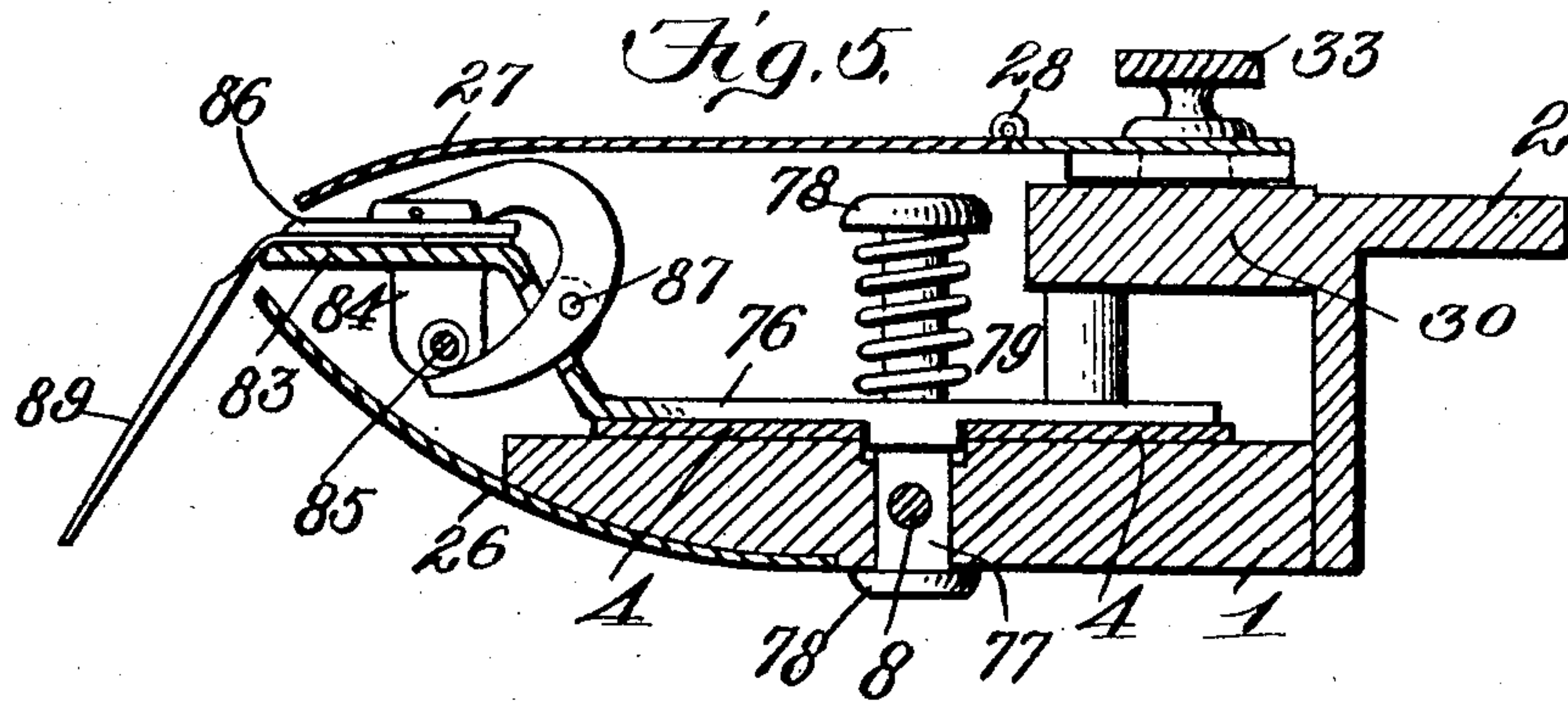
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NO MODEL.

4 SHEETS—SHEET 4.



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# UNITED STATES PATENT OFFICE.

HARRY C. CROZIER, OF SAN ANTONIO, TEXAS, ASSIGNOR OF ONE-HALF  
TO LUTHER B. CLEGG, OF SAN ANTONIO, TEXAS.

## RULING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 774,718, dated November 8, 1904.

Application filed March 5, 1904; Serial No. 196,689. (No model.)

*To all whom it may concern:*

Be it known that I, HARRY C. CROZIER, a citizen of the United States, residing at San Antonio, in the county of Bexar and State of Texas, have invented new and useful Improvements in Ruling-Machines, of which the following is a specification.

This invention relates to ruling-machines, and particularly to the class of ruling-machines in which the pens and penholders are movably supported on a beam and are adjustable toward and from each other and in which a system of lazy-tongs is employed to adjust the pens and penholders to cause the pens to rule lines on the paper at varying distances apart; and it has for its object, first, to provide an improved lazy-tongs arrangement for adjusting the pens with great accuracy and uniformity and to prevent any lost motion that may occur in the lazy-tongs from affecting the adjustment of the pens; second, to provide differential gearing for actuating the lazy-tongs mechanism to adjust the pens; third, to provide improved means for removably holding the pens in position; fourth, to provide an improved apron for protecting the mechanism, said apron being so constructed and arranged that it may be readily raised to afford access to the mechanism and to the penholders and also to automatically adjust itself to the movement of the pens as the latter are adjusted; fifth, to provide improved means for ruling the head-lines, and, lastly, to improve and simplify the construction and render more efficient the operation of this class of machines generally.

To these ends my invention consists in the features and in the construction, combination, and arrangement of parts hereinafter described, and more particularly pointed out in the claims following the description, reference being had to the accompanying drawings, forming a part of this specification, wherein—

Figure 1 illustrates a partial plan view of my improved machine. Fig. 2 is a plan view of the differential gearing for actuating the lazy-tongs, the housing being removed. Fig. 3 is a side elevation of the gearing. Fig. 4 is a

top plan view of the machine. Fig. 5 is a section taken on the line 5 5 of Fig. 4. Fig. 6 is a similar view taken on the line 6 6. Fig. 7 is a similar view taken on the line 7 7. Fig. 8 is a similar view taken on the line 8 8. Fig. 9 is a detail view of the clamp. Fig. 10 is a bottom plan view of the shield. Fig. 11 is a perspective view of a portion of one of the rack-bars. Fig. 12 is a perspective view of one of the sleeves holding a penholder, and Fig. 13 is a detail perspective view of one of the pens.

Referring to the drawings, the numeral 1 indicates a beam formed of any suitable material and extending transversely across the bed of the main frame of the machine from edge to edge in the usual manner and is provided at its rear end with a tongue or tongues 2, which is or are adapted to be clamped to the frame of the machine by a suitable clamp or clamps in the ordinary and well-known manner. The upper surface of the beam 1 is longitudinally mortised, as at 3, and is provided on its upper side with two bearing-plates 4, which are fixed on the beam on each side of the mortise 3, the adjacent ends of said plates being slightly separated to form a slot 5, for the purpose hereinafter made apparent.

Supported and adapted to slide on the bearing-plates 4 is a system of lazy-tongs, (indicated generally by the numeral 6,) said tongs comprising two series of levers, the levers in one series being arranged parallel to another and disposed diagonally across the parallel levers of the other series, the levers comprising the two series being respectively numbered 7 and 8. The levers 7 of one series are pivoted at their opposite ends, as at 9 and 10, to the levers 8 of the other series, and said levers where they cross each other are pivoted together, as at 11, the whole being constructed and arranged in an ordinary and well-known manner. Each alternate pair of levers 7 and 8 is pivoted centrally by bolts 12, each of said bolts on its upper side having an enlarged cylindrical portion 13 and a head 14 and at its lower end is provided with a nut 15. The bolts 12 pass through the levers 7 and 8 and form pivots, about which said levers may



turn and also pass through the slot 5 between the bearing-plates 4, the heads or nuts 15 on the lower ends of said bolts being arranged to travel in the mortise 3, and thus form guides for centering and holding the lazy-tongs as the latter are folded and unfolded.

For the sake of clearness I denominate the lazy-tongs numbered 6 as the "main" lazy-tongs. Disposed over the forward ends of the main lazy-tongs is a system of small lazy-tongs, (indicated in a general way by the numeral 16) and constructed in the same manner as the main lazy-tongs before described. The pivots 10, which serve to pivot together the forward ends of the levers 7 and 8 of the main lazy-tongs, also serve as pivots for centrally pivoting together the levers of the auxiliary lazy-tongs 16, said levers of the auxiliary system of lazy-tongs being respectively numbered 17 and 18. The forward ends of the levers 17 and 18 are pivoted together by pivot-pins 19, and their opposite ends are pivoted together by pivot-pins 20. As shown, the levers 17 and 18 of the auxiliary lazy-tongs are approximately one-half the length of the levers 7 and 8 of the main lazy-tongs, whereby as the main system of lazy-tongs is folded and unfolded, thereby folding and unfolding the auxiliary system of lazy-tongs, the latter will move approximately one-half the distance that is traveled by the former. Formed on the upper ends of the pivots 19 are sleeves 21, and formed on the upper ends of the pivot-pins 20 are perforated heads 22.

The numeral 23 indicates the penholders, carrying at their forward ends ruling-pens 24 of ordinary or any preferred or suitable construction. The penholders 23 are passed through the sleeves 21 and through the perforated heads 22 and are held in place by spring-catches 25, carried by the sleeves 21, the ends of the spring-catches being turned at right angles to engage notches formed in the penholders 23 and hold the latter in place in the sleeves 21, the rear end of the penholders being adapted to freely slide in the perforated heads 22 of the pivot-pins 20.

The end pivot-pin 11 of the main system of lazy-tongs is secured into the beam 1.

From the foregoing it will be readily understood by those skilled in the art that as the main system of lazy-tongs is folded and unfolded the auxiliary system of lazy-tongs carrying the penholders will also be folded and unfolded, but in a lesser degree, and during such movements the ends of the penholders will slide back and forth in the perforated heads 22, and the penholders will thus be always held in perfect parallelism.

On the under side of the beam is attached an upwardly-curved shield or apron 26, and arranged over the operative parts of the mechanism above described is a downwardly-curved apron 27, said apron being preferably constructed of sheet metal and serving to inclose

and protect the operative parts. The apron 27 has hinged about its rear end, as at 28, a plate 29, which is adapted to have a limited sliding movement back and forth upon the upper rear portion 30 of the beam. Journaled at the opposite ends of the portion 30 of the beam are spindles 31, provided with pinions 32 and provided at their upper ends with knobs 33, by means of which said pinions may be rotated. The plate 29 is provided with elongated slots 34, through which the spindles 31 pass, and formed on the under side plate are racks 35, which are in engagement with said spindles. Normally the forward or front edge of the apron 27 rests under and behind extensions 36, formed on the upper ends of the pens, and when it is desired to raise said apron to afford access to the operative parts the knobs 33 are rotated, so as to turn the pinion 32, and the latter being in engagement with the racks 35 of the plate 29 the apron 27 will be retracted, so that its forward edge will be withdrawn from behind and from under the extensions 36 on the pens, when the apron may be raised and folded back, the slots 34 in the plate 29 permitting of this movement. Said slots 34 also subserve another useful function—namely, as the lazy-tongs are folded and unfolded to adjust the pens toward and from each other it will be obvious that the pens also move to and fro lengthwise—and by providing the slots 34 the apron 27 will be enabled to move back and forth to correspond with the movement of the pens.

It will be obvious that as the main system of lazy-tongs is folded and unfolded the auxiliary system of lazy-tongs will also be folded and unfolded in a lesser degree, moving the pens closer together or farther apart, the relative distances between the pens being maintained uniform—that is to say, as the pens are adjusted nearer together or farther apart the distance between any two of the pens will be precisely the same as the distance between any other two of the series of pens. It will be evident that as the pens are adjusted toward and from one another each preceding pen proceeding from the fixed end of the lazy-tongs—in the present instance shown at the left hand—will of necessity have to travel twice the distance traveled by the succeeding pen—that is to say, if the second pen is moved an inch away from the first pen said second pen will of course travel a distance of one inch. Consequently the third pen in moving an inch from the second pen will have to move two inches, and the fourth pen in moving an inch from the third pen will have to move a distance of three inches, and so on throughout the entire series of pens. It therefore follows that in adjusting the pens to separate them or increase the distance between them each preceding pen will have to move twice as fast as each succeeding pen, and this adjustment of the pens is accom-



plished by means of the following mechanism: Pivoted on the enlarged portions 13 of each of the pivot-bolts 12 is a bracket, (indicated in a general manner by the numeral 37,) each of said brackets comprising an arm consisting of two members 38 and 39, bent at right angles to each other, and attached to or formed with each of said brackets is a reciprocating bar, said bars being indicated by the numerals 40 to 54, both inclusive. The upper edges of said bars are provided with rack-teeth 55 and are arranged to reciprocate in guides 56, attached to the back of a housing 57. As shown, the rack-bars are arranged side by side in groups, the number of groups and the number of rack-bars in each group depending upon the number of pens adapted to be carried by the apparatus. In the present instance I have shown four such groups, (respectively indicated by the reference-letters A, B, C, and D,) the groups A, B, and C each comprising four rack-bars and the group D three. For the sake of compactness the rack-bars of each group are arranged side by side and overlap one another at their toothed ends in different horizontal planes. Journaled in the sides of the housing 57 are four shafts, respectively numbered 58, 59, 60, and 61. Fixed on the shafts 58 and 59 are gear-wheels 62 and 63, which are geared together by an intermediate gear-wheel 64, and fixed on the shafts 59 and 60 are gear-wheels 65 and 66, which are geared together by an intermediate gear-wheel 67, and fixed on the shafts 60 and 61 are gear-wheels 68 and 69, geared together by an intermediate gear-wheel 70. It will be obvious that the shafts 58, 60, and 61 through the described trains of gears will receive their movements from the shaft 59. Fixed on one end of the shaft 59 is a worm-wheel 71, and gearing with said worm-wheel is a gear 72, which is fixed on one end of a shaft 73, that is adapted to be rotated by a crank, so that by turning the crank the shaft 59 will be rotated and in turn will rotate the shafts 58, 60, and 61. Fixed on the shafts 58, 59, 60, and 61 are groups of gear-wheels, (respectively indicated in a general way by the reference-letters *d*, *c*, *b*, and *a*.) The three groups of gear-wheels *a*, *b*, and *c* each comprises four gears, each succeeding gear of each group being of greater diameter than the preceding gear of the same group, and the group *d* of gear-wheels comprises three gears of corresponding different proportions, the several gears of the groups *a*, *b*, *c*, and *d* engaging the corresponding rack-bars of the groups A, B, C, and D. It will be noted that the gears comprising the group *b* are larger than those of the group *c*, that the gears in the group *c* are correspondingly larger than those in the group *d*, and, finally, that the gears comprising the group *a* are larger than those comprising the group *b*. Hence it will be apparent that when the shafts

are rotated they will in turn rotate the four groups of gear-wheels, and the latter being in engagement with the several groups of rack-bars the latter will be reciprocated in one direction or the other, according to the direction in which the shafts are turned. The several groups of gear-wheels being of different size, as before described, the group A of rack-bars, which are connected with the levers nearest the free end of the main system of lazy-tongs, will be moved faster than the group B of rack-bars, which are connected with the levers of the main system of lazy-tongs next adjacent to those connected with the group A, and the same is true of the groups D and C and that rack-bar of the group A which is connected to the outermost pair of levers on the free end of the main system of lazy-tongs. Being in engagement with the largest gear-wheel of the group *a*, said rack-bar will be moved faster than the next adjacent rack-bar, and so on through said group and through each of said groups of gear-wheels and rack-bars, the arrangement being such that each pair of levers of the lazy-tongs proceeding from left to right will move faster than the preceding pair—that is to say, will move a greater distance in the same time. As before described, it is necessary for each pen as the pens are adjusted farther apart to move approximately twice the distance that is moved by each succeeding pen, and the differential gearing will operate to actuate the lazy-tongs in such manner as to simultaneously spread apart all the pens uniformly, or, in other words, will simultaneously spread out all the pens and during the operation retain a uniform distance between each pair of pens. Should only one rack-bar be employed and attached to the outer pair of levers at the free end of the main system of lazy-tongs, then in unfolding said lazy-tongs to spread apart the pens there would be an irregular movement of said pens relatively one to the other, owing to the fact that there is a certain amount of lost motion between the levers comprising the lazy-tongs, and hence the pens nearest the fixed or stationary portion of the lazy-tongs would have less movement than those nearest the movable ends of said tongs, and hence the pens would not be uniformly spaced apart; but by providing the several groups of rack-bars and the differential gearing for actuating them all parts of the lazy-tongs are so moved as to cause the pens to be uniformly spaced apart.

In the above-described operation of the device I have referred to the pens as being adjusted away from each other, so as to cause them to rule lines at increased distances apart; but it will be obvious that the same action will take place when the parts are reversely actuated—that is to say, when the mechanism is operated to adjust the pens nearer together.

Should it be desired to rule lines farther



apart than the above-described mechanism will provide for, it is only necessary to remove each alternate pen, when the same mechanism may be employed for adjusting the pens, and this operation may be repeated as often as desired, thereby obtaining an almost unlimited latitude of adjustment with the same machine.

In order that the pens may be spaced apart at any predetermined or desired distance without actually measuring the distance between the pens, I fix on any one of the shafts—such as shaft 61, for example—a wheel 74, which is graduated on its periphery into fractions of inches or fractions of other units of measurement, so that by actuating the differential gearing to adjust the pens the graduated marks on the wheel 74 will indicate when the desired adjustment has been obtained. Any suitable index-hand, pointer, or score-mark arranged over or opposite the periphery of said wheel to indicate when the proper adjustment has been effected may be employed. In the drawings a window 75 is shown in the housing inclosing the gearing, said window being arranged over the periphery of the graduated wheel 74, and a transverse mark is made on the window-pane, by means of which the graduations on said wheel can be accurately read.

In some of the methods of ruling it is customary to merely form a series of parallel heavy lines indistinct in colors to form what is known in the art as a "heading." In other ruled paper it is the practice to form what is known as a "box-heading"—that is to say, a heading that is inclosed between a series of closely-ruled lines and another line or lines arranged parallel thereto at some distance therefrom. In order to form both the plain and the box heading, I provide the following mechanism: Arranged to slide on the upper surfaces of the bearing-plates 4 is a plate 76, through which projects a spindle 77, provided at its opposite ends with heads 78. About said spindle and between said plate and the uppermost head is disposed a spiral spring 79, the arrangement being such that the spring operates to hold the plate firmly to its seat on the bearing-plates. Arranged on the end of the beam 1 is a plate 80, in which is journaled a rod 81, said rod being threaded and passing through a corresponding threaded aperture in the spindle and at its outer end is provided with a milled knob 82, by means of which the rod is made to conveniently turn to adjust the plate back and forth upon the bearing-plates 4. Said plate is provided at its forward edge with a horizontally and forwardly projecting plate 83, which is provided at its opposite edges with depending lugs 84, said lugs being provided with threaded apertures through which projects a threaded shaft 85. A plate 86 is superimposed upon said horizontally-projecting plate and is attached to a substantially U-shaped yoke, which is fulcrumed intermediate its ends, as at 87, and the lower

end of said yoke is disposed beneath the threaded rod 85. The threaded rod 85 is provided with a beveled portion 88, which is adapted to engage the free end of the U-shaped yoke, the arrangement being such that when the threaded rod is screwed up its beveled portion will engage the free end of the yoke and clamp the two plates together. Adapted to be secured between said plates is a series of needles 89, which are designed to rule the heading, and it will be evident that each machine may be supplied with a number of different head-ruling pens, so that by clamping any one of the different heading series of pens any desired head-line or ruling may be formed. By turning the rod 81 in one direction or the other the pens designed to form the head-lines may be adjusted toward and from the ruling-pens arranged to form the first line on the sheet, and in this manner a head-line of any preferred design may be formed and may be ruled at any desired distance on the initial line of the ruled paper.

By causing the forward edge of the downward-curved apron 27 to engage the extensions 36 of the pens in the manner shown and described all the pens will be caused to bear with a uniform pressure on the paper, whereby the ruled lines will present a substantially uniform appearance.

Having described my invention, what I claim is—

1. In a ruling-machine, the combination with a beam, of a system of lazy-tongs supported by and movable on said beam, a series of penholders carried by the lazy-tongs, differential gearing and connections between said differential gearing and different portions of said lazy-tongs for opening and closing said portions of the lazy-tongs simultaneously at different speeds, substantially as described.

2. In a ruling-machine, the combination with a beam, of a main system of lazy-tongs supported by and movable on said beam, an auxiliary system of lazy-tongs connected to and movable with the main system of lazy-tongs, a series of penholders carried by the auxiliary lazy-tongs, and means for opening and closing the main system of lazy-tongs to adjust the penholders relatively one to another, substantially as described.

3. In a ruling-machine, the combination with a beam, of a main system of lazy-tongs supported by and movable on said beam, an auxiliary system of lazy-tongs connected to and movable with the main system of lazy-tongs, a series of penholders removably attached to and movable with the auxiliary system of lazy-tongs, and mechanism for folding and unfolding the main system of lazy-tongs to adjust the pens relatively one to another, substantially as described.

4. In a ruling-machine, the combination with a beam, of a system of lazy-tongs supported



by and movable on said beam, a series of pens connected to and movable with the lazy-tongs, a series of rack-bars connected at different points throughout the length of said lazy-tongs, and differential gearing for simultaneously moving said rack-bars at different speeds, substantially as and for the purpose specified.

5. In a ruling-machine, the combination with a beam, of a system of lazy-tongs supported by and movable on said beam, sleeves pivotally arranged on the forward meeting ends of the levers constituting the lazy-tongs, perforated pivots arranged on the opposite ends of said levers, penholders fitted in said sleeves and projecting through said perforated pivots, and means for folding and unfolding the lazy-tongs, for the purpose specified.

6. In a ruling-machine, the combination with a beam, of a system of lazy-tongs supported by and movable thereon, sleeves pivotally attached to the forward meeting ends of the sleeves constituting said lazy-tongs, perforated pivots on the other ends of said levers, notched penholders fitted in said sleeves and projecting through said perforated pivots, and springs carried by said sleeves and arranged to engage the notches in the penholders to hold the latter in place, substantially as described.

7. In a ruling-machine, the combination with a beam, of a system of lazy-tongs supported by and movable on said beam, a series of penholders carried by said lazy-tongs, ruling-pens fitted on the ends of said holders and provided with upwardly and rearwardly inclined extensions, a slidable cover arranged over the lazy-tongs and penholders and arranged at its forward edge to engage said extensions, and means for folding and unfolding the lazy-tongs to adjust the pens relatively one to another, substantially as described.

8. In a ruling-machine, the combination with

a beam, of a series of ruling-pens carried thereby, a plate movably arranged on one end of the said beam and provided with a forwardly-projecting extension, a movable plate arranged over said extension, a substantially U-shaped arm attached to said plate and pivoted thereto intermediate its ends, a set-screw provided with a beveled portion arranged to engage the free end of said arm, whereby said plates may be clamped together to hold a pen for ruling the head-line, and means for adjusting said plate toward and from the series of ruling-pens, substantially as and for the purpose specified.

9. In a ruling-machine, the combination with a longitudinally-slotted beam, of a series of ruling-pens supported thereby, a plate movably arranged on one end of said beam and provided with a clamp for holding a pen constructed to rule the head-line, a spring-bolt passing through the slot in said beam and through said plate, and an adjusting-screw passing through said spring-bolt and held against endwise movement, substantially as described and for the purpose specified.

10. In a ruling-machine, the combination with a longitudinally-grooved beam, of a system of lazy-tongs supported on said beam, the central pivots of the levers comprising said tongs being movably fitted in said groove, a series of penholders carried by said lazy-tongs, members connected at different points throughout the length of said lazy-tongs for folding and unfolding the same, and means for simultaneously moving the said members.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HARRY C. CROZIER.

Witnesses:

THEO. S. SMITH,  
WM. S. SMITH.