

No. 804,303.

PATENTED NOV. 14, 1905.

D. CARLAW, SR., D. CARLAW, JR., A. L. CARLAW, & J. W. CARLAW.

PRINTING AND NUMBERING MACHINE.

APPLICATION FILED APR. 28, 1904.

5 SHEETS—SHEET 1.

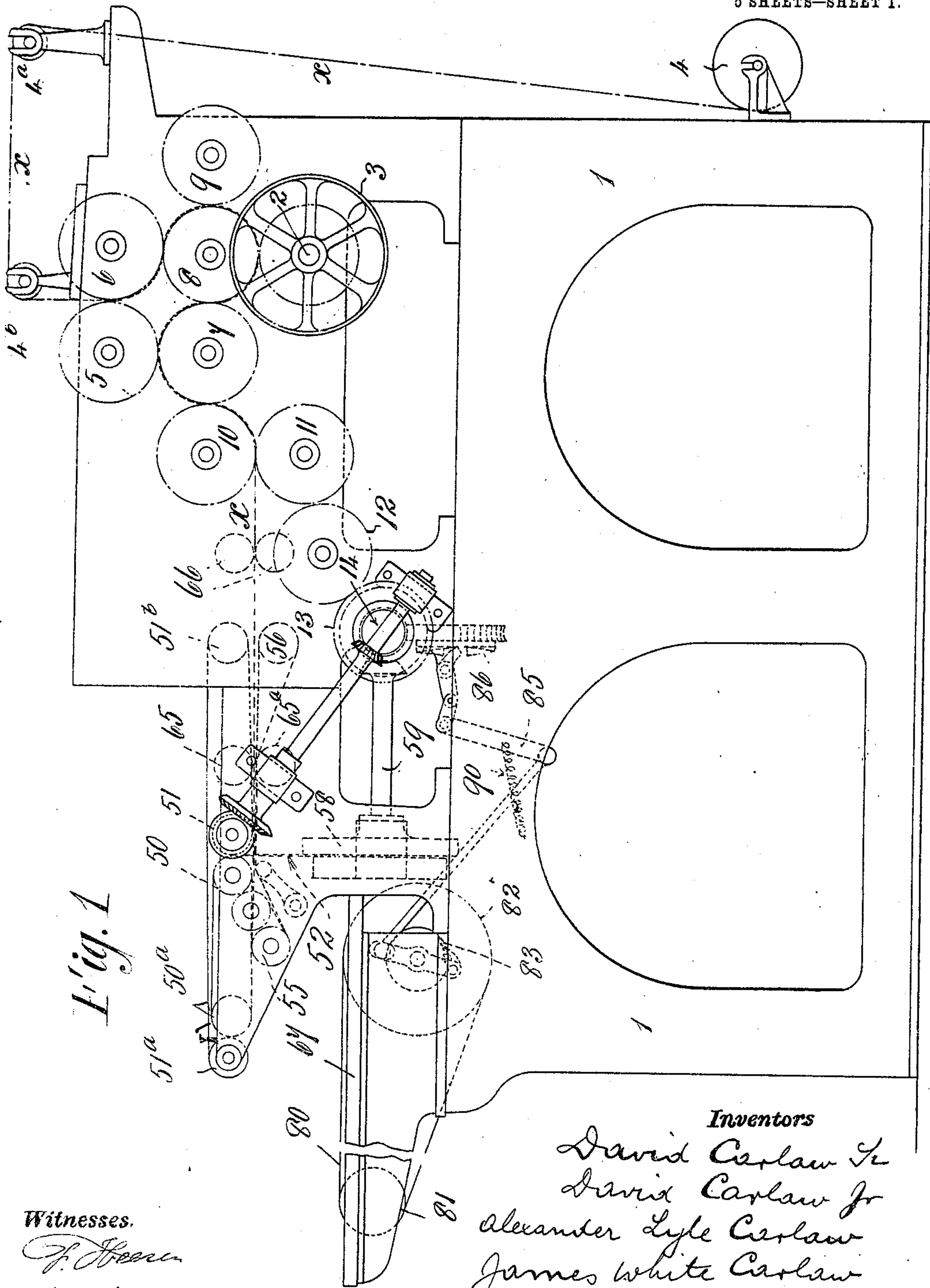


Fig. 1

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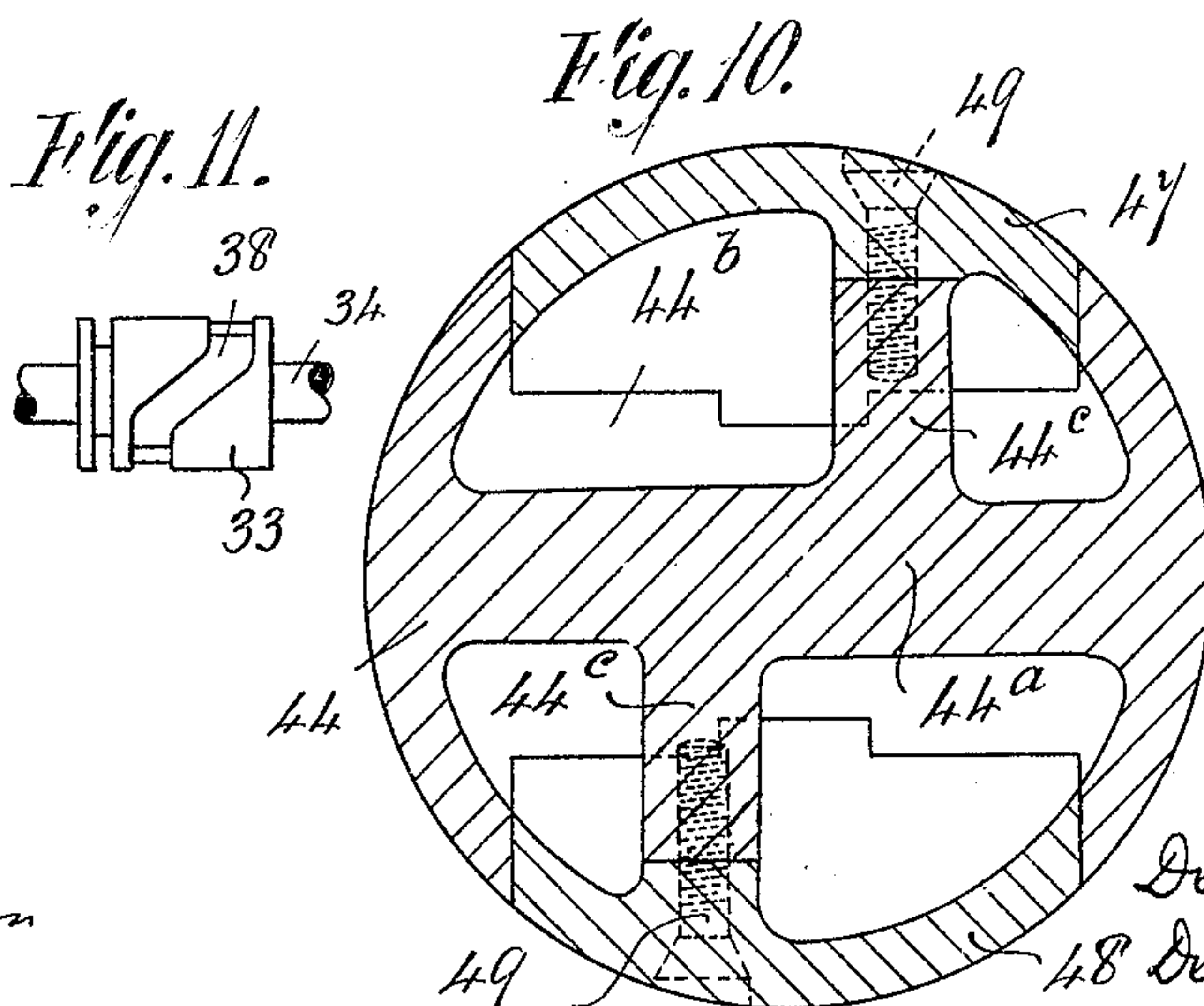
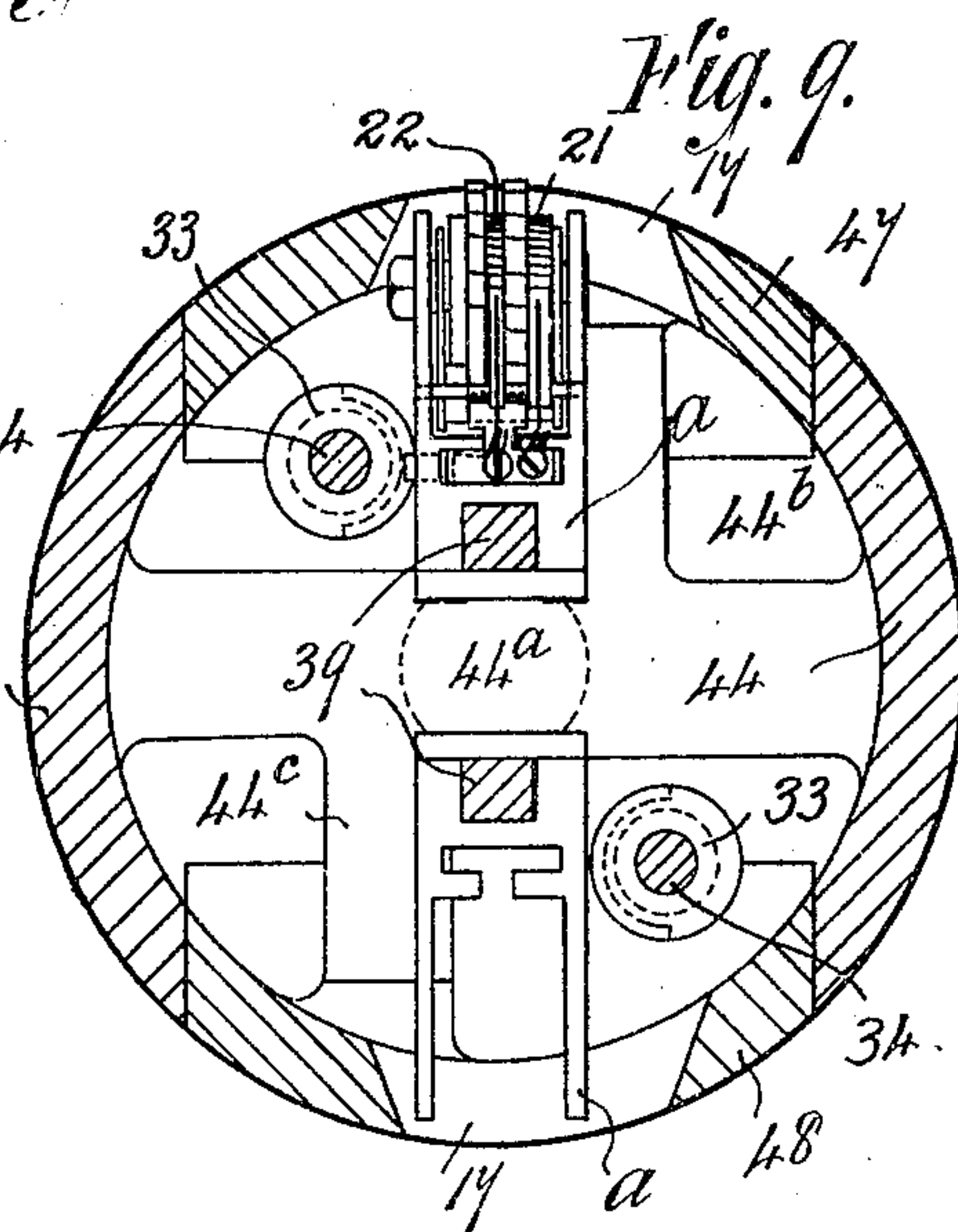
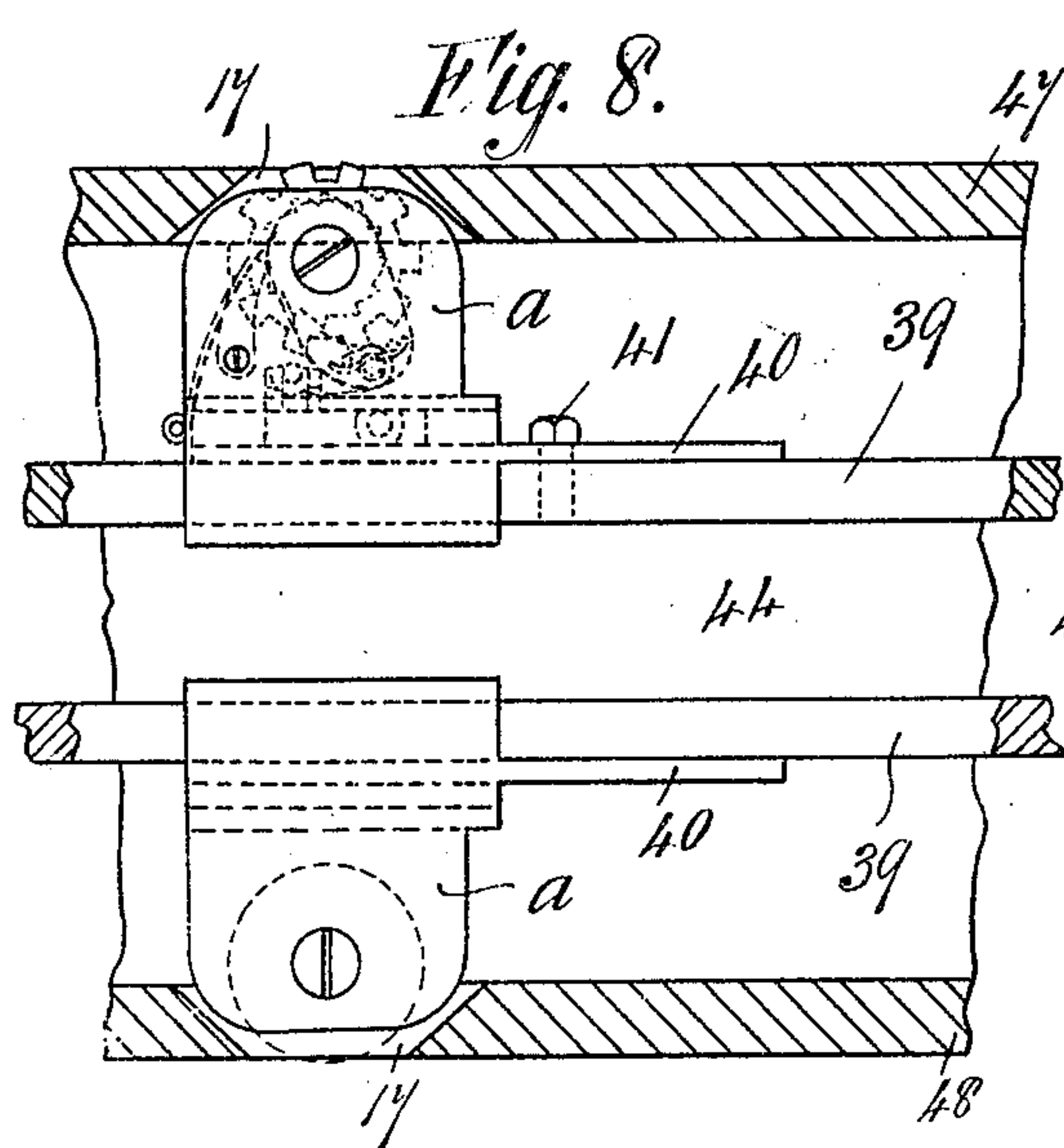
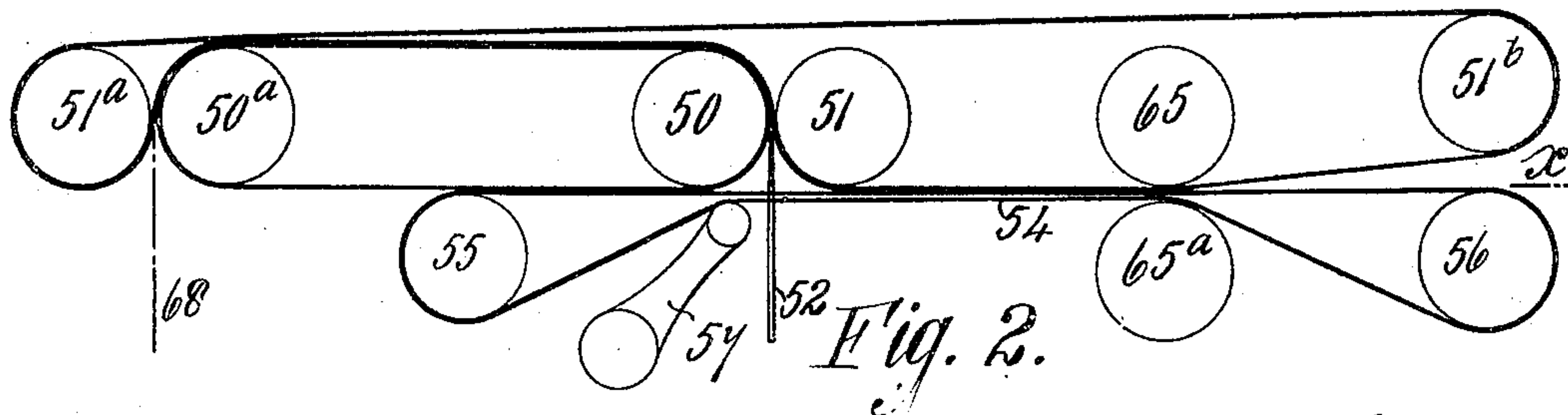
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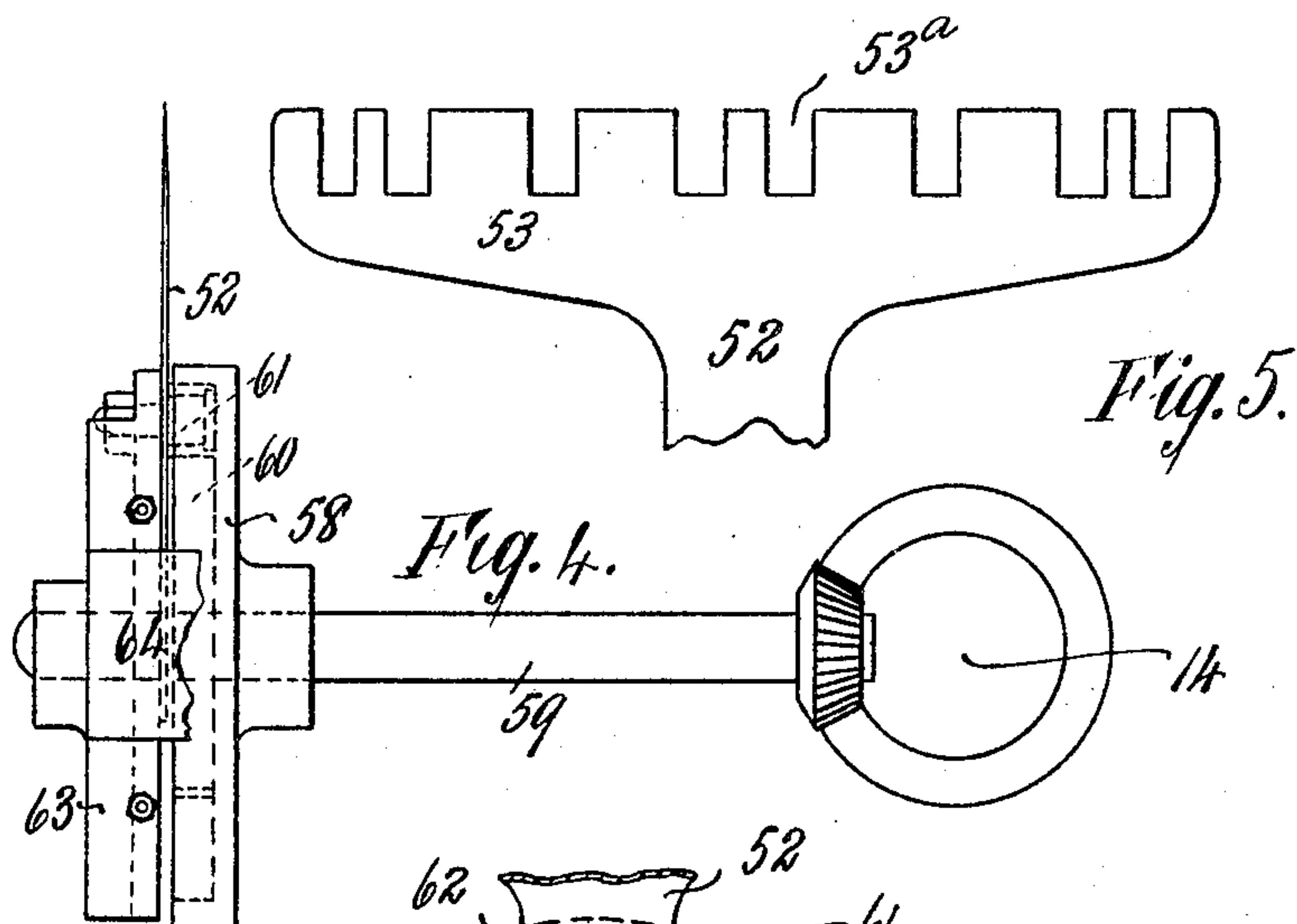
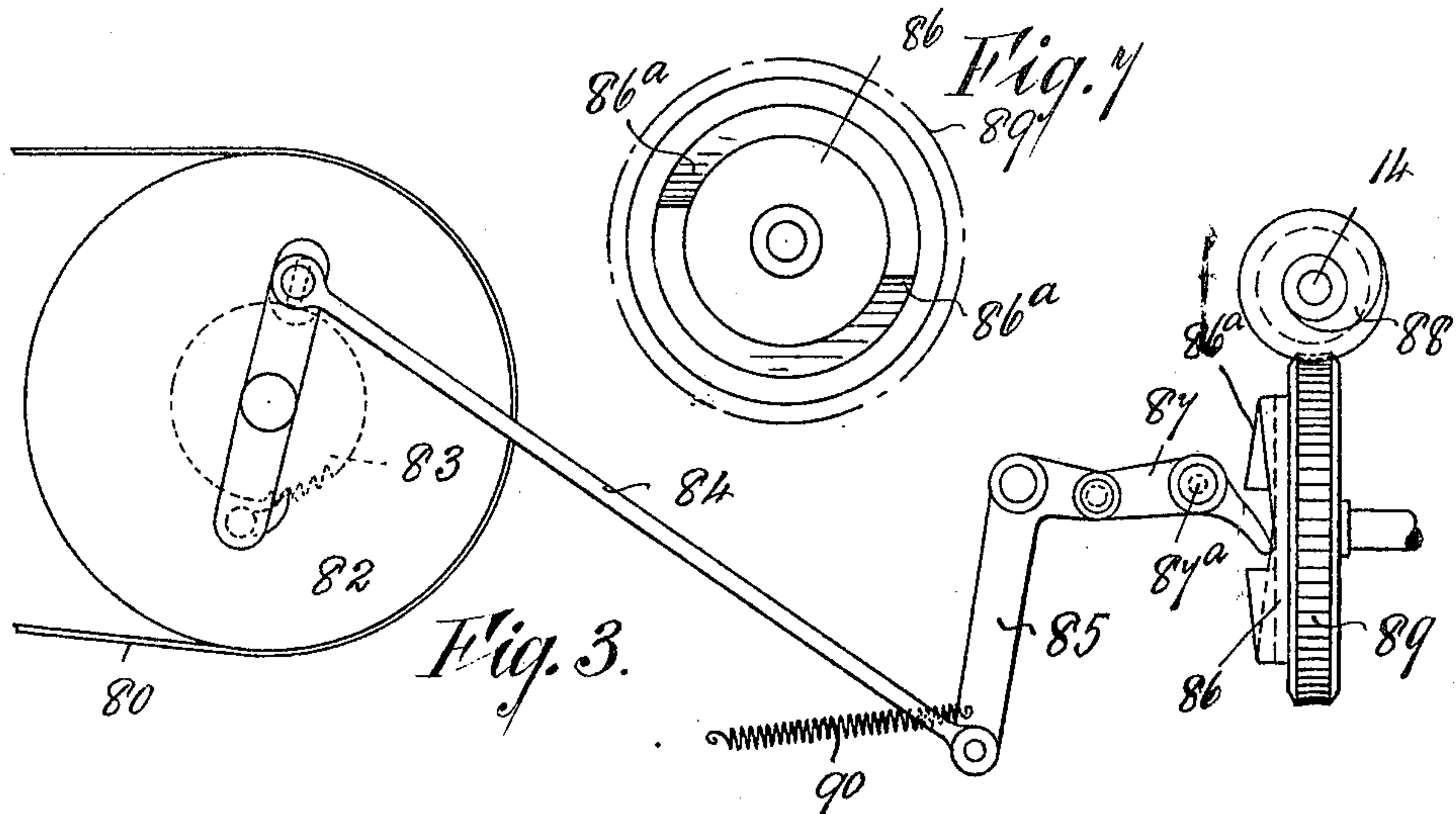
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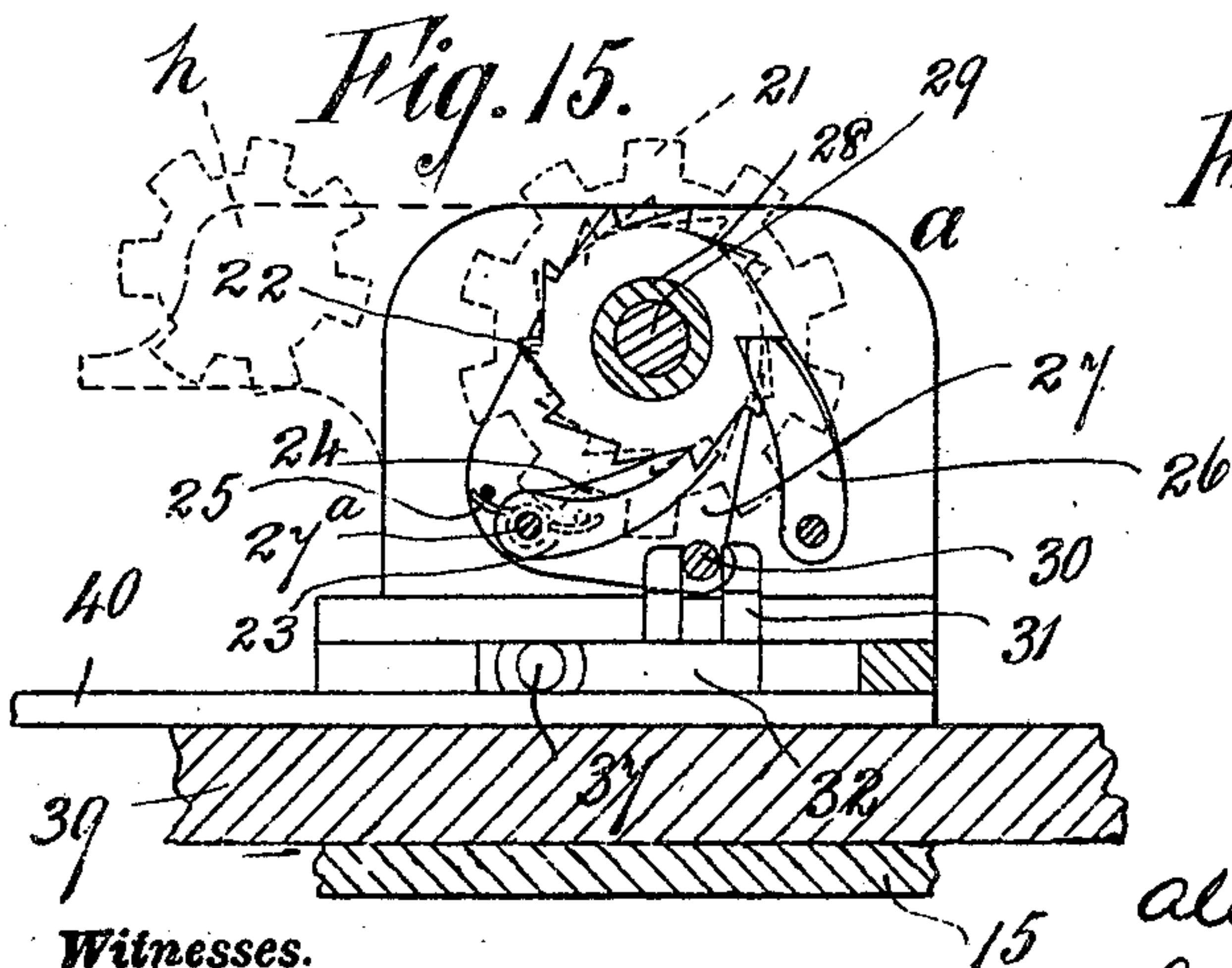
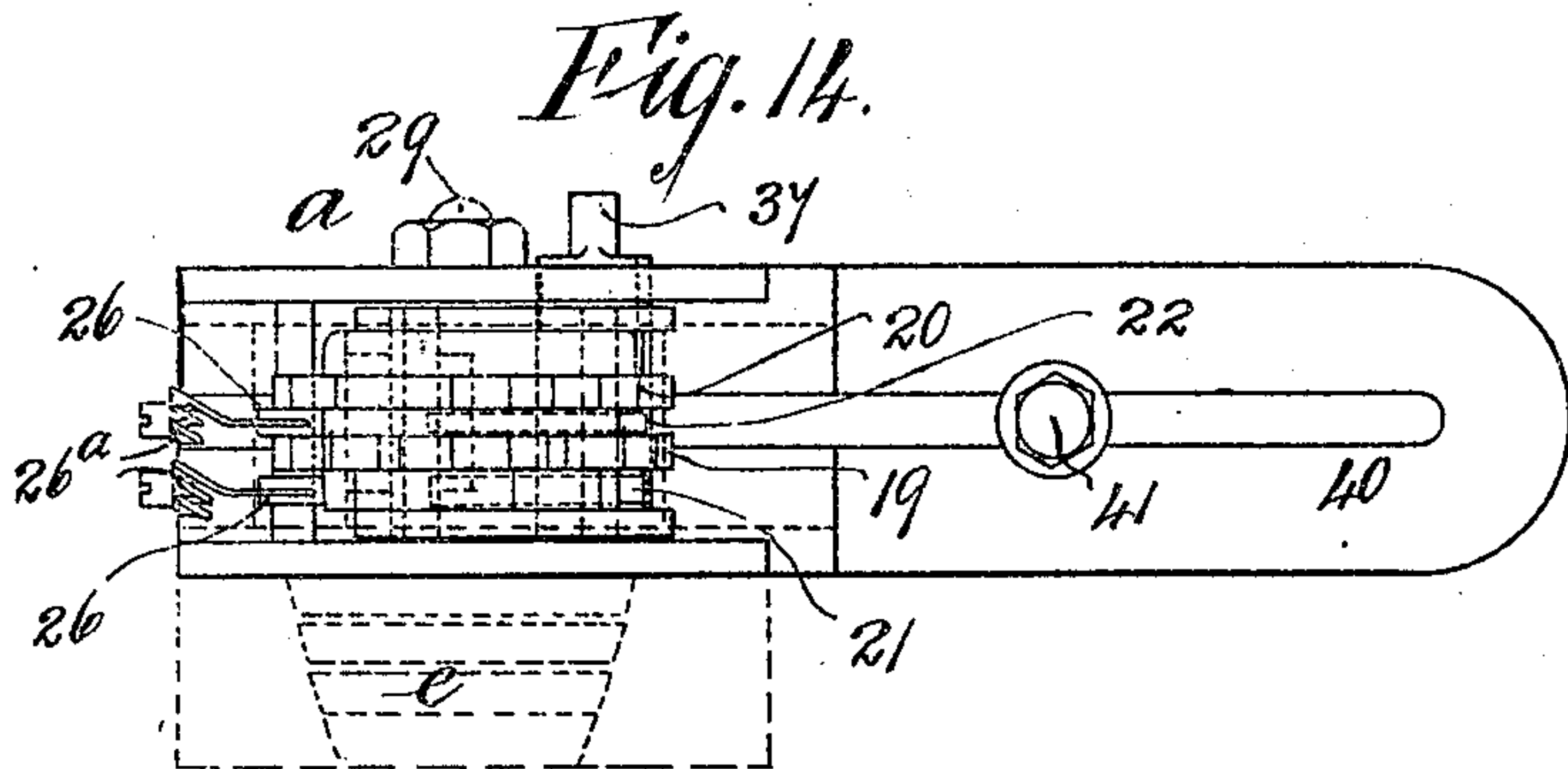
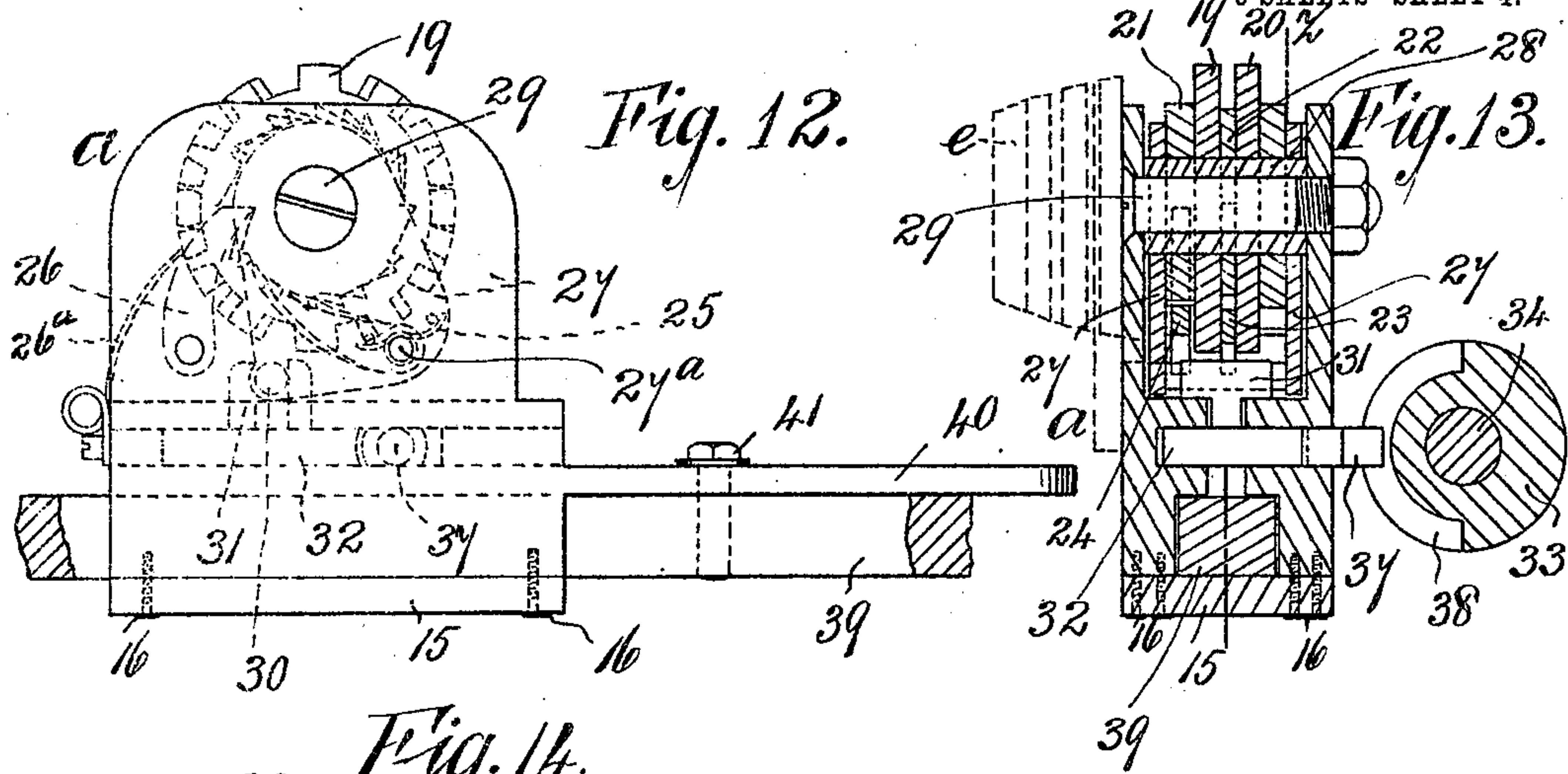
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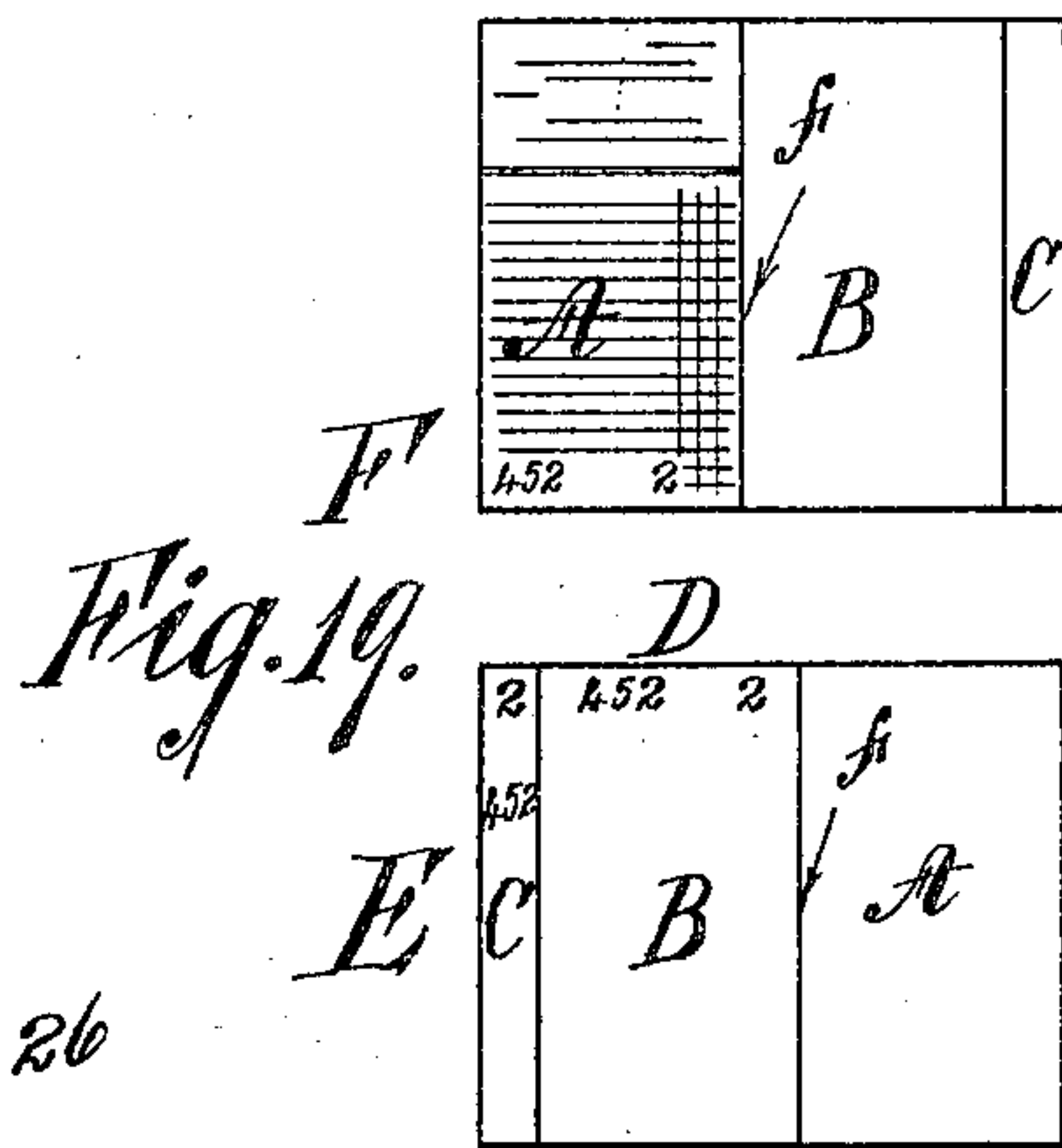
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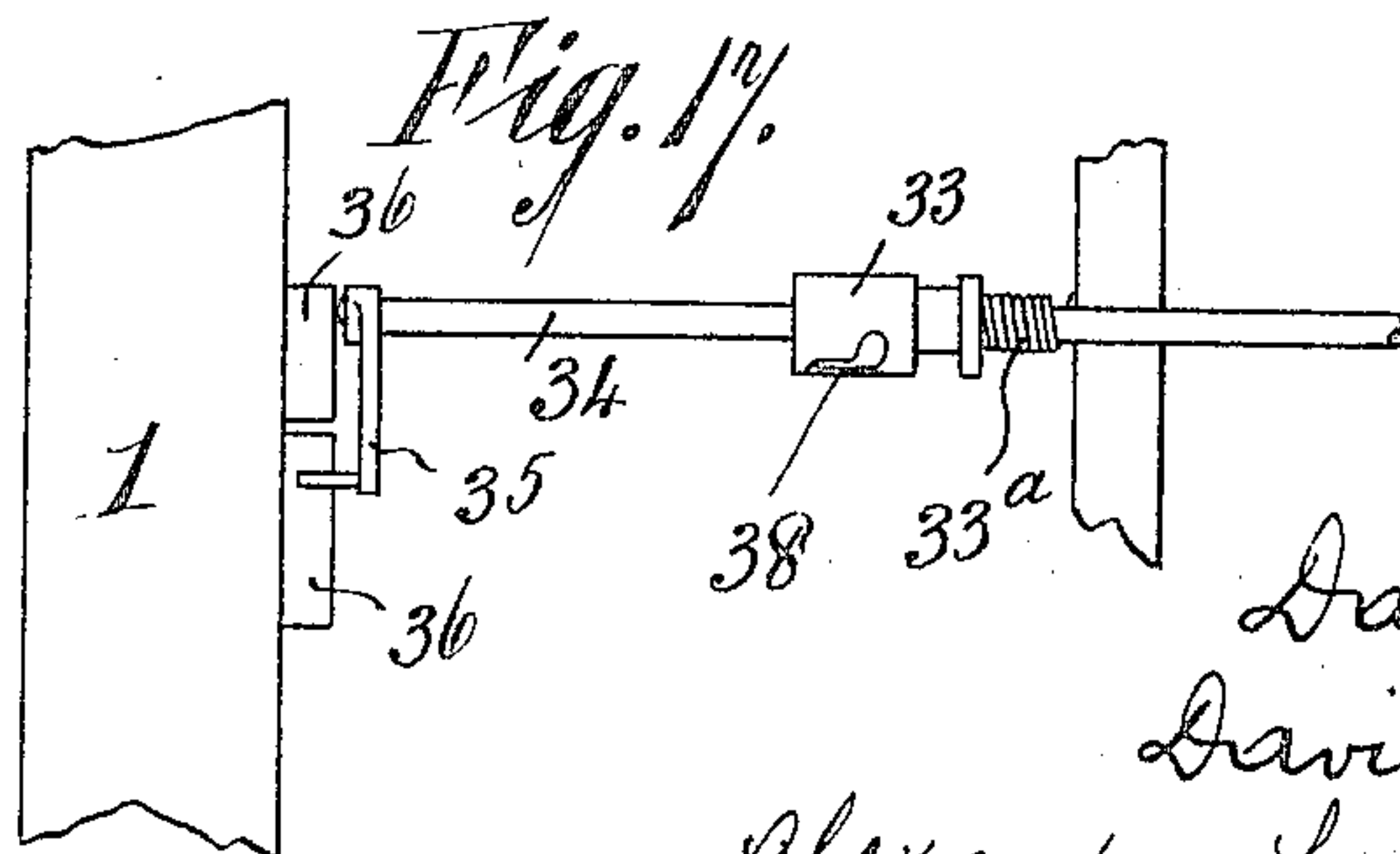
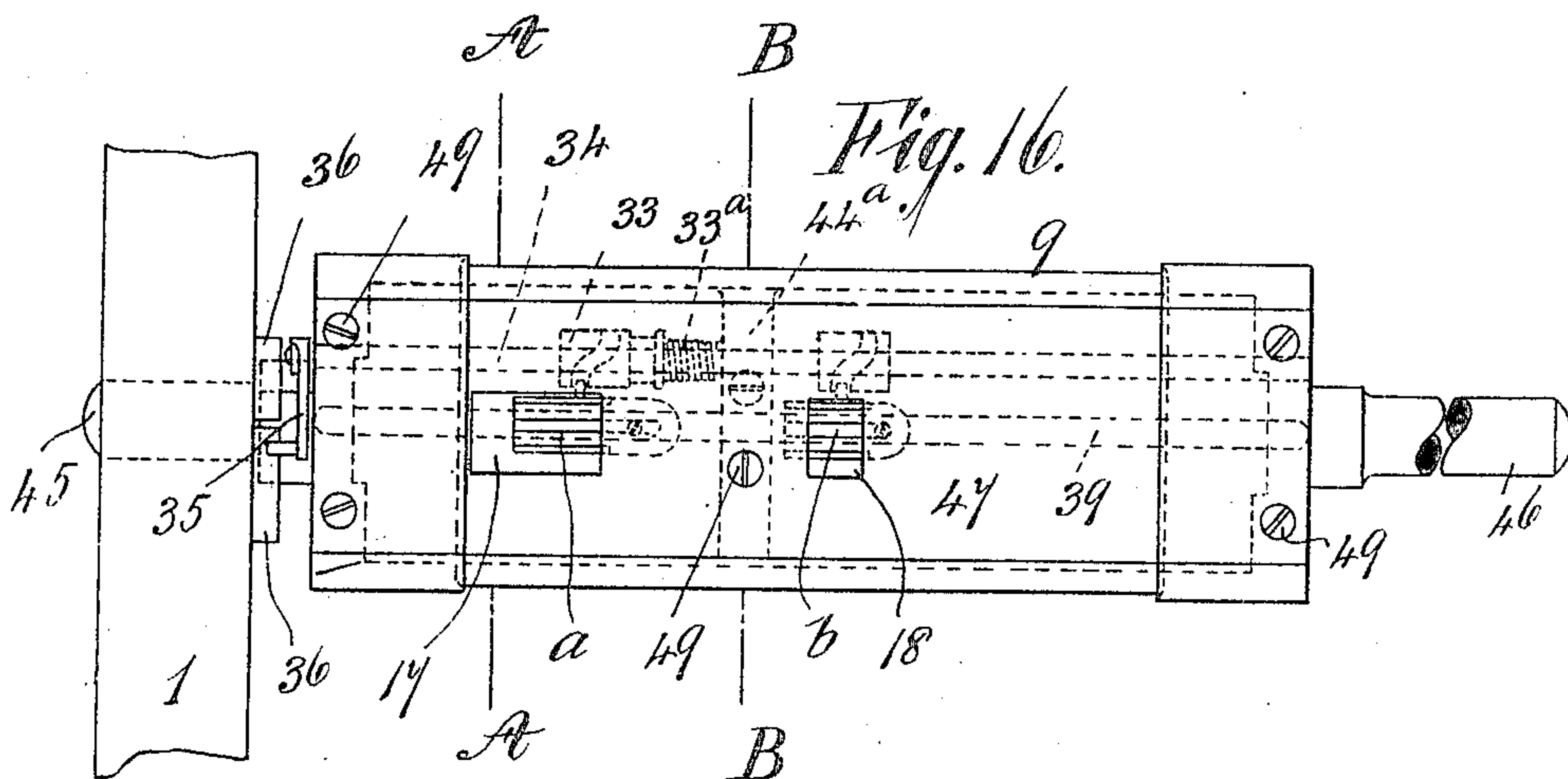
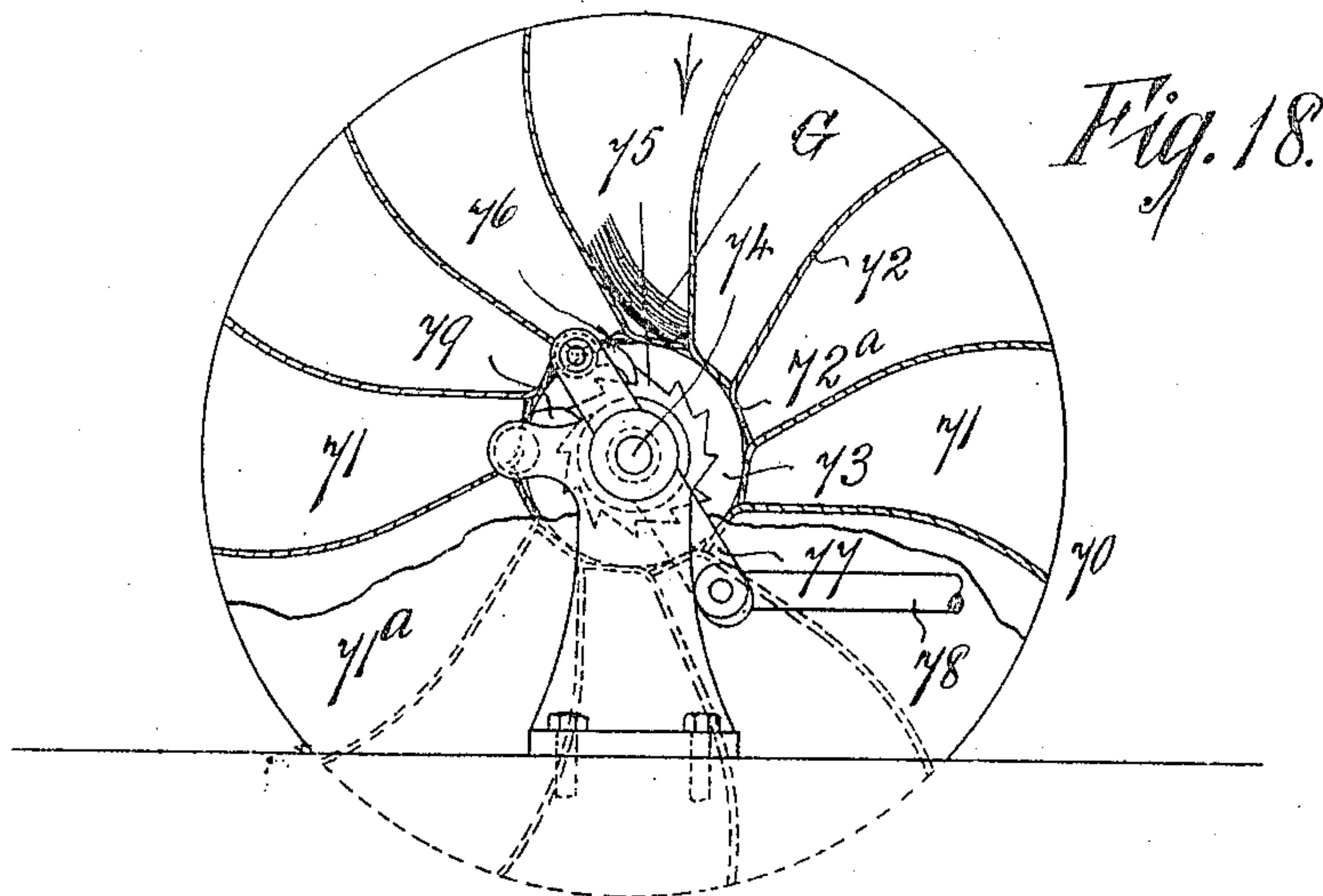
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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

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PRINTING AND NUMBERING MACHINE.

No. 804,303.

Specification of Letters Patent.

Patented Nov. 14, 1905.

Application filed April 28, 1904. Serial No. 205,412.

To all whom it may concern:

Be it known that we, DAVID CARLAW, Sr., DAVID CARLAW, Jr., ALEXANDER LYLE CARLAW, and JAMES WHITE CARLAW, engineers, subjects of the King of Great Britain, all of 11 Finnieston street, Glasgow, Scotland, have invented certain new and useful Improvements in Printing and Numbering Machines, of which the following is a specification.

10 This invention relates to improvements in rotary letter-press printing and numbering machines such as described in the specification of David Carlaw's prior United States patent, No. 385,592, July 3, 1888. The machine, which is mainly designed for printing and numbering counter check-books, bill-heads, tickets, labels, and such like, works from a reel of paper and delivers the sheets whole or cut and perforated and folded.

20 The present invention comprises several improvements on and additions to the original invention.

Under the present invention the machine is made with hollow printing and numbering cylinders, having the numbering-wheel cases fitted removably therein and longitudinally of the cylinder, so that the numbering-wheels revolve in a plane at right angles to the plane of revolution of the cylinder. The numbering-wheels, which print through recesses in the surface of the cylinder, as before, are operated by driving pawl-and-ratchet gear. The pawl is connected with a slide, from which a stud projects. This stud works in a slot in a cam on a shaft which extends longitudinally through the cylinder and is turned at the proper times by means of cam mechanism at the side of the machine, so as to move the slide and actuate the pawl-and-ratchet gear and turn the numbering-wheels. Retaining-pawls are provided in connection with the numbering-wheels, which latter may be constructed and arranged in a similar manner to the numbering-wheels described in specification of Patent No. 385,592, of 1888. Each set of numbering-wheels (for numbering from "1" to "50" or "1" to "100," &c.) is contained within a case, which is carried by and is adjustable (by means of a slot and pin or other suitable arrangement) on a rectangular bar arranged longitudinally within the cylinder. In cases where it is desired to print salesmen's or other numbers, as well as the ordinary consecutive numbers for the checks,

the numbering-wheel case may carry also wheels arranged near the consecutive-numbering wheels and adapted to print through the recess in the cylinder the salesmen's or other numbers. These wheels may be turned by hand. Spring-pawls are provided for holding the wheels in position. There may be two sets of numbering-wheels arranged at opposite sides of the cylinder with shafts and mechanism for operating them. The numbering-wheels on both sides of the cylinder would print through recesses in the cylinder-shells. If desired, there may be more than two sets. The printing-cylinder is made in parts, which are screwed in place in such manner that they can be removed and the wheel-cases, with their wheels, removed for the purpose of being changed or for other desired purpose. We prefer to make the cylinder with a solid body, having the journals at the ends, and a part at each side, which is removably screwed to the body. Mechanism for folding the sheets being printed and numbered is or may be also provided on the machine. This mechanism may consist of two rollers with a vertically-moving folding-knife arranged to work between. This knife, which is cut so as to clear the traveling tapes of the machine, is operated by cam mechanism so as to rise up at the proper times and fold the paper being carried along by the tapes. The operating-cam can be fixed by a feather to its shaft and can be altered to suit the folding required.

We provide the machine with a revolving hopper or collector for the printed checks, sheets, or the like, being printed and (or) numbered, which consists of a wheel formed by two disks with a series of curved blades or partitions extending between the disks, so as to form a series of radial chambers or hoppers. The partitions or blades are curved in a special manner, springing from the hub at a tangent thereto and then bending gradually outward to the circumference of the wheel. This collecting-hopper wheel receives the checks, sheets, &c., and then discharges them onto the table or onto a belt leading to the table or into a receptacle. The hopper-wheel may be driven by means of worm-gear, which actuates a cam, which latter kicks at the proper times a bell-crank and shifts a driving-pawl engaging with a ratchet-wheel on or in connection with the hopper-wheel, so as to

move the ratchet one tooth at a time and turn the hopper-wheel through an arc sufficient to move the chambers round one at a time. The hopper-wheel is driven at the proper speed in order to collect in each chamber the desired number of checks, sheets, &c., and owing to the curvature of the partitions the checks, &c., are received and lie upon one another in their proper sequential order. The advantage of this hopper-wheel is that the proper number of checks, sheets, &c., to be bound into each book can be collected in each chamber and will lie therein in their proper sequential order, so that as the hopper-wheel revolves and discharges the contents of each chamber the checks, sheets, &c., are delivered ready to be bound together in books.

We will now proceed to more particularly describe the invention with reference to the accompanying sheets of drawings, which show, by way of example, our improvements as adapted to a machine for printing and numbering salesmen's check-books.

Figure 1 is a general view of the machine, but simply showing or indicating such parts thereof as may be necessary for the clear understanding of the invention. Fig. 2 is a diagrammatic view showing the arrangement of tapes for the folding and delivering part of the machine. Fig. 3 is a side view of the mechanism for driving the band 80. Fig. 4 is a side view of the folding-knife and its actuating mechanism. Fig. 5 is a front view of the folding-knife. Fig. 6 is a front view of the knife mechanism, Fig. 4. Fig. 7 is a front view of the cam-wheel, Fig. 3. Fig. 8 is a part longitudinal section, Fig. 9 a cross-section on the line A A, Fig. 16, and Fig. 10 a cross-section on the line B B, Fig. 16, of one of the numbering-cylinders. These views are drawn to a scale twice as large as Fig. 16. Fig. 11 is a side view of the cam 33. Fig. 12 is a front view, Fig. 13 a cross-section, and Fig. 14 a plan view of a numbering-wheel case with its numbering-wheels and accessories. Fig. 15 is a sectional view looking at the opposite side of the case from Fig. 12 and taken on the line Z Z, Fig. 13. Some of the parts are removed so as to clearly show the ratchet mechanism. Fig. 16 is a plan view of one of the numbering-cylinders. Fig. 17 is a detail view of the rocking bar or shaft 34 and its cam. Fig. 18 is a partial vertical section of the collecting-hopper wheel. Fig. 19 is a front and back view of a leaf of a check-book printed in the machine.

Referring to the drawings, whereon the same reference characters wherever repeated indicate the same or similar parts, 1 is the machine-framing.

2 is the main shaft, which may be driven by belt-pulleys 3 or otherwise. This shaft drives, by means of any suitable and well-known arrangement of gear-wheels, all the various cylinders of the machine.

4 is the paper web or roll, and x indicates the paper as it passes through the machine.

5 is a printing and numbering cylinder; 6, a cylinder for printing the salesmen's and book numbers on the fly or duplicate sheet; 7 and 8, impression or blanket cylinders; 9, a cylinder for printing the stub and salesmen's numbers; 10 and 11, the perforating-cylinders; 12 and 13, gear-wheels, and 14 the shaft of the wheel 13.

It will be seen by comparison of the specifications that the present machine is similar in some respects to the machine described in the specification No. 385,592, of 1888.

In our present invention each hollow printing and numbering or merely numbering cylinder has, as shown at Figs. 8, 9, and 16, the numbering-wheel cases a fitted removably therein and longitudinally of the cylinder, so that the numbering-wheels revolve in a plane at right angles to the plane of revolution of the cylinder. It will be seen that the cylinder at Fig. 16 is made with two recesses or openings 17 18, through which the printing-teeth of the numbering-wheels a b project, so as to print the sheets or checks, and it will also be clearly seen from Figs. 8 and 9 that the numbering-wheels are arranged upon bars 39, which run longitudinally of the cylinder.

As shown clearly at Figs. 12, 13, 14, and 15, the numbering-wheels 19 20 of the case a have ratchets 21 22, and engaging with the ratchets are driving-pawls 23 24, which are retained in engagement with the teeth of the ratchets by springs 25.

26 indicates retaining-pawls, and 26^a the springs of said pawls. The driving-pawls are fulcrumed at 27^a on a swinging arm 27, which is made double and hung loosely on the sleeve 28 of the bolt 29 of the wheel-case. The swinging arm is provided with a pin 30, with which a jaw 31 on the slide 32 engages. This slide has a laterally-projecting stud 37, which enters an oblique or curved slot 38 in the cam 33 of the rock bar or shaft 34. This bar extends longitudinally of the cylinder and one of its ends is prolonged out through the cylinder and is provided with an arm or crank 35, which is acted on by cams 36 on the side of the machine-framing 1. The bar is also acted on by a torsion-spring 33^a, which is adapted to bring it back after each action of the cams 36. (See Figs. 16 and 17.) At each revolution of the numbering-cylinder the crank 35 is rocked and the cam 33 moved so as to actuate the slide 32 and swinging arm 27 and move the pawls 23 24 and turn the ratchets 21 22 and numbering-wheels 19 20.

Preferably when printing the leaves of salesmen's check-books we make each numbering and printing cylinder of such a diameter that it will print and number at each revolution two complete sheets, such as shown at Fig. 19. In order to number the sheets, we arrange two sets of numbering-wheels a a

in the circumference of the cylinder, one set at one side and the other set at the opposite side, as shown at Figs. 8 and 9. In this case there are, as shown, two cams 36 on the machine-framing, and at each revolution of the cylinder the bars 34 are rocked twice and the numbering-wheels moved a tooth at each rock, so as to print a different number after each movement.

10 We may when the paper web is a broad one print four or more sheets at each revolution, and in this case we fit more numbering-wheel cases in the cylinder in the same manner as the cases *a a*. Thus in Fig. 16 a roller is shown for printing four sheets at each revolution—namely, two in the length and two in the circumference. Two wheel-cases *a* (one at one side and the other at the other side of the cylinder, as at Fig. 8) and two similar wheel-cases *b* effect the printing of the four sheets. The wheels are all operated in the same manner and the sets of wheels *a b* on the one side of the cylinder are fitted on the same bar 39 and operated from the same bar 25 or shaft 34, while the sets *a b* at the other side are similarly arranged. Of course the cylinders would be made and the wheels arranged so as to print the greatest number of sheets out of the paper web at each revolution.

30 It will be seen that each numbering-wheel case is fitted removably by means of the plate 15 and screws 16 on a rectangular bar 39, secured in the interior of the hollow cylinder, and the numbering-wheel cases can be adjusted in position on these bars by means of a slotted tongue 40 on the case and a screw-stud 41 which enters a hole in the bar.

40 The arrangement shown on the drawings is, as before stated, for printing and numbering salesmen's check-books, and in doing this the traveling paper strip or web *x* is led from the roll 4 (see Fig. 1) over the guide-rollers 4^a 4^b to and between the letter-press printing-cylinder 5 (but is not at this time printed by the cylinder) and the cylinder 6, which prints the salesmen's and book numbers on the back of the sheets, (for the fly-leaf or duplicate see D, Fig. 19, where "452" is the salesman's number and "2" the book-number,) and then down and between the impression-cylinder 8 and the cylinder 9, which prints on the stub the stub and salesmen's numbers, as at E, Fig. 19. Thereafter the web passes under the cylinder 8 and up between the impression-cylinder 7 and the printing-cylinder 5, and is printed on the front of the sheets with the letter-press, &c., and also with the salesman's number and the book-number, as at F, Fig. 15. Then the web passes down again below and between the perforating-cylinders 10 11, (and is perforated,) from which again it travels to the folding and delivering mechanism, which will be fully described hereinafter. As 65 will be seen from Fig. 19, each sheet consti-

tuting a leaf of the check-book consists of three portions—the front portion or leaf proper, A, the duplicate or fly-leaf B, and the stub C—and it is necessary that each portion should be numbered alike and consecutively. 70 The several numberings are performed by the numbering-cylinders 5, 6, and 9. The consecutive numbers for the leaves of the books are printed by the numbering-wheels in the cases *a a*, (see Figs. 8 and 9,) while 75 the salesmen's numbers are printed in the case of the leaf and its duplicate (A B, Fig. 19) by means of wheels arranged in a case fitted to the side of each case *a* of the cylinders 5 and 6, as shown in dotted lines at *c*, 80 Figs. 13 and 14. In the case of the stub-numbering cylinder 9 the salesman's number is printed by wheels mounted at the rear instead of at the side of the consecutive-number wheel-case *a*, as indicated in dotted lines 85 at *h*, Fig. 15. The recesses in the cylinder are of course made long enough and wide enough to permit the salesmen's number-wheels to print properly.

The salesman's number-wheels may be 90 turned by hand; but the consecutive-numbering wheels are operated by the mechanism hereinbefore described. The numbering-wheels themselves are preferably made in the same or a similar manner to the wheels described in the specification of the Patent No. 385,592, of 1888. The numbering-cylinders are made with a solid body 44, cast all in one piece, and with a bridge-piece 44^a at the center and solid ends 44^b, from which project the journals 45 46. Fitted into this body are two side pieces 47 48, having the recesses 17 18 therein, and which are removably screwed to the body by screws 49 at the ends and center. The central screws enter holes in projections 105 44^c on the bridge. It will be readily seen that with this arrangement the side pieces can be easily removed, so as to give access to the numbering-wheel cases.

The folding mechanism consists of the rollers 50 51, with a vertically-moving knife 52 arranged between. This folding-knife is made, as shown at Figs. 4 and 5, with a broad blade 53, which has a number of vertical recesses 53^a, as shown, so as to clear the traveling 115 tapes 54, which run on the rollers 55, 56, and 65^a. (See Fig. 2.) The under side of the tapes is forced up by a crank-arm 57, so as to reduce the depth which it is necessary to make the recesses 53^a as much as possible. The knife is operated by means of a cam-wheel 58 on the cam-shaft 59, which is driven by bevel-gear from the shaft 14. The cam has an elliptical race 60 in it, (see Fig. 6,) in which a pin 61 on the knife 52 works. 62 is a guide-plate on the knife and which slides on the guides 63 of the fixed cross bracket or bar 64. The arrangement is such that owing to a drawing action which is arranged between the rollers 65 and 66 the already-perforated sheets 130

or leaves are sundered or separated and in this condition travel along the tapes 54. When a sheet comes over the knife, the latter rises and catches it along the central line—*i. e.*, the line *f*, Fig. 19—between the duplicate or fly sheet B and the original A and forces up and folds the sheet between the rollers 50 51. A band of tapes travels round the rollers 50 50^a and a second band of tapes round the rollers 51 51^a 51^b. The folded paper is caught between these bands and pressed flat and also carried forward and delivered onto the table 67, as indicated by the arrow 68 at Fig. 2. Of course the mechanism is very accurately timed to give this result. The cam-wheel 58, which is simply keyed on its shaft, can be removed and changed when desired to suit the folding required.

The revolving hopper or collector for the printed checks, sheets, &c., may consist, as shown at Fig. 18, of a wheel 70, formed by two disks 71 71^a, arranged side by side and with a series of curved blades or partitions 72, extending across between the disks, so as to form a series of radial compartments or hoppers. In the figure the side disk 71^a is broken away, so as to show the compartments. As will be seen, each partition or blade 72 springs at 72^a tangentially from the hub 73 for a short distance and then bends or curves gradually outward to the circumference of the wheel. 74 is the wheel-shaft, and it is revolved at the proper speed by means of the ratchet 75 and pawl 76, which latter is operated by the swinging lever 77, jointed to the connecting-rod 78, which latter is reciprocated by a cam or equivalent mechanism operated by the machine. 79 is a retaining-pawl. The collector-wheel would be arranged below the rollers 51^a 50^a. The driving mechanism is so arranged that the ratchet 75 is moved one tooth at a time and turns the wheel through an arc sufficient to move the compartments round one at a time. If it is desired to make the check-books with fifty sheets or leaves to each book, then the speed of the wheel is arranged to be such that each compartment remains stationary until fifty leaves have dropped down into it from the delivery-tapes running between the rollers 51^a and 50^a, Fig. 2. Owing to the peculiar shape or curve of the partitions, the leaves as they fall into the compartment lie one upon the other in their proper sequential order. (See the lines at G.) When the fifty sheets have fallen into the compartment, the wheel turns automatically and brings the next compartment under the delivery-tapes. As the wheel revolves it discharges the contents of each compartment onto a table or traveling band, and as the leaves are all in order they have merely to be taken away and bound up into books.

If desired, instead of having the hopper-wheel arrangement I may use a simple traveling band (or band of tapes) 80, which is ar-

ranged on the delivery-table 67 and runs round the rollers 81 82. This band has an intermittent motion imparted to it by means of ratchet-gear 83, (see also Fig. 3,) driven by means of the rod 84 and bell-crank 85 from the face-cam 86 by means of the lever 87, fulcrumed at 87^a. The worm 88 of the shaft 14 revolves the worm-wheel 89 and cam 86, and the inclines 86^a of the latter actuate the lever 87 and bell-crank, and thereby move the pawl-and-ratchet gear. 90 is a retracting-spring which acts on the bell-crank. The cam is preferably arranged to actuate the ratchet twice in each revolution, and the whole mechanism is so made that the band 80 remains at rest until the desired number of leaves or sheets have fallen from between the rollers 51^a 50^a to form a book when the band moves forward a certain distance and again stops until another series of leaves is collected sufficient to form another book, when it is again moved, and so on. The cam 86 is adapted for giving two such movements (sufficient to allow collections of fifty leaves between each movement) at each revolution. If it is desired to collect other numbers, then the cam requires to be changed, and this can be easily done, as it is only keyed on its shaft. Of course it is self-evident that any other suitable form of cam or equivalent mechanism can be employed instead of the mechanism shown. The intermittent traveling band 80 practically performs the same work as the hopper-wheel. If the latter is used, it can be driven by mechanism of a character similar to that shown for actuating the band.

The mechanisms can of course be altered or modified to suit the different classes of work which it is desired to print and number, or to number merely, and after a careful perusal of the foregoing description it will be quite evident to one skilled in the art, without further detailed information, how such slight alterations or adaptations can be carried out.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In combination, cylinders for numbering and printing paper, means for rotating the cylinders, numbering-wheels, means for actuating the numbering-wheels, means for dividing the paper into sheets, means for folding the sheets, a traveling collecting-table operated by a ratchet, a pawl, a rod connected with the pawl, levers connected to the rod, a spring, a face-cam, and worm-gear for driving said cam, substantially as described.

2. In combination, cylinders having numbering-wheels for numbering and printing paper, means for rotating the cylinders, means for actuating the numbering-wheels, means for dividing the paper into sheets, means for folding the sheets, a cam having inclines thereon, lever mechanism operated by the inclines of said cam, worm-gear for driving the cam,

ratchet mechanism, and an endless traveling band which serves as a collecting-table, substantially as described.

3. In combination, cylinders for numbering
5 and printing paper, means for rotating the cylinders, numbering-wheels, means for actuating the numbering-wheels, means for dividing the paper into sheets, a cam, mechanism for operating the cam, a reciprocating sheet-folding knife operated by the cam, recesses in the
10 knife-blade, endless traveling tapes, the means for operating the tapes, a traveling collecting-table, and means for imparting an intermittent action to the table, substantially as described.

4. A hollow numbering or numbering and printing cylinder having the numbering-wheels arranged within the cylinder and adapted to revolve in a plane at right angles
20 to the plane of revolution of the cylinder, said cylinder having the body and ends made in one piece and provided with a cross-bridge and side pieces which latter are removably fastened to the body and bridge in order that the
25 numbering-wheels can readily be removed or changed whenever desired, substantially as described.

5. In combination, a hollow rotary numbering or numbering and printing cylinder, numbering-wheels arranged within the cylinder and adapted to revolve in a plane at right angles to the plane of revolution of the cylinder, and mechanism for automatically revolving the wheels comprising a cam, a rocking
30 bar, a cam thereon, a slide actuated by the cam, a swinging arm operated by said slide and pawl-and-ratchet gear, substantially as described.

6. In combination, cylinders for numbering
40 and printing paper, means for rotating the cylinders, numbering-wheels, means for actuating the numbering-wheels, means for dividing the paper into sheets, a cam, mechanism for operating the cam, a reciprocating sheet-folding knife operated by the cam, recesses in the knife-blade, a double arrangement of tapes running on rollers for receiving, pressing and delivering the folded sheets
45 of paper, and means for collecting the folded sheets into bunches ready to be bound into books, substantially as described.

7. In a machine for consecutively numbering sheets of paper for use in check-books, salesmen's books and the like, means for printing
55 similar numbers consecutively upon opposite sides of different portions of the same sheets, tapes for carrying the printed sheets forward, means for folding the said printed

sheets, said means comprising a reciprocating folding-knife having recesses therein to clear
60 the said tapes and means for receiving, pressing and delivering the folded sheets ready to be bound into books, every page of which is adjacent a similarly-numbered page.

8. In a machine for consecutively numbering
65 sheets of paper for use in check-books, salesmen's books and the like, means for printing similar numbers consecutively upon opposite sides of different portions of the same sheets, tapes for carrying the printed sheets
70 forward, means for folding the said printed sheets, said means comprising a reciprocating folding-knife having recesses therein to clear the said tapes, a system of rollers and a double arrangement of tapes running upon the
75 rollers and arranged to receive, press and deliver the sheets of paper ready to be bound into a book.

9. In a machine for consecutively numbering
80 sheets of paper for use in check-books, salesmen's books and the like, means for printing similar numbers consecutively upon opposite sides of different portions of the same sheets, tapes for carrying the printed sheets forward, a sheet-folding means comprising a
85 vertically-reciprocating knife with a broad blade having a number of recesses therein to clear the said tapes, guides for the knife, cam mechanism for reciprocating the knife and a double arrangement of tapes running on rollers
90 for receiving, pressing and delivering the sheets of paper ready to be bound into a book.

10. In a machine for consecutively numbering
95 sheets of paper for use in check-books, salesmen's books and the like, means for printing similar numbers consecutively upon opposite sides of different portions of the same sheets, tapes for carrying the printed sheets forward, a sheet-folding means comprising a
100 vertically-reciprocating knife with a broad blade having a number of recesses therein to clear the said tapes, rollers arranged above the folding-knife for receiving the sheets after being folded and a double arrangement of tapes
105 for receiving, pressing and delivering the sheets ready to be bound into a book.

Signed at Glasgow, Scotland, this 18th day of March, 1904.

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