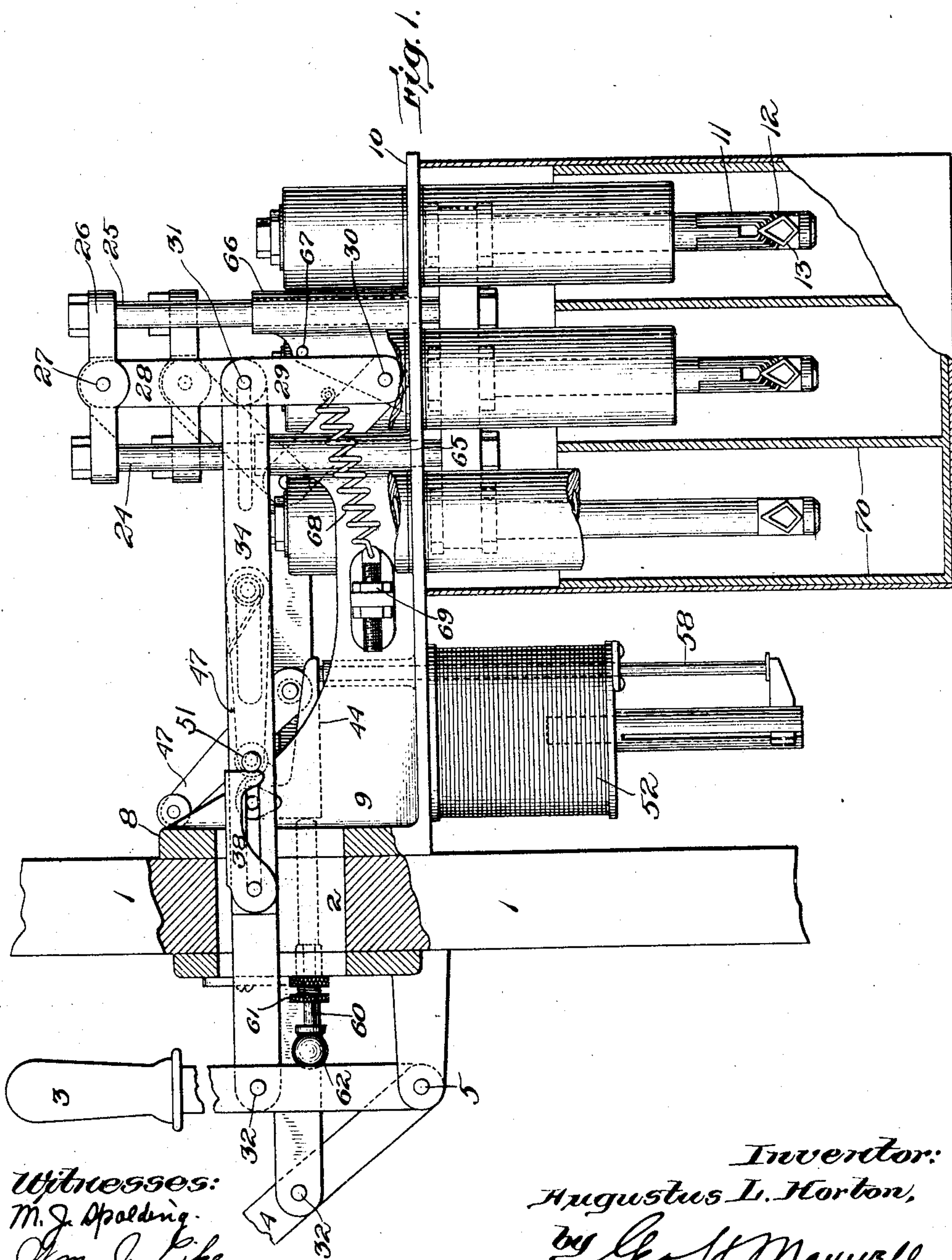


998,580.

A. L. HORTON.
CIRCUIT BREAKER.
APPLICATION FILED JULY 18, 1906.

Patented July 18, 1911
5 SHEETS—SHEET 1.



A. L. HORTON.
CIRCUIT BREAKER.

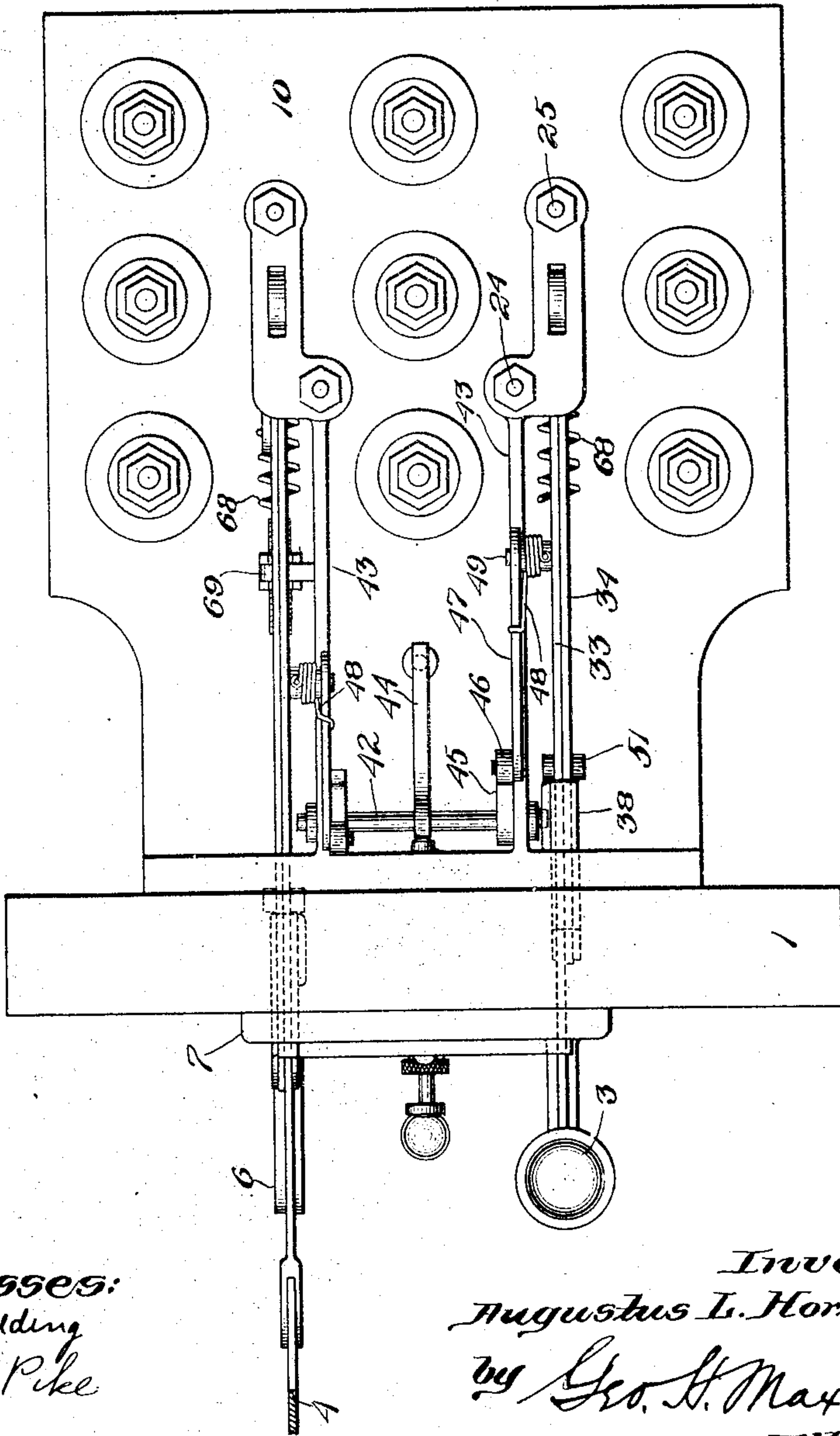
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5 SHEETS—SHEET 2.

998,580.

Fig. 2.



Witnesses:
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Inventor:
Augustus L. Horton,
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998,580.

5 SHEETS--SHEET 3.

Technical drawing of a mechanical device, showing two views: a top view and a cross-sectional view.

Top View:

- The device consists of a rectangular frame with two vertical rods (3 and 4) and two horizontal rods (5 and 6) connected by a diagonal rod (7).
- Labels 3, 4, 5, 6, and 7 identify the main components.
- Labels 63 and 64 indicate specific points or joints on the diagonal rod.

Cross-sectional View:

- This view shows the internal structure of the device, including two vertical rods (52 and 53) and two horizontal rods (54 and 55) connected by a diagonal rod (56 and 57).
- Labels 52, 53, 54, 55, 56, and 57 identify the internal components.

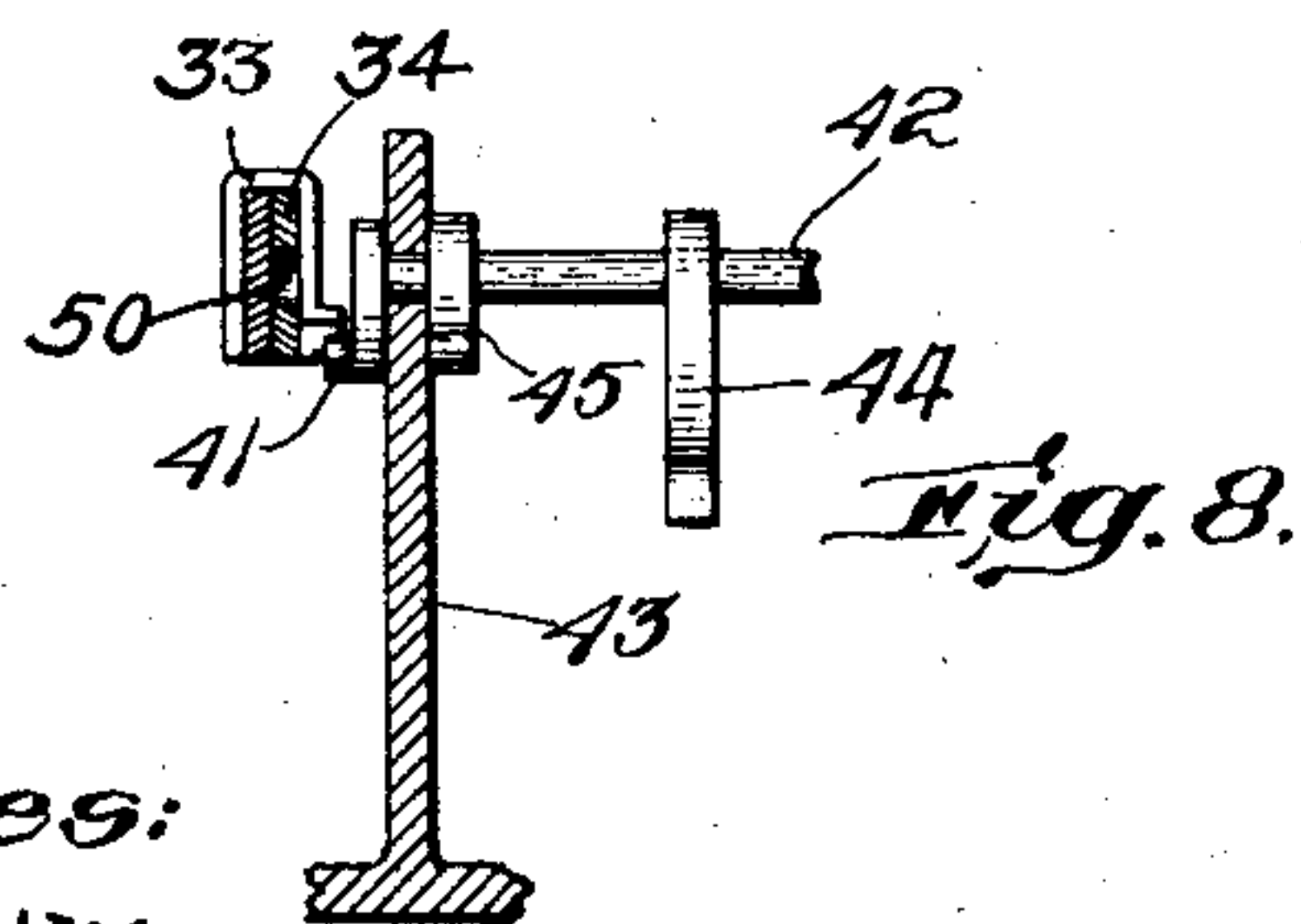
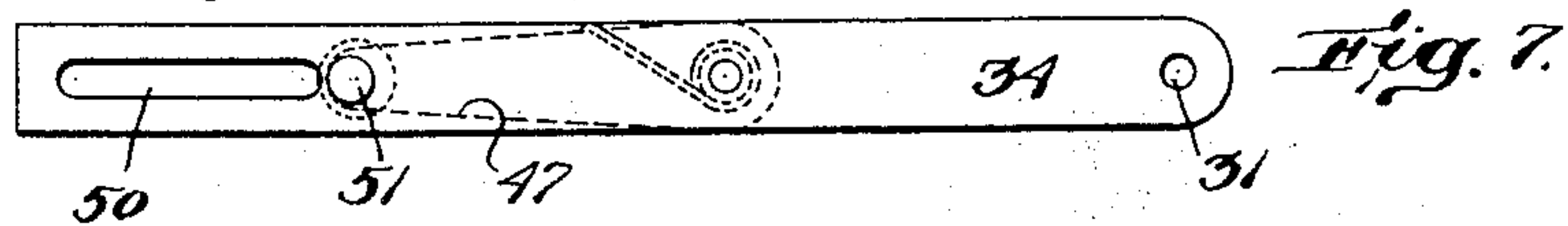
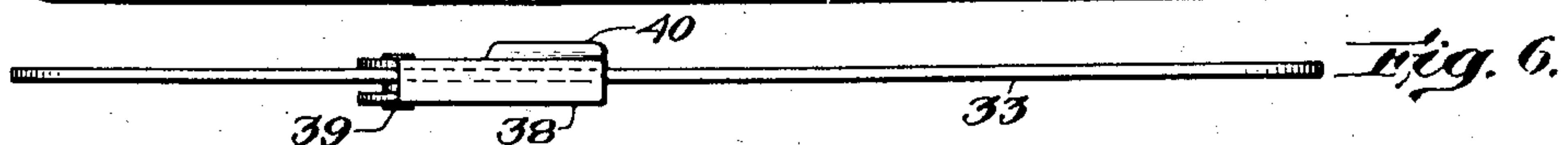
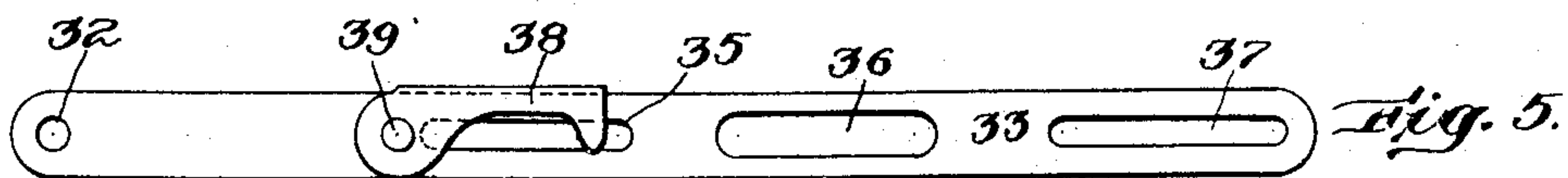
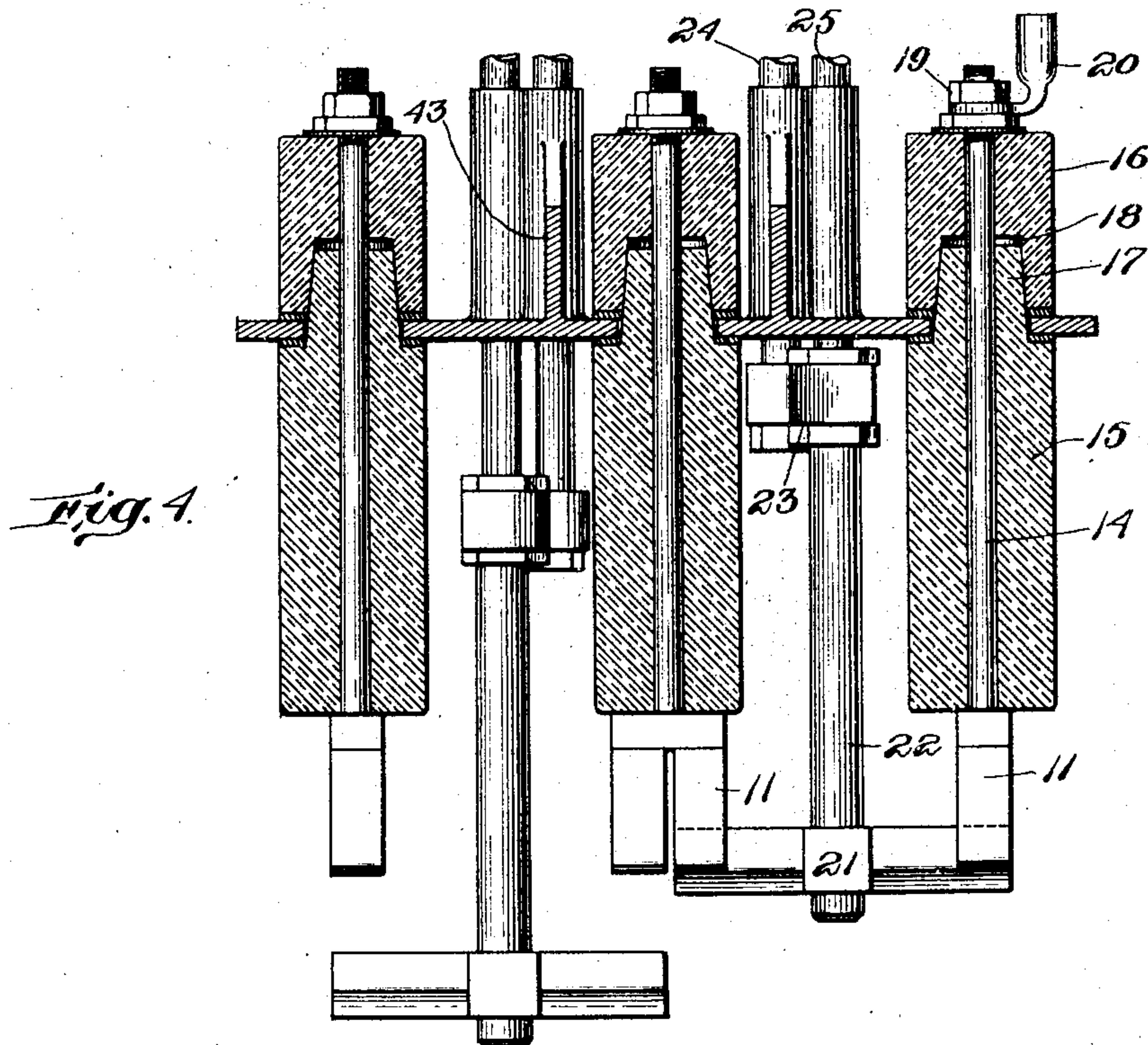
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5 SHEETS—SHEET 4.



Witnesses:
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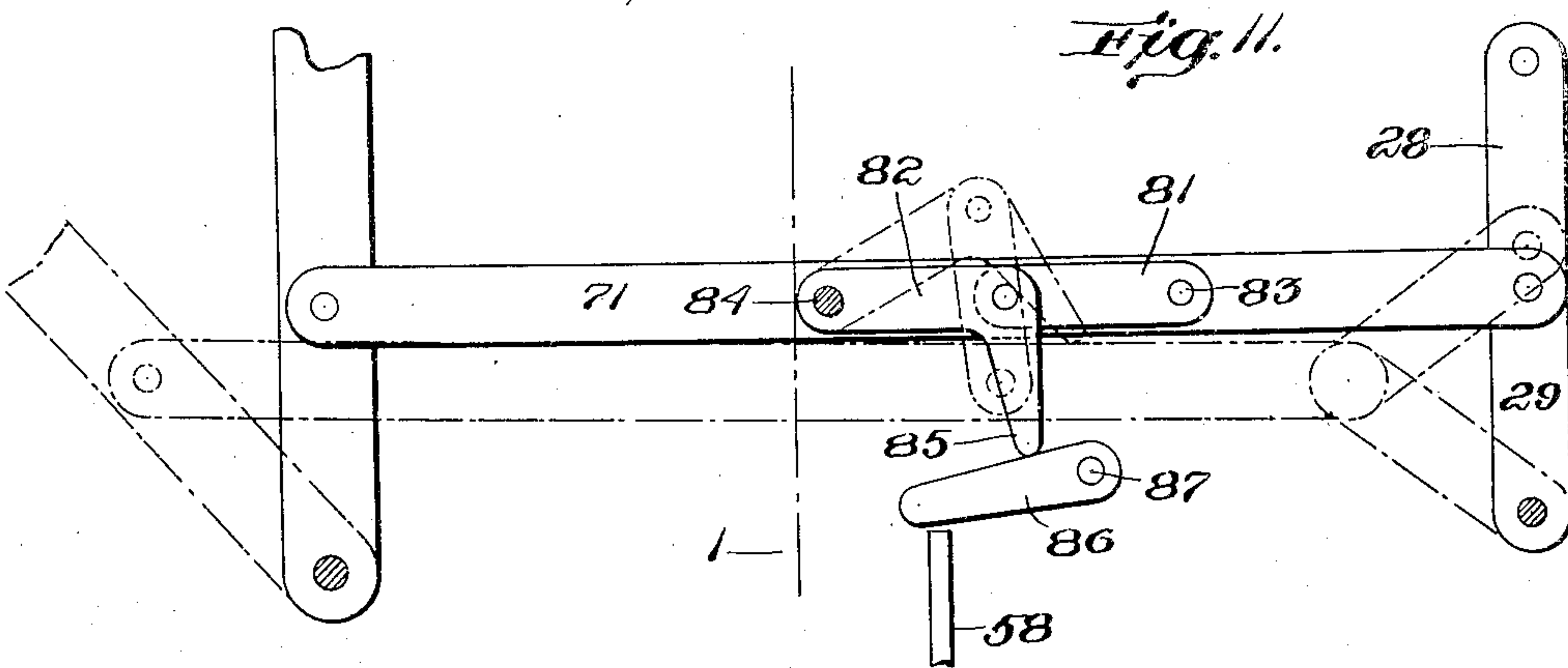
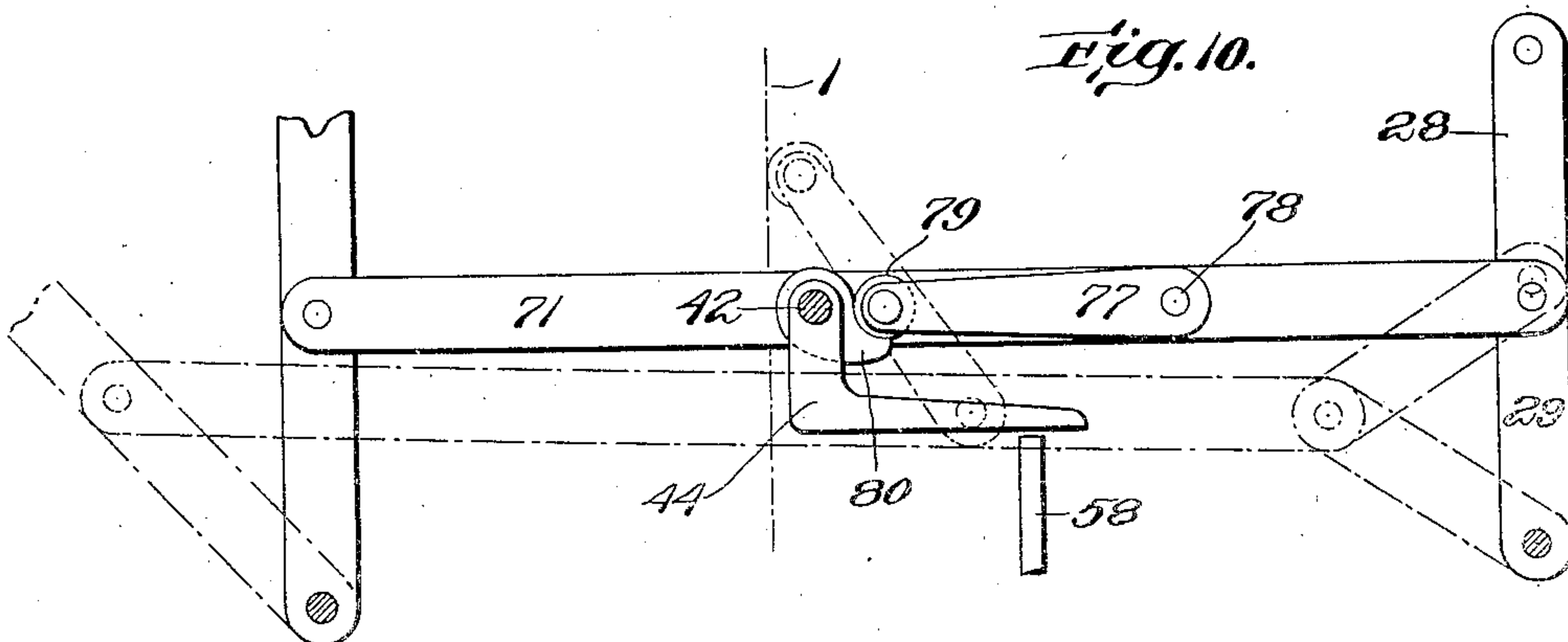
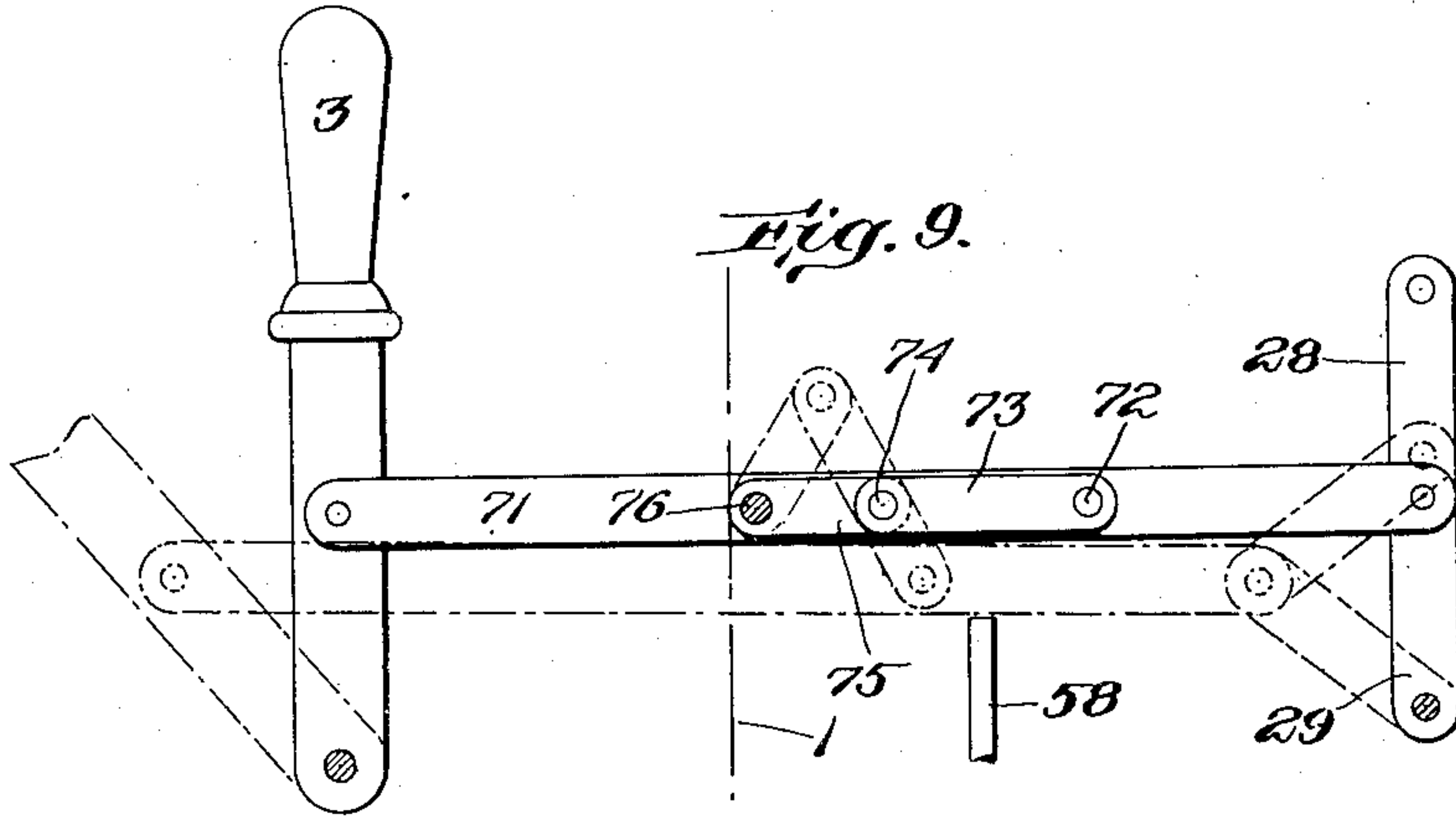
A. L. HORTON.
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998,580.

5 SHEETS—SHEET 5.



Witnesses:
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UNITED STATES PATENT OFFICE.

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CIRCUIT-BREAKER.

998,580.

Specification of Letters Patent.

Patented July 18, 1911.

Application filed July 18, 1906. Serial No. 326,704.

To all whom it may concern:

Be it known that I, AUGUSTUS L. HORTON, a citizen of the United States, residing at Beachmont, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Circuit-Breakers, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention is a double throw, oil tank switch, especially designed for heavy current.

In carrying out my invention I aim to provide simple movements coupled with mechanism providing extreme strength and power. The stationary contacts, oil pan, etc., are supported from a single frame or bracket, the movable contact being raised and lowered by toggles connected vertically to lift yokes, and the connections from said toggles to the operating levers moving parallel to themselves in opening and closing, or in other words, remaining at all times horizontal. Said connections are located between the poles of the switch for affording convenience to the terminal wires. I provide means for interlocking the levers so that only one switch can be closed at a time, in the case of a double throw circuit breaker, also besides providing an automatic overload trip I provide a hand trip at the front of the switch board. And the cooperating contacts are self-aligning, easy opening, and provide spaces for oil insulation, obtaining surer contact than the ordinary flatwise engagement of spring contacts.

The constructional features and further advantages of my invention will be pointed out more at length in the course of the following description, reference being had to the accompanying drawings, in which I have shown a preferred embodiment of my invention.

In the drawings, Figure 1 is a view mainly in side elevation and partly in broken section, showing one embodiment of my invention; Fig. 2 is a top plan view thereof; Fig. 3 is a front elevation, parts being broken away; Fig. 4 is a transverse sectional view through the front series of insulators; Figs.

5, 6 and 7 are details of the horizontal portions of the operating mechanism; Fig. 8 is a transverse sectional view of a detail of the operating mechanism; and Figs. 9, 10 and 11 show modified constructions of connecting mechanism.

Viewing Fig. 1, it will be seen that I have shown my improved switch mounted on a switch-board 1 provided with an opening 2 for accommodating the movement of the operating connections, the operating handles 3, 4 being pivoted at 5, 6 to a plate 7 secured to the front of the switch-board 1 and at the rear of said board is secured at 8 a heavy bracket or supporting frame 9 projecting out horizontally at 10 and supporting all the remaining parts of the switch. As herein shown, I have provided a double throw, triple pole circuit breaker, whose cooperating contacts are clearly shown in Figs. 1 and 4, the stationary contacts consisting of laminated spring members 11 bent inwardly at their contacting ends 12 and successively shorter toward the converging upper portion of the contact, so as to provide intervening gaps between the successive springs as clearly shown in Fig. 1, to cooperate with wedge-shaped movable contacts 13. This specific form and arrangement of contacts is not herein claimed, but is reserved for a divisional application. The stationary contacts are secured to the lower ends of conductor rods 14 mounted in heavy porcelain insulators 15, 16, the former having a conical extension 17 to fit into a conical recess 18 in the portion 16 and the rod 14 being clamped in position by nuts 19, which secure terminal connections 20. I have merely shown one of the latter, having omitted the rest as well as other details so as to show the novel features of my circuit breaker more clearly. The movable contacts are mounted on heads 21 supported by slide posts 22 clamped to a truss or cross bar 23 operated by rods 24, 25 joined at its upper ends by a yoke 26. To the yoke 26 is pivoted at 27 one link 28 of a toggle, whose other link 29 is pivoted at 30 to the base plate or frame 10. The toggle is pivoted at 31 to one end of the operating connections, whose opposite end is pivoted at 32 to the handle of the respective switch.

The operating mechanism consists of a main operating bar 33 and an auxiliary bar 34, said main bar being slotted at 35, 36 and 37 and provided with a tripping dog 38 pivoted thereto at 39 and provided on its inner side with a tripping flange 40 in position to be engaged by an eccentric lug 41 at the end of a rock shaft 42 pivoted in flanges or ribs 43, extending upwardly from the base plate 10 of the supporting frame of the circuit breaker. The rock shaft 42 has fast thereon an L-shaped tripping lever 44 best shown in Fig. 1, and a locking cam or dwell 45. The latter is normally engaged by the roll 46 on the end of an arm 47 held down by a spring 48 and pivoted to a post 49 projecting from the auxiliary bar 34. At its inner end the bar 34 has a slot 50 riding over the pivot pin 39 of the main operating bar 33 and is also provided at the rear end of said slot with a transverse pin or projecting stud 51 in position to engage a lug against the free end of the dog 38 when the latter is lowered, as shown in the drawings. At any suitable place I provide automatic tripping coils 52, 53, of usual construction and operation, whose movable cores 54, 55, carry arms 56, 57, engaging a trip rod or plunger 58 guided at 59 in position to trip the free end of the L-shaped tripping lever 44. Also I provide a hand trip, shown as a sliding bolt 60, adjustably secured by a nut 61 and having an external handle 62 permitting the operator to trip the switch by shoving in said handle. Just above this hand trip I provide a transverse locking bar 63 pivoted at 64 at such a height on the plate 7 as to permit one of the operating mechanisms to be closed at any time, being thereby caused to swing down as shown in Fig. 3 into such position as to prevent the closing of the other switch. For convenience I have shown this bar mounted on the outside of the machine, although in practice I conceal it at the back of one of the castings. The ribs 43 extend rearwardly as clearly shown in Fig. 1, and provide long bearings 65 for directing the supporting rod 24, the supporting rod 25 being guided in a similar bearing 66, see Fig. 1, which also contains a projecting pin or stop 67 for holding the toggle substantially on a dead center when the switch is closed, opening movement being given to the toggle by a spring 68 adjustably secured at 69. The oil pan contains linings and partitions 70 of wood or other suitable insulator.

The operation of the mechanism thus far described is as follows. Supposing the switch be closed as shown on the near side of Fig. 1. If an overload takes place the rod 58 is at once raised, thereby tripping the trip lever 44, which, through the rock bar 42, raises the cam retainer or dwell 45 so as to lift the arm 47 and simultaneously there- with through the action of the lug 41 upon

the dog 38 permits the auxiliary bar 34 instantly to slide backwardly upon the main operating bar 33, thereby opening the switch without disturbing the handle 3. The operator thereupon closes the switch by swinging the handle 3 down to the left, Fig. 1, so as to cause the dog 38 to engage against the pin or lugs 51, thereby securing control of the auxiliary bar 34 and then he swings the lever 3 inward to its raised position Fig. 1, until the switch toggle is straightened. If the overload has ceased, the locking arm or detent 47 will instantly lock against the cam locking surface or dwell of the locking cam 45 and hold the parts in their raised horizontal position, but if the overload still remains, the auxiliary operating bar 34 cannot be retained, but will fly back again to its tripped position, thereby preventing the operator from obtaining control of the switch as long as the disturbance lasts.

The operating connections between the toggle and the operating handle move up and down in a horizontal position or parallel to themselves, and the thrust on the toggle is always in a straight line by means of a straight bar, the closing movement of the toggle being the most powerful at the ends of its closing movement. This construction not only affords durability, strength and ease of operation, but are simple, and inexpensive to construct (being simply stampings, requiring no particular machining) cannot readily get out of order, and if they should get out of order they are easily repaired. Practically all the parts are carried by a single frame or casting, and the stationary contacts are individually supported and strongly insulated in the porcelain bushings. The wedge-shaped contacts automatically align themselves, and by having the laminated strips of copper individually bent at their ends perpendicularly to the diagonal surface of the movable contacts and separated from each other slightly, I obtain an end bearing of the upper strips against the wedge-shaped surface, which provides a surer contact and also affords intervening spaces to permit of free circulation of the oil for the purpose of radiating the heat. Also this construction gives a minimum resistance to opening and closing movement, which is of importance in this class of heavy apparatus.

In Figs. 9-11 I have shown modified constructions, which, although provided with automatic overload tripping mechanism, are not automatically placed beyond the control of the operator, as shown in the preceding figures. In Fig. 9 a main operating bar 71 connects the handle and toggle, and has pivoted thereto at 72 a link 73 pivoted at 74 to a short link 75 pivoted at 76 to the switch-board, indicated at 1, so that when the rod 58 is automatically raised by an overload, it

trips the toggle formed by the links 73, 75 and thereby permits the automatic opening of the circuit breaker. In Fig. 10 I have shown a similar main operating bar 71, provided however with an arm or detent 77 pivoted thereto at 78 and provided with a roll 79 to engage the dwell of the cam finger or lever 80 on the rock bar 42 so that when the L-shaped tripping lever 44 is raised by the rod 58 the arm 77 is thereby tripped the same as previously explained in connection with the arm 47 of the preferred construction. In Fig. 11 a similar main operating bar is connected by links 81, 82 the former pivoted at 83 to said bar and the latter pivoted at 84 to the switch-board indicated at 1, said link 82 being provided with a downwardly projecting end 85 in position to engage an arm 86 on a rock shaft 87 so that when the rod 58 is raised by the overload the toggle 81, 82 is tripped the same as the toggle 73, 75 in the construction of Fig. 9.

I have herein indicated only a few of the various constructions in which my invention may be embodied, and it will be understood that I am not restricted to the constructional details excepting as otherwise expressed in the claims.

Having described my invention, what I claim as new and desire to secure by Letters Patent is,

1. An electric switch, comprising contacts separable by vertical movement, raising means in the path of said vertical movement, an operating lever, and a straight slotted main connecting bar from said operating lever to said raising means, means slidably mounted on said bar to permit the opening of the circuit breaker when tripped, and means for tripping said sliding means.

2. An electric switch, comprising contacts separable by vertical movement, raising means in the path of said vertical movement, an operating lever, and a straight slotted main connecting bar from said operating lever to said raising means, and means slidably mounted on said bar to permit the automatic opening of the circuit breaker.

3. An electric switch, comprising separable contacts, and operating mechanism therefor, including an operating toggle for said contacts, an operating handle, a slotted operating bar connected at one end to said handle and at the other end to said toggle, an auxiliary member pivoted to said toggle to slide on said slotted bar, and locking means carried by said operating bar for normally holding said auxiliary member in toggle-closing position, combined with tripping mechanism for releasing said locking means.

4. An electric switch, comprising separable contacts, a vertically extending toggle above said contacts for opening and closing the same, an operating handle, an operating bar connecting said toggle and handle, an

auxiliary bar pivoted to said toggle and slidably mounted on said operating bar, a tripping dog pivoted on said operating bar to engage said sliding bar, embracing both of said bars and provided with a tripping flange, and automatic tripping means for engaging said flange to operate said trip and permit opening movement of the toggle.

5. An electric switch, comprising separable contacts, a vertically arranged operating toggle therefor, a vertically extending handle, a main operating bar connecting said handle and toggle, an auxiliary bar pivoted to said toggle to slide on said operating bar, a trip normally engaging said auxiliary bar to hold said toggle closed, an L-shaped trip pivoted adjacent said bar to engage said first mentioned trip, automatic actuating means for engaging the free projecting end of said L-shaped trip, and hand actuated means engaging the elbow of said L-shaped trip and thereby actuating said engaging trip to permit the toggle to move to open position.

6. A double throw switch, having two operating handles, two sets of contacts, separate connecting bars extending from said respective handles to said contacts respectively, and a locking bar pivoted to swing in a plane transverse to the longitudinal direction of said separate connecting bars and mounted for one way engagement with said two connecting bars so as to be moved by the closing operation of one handle into engagement with one bar to lock the other bar against closing movement while permitting both to be moved to open position at will.

7. A double throw switch, comprising opposite sets of contacts, separate controllers for each set, separate operating devices for each controller, separate connections with lost motion provision from each operating device to each controller, means for rendering said lost motion provisions normally inactive, a transverse rock-shaft provided with means for rendering active said lost motion provisions, and automatic means responsive to an overload for rocking said shaft.

8. A double throw switch, comprising opposite sets of contacts, opposite closing toggles, separate operating handles, and independent operating connections from said handles to said closing toggles, located between said contacts.

9. A double-throw switch, having two operating handles, two sets of contacts, separate connecting bars extending from said respective handles to said contacts respectively, all capable of occupying open-circuit positions at the same time, and a locking bar pivoted to swing in a plane extending transversely of the plane which embraces said separate connecting bars when both in open-switch positions, said locking bar being mounted for one way engagement with each

of said connecting bars so as to be moved by the closing operation of one of said two handles into engagement with one bar to lock the other bar against closing movement while permitting both to be moved to open position at will.

In testimony whereof, I have signed my

name to this specification, in the presence of two subscribing witnesses.

AUGUSTUS L. HORTON.

Witnesses:

GEO. H. MAXWELL,
WM. J. PIKE.