No. 627,936. Patented June 27, 1899.

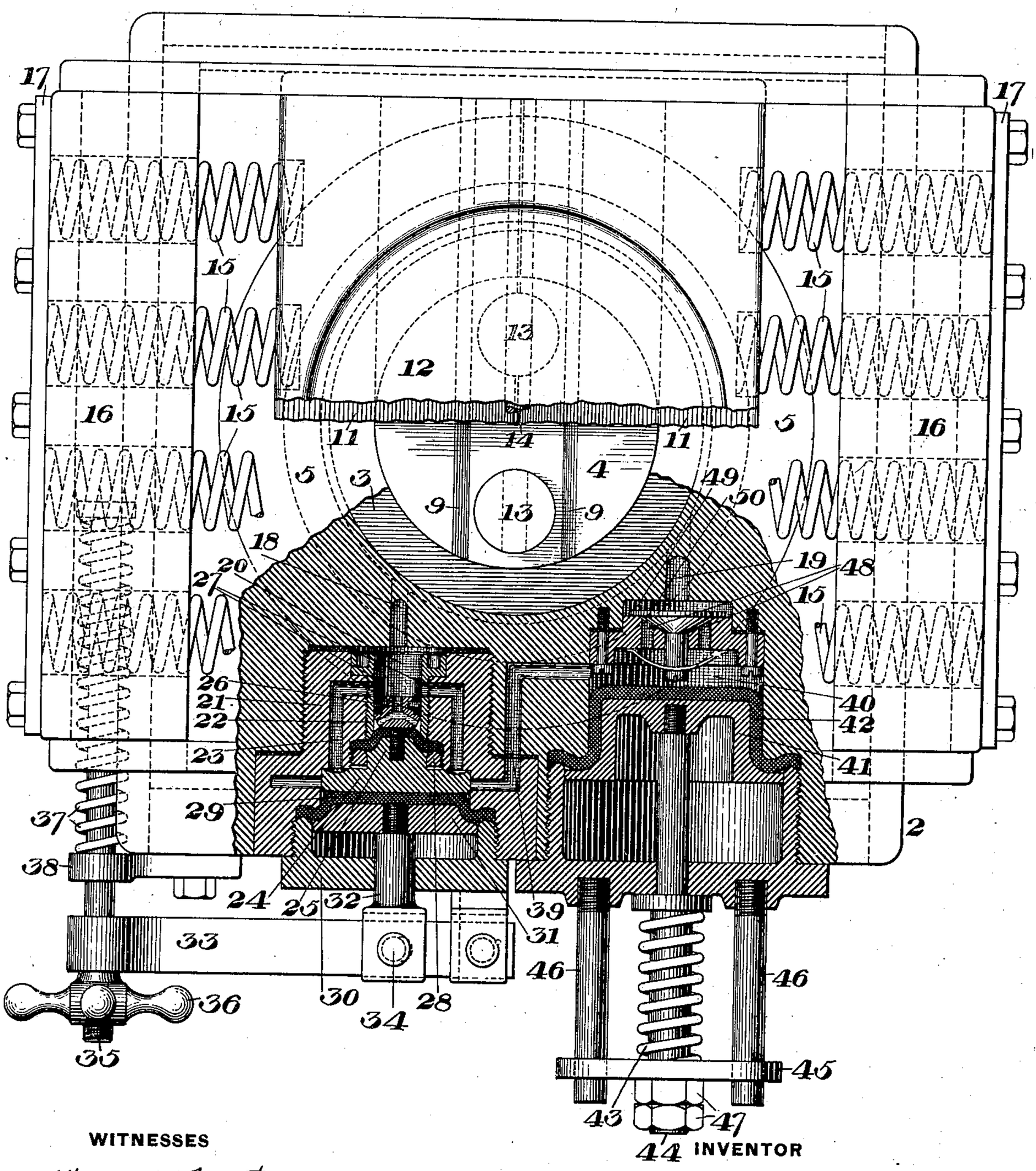
C. KUHLEWIND.

AUTOMATIC RELEASE DEVICE FOR ROLLS.

(Application filed May 7, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

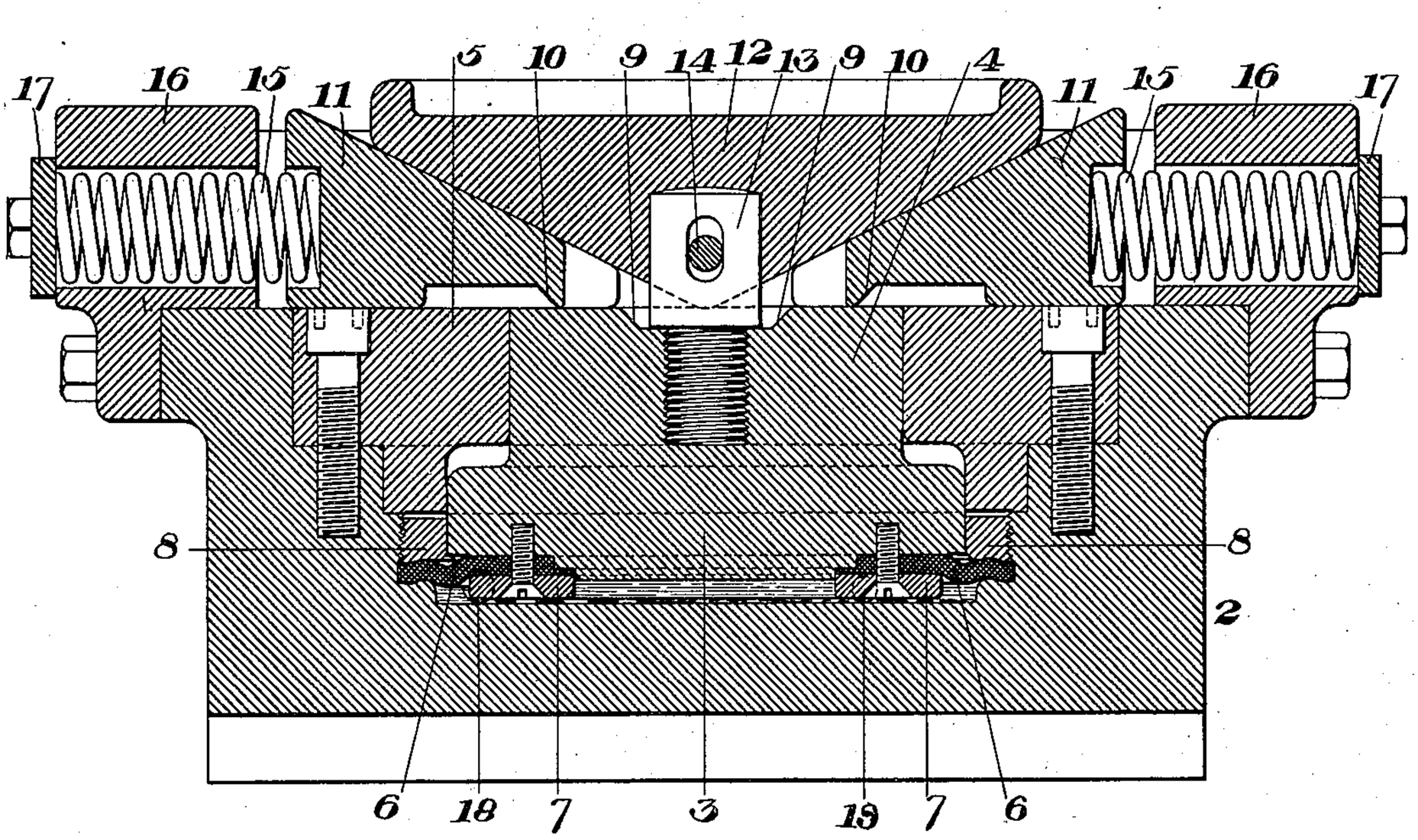

Fig. 3.

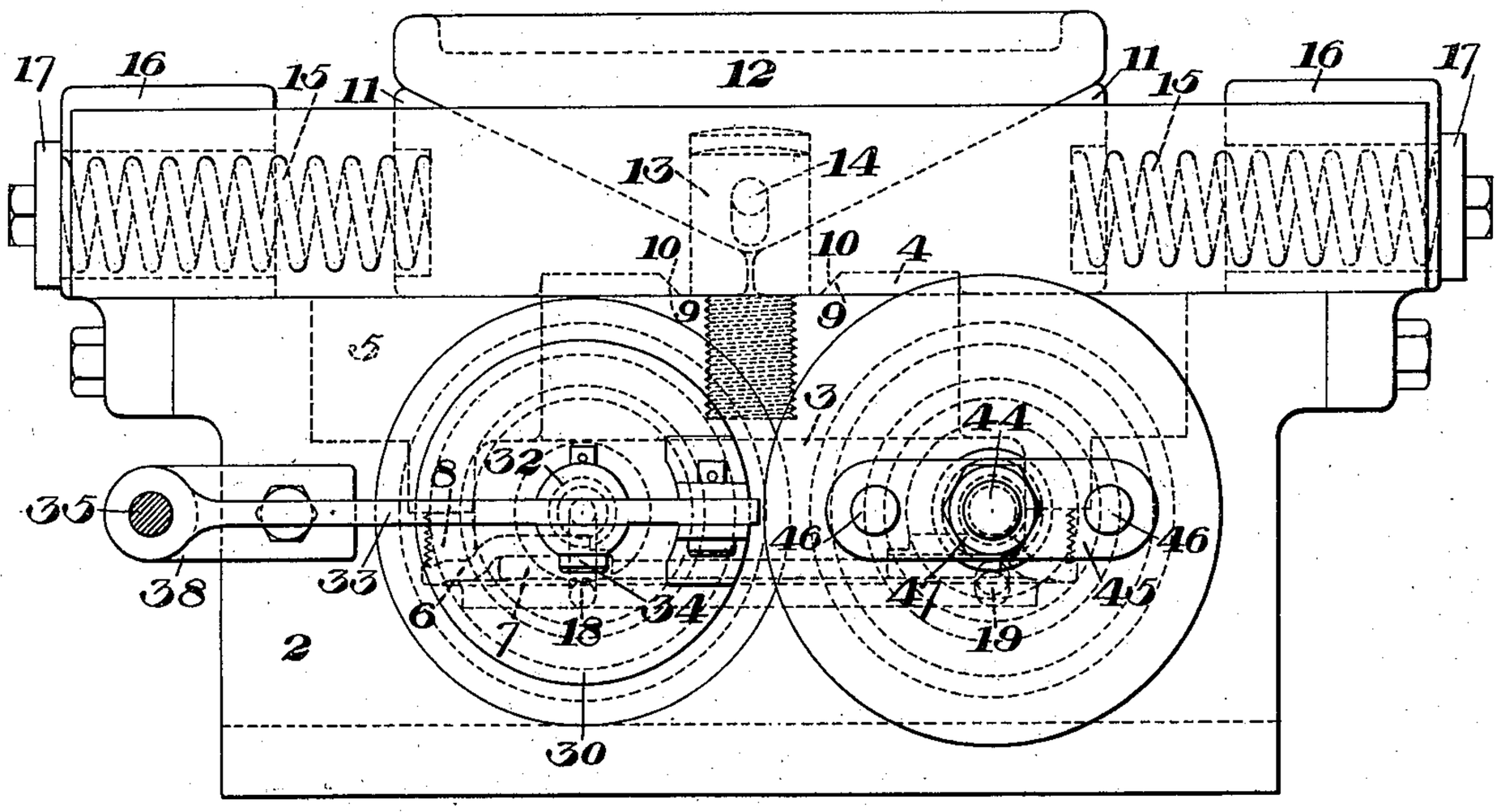

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Fig. 4.

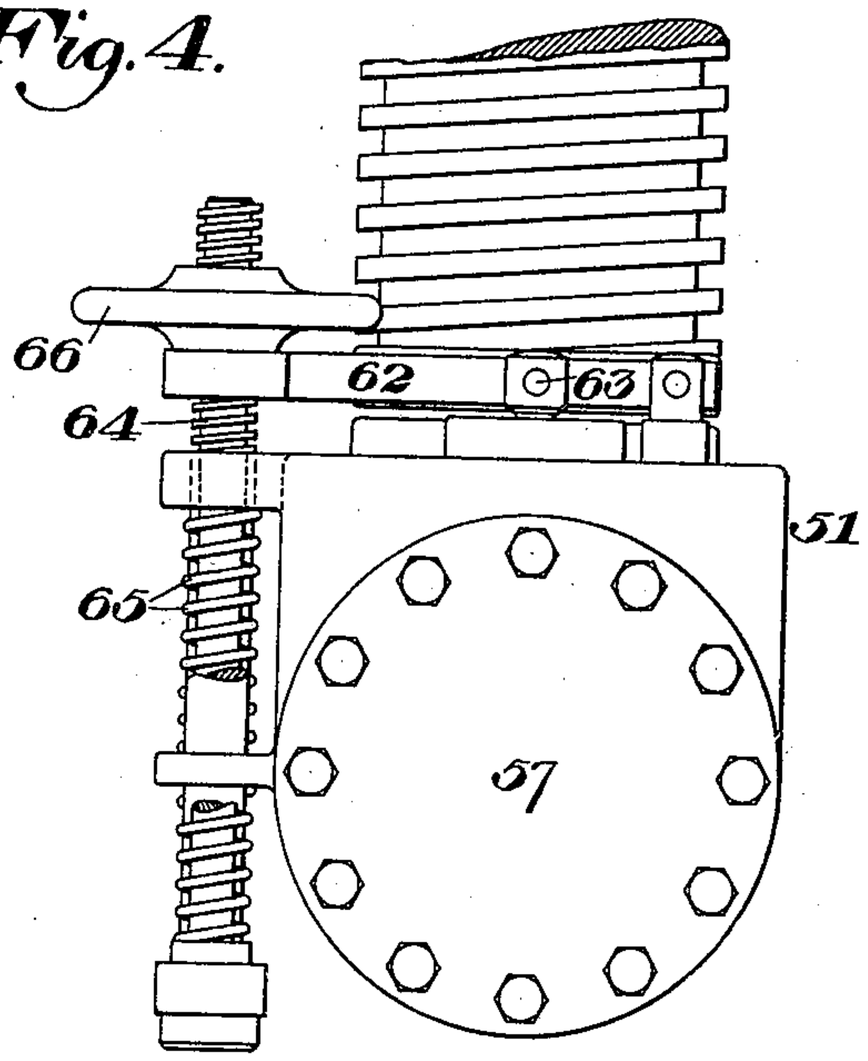

Fig. 5.

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UNITED STATES PATENT OFFICE.

CORNELIUS KUHLEWIND, OF KNOXVILLE, PENNSYLVANIA, ASSIGNOR TO THE HYDRAULIC VALVE AND REGULATOR COMPANY, LIMITED, OF PITTSBURG, PENNSYLVANIA.

AUTOMATIC RELEASE DEVICE FOR ROLLS.

SPECIFICATION forming part of Letters Patent No. 627,936, dated June 27, 1899.

Application filed May 7, 1898. Serial No. 680,048. (No model.)

To all whom it may concern:

Be it known that I, CORNELIUS KUHLEWIND, of Knoxville borough, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Automatic Release Devices for Rolls, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a top plan view, partly broken away, on an irregular line, showing one form of roll-breaker constructed in accordance with my invention. Fig. 2 is a central vertical section of the same. Fig. 3 is a side elevation. Fig. 4 is an end elevation showing another form of the breaker, and Fig. 5 is a sectional side elevation of the same.

My invention relates to the devices employed for automatically relieving one of the rolls in rolling-mills when the pressure upon the rolls exceeds a certain limit; and it consists in a breaker for the roll-bearing which is provided with a cylinder containing a plunger and with a separate chamber into which liquid is forced from the cylinder when the pressure exceeds the predetermined limit, the liquid being returned from the chamber to the cylinder when the pressure is again reduced.

It also consists in a cushioning device consisting of spring-pressed wedges combined with a liquid-containing cylinder, the two coacting to afford the desired release.

In the drawings, referring to the form of Figs. 1, 2, and 3, 2 represents the breaker, which is centrally bored out to form a cylindrical cavity, within which is fitted a piston or plunger 3, having an upper reduced portion 4. An annular ring 5 closes this cavity and is shaped to fit around the upper reduced portion and also the lower larger portion of the piston, as shown. A flexible packing-ring 6 is secured to the lower face of the piston by a clamping-ring 7, this packing-ring being secured at its outer edges by a clamping-ring 8, which is externally screw-threaded to engage the screw-threaded walls of the cavity. This packing-ring will allow the small movement of the piston or plunger and will effectually prevent the oil or other liquid beneath the piston from leaking around it. The upper face of the plunger is provided with a transverse groove having opposite inclined faces 9, which extend parallel to each other, and when the plunger is in normal position, with its upper end projecting beyond the ring or cylinder-head 5, these inclined faces are engaged by similar inclined faces 10, formed by grooving the lower faces of two sliding blocks 11 11. These blocks extend across the top of the breaker and their ends engage suitable guiding-grooves within the ends of the breaker. The blocks are provided with inclined upper faces, upon which rest the correspondingly-inclined faces of a wedge-block 12, upon which the usual adjusting-screws bear, and this wedge-block is guided by two pins 13, which are screwed into the plunger and are provided with slotted heads entering suitable recesses in the wedge-block, this block having a cross-pin 14 extending through the slots in the heads.

The blocks 11 are normally forced forward by a series of springs 15, extending through holes in suitable end blocks 16 and into recesses in the blocks 11. When the springs have been inserted, they are held by suitable closing-strips 17.

From the cavity beneath the plunger lead an outlet-port 18 and an inlet-port 19. The outlet-port leads to a valve-chamber 20, formed in a screw-threaded valve plug or casing 21. This valve-chamber is formed within an externally-screw-threaded sleeve 22, which is secured within the plug and has a series of holes registering with a series of ports 23. The valve consists of a disk 24, which closes the lower ends of these ports, and is provided with a central boss 25, to which is secured, by a screw-threaded stem, a hollow head 26, to the upper reduced part of which are secured on each side a series of thin flexible metal plates 27, which are preferably made of steel. These plates are ground very thin and are fitted one upon the other, being secured by screws passing through them into the head. Between the head and the boss is secured a cup-packing whose edges are held by a clamping-ring 28, and to the lower face of the disk 24 is secured another flexible packing-disk 29, the edges of which are secured within the valve-plug by the follower 30. The head is inwardly beveled and

provided with branch ports, as shown, so that any leakage past the thin plates will be returned to the valve-chamber. 31 is a backing-plate for the packing 29 and to which is secured the plug 32, which is externally slotted and pivotally secured to a lever 33, fulcrumed at 34 and engaged by a stem 35, having an adjusting-wheel 36 bearing upon the lever. The valve is normally pressed in to close the ports by a spiral spring 37, surrounding the stem 35 and bearing against a collar at its end and a stationary collar 38 upon the frame, the power of the spring being regulated by the wheel 36.

The ports 23 lead to an annular groove or recess, from which a port 39 leads to the relief-chamber proper, 40. The outer end of this chamber is closed by the plunger 41, having the packing 42 secured at its edges to the chamber, and this plunger is normally forced inwardly as far as its outer enlarged portion will permit by means of a spiral spring 43, surrounding the external portion of the stem 44 of the plunger and bearing against a ring thereon, and an outer plate 45, held by bolts 46. The power of this spring may be adjusted by suitable nuts 47, which surround the stem and bear upon the plate.

At its inner end the relief-chamber communicates by a series of ports 48 with a valve-chamber 49, containing the outwardly-seating valve 50, and from this valve-chamber leads the inlet-port 19.

The operation is as follows: The chamber below the cylinder-plunger, as well as the various passages and the relief-chamber, being filled with oil, the parts normally rest in the position shown in Figs. 1 and 3, the inclined faces upon the face of the plunger bearing upon the similar faces in the grooves of the sliding blocks. When, however, the pressure exceeds a predetermined limit, the wedge-block and the breaker will move toward each other, and the blocks 11 being acted upon by the wedge will be forced outwardly against the action of the springs and as they slide out will force the piston into the cylinder, and the oil being forced into the valve-chamber of the outlet will press back the outlet-valve and enter the relief-chamber, thus forcing back the yielding plunger therein. The parts then assume the position shown in Fig. 2, and as soon as the excessive pressure is relieved the springs will force the sliding blocks back to their original position, and the spring 43 will force in its plunger, thus driving the oil out of the relief-chamber and back into the cylinder. The plunger rises in the cylinder and the parts again assume their original position.

In Figs. 4 and 5 I show another form of my device wherein the wedge system is within the breaker and the cylinder is supported at its end, the liquid flowing from one side of the piston to the other side as this piston moves in the cylinder. In this form 51 is the breaker, having a vertically-sliding block 52, with which the ordinary adjusting-screw 53 contacts. Within the breaker this block is provided with an inclined face, which fits upon the inclined face of a wedge 54, which is arranged to move horizontally and the stem 55 of which projects through the breaker and is secured to the piston 56 of the hydraulic cylinder 57. A series of ports 58 extend through the piston, these being normally closed by the spring-pressed inwardly-seating valve 59. 60 is the outlet-port, which leads to a valve-chamber containing a valve 61, which closes this port, and is provided with a protruding stem pivoted to a lever 62, fulcrumed at 63 and acted upon by the stem 64, which is provided with a spring 65 and adjusting-wheel 66, as in the first form. From the valve-chamber a port 67 leads to the other side of the piston, and within the cylinder upon this side is provided a spring-pressed ring or annulus 68, which is suitably packed, as shown. The operation of this form will be substantially the same as above described, except that the oil is forced from one side of the piston to a chamber which is within the cylinder upon the other side of the piston instead of being a separate chamber independent of the cylinder. The springs 69 act to force the piston back to its original position as soon as the excessive pressure is removed.

The advantages of the invention result from the use of the relief-chamber, which is separate from the cylinder, but connected thereto by inlet and outlet ports. It also results from the use of the wedges in conjunction with the plunger, since with this combination the parts are held rigidly in their normal position until the moment that the pressure exceeds the predetermined limit, and the action is then quick and certain. The co-acting inclined shoulders upon the sliding blocks and the plunger act to practically lock the parts in their normal position until the excess of power is applied.

Many variations may be made in the form and arrangement of the wedge system and its connection with the plunger, as well as in the form and connection of the relief-chamber and the passages, without departing from my invention, since

I claim—

1. The combination with a roll, of an automatic relief device therefor, comprising a breaker having a cylinder and plunger, and a separate relief-chamber carried by and movable with the breaker, said relief-chamber having ports connecting with the cylinder, at least one of these ports having a yieldingly-pressed valve controlling it; substantially as described.

2. The combination with a roll, of an automatic relief device therefor, comprising a breaker having a cylinder and plunger, and a wedge system in line with the plunger and coacting therewith to automatically relieve the roll-pressure when it becomes excessive; substantially as described.

3. The combination with a roll, of an automatic relief device comprising a breaker, having a cylinder and plunger, a wedge in line with and connected to the plunger and spring-pressed sliding blocks contacting with said wedge; substantially as described.

4. The combination with a roll, of an automatic relief device therefor, comprising a breaker containing a cylinder and plunger, said breaker having also therein a separate relief-chamber carried upon and movable therewith, said chamber being connected with the cylinder by ports extending to the same side of the piston, and a spring-pressed valve governing one of said ports; substantially as described.

5. The combination with a roll, of a hollow breaker therefor, containing a plunger, inclined faces upon the plunger contacting with similar faces upon sliding blocks, and a wedge bearing upon the sliding blocks and arranged to cause their inclined faces to slide over the faces upon the plunger; substantially as described.

6. The combination with a roll, of an automatic relief device therefor comprising a hollow breaker having a cylindrical cavity, a plunger movable therein, a separate relief-chamber carried by and movable with the breaker, said chamber being provided with a spring-pressed wall or plunger, and ports connecting the relief-chamber with the cylinder, one of said ports being controlled by a yieldingly-pressed valve; substantially as described.

7. A roll-breaker, having a cavity forming a cylinder, a plunger movable within the cylinder and having a projecting portion provided with inclined faces, horizontally-sliding spring-pressed blocks having inclined faces arranged to bear upon the inclined faces of the plunger, and a vertically-movable wedge bearing upon the block and arranged to move them outwardly and cause the cylinder and plunger to move relatively to each other; substantially as described.

In testimony whereof I have hereunto set my hand.

CORNELIUS KUHLEWIND.

Witnesses:

GEORGE B. BLEMMING,

H. M. CORWIN.