No. 876,503. PATENTED JAN. 14, 1908.

M. R. SULIOT.

SAFETY DEVICE FOR ELECTRIC CRANES.

APPLICATION FILED JULY 24, 1907.

3 SHEETS—SHEET 1.

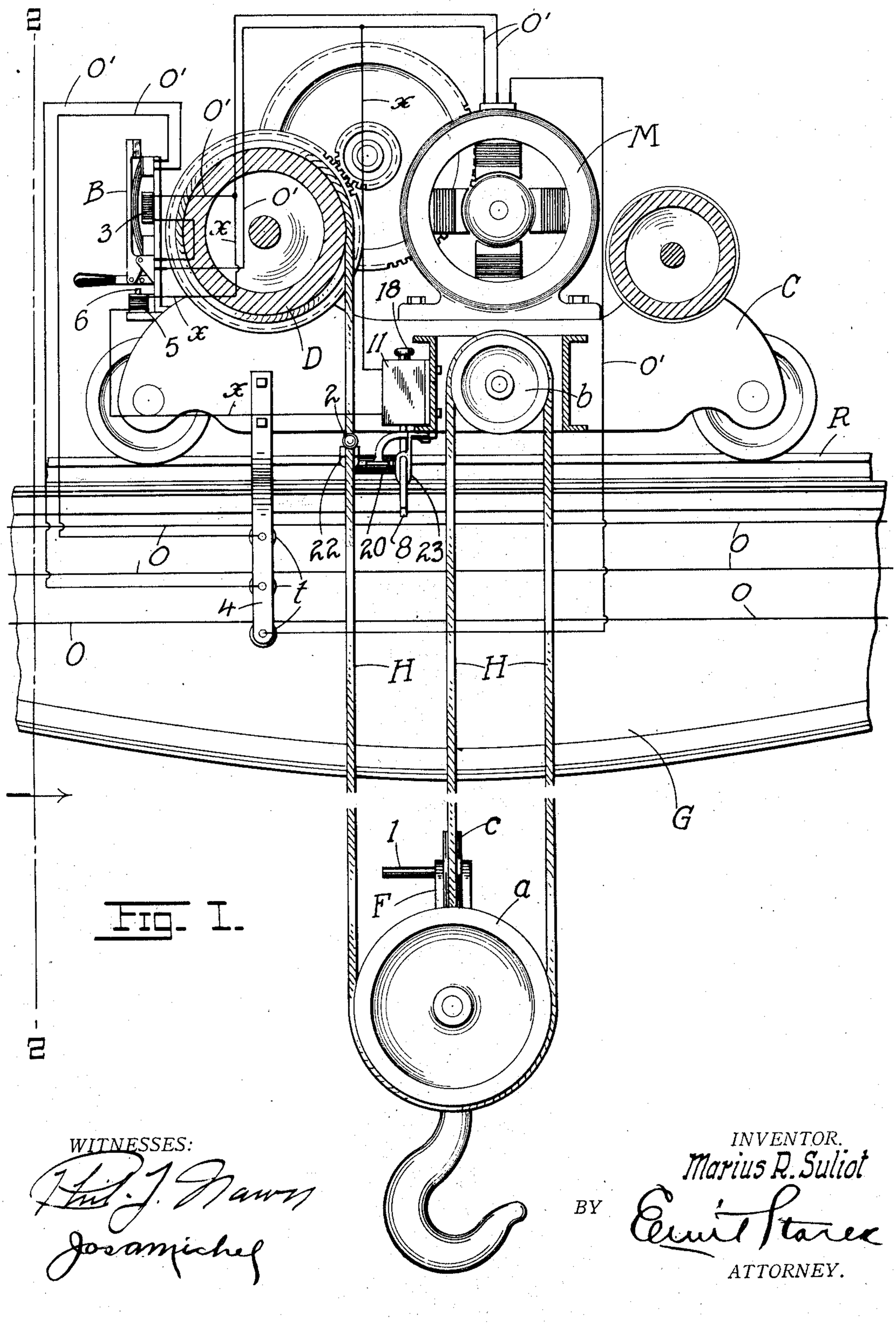

Fig. 1.

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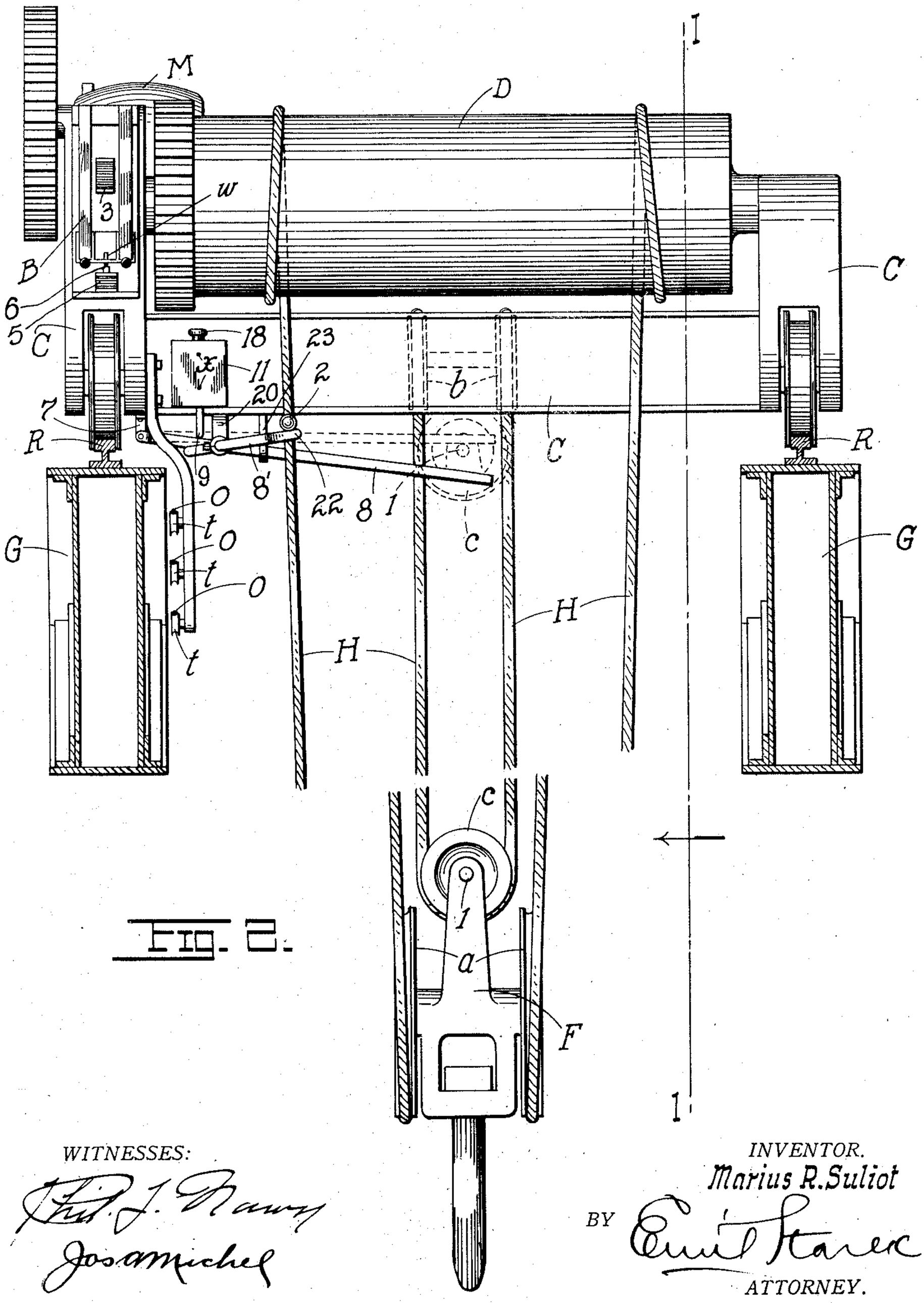

Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

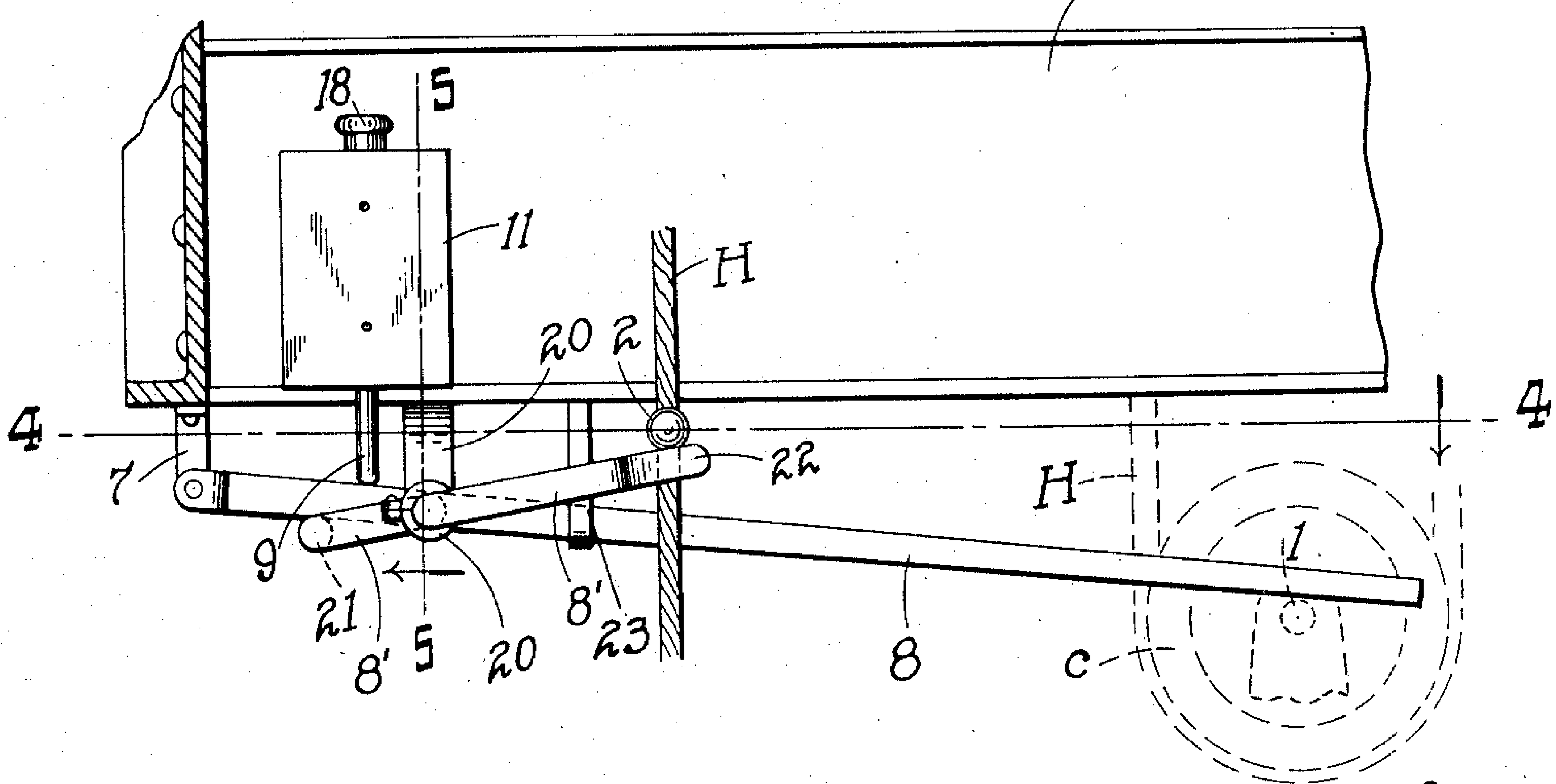
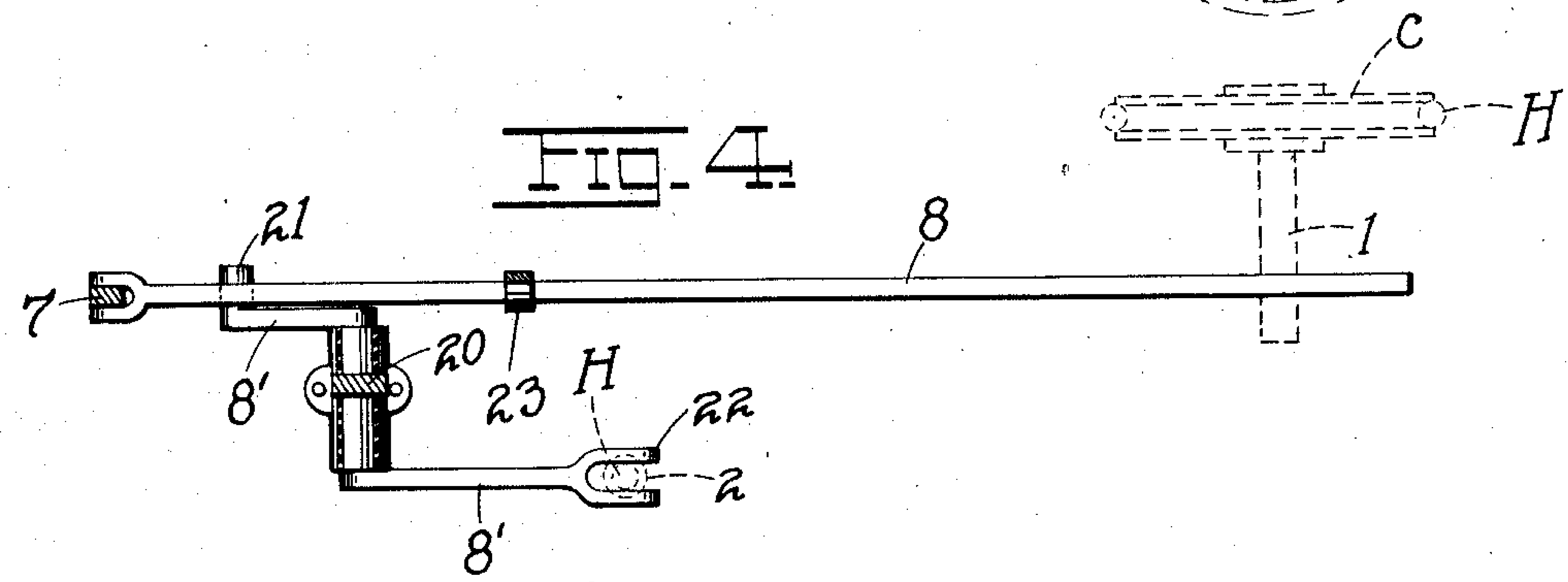


Fig. 4.



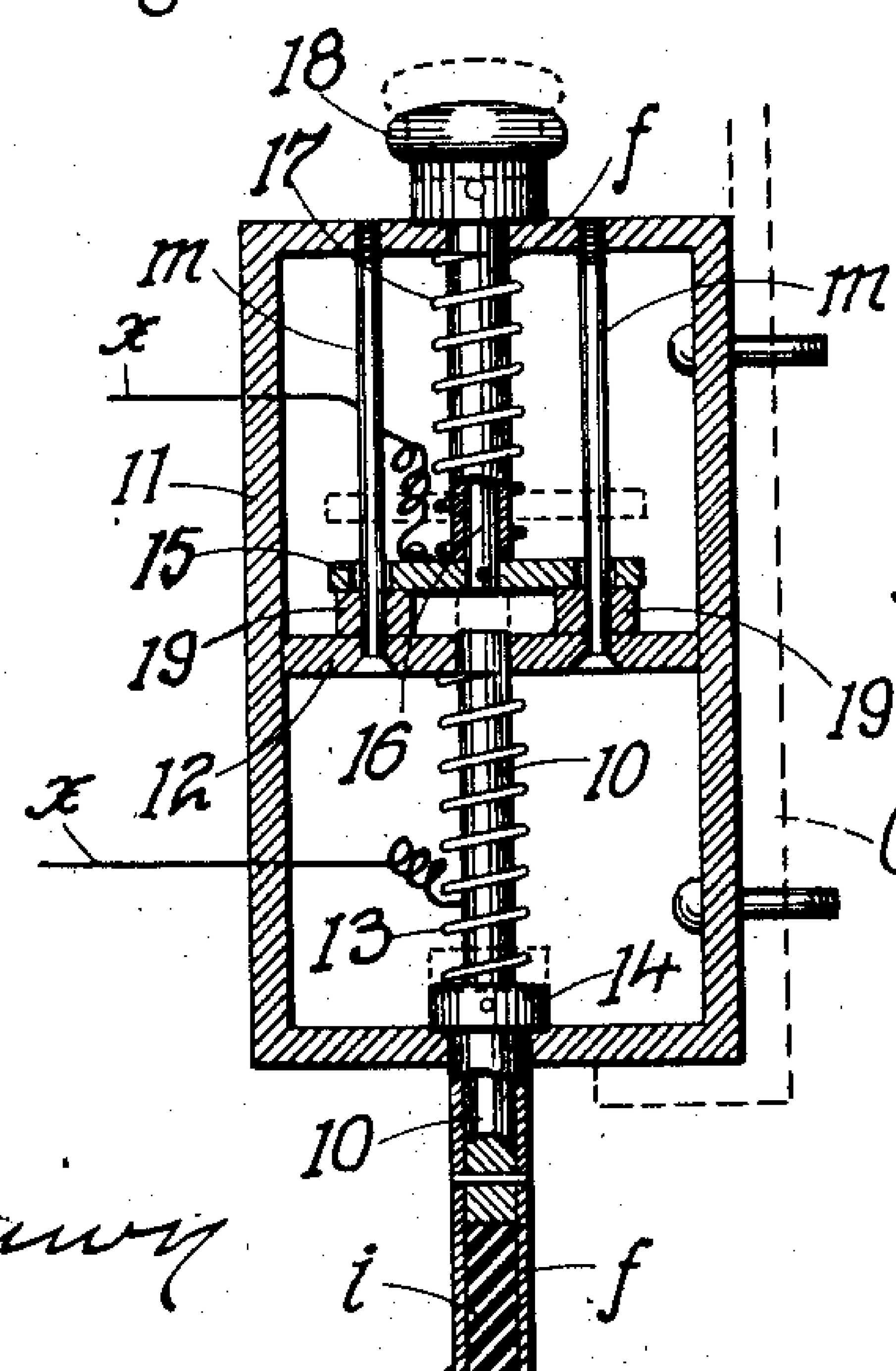


Fig. 5.

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UNITED STATES PATENT OFFICE.

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SAFETY DEVICE FOR ELECTRIC CRANES.

No. 876,503. Specification of Letters Patent. Patented Jan. 14, 1908.

Application filed July 24, 1907. Serial No. 385,358.

To all whom it may concern:

Be it known that I, MARIUS R. SULIOT, citizen of the United States, residing at Salem, in the county of Columbiana and State of Ohio, have invented certain new and useful Improvements in Safety Devices for Electric Cranes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in safety devices for electric cranes; and it consists in the novel construction and arrangement of parts more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a vertical transverse section on the line 1—1 of Fig. 2, taken through the carriage-body of a traveling crane; Fig. 2 is a section on line 2—2 of Fig. 1, parallel to the carriage-body and transverse to the girders and rails supporting the same; Fig. 3 is an enlarged side elevational detail of the fiber contact-box and levers for actuating the contacts; Fig. 4 is a horizontal section on the line 4—4 of Fig. 3; and Fig. 5 is an enlarged vertical section through the contact-box on the line 5—5 of Fig. 3.

The object of my invention is to provide suitable means which will automatically prevent either overwinding or overlowering in the operation of electric cranes; and while herein specifically illustrated in connection with a crane, it is to be understood that the invention may be equally applied on elevators, hoists and the like, and with either direct or alternating current systems. Overwinding, as well understood, consists in raising the fall-block so high that it runs into the upper sheaves, thus breaking sheaves and cable. Overlowering, consists in lowering the block too far and in so doing, winding the cable on the drum the wrong way.

With my improvement the movement of the hoisting cable is availed of at the critical moment to set into operation certain devices through which there is shunted a portion of the feeder circuit, thereby energizing a shunt trip which in turn operates the circuit-breaker by which the feeder circuit is controlled. The closing and breaking of the shunt circuit is effected by means of suitable copper contacts within a hard-fiber contact box which completely covers and protects the electrically-charged parts so that absolute safety with regard to the crane or hoist operatives is insured.

The invention too, combines simplicity with cheapness of construction, and reliability, the circuit breaker being used if necessary as an overload circuit-breaker as well, by the mere employment of a series coil all as will more fully appear from a detailed description of the invention which is as follows:

Referring to the drawings, G, represents the girders supporting the rails R over which travels the carriage C of the crane, the same being impelled in proper direction by any suitable source of power, but preferably electric. D, represents the main hoisting drum of the carriage, the said drum having rotation imparted thereto in proper direction for raising or lowering a load, by the electric motor M, suitable gearing (as shown) coupling the motor to the drum. The character and details of this gearing are not herein entered into, as they may be of any prevailing and conventional form. Adapted to coil about the drum D from opposite ends toward the center thereof, and to uncoil therefrom from the center to the ends are the opposite ends of a hoisting cable H said cable passing over the sheaves *a a* of the fall-block F, thence over the fixed pulleys or sheaves *b*, thence over the block-pulley or sheave *c*, all as fully understood in the art. The fall-block carries a tripping pin or arm 1, and the cable H has adjustably mounted thereon near one of the ends thereof, a tripping button 2, these tripping devices serving to actuate at the proper moment suitable mechanism for cutting off the current from the motor M when there is danger of overwinding or overlowering as above described. To break the current for the purposes aforesaid an ordinary two-pole overload circuit-breaker B is availed of, the same being provided with an energizing series coil 3 which discharges its regular function in the event the current comes too strong, and no comment is necessary relative to this functional feature of the circuit-breaker. The current in the present instance is a three-phase one, the feeders therefor being represented by O, O, O, from which the current is conducted by the trolley-wheels *t, t, t,* mounted on the arm 4, and the conducting wires O′, O′, O′, in the path of two of which the circuit breaker B is interposed,

(Fig. 1). Interposed in the circuit of a shunt circuit *x*, *x*, *x*, of two of the wires O′ O′, is an energizing shunt coil 5 or shunt trip, which, on being energized raises the iron core 6, the latter striking the trip *w* of the circuit breaker and thus breaking the circuit. These features and their mode of operation are well understood in the art and no special claim is made thereto. The coil of the shunt trip is energized at the proper moment to prevent overwinding or overlowering as the case may be by the following instrumentalities which in conjunction with the tripping devices 1, and 2 constitute the main features of my invention. These I shall now describe. Pivoted at one end to a bracket 7 of the carriage C, is a tripping lever 8 of the second class, its free end being adapted to be impinged and raised by the tripping pin or arm 1 on the fall-block F. The lever bears against the lower end of the stem 9 coupled to the reciprocating metallic rod 10 of the fiber contact-box 11, the rod 10 loosely operating through the wall or diaphragm 12 in said box. The rod 10 is normally held down by an expanding spring 13 interposed between the wall 12 and a collar 14 fixed to the rod; the stem 9 is composed of an outer fiber sheet or shell *f* and an inner insulating compound *i* (Fig. 5). The upper end of the rod 10 is adapted to engage the contact plate 15 carried at the lower end of a metallic rod 16 likewise covered with a layer of fiber *f*, said rod 16 passing loosely through the top of the fiber contact-box 11 and terminating in a knob or handle 18. The contact plate 15 is normally forced by the spring 17 against the fiber spacing pieces or blocks 19 resting on the wall 12, the latter being coupled to the top of the box by bolts *m* loosely passing through suitable openings in said spacing-pieces and contact plate respectively. The shunt wires *x*, *x*, lead respectively to the rod 10 and the contact plate 15 as shown (Fig. 5). The box 11 is preferably bolted to the side of the carriage C.

Pivoted to a bracket 20 depending from the carriage is a bent supplemental tripping lever 8′ of the first class, one end of the lever terminating in a pin or arm 21 bearing against the lower edge of the main lever 8, and the opposite end terminating in a fork 22 adapted to be engaged by the button 2 (Figs. 1, 2, 3.)

The operation of the device may be described as follows: As the hoisting drum D winds up the cable H in the raising of a weight, should the fall-block approach too near the drum, the pin 1 of the block will engage the long arm of the primary tripping lever 8 (dotted position Fig. 2) oscillating the same upwardly. The lever in turn raises the stem 9 and forces the contact 10 into engagement with the contact 15 thereby closing the shunt circuit *x*, *x*, energizing the coil 5 of the shunt trip, whereupon the core 6 of the latter at once actuates the trip *w* of the circuit breaker B and thus breaks the circuit to the motor M. On the other hand, should it happen that in the lowering of the fall-block the drum is in danger of unwinding too far, the button 2 will engage the forked end 22 of the supplemental tripping lever 8′, raising the short arm thereof and causing the terminal pin 21 to raise the lever 8 sufficiently to again effect contact between the parts 10 and 15, the shunt circuit closing and breaking the circuit to the motor, as before.

After the device has operated, it is only necessary to raise the handle 18, thus separating the contacts 10 and 15, and insert a small block of wood under the handle. This will allow the circuit-breaker B to be closed. The crane-block or hoist may then be lowered (or raised) out of danger, after which the small wooden block under the handle is removed and the device, under the action of the spring 17 is restored to its normal position and ready for another operation. By lengthening or shortening the fiber tube *f* and compound *i* (stem 9) the time of tripping may be adjusted. So too by shifting the button 2 on the cable, the time of tripping in the unwinding or lowering may be accurately adjusted.

The vital and most important feature of the invention resides in the fiber-box with its contacts. It is here that the circuit is completed which stops the motor, the block, levers, and other connections constituting the means through which the contacts are made to operate.

The advantages of the device are its simplicity, reliability, and cheapness of manufacture, its absolute safety with regard to the crane or hoist operatives, none of the electrically charged parts being in any way exposed. No attempt is here made to illustrate the details of the circuit-breaker, the same being herein shown conventionally, since its mode of operation is well understood by those skilled in the art, there being many forms of automatic breakers. It may be stated that the lever 8 is supported by a looped bracket or hanger 23 as shown or by any equivalent means which will permit the necessary oscillation which the lever undergoes when struck by the arm 1.

Having described my invention what I claim is:

1. In combination with a hoisting cable, an electric motor for raising and lowering the same, a contact-box, normally separated contacts confined within the box, a projecting stem operating loosely through the wall of the box and secured to one of the contacts, a tripping lever pivoted in proximity to the box and engaging the stem aforesaid, devices actuated by the cable for moving the lever and actuating the stem, and forcing

the contacts together within the box, conducting shunt-wires leading from the contacts, an energizing coil in the circuit of the shunt, a circuit breaker for the electric motor, the energizing of the shunt coil opening the breaker and breaking the circuit to the motor upon movement of the tripping lever by the devices actuated by the cable, substantially as set forth.

2. In combination with an electric motor, a fall-block and cable actuated thereby, a circuit-breaker in circuit with the motor, a contact-box, contacts within the box, springs for normally separating said contacts, a handle coupled to one of the contacts and normally resting on the box, an insulated reciprocating stem coupled to the second contact and projecting through the opposite wall of the box, a shunt-circuit having its terminals leading from the main feeders to the contacts through the walls of the box, a main tripping lever hinged at one end and engaging the end of the projecting stem aforesaid, a second or supplemental tripping lever having one end engaging the main lever at a point removed from the fixed end of the latter lever, and devices on the fall-block for raising the main lever whereby the contacts are forced into engagement and the shunt circuit is closed, and an energizing coil in the shunt circuit for opening the circuit-breaker and breaking the circuit to the motor, substantially as set forth.

3. In combination with an electric motor, a fall-block and cable actuated thereby, a circuit-breaker in circuit with the motor, a fiber-contact-box, contacts within the box, springs for normally separating the contacts, a handle coupled to one of the contacts and normally resting on top of the box, an insulated reciprocating stem secured to the second contact and projecting through the bottom of the box, a shunt-circuit having its terminals leading from the main feeders to the contacts through the walls of the box, a main tripping lever hinged at one end and engaging the end of the projecting stem aforesaid, a second or supplemental tripping lever having one end bearing against the main lever, a button on the cable engaging and tripping said supplemental lever for an over-lowered position of the fall-block, devices on the fall-block for raising the main lever for an over-wound position of the cable, whereby, and for the tripped position of either lever the contacts are forced into engagement and the shunt circuit is closed, and an energizing coil on the shunt for opening the circuit breaker and breaking the circuit to the motor, substantially as set forth.

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

MARIUS R. SULIOT.

Witnesses:

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R. C. KRIDLER.