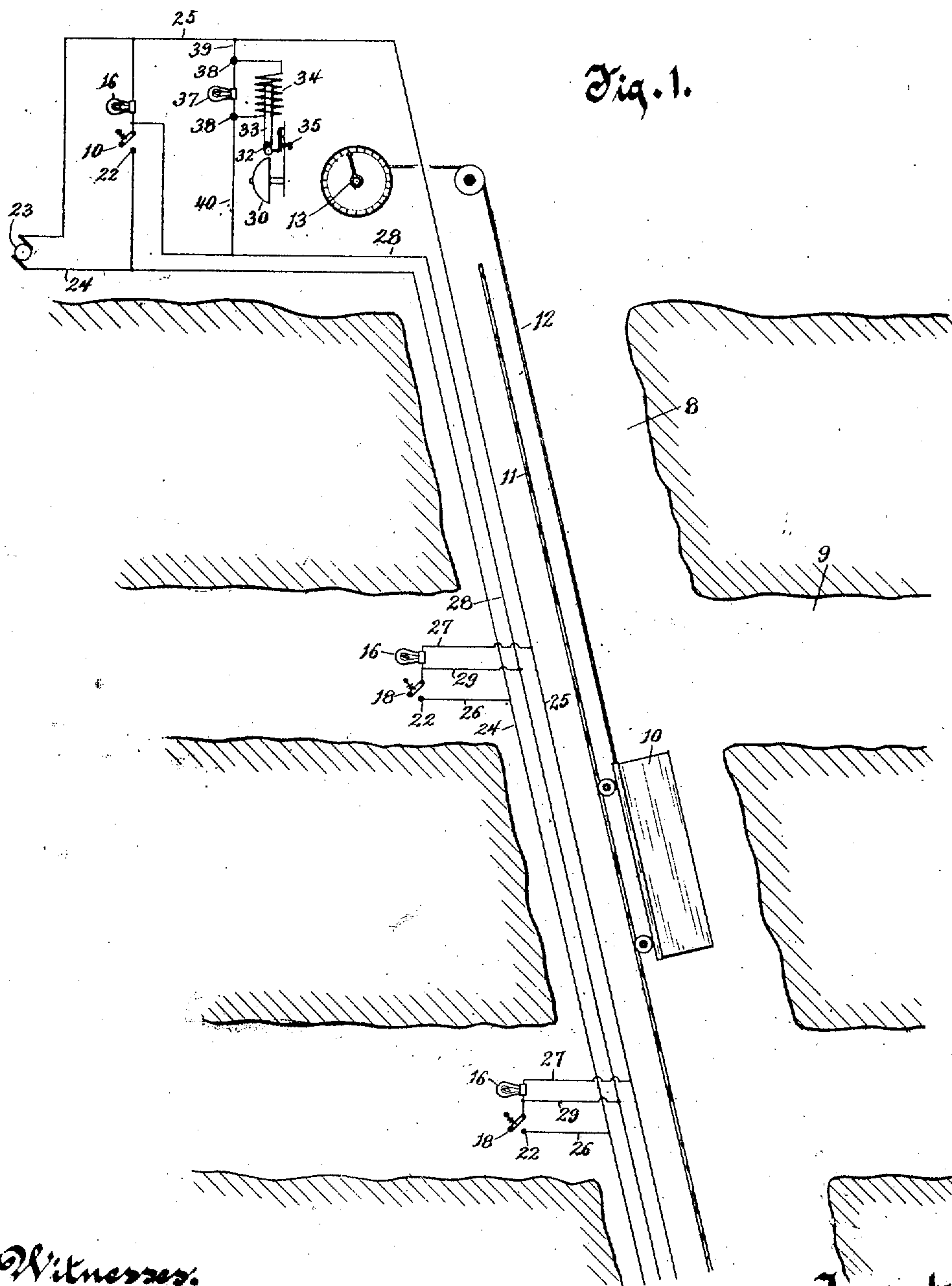


N. S. RICHMOND.
MINING SIGNAL SYSTEM.
APPLICATION FILED APR. 9, 1906.

2 SHEETS—SHEET 1.



Witnesses.

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Anna F. Schmidtbauer

Inventor

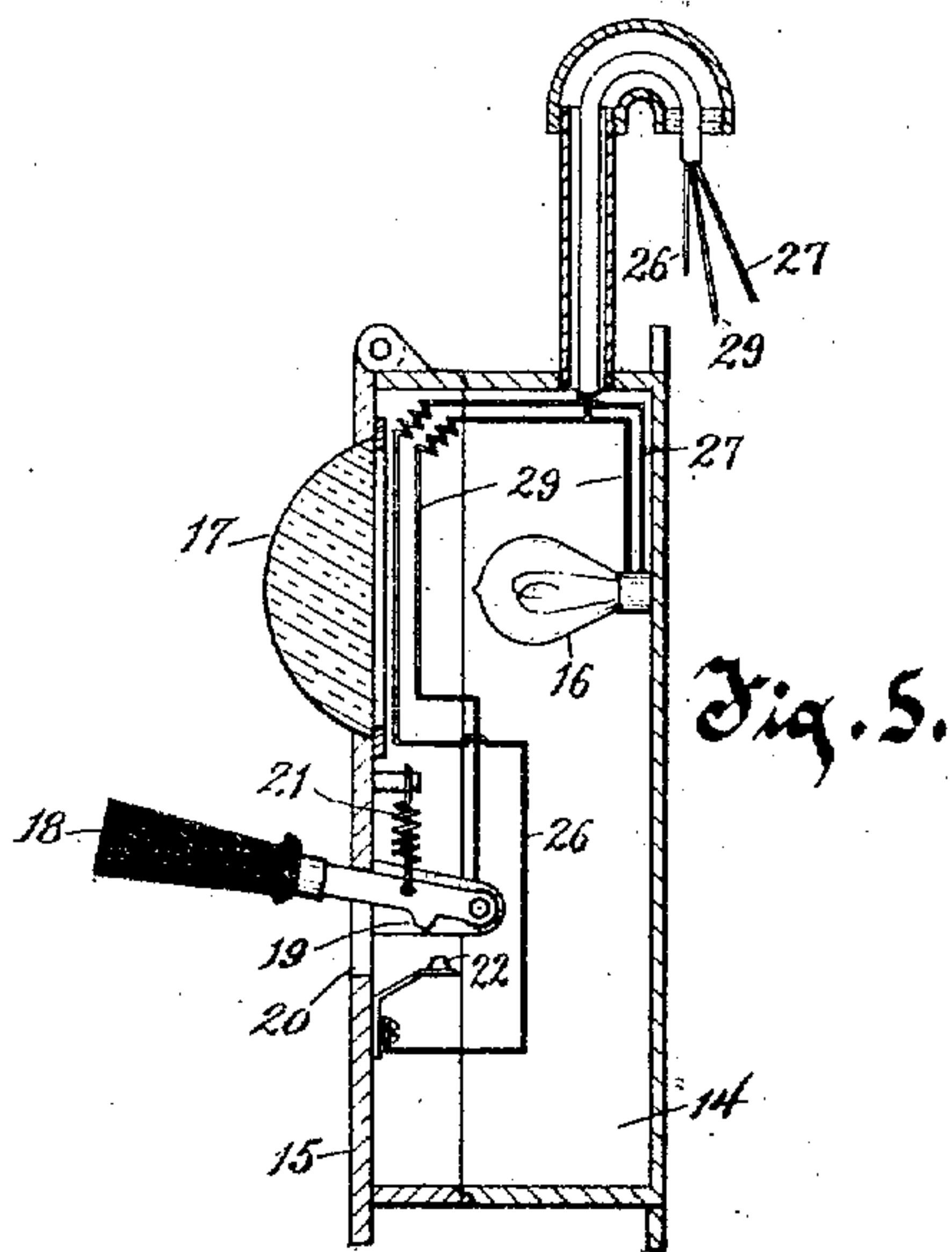
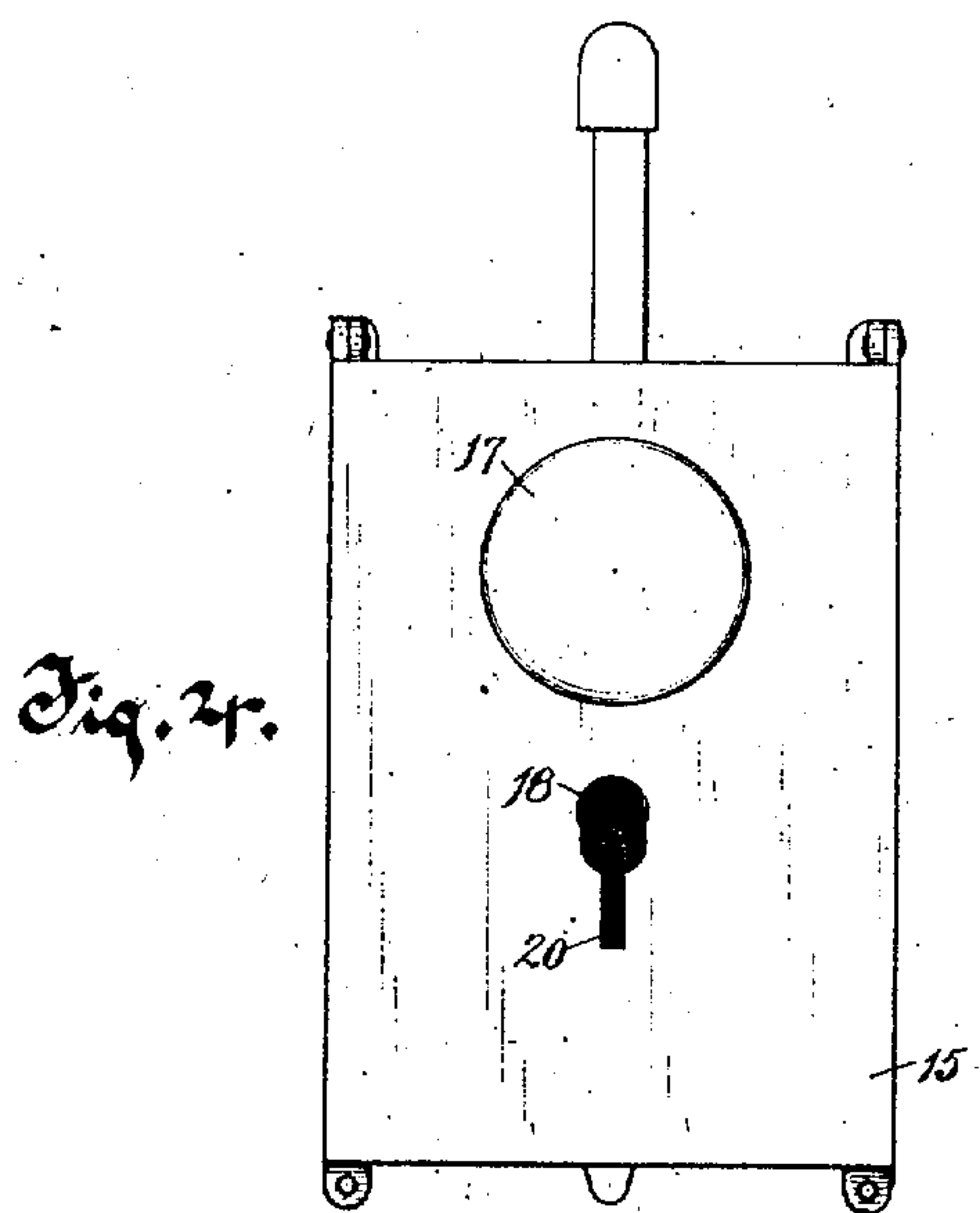
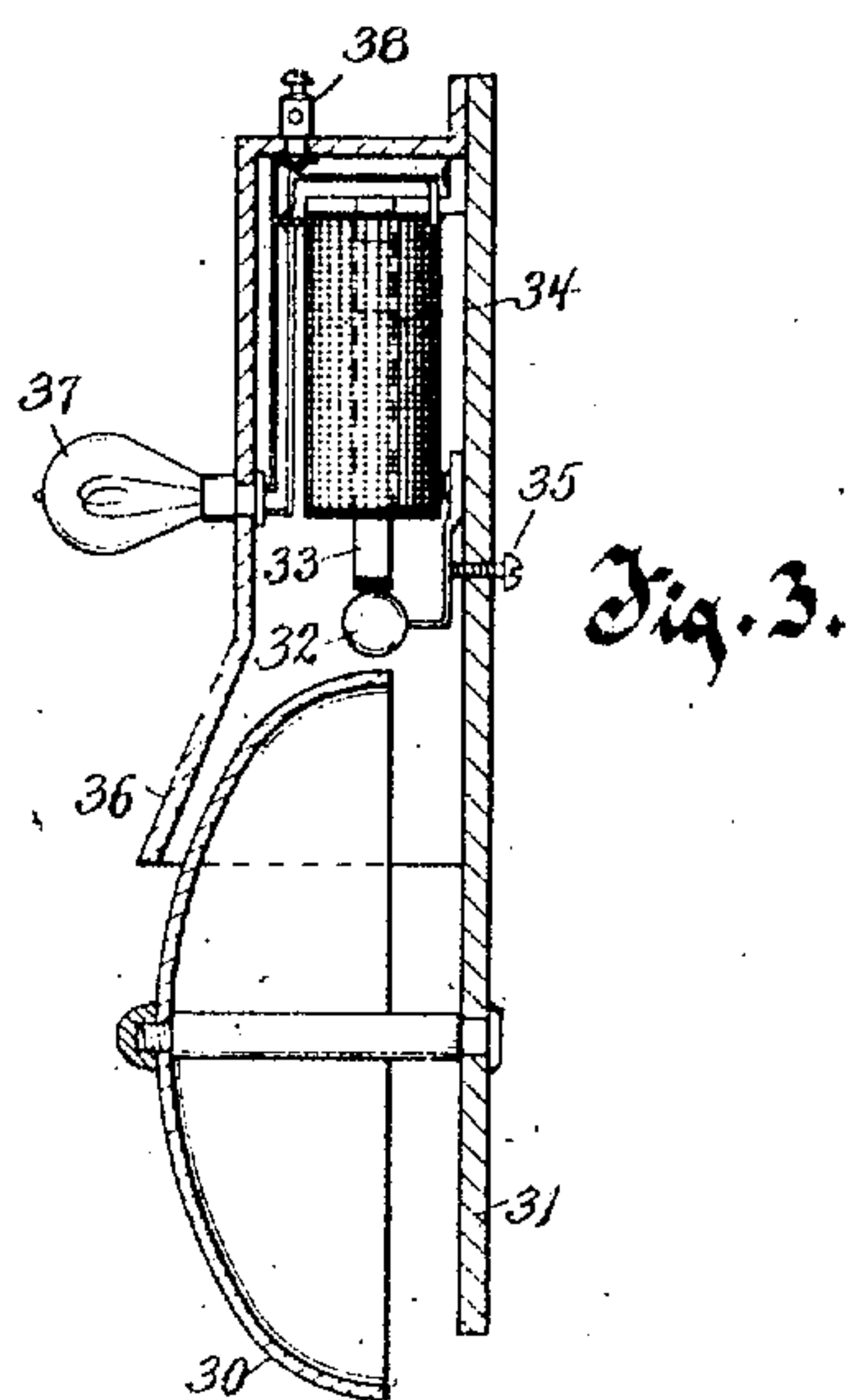
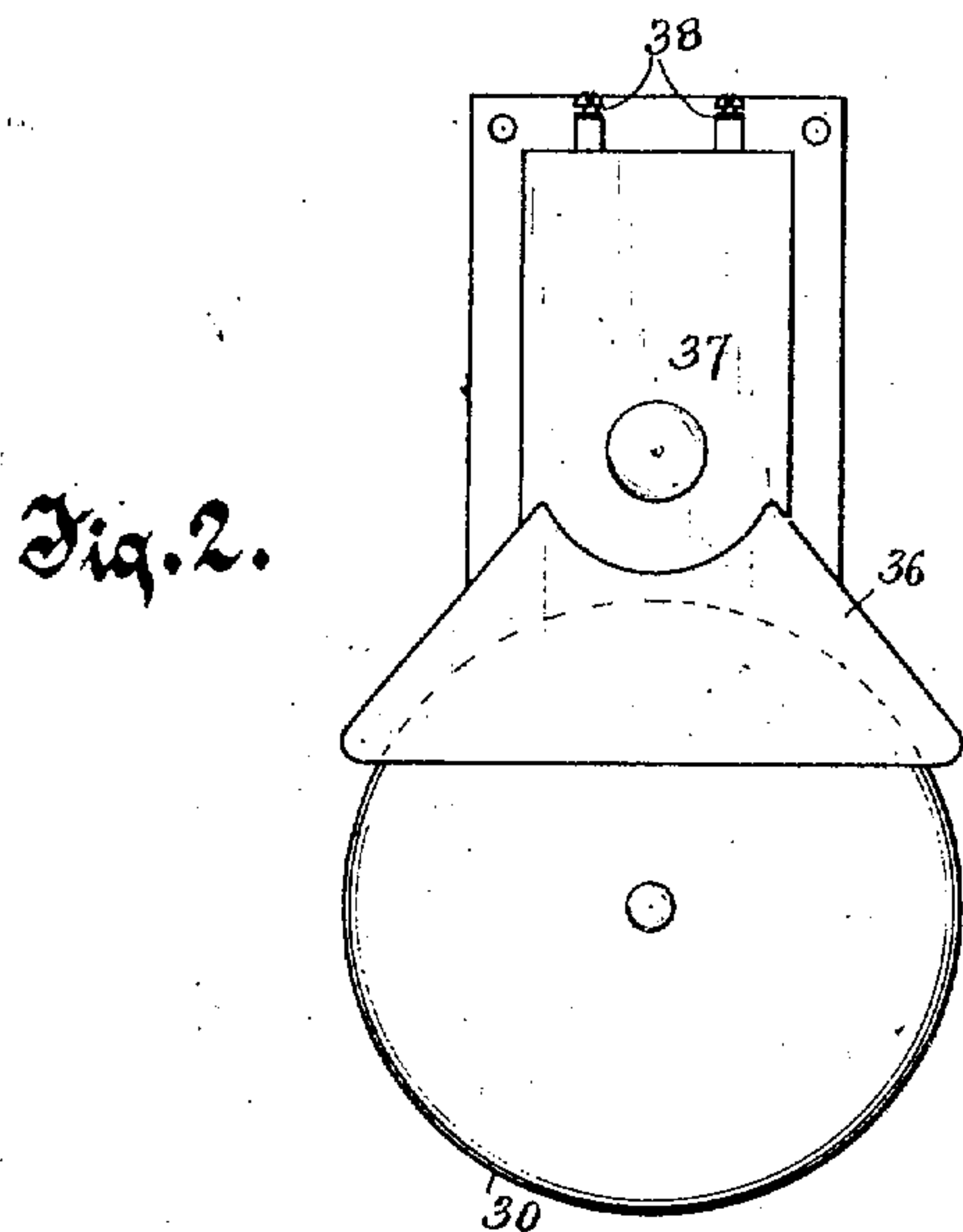
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Attorneys

No. 850,100.

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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

NORMAN S. RICHMOND, OF OSHKOSH, WISCONSIN.

MINING SIGNAL SYSTEM.

No. 850,100.

Specification of Letters Patent.

Patented April 9, 1907.

Application filed April 9, 1906. Serial No. 310,861.

To all whom it may concern:

Be it known that I, NORMAN S. RICHMOND, residing in Oshkosh, in the county of Winnebago and State of Wisconsin, have invented new and useful Improvements in Mining Signal Systems, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

10 This invention relates to new and useful improvements in mining signal systems, and has for its object to provide a signal system for use in mines whereby signals may be sent from any level to the engineer in charge of the machinery operating the lift or skip.

15 An object of the invention is to provide such a signaling system which will indicate at each level the fact that a signal is being sent, and thereby avoid the interference of signals which would occur if more than one signal were sent at a time.

20 Another object of this invention is to provide each signal station or level of the mine with a signaling-switch for controlling an electric-lamp circuit, there being incandescent lamps at each signal-station to glow when the signal-circuit is closed by any signal-switch, and thus indicate the signal being given.

25 Another object of this invention is to provide such a signal system with a combined visible and audible signaling means at the engineer's station, the visible and audible signaling parts cooperating in the production of signals.

30 Another object of this invention is to provide signal-boxes and engineer's signal means of novel construction.

35 With the above and other objects in view the invention consists in the system and devices, their parts and combinations herein claimed, and all equivalents thereof.

Referring to the accompanying drawings, in which like characters of reference indicate the same parts in the several views, Figure 1 is a sectional view of a portion of a mine-shaft with the improved signal system of this invention shown in diagram. Fig. 2 is a front elevation of the engineer's signal means. Fig. 3 is a vertical sectional view thereof. Fig. 4 is a front elevation of a signal-box, and Fig. 5 is a longitudinal sectional view thereof.

40 In the drawings, 8 represents a mine-shaft, which is inclined and has various horizontal passages or levels 9 connecting therewith. In copper mines the shaft 8 is fre-

quently a mile or more in length, and the levels 9 are arranged about one hundred feet apart. The lift or skip 10, which rides on a suitable track 11 in the shaft, is raised and lowered by means of a cable 12, which is wound upon a powerful engine-operated hoist under the control of the engineer in the engineer's station at the surface. The hoist is capable of very rapid operation to move the skip or lift at the speed of a mile a minute when desired. At the engineer's station the cable 12 is caused to operate the index-hand or an indicator 13, which shows at a glance the position of the skip at any time. At each level is stationed an attendant, known as a "lander," whose duty it is to signal to the engineer such information as that the skip is desired at his level to convey passengers, ore, timber, or the like to a specified level or to the surface and whose duty is also to give what is known as a "half-signal" when the skip is slowly approaching his level to indicate when it is in the desired position for receiving or unloading the load, so that the engineer may stop the skip at that point. There are various other signals which the landers are required to transmit to the engineer on different occasions, and it is very important that one signal should not interfere with another by two or more landers signaling at the same time. It is to avoid this confusion of interfering signals that the signal-station on each level is provided with a signal-lamp in addition to its signaling-switch to glow with each signal-contact wherever made, and thus caution the lander against sending signal until the signal system is again out of use.

The signal-station at each level is furnished with a signal-box, (shown in detail in Figs. 4 and 5,) comprising a casing 14, with a hinged front 15, making a water-tight compartment to contain the signaling apparatus, there being an incandescent lamp 16 mounted within the signal-box and visible through a lens 17 in the front. A hand-switch lever 18 is pivotally connected to a projection 19 on the inside of the signal-box front and passes through a slot 20 in said front, being normally held in its uppermost position by means of a retractile spring 21. The switch-lever 18 carries a contact-point adapted when the lever is pressed to its lowermost position to contact with a stationary contact-point 22 therebeneath, the stationary contact being mounted on the signal-box front and the parts suitably insulated from each other, so

that the contacts may make and break a signaling-circuit in which the lamp 16 is included.

A generator 23 or other suitable source of supply of electrical energy at the engineer's station has its terminal wires 24 and 25 extending down the shaft and connected with the stationary contact 22 and one side of the signal-lamp 16 of the signal-box at each level by means of branch wires 26 and 27, respectively, there being a third or signal wire 28 also extending from the engineer's station down the shaft and connected with the other side of the signal-lamp 16 and also the switch-lever 18 of the signal-box of each level by means of branch wires 29. Thus the signal-lamps 16 are connected in multiple between the signal-wire 28 and the terminal wire 25, and the signal-switches are connected in multiple between the signal-wire and the other terminal wire 24, so that when all of the switches are open no current passes through the signal-lamps, but when any one of the switches is closed all of the signal-lamps are lighted.

At the engineer's station there is provided a signal-box containing the lamp 16 and the switch 18, having the same connections as the switch-box at the different levels, so that the engineer may signal in reply when desirable, and in addition there is provided an engineer's signal, which comprises a combined visible and audible signal means specially adapted for the purpose of this invention. The engineer's signal comprises a gong 30, mounted on a base 31, which supports a spring-clapper 32, adapted to be struck by the movable core 33 of a solenoid 34. The solenoid is mounted on the base above the gong, so that when it is deenergized it drops the core on the clapper 32 and causes the clapper to strike the gong. The position of the clapper 32 with respect to the gong may be adjusted by means of a set-screw 35, threaded through the base. The core 33 is prevented from clinging to the clapper by its residual magnetism by having a protecting tip of brass or other non-magnetic material on its end. The gong has mounted over it a hood 36, which constitutes a casing inclosing the solenoid, and on it is mounted an incandescent lamp 37, which is connected in shunt with the solenoid, and their joint terminals connect with binding-posts 38 on top of the hood, which connect, by means of wires 39 and 40, with wires 25 and 28, respectively. The signal-lamp 37 and the solenoid 34 being thus connected between the signal-wire 28 and the terminal wire 25 will receive the signaling current whenever a signal-switch is closed, the lamp glowing the same as signal-lamps 16 and the solenoid becoming energized to lift its core 33, so that when the current is broken and the solenoid releases its core the core

drops upon the clapper 32 and causes it to sound the gong 30. With this engineer's signal each signal stroke of the key is indicated by the visible indicator—the lamp 37—and by the audible indicator—the gong 30. When the signal-key is held closed for any considerable time for producing the half-signal for the purpose above described, the lamp 37 will glow continuously during the time the switch is held closed to serve as a warning to the engineer that the movement of the skip should be very slow, as its destination is being approached, and then the sound of the gong indicates the exact time at which the hoist should be stopped to cause the skip to stand in the desired location. As it is sometimes necessary to run trucks or cars of rails and the like from tracks at the levels onto the skip, the exact positioning of the skip is very necessary.

In operation a lander on any level who desires to have the skip brought there to carry a cargo to any other level will approach the signal-box at his level, and if the lamp 16 thereof is not glowing to indicate that some one else is using the signal system he moves the hand-lever 18 downwardly a number of times to make connection between the contact-points 19 and 22, so as to close the signaling-circuit, and thereby transmit signals to the engineer's station, indicating his requirements. The signals at the engineer's station are produced visibly and audibly by the engineer's signal and may be read from the signal-box of all levels by the flaring signals of the signal-lamps 16, so that the lander on the level to which the skip is sent may know that it will become his duty to signal the engineer when the skip is in the proper position at his level.

When the engineer is awaiting the half-signal for stopping the skip at a certain level and some one not aware of the fact that the signal system is then in use starts to send a signal, the engineer will know by the position of his indicator 13 that the skip is not near the level where it is ordered to stop and will realize that the signal being sent is by mistake and is not to be understood as the signal to stop, so he will continue the movements of the skip until on approaching the destination the half-signal is given. Obviously the party attempting to signal a new order will become aware of the fact that the signal system is in use as soon as his lamp glows continuously for the half-signal and he will of course leave his switch alone until the half-signal is completed and the signal system is again out of use. In this way there can be no interference of signals. Preferably the wiring throughout the system is protected by armored conduits, such as shown in connection with the signal-box in Fig. 5, which will protect it from abrasion and moisture to

which it might otherwise be subjected. In this way the system is admirably adapted to the purpose intended.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a mining signal system, a pair of terminal wires having connection with a suitable source of electrical supply and extending down the mine-shaft, a signal-wire also extending down the mine-shaft, signaling means at each of a number of levels of the mine connected between the signal-wire and one of the terminal wires, an engineer's signal at the engineer's station also connected between the signal-wire and said terminal wire, and signal-switches at each of said levels adapted to make connection between the signal-wire and the other terminal wire.

2. In a mining signal system, a pair of terminal wires having connection with a suitable source of electrical supply and extending down the mine-shaft, a signal-wire also extending down the mine-shaft, signal-lamps at different levels of the mine connected between the signal-wire and one of the terminal wires, an engineer's signal at the engineer's station also connected between the signal-wire and said terminal wire, and signal-switches at said levels adapted to make a connection between the signal-wire and the other terminal wire.

3. In a mining signal system, a pair of terminal wires having connection with a suitable source of electrical supply and extending down the mine-shaft, a signal-wire also extending down the mine-shaft, a waterproof signal-box at each of a number of levels containing a signal-lamp connected between the signal-wire and one of the terminal wires and a signal-switch connected between the signal-wire and the other terminal wire, and an engineer's signal means between the signal-wire and the terminal wire with which the signal-lamps are connected.

4. In a mining signal system, a pair of terminal wires having connection with a suitable source of electrical supply and extending down the mine-shaft, a signal-wire also extending down the mine-shaft, an engineer's signal between the signal-wire and one of the terminal wires, and a waterproof signal-box at a level comprising a box portion with a hinged front carrying a spring-retracted contact-lever adapted to engage a stationary contact and form a signal-switch therewith, said switch being connected between the signal-wire and the other terminal wire, an incandescent lamp in the box member connected between the signal-wire and the terminal wire with which the engineer's signal is connected, and a lens in the box-front through which the incandescent lamp may be seen.

5. In a mining signal system, a pair of terminal wires having connection with a suit-

able source of electrical supply and extending down the mine-shaft, a signal-wire also extending down the mine-shaft, signal means at each of a number of levels of the mine connected between the signal-wire and one of the terminal wires, a signal-switch at each of said levels of the mine connected between the signal-wire and the other terminal wire, and an engineer's signal comprising an incandescent lamp and an electric gong connected between the signal-wire and the terminal wire with which the signal means are connected.

6. In a mining signal system, a pair of terminal wires having connection with a suitable source of electrical supply and extending down the mine-shaft, a signal-wire also extending down the mine-shaft, signal means at each of a number of levels of the mine connected between the signal-wire and one of the terminal wires, a signal-switch at each of said levels of the mine connected between the signal-wire and the other terminal wire, and an engineer's signal comprising an incandescent lamp and a solenoid connected between the signal-wire and the terminal wire with which the signal means are connected, a core operating within the solenoid, a spring-clapper adapted to be engaged by the core when the core is dropped by the solenoid, and a gong in the path of the clapper to be struck thereby.

7. In a mining signal system, a pair of terminal wires having connection with a suitable source of electrical supply and extending down the mine-shaft, signal means at each of a number of levels of the mine connected between the signal-wire and one of the terminal wires, a signal-switch at each level of the mine connected between the signal-wire and the other terminal wire, and an engineer's signal comprising an incandescent lamp and a solenoid connected between the signal-wire and terminal wire with which the signal means are connected, a core operating within the solenoid, an adjustable spring-clapper adapted to be engaged by the core when the core is dropped by the solenoid, and a gong in the path of the clapper to be struck thereby, the incandescent lamp of the engineer's signal visibly indicating the periods during which the signal-switches remain closed and the gong audibly indicating the instant that the signal-switches are opened.

8. In a mining signal system, a pair of terminal wires having connection with a suitable source of electrical supply and extending down the mine-shaft, a signal-wire also extending down the mine-shaft, a signal-box at each of a number of levels of the mine and comprising a signal-lamp connected between the signal-wire and one of the terminal wires and a signal-switch connected between the signal-wire and the other terminal wire, a

signal-box at the engineer's station provided with a signal-lamp and a signal-switch having the same connections as the corresponding parts in the signal-boxes of the levels; 5 and an engineer's signal at the engineer's station comprising a solenoid connected between the signal-wire and the terminal wire with which the signal-lamps are connected, a core operating therein, an adjustable spring-clapper beneath the core adapted to be 10 struck thereby when the core is released by the solenoid, a gong beneath the clapper to be struck thereby, a hood inclosing the solenoid and a portion of the gong, and an incandescent lamp mounted on the hood and connected in shunt with the solenoid. 15

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

NORMAN S. RICHMOND.

Witnesses:

R. S. C. CALDWELL,

ANNA F. SCHMIDTBAUER.