

No. 638,545.

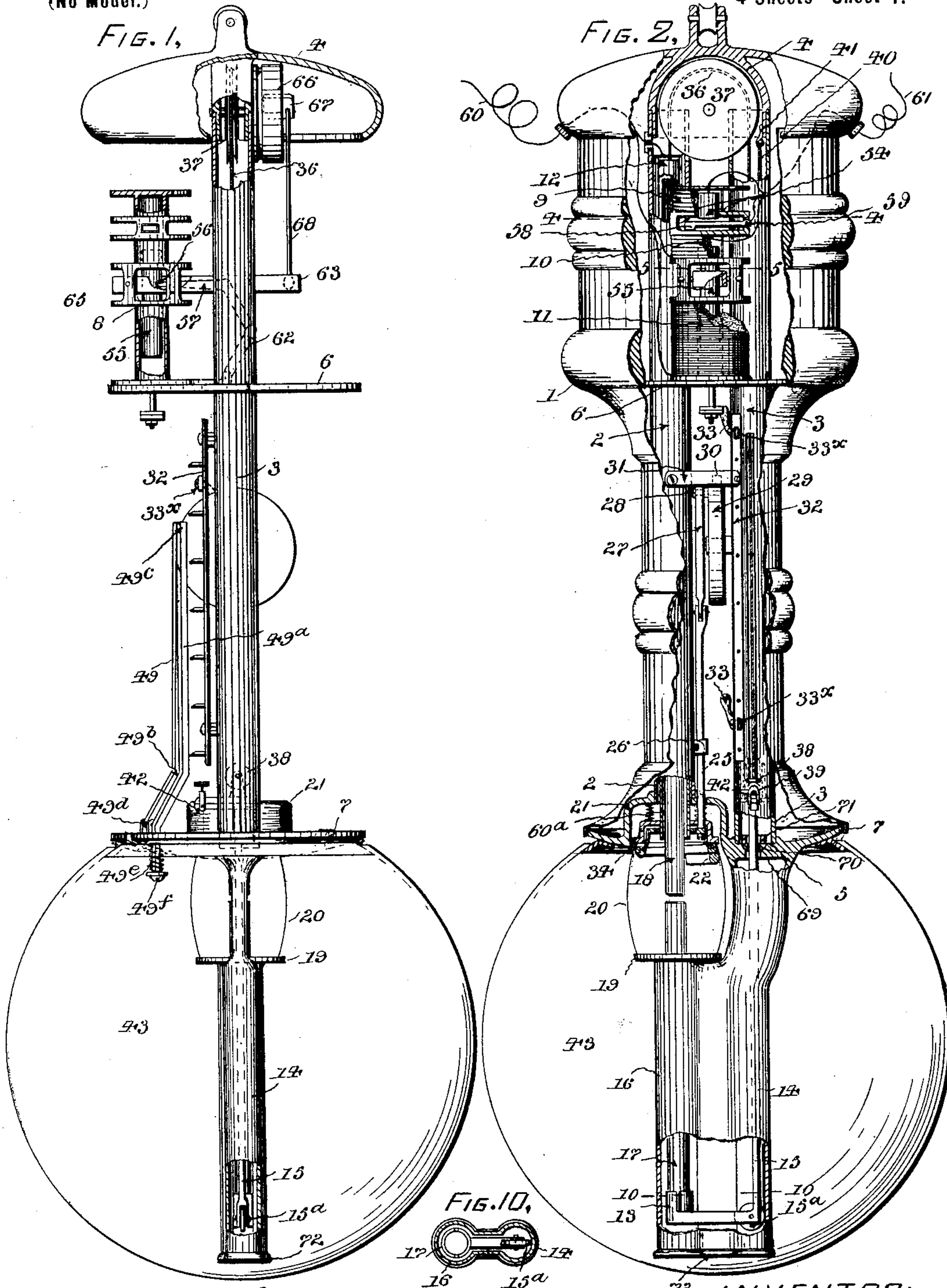
Patented Dec. 5, 1899.

E. H. BELDEN.
ELECTRIC ARC LAMP.

(Application filed Oct. 19, 1898.)

(No Model.)

4 Sheets—Sheet 1.



WITNESSES:
R. H. F. Ogilvie.
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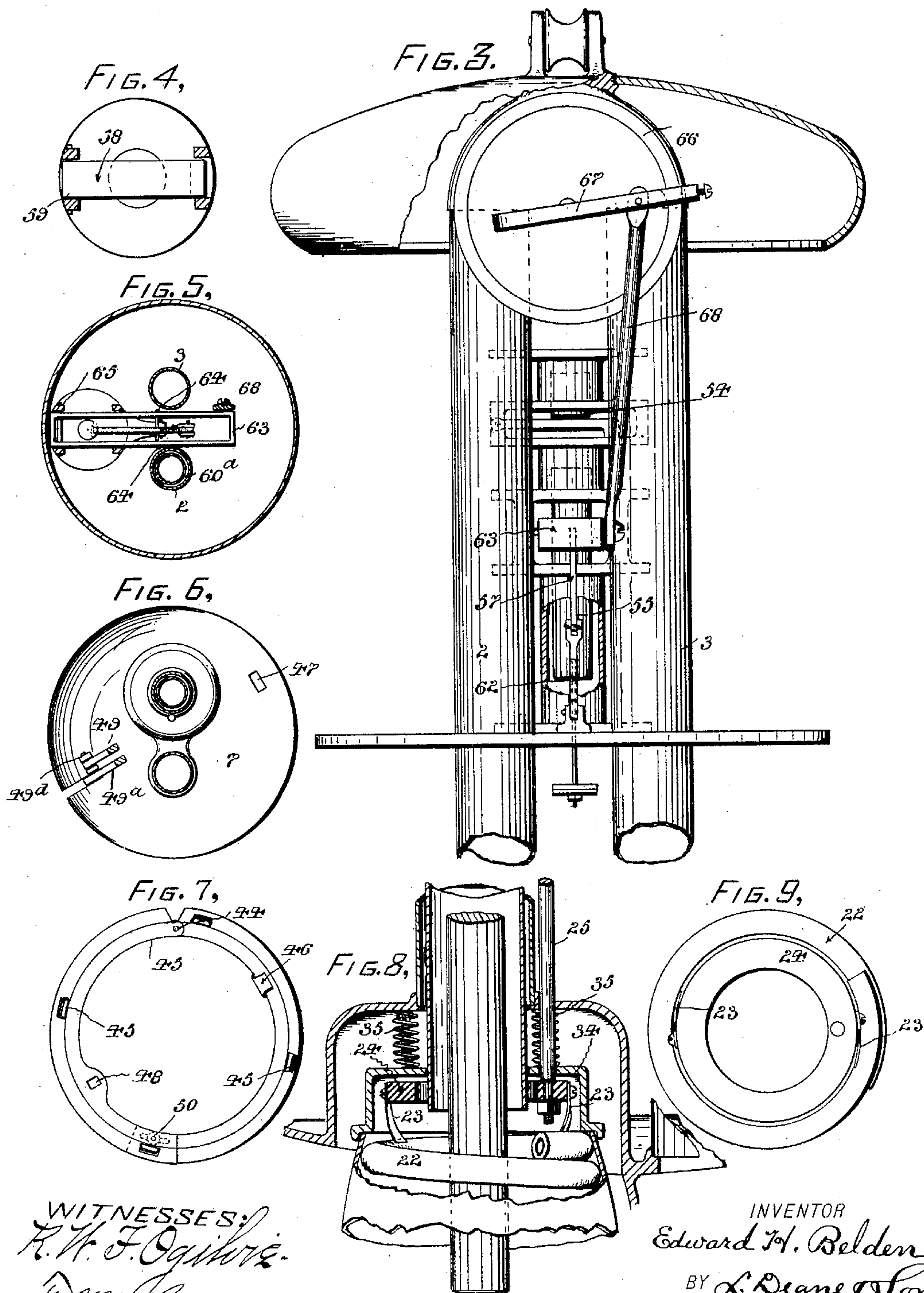
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4 Sheets—Sheet 2.



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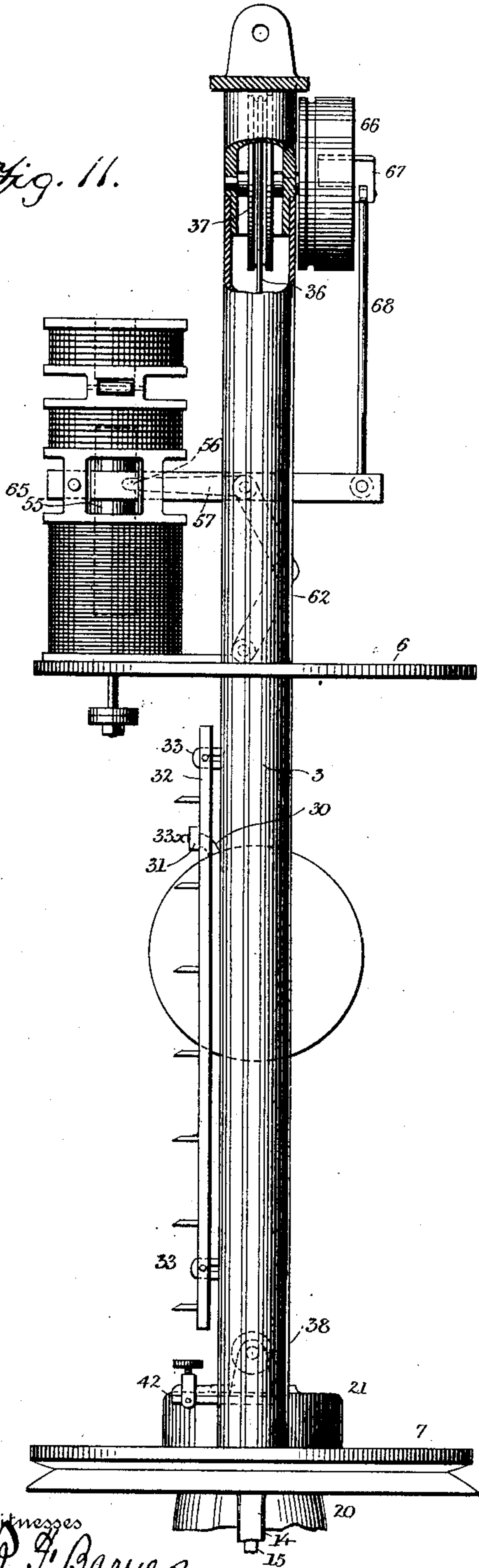
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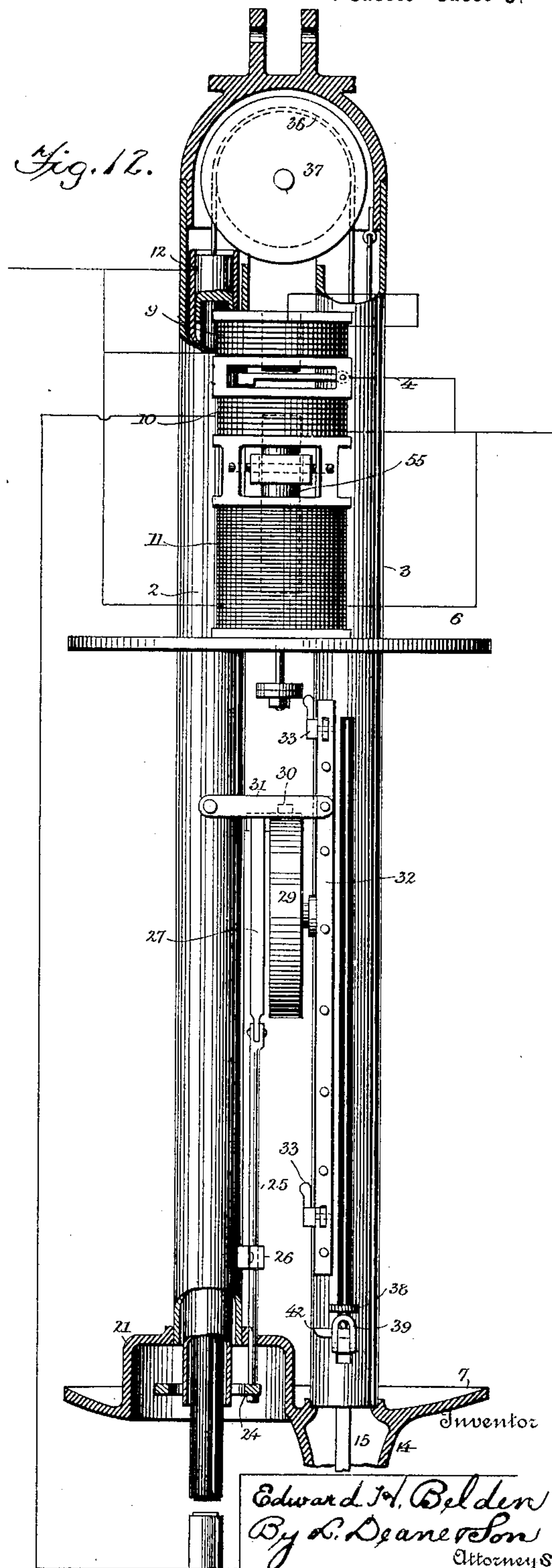
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Fig. 11.



Witnesses
P. J. Barnes.
Henry C. Cropper.

Fig. 12.



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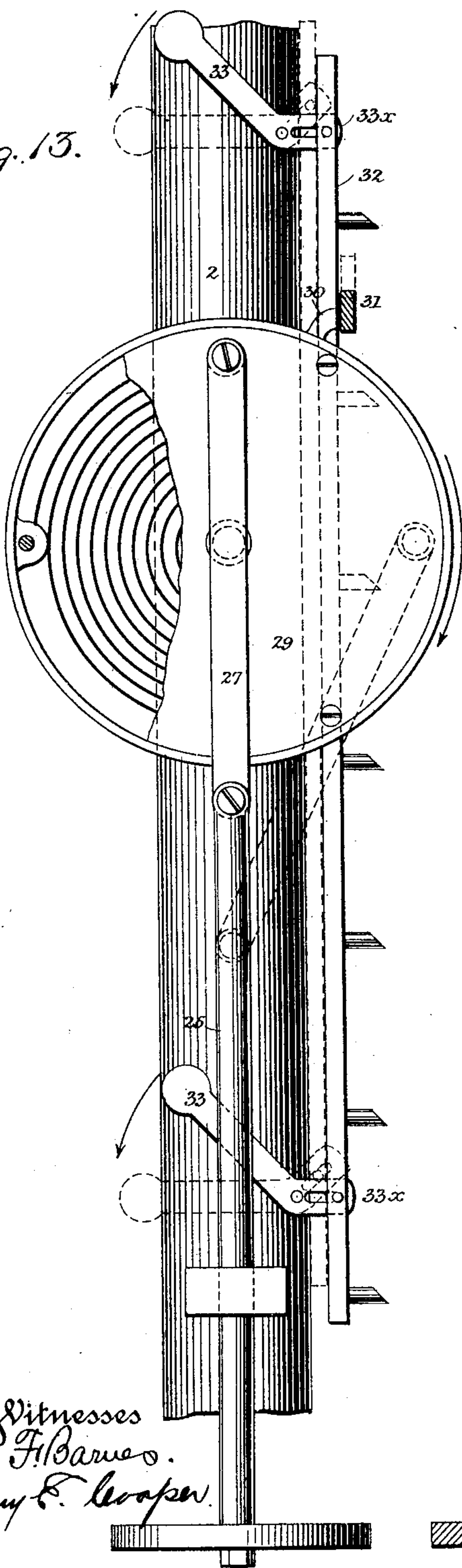
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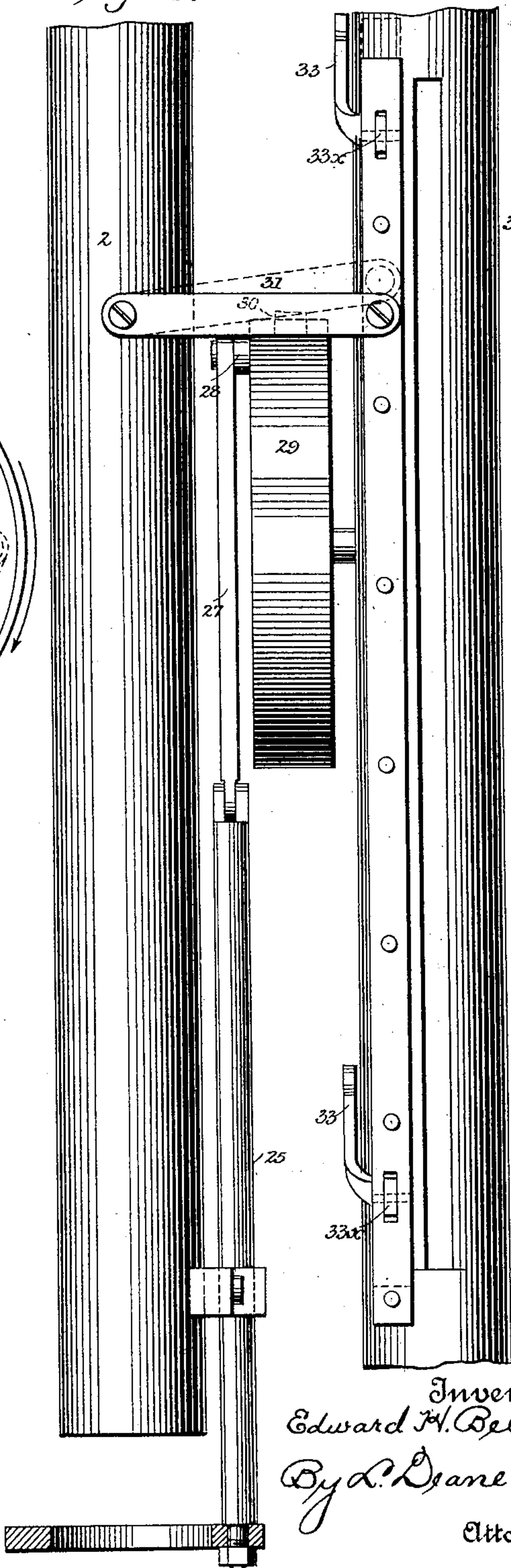
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Fig. 13.



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Fig. 14.



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UNITED STATES PATENT OFFICE.

EDWARD H. BELDEN, OF JACKSON, MICHIGAN.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 638,545, dated December 5, 1899.

Application filed October 19, 1898. Serial No. 694,008. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. BELDEN, a citizen of the United States, residing at Jackson, in the county of Jackson and State of Michigan, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to electric-arc lamps; and its objects are to provide a lamp so constructed that its parts may be readily disconnected for cleaning or renewal; to avoid the employment of elements which easily corrode or become dirty, thus affecting the operation of the lamp; to provide means for automatically cleaning the arc-inclosing globe, thus permitting the use of the lamp for a considerable time without requiring attention; to provide means for inclosing the bottom of the lamp, thus avoiding accidents from this cause, and, finally, to provide a lamp which shall be efficient in construction and durable in use.

The characteristic features of the invention will be fully described hereinafter and defined in the appended claims.

In the accompanying drawings, illustrating the invention, Figure 1 is a side elevation of the lamp with parts broken away. Fig. 2 is a front elevation, also partly broken away. Fig. 3 is an elevation of the upper portion of the lamp on an enlarged scale. Fig. 4 is a horizontal section on the line 4 4 of Fig. 2. Fig. 5 is a horizontal section on the line 5 5 of Fig. 2. Fig. 6 is a plan view of the lower casting of the lamp-frame. Fig. 7 is a plan view of the outer-globe holder. Fig. 8 is a vertical section showing the globe-cleaning mechanism. Fig. 9 is a plan view of the globe-cleaner attached to its ring or carrier, and Fig. 10 is a horizontal section on the line 10 10 of Fig. 2. Fig. 11 is an enlarged elevation, partly in section, of a portion of the lamp. Fig. 12 is an elevation looking from a direction at right angles to Fig. 11, and Figs. 13 and 14 are enlarged detail elevations of different sides of the frame of the lamp.

The reference-numeral 1 designates the casing of the lamp inclosing the working parts. Within the casing are arranged two vertical tubes 2 and 3, constituting the lamp-

frame, the upper ends of which are secured to a sheave-casing 4, while their lower ends are connected to a lower casting 5.

6 and 7 designate horizontal platforms constituting parts of the frame and serving as supports for parts of the operative mechanism of the lamp. Upon the upper platform 6 is secured a magnet-frame 8, adapted to support three independent magnets 9, 10, and 11. As best shown in Fig. 1, this frame 8 is arranged to support the three magnets in vertical alinement.

12 designates the holder for the upper carbon, and 13 the lower-carbon holder.

14 designates a tubular portion of the lower casting 5, which forms a continuation of the tube 3 and is internally contracted to form a practically air-tight passage-way for a rod 15, connected to the lower-carbon holder 13 and carrying an antifriction-roller 15^a. The tubular portion 14 is also flattened externally to cause the minimum obstruction of the light.

The tube 16, which contains the lower carbon 17, is in proper alinement with the tube 2, within which the upper carbon 18 is supported. A bracket or platform 19, fixed to the upper end of the tube 16, supports the arc-inclosing globe 20. A dome 21 is supported above the globe 20, and within this dome a portion of the globe-cleaning mechanism is arranged. The cleaning devices comprise a wiper-coil 22, preferably of fibrous material, covering a coil-spring and suspended by springs 23 from a ring 24, which is connected to the lower end of an operating-rod 25, which extends up through a guide 26 and is hinged at its upper end to a connecting-rod 27, which is connected to a wrist-pin 28, projecting from a wheel 29, suitably mounted upon the lamp-frame between the tubes 2 and 3 and adapted to be driven by an internal spring. This wheel 29 is provided with a tooth 30, which is adapted to contact with a detent-bar 31, pivoted at one end to the tube 2 and at its opposite end to a vertical movable rack 32, provided with teeth.

33 and 33 designate gravity-cams pivoted to the tube 3 and slotted at their shorter ends to engage pins 33^x, extending through the rack.

The cap 34 of the arc-inclosing globe is

preferably held in place by springs 35, interposed between the cap and the inner side of the dome 21.

The means for operating the rack and its coacting parts will be described hereinafter.

The upper-carbon holder is secured to one end of a cord or chain 36, which passes over a sheave 37, mounted upon a suitable shaft in the casing 4, and then extends down through the tube 3 and around a pulley 38, secured to the upper end of the rod 15 by a yoke 39, and thence upward, where its end 40 is attached to an eye 41. Thus it will be observed that both the upper and lower carbons are suspended by the cord 36.

The upper end of the rod 15, which supports the lower-carbon holder, is provided with a projecting finger 42, which is adapted to strike the teeth of the rack 32, thus raising the rack and lifting the detent-bar 31, secured thereto, out of contact with the tooth 30 and permitting the wheel 29 to revolve. This upward movement of the finger 42 occurs through the upward movement of the lower carbon as the latter is consumed. As soon as the pressure of the tooth 30 is off of the detent-bar 31 the slotted cams 33 force the rack 32 against the tube 3, allowing the finger 42 to pass the adjacent tooth of the rack. As soon as the ratchet-tooth has passed the detent-bar 31 and the finger 42 has passed the rack-tooth the detent-bar drops down onto the drive-wheel, arresting its movement at the end of one revolution. The drive-wheel 29 forces the wiper down through the globe 20 and back to its initial position, wiping the globe twice at each revolution of the wheel.

The numeral 43 designates the outer globe, secured by a holder comprising a two-part ring hinged at 44 and provided with guide-lips 45. (See Figs. 6 and 7.)

46 indicates a hook passing through an opening 47 in the platform 7 and holding one side of the device in place.

48 is an opening in the holder for the passage of one end of a hanger. This hanger consists of two bars 49 and 49^a, bent at the point 49^b and pivotally secured together at their upper ends 49^c. The lower end of the bar 49 is pivoted between lugs 49^d, projecting from the platform 7, while the lower end of the bar 49^a is extended to pass through the opening 48 and is provided with a coil-spring 49^e, held by a washer and screw, as shown at 49^f. This special form of hanger constitutes an important feature of my lamp, since it is adapted to be rocked to disengage the hook 46 from the platform 7 and allow the globe to be swung out clear of the lamp for trimming purposes. The distance to which the globe is swung outward depends upon the length of the hanger-bars 49 and 49^a.

The ends of the sections constituting the globe-holder overlap and are secured adjustably by a clamping-screw 50, so that the holder is adapted for globes of different size.

The three electromagnets 9, 10, and 11 which I employ I term, respectively, the "starting-magnet," the "main magnet," and the "shunt-magnet."

54 is a small armature which is designed as a gravity cut-out, and in connection with magnet 9 is also used as a starting device.

55 is an armature formed with a recess 56, into which projects one end of a lever 57, forming a part of the governing mechanism of the lamp, which is operated by the armature 55.

58 designates a relighting-contact, hinged at one end 59.

60 designates the positive and 61 the negative wire of the lamp.

The governing mechanism comprises a lever 62, hinged at one end to the magnet-frame and pivotally secured at its other end to the lever 57, the levers 62 and 57 constituting a toggle-joint, a frame 63, pivotally secured to the lever 57 by screws 64 and fulcrumed at one end at 65, Fig. 5, a flanged wheel 66, and a dog 67, connected to the frame 63 by a rod 68.

It is important to exclude air from the arc-inclosing globe as far as possible, and to accomplish this I provide the casting 5 with a concave seat or socket 69, within which rests a convex or rounded plug or valve 70, through which the rod 15 passes. Upon the valve 70 is arranged a loose washer or collar 71, also provided with an opening for the rod 15. Both the valve 70 and the collar 71 are capable of a limited lateral movement, so as not to bind the rod 15 in its vertical movement; but the valve serves to close the upper end of the casting 5 and to a degree excludes air from the globe 20.

The lower ends of the tubes 14 and 16 are closed by a cap 72, which excludes air from said tubes.

The operation of the mechanism as thus described is as follows: The current enters the lamp through the positive wire 60, connecting with upper-carbon holder 12, also with magnet 10. On account of the carbons being held apart by the gravity of the armature 55 the current has but one path, which is as follows: through the magnet 10 to armature 54, which rests on the relighter 58. The relighter 58 being insulated from the magnet-frame 8, the current passes through the relighter to the negative wire. The power of the magnet 10 being sufficient, it raises the frame 63 until the flange-wheel 66 is released from the grip of the grip-dog 67, which is connected to the frame 63 by the rod 68, which allows the gravity of the carbon-holder 12 to rotate the flange-wheel 66 until the carbons come together. The movement of flange-wheel 66 changes the cant or slant of the grip-dog until it reaches a predetermined point, where the connecting-rod 68 holds the grip-dog jaws parallel with the flange, thus releasing the flange-wheel, which gives the current a second path, as follows: from posi-

tive wire 60 through the upper-carbon holder 12 and upper carbon, which are insulated from the frame by means of an inner tube 60^a, which is placed inside of the tube 2 and is insulated from the frame and electrically connected to the positive wire 60. Said inner tube insulates the positive carbon from the frame and carries the current to the positive carbon, then through the lower carbon into the frame, and from the frame through the magnet 9, which is electrically connected to the magnet-frame 8 at one end and to the negative wire 61 at the other end. The power of the magnet 9 being sufficient, it raises the armature 54 off of the relighter 58. The shunt-magnet 11 is connected at one end to the positive wire 60 and at the other with the frame. After the armature 54 is disconnected from the relighter 58 the current has two paths, one from the positive wire through the carbons into the frame and from the frame through the magnet 9 to the negative wire 61, while the other path is from the positive wire 60 through the shunt-magnet 11, which regulates the approach of the carbons and keeps them at the proper distance apart to form an arc and keeps the arc at a predetermined value, which is accomplished as follows: Any variation in the arc changes the amount of current passing through the shunt-magnet 11, which changes the power of the shunt-magnet, and such changes of power acting on armature 55 act on the frame 63 by means of the lever 57, which is pivoted to the frame 63 by the pivot-pointed screws 64 and hinged to the lever 62. The movement of the frame 63 varies the distance between the carbons, which keeps the arc at the predetermined value as the carbons burn away by being connected with the cord or chain, and when the frame 63 has moved up (to allow the carbons to approach) a predetermined distance the grip-dog 67 is tripped by the connecting-rod 68, which allows the gravity of the upper-carbon holder 12 to rotate the flange-wheel 66, thereby lessening the resistance of the arc, which lessens the power of the shunt-magnet 11, thereby allowing the frame 63 to lower. Then again as the carbon burns away the resistance of the arc becomes greater, likewise the power of the shunt-magnet 11 becomes greater, which again raises the frame 63, as before, and so on until the carbons are entirely consumed.

The starting-magnet 9 is placed above and attached to the magnets 10 and 11, so that if the lamp should receive an excess of current at any time from any cause the excess current will cause the armature 55 to rise and lift the relighter 58 until the relighter touches the armature 54, thereby cutting out the lamp. The magnets 9, 10, and 11 are insulated from the magnet-frame 8. The magnet-frame 8 is cast in one piece for convenience of manufacturing and also to prevent the magnets from getting out of line and to allow the gov-

erning-frame to be so attached that the entire lamp mechanism can be removed as one piece.

I claim—

1. In an arc-lamp, a frame consisting of a tubular guide for the upper carbon, and a tubular guide for the lower carbon, said guides being in vertical alinement, in combination with platforms secured to said guides and adapted to support the operative mechanism of the lamp, and a tube interposed between the upper carbon and its tubular guide.

2. In an arc-lamp, a frame consisting of upper and lower tubular guides for the carbons, in combination with a platform located at the upper end of the lower guide and adapted to support an arc-inclosing globe, and a tube interposed between the upper carbon and its tubular guide.

3. In an arc-lamp, the combination with the magnet-frame, and the carbon suspending and controlling mechanism, of a toggle-lever one member of which is pivotally secured to the magnet-frame, while the other member is pivotally secured to a tilting frame carried by said magnet-frame.

4. In an arc-lamp, the combination with the magnet-frame, and the carbon-suspending mechanism, of a toggle-lever one member of which is pivotally secured to said frame, while the other member is pivotally secured to a tilting frame carried by the magnet-frame, a flanged wheel and gripping-dog, and a connection between said tilting frame and gripping-dog.

5. In an arc-lamp, the combination with the lamp-frame, of a pulley at the upper end thereof, a carbon-suspending cord passing around said pulley, a flanged wheel concentric with said pulley, a gripping-dog adapted to engage the flange of said wheel, a magnet-frame, a tilting frame arranged thereon, a toggle-lever connecting the magnet-frame and tilting frame, and a connection between said tilting frame and gripping-dog.

6. In an arc-lamp, the combination with a frame comprising a tube for the upper carbon, a tube for the mechanism controlling the lower-carbon holder, and a tube for the lower carbon, of an arc-inclosing globe located between the proximate ends of the upper and lower carbon tubes, a cap for said globe having an opening for the passage of the upper carbon, and a cap closing the lower ends of the tubes for the lower carbon and lower-carbon-holder mechanism.

7. In an arc-lamp, the combination with the lamp-frame, of an arc-inclosing globe, a cleaner within the globe, a spring-controlled drive-wheel mounted upon the frame, a connection between said wheel and cleaner, and mechanism for controlling the movement of said wheel.

8. In an arc-lamp, the combination with a lamp-frame, and an arc-inclosing globe, of an automatic globe-cleaner forced against the

globe by spring-pressure, a spring-controlled wheel connected with said cleaner, and mechanism for controlling the rotation of the wheel.

9. The combination with an arc-lamp of a globe-holder, and a hanger therefor, said hanger being centrally jointed, and adapted to be folded together to support the globe in position, and to be unfolded to suspend the globe at a distance from the lamp to facilitate recarboning.

10. The combination with an arc-lamp, of a globe-holder adapted to embrace the upper part of the globe, and a jointed hanger adapted to be folded and unfolded, substantially as described.

11. An arc-lamp frame comprising tubes 1, 3, 14 and 16, in combination with an arc-inclosing globe located between the tubes 1 and 16, and a closing-plate 72, whereby air is excluded from the arc-inclosing globe.

12. In an arc-lamp, the combination with an arc-inclosing globe, of a wiper or cleaner, arranged within the globe, and means controlled by the carbon-supporting mechanism of the lamp for automatically operating said wiper or cleaner.

13. In an arc-lamp, the combination with an arc-inclosing globe, of a cleaner arranged within the globe and comprising an expandible wiper, and means, controlled by the carbon-supporting mechanism of the lamp, for

bon-supporting mechanism of the lamp, for automatically moving the wiper within the globe.

14. In an arc-lamp, the combination with an arc-inclosing globe, of a cleaner comprising a self-expanding fibrous wiper and mechanism operated by the lower-carbon holder for moving said wiper within the globe.

15. In an arc-lamp, the combination with an arc-inclosing globe, of a wiper suspended within the globe by a supporting device, a rod secured to said supporting device, and mechanism operated by the movement of the lower-carbon holder for reciprocating said rod.

16. In an arc-lamp, the combination with an arc-inclosing globe, of tubes 14 and 16, the tube 14 having a concave socket, a valve seated in said socket, and a cap for the lower ends of the tubes.

17. In an arc-lamp, the combination with an arc-inclosing globe, of tubes 14 and 16, and means substantially as described for excluding air from said globe.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD H. BELDEN.

Witnesses:

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HENRY E. COOPER.