(No Model.) 2 Sheets—Sheet 1.

A. B. RONEY.

CAR BRAKE.

No. 552,486. Patented Dec. 31, 1895.

Fig. 2.

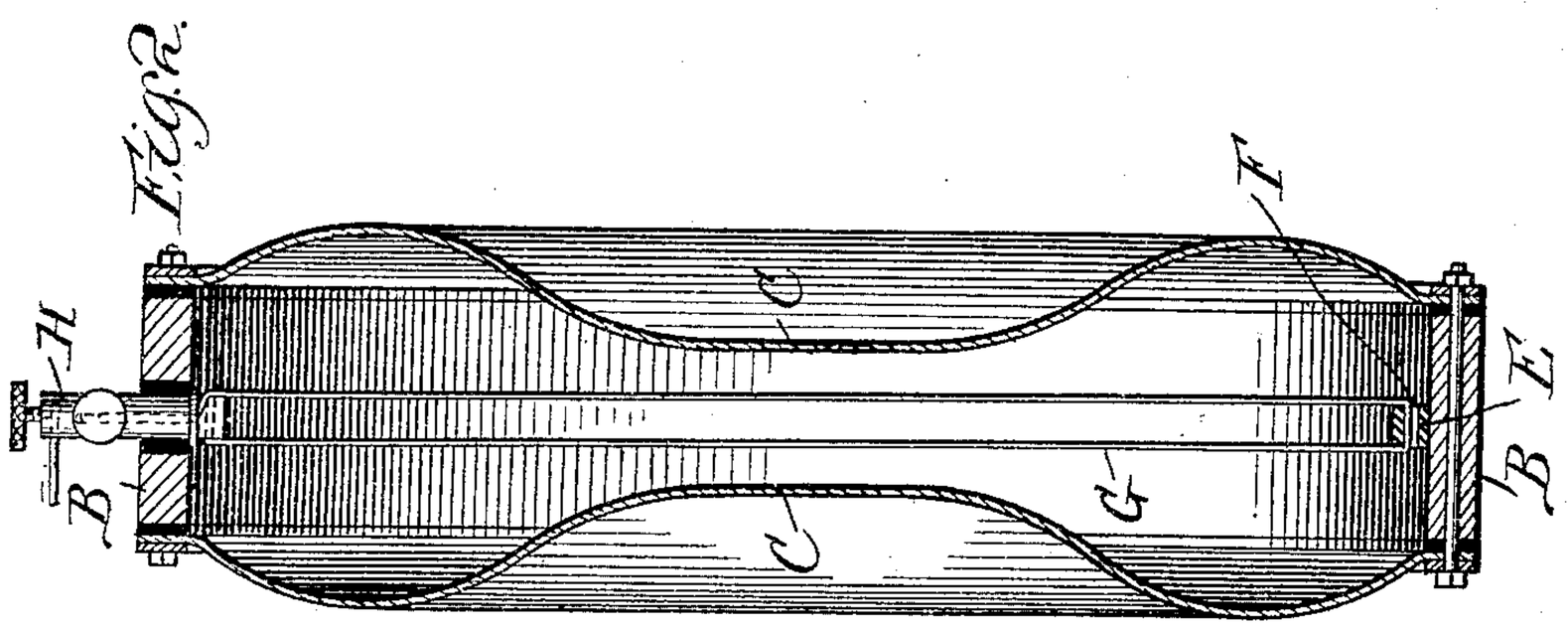
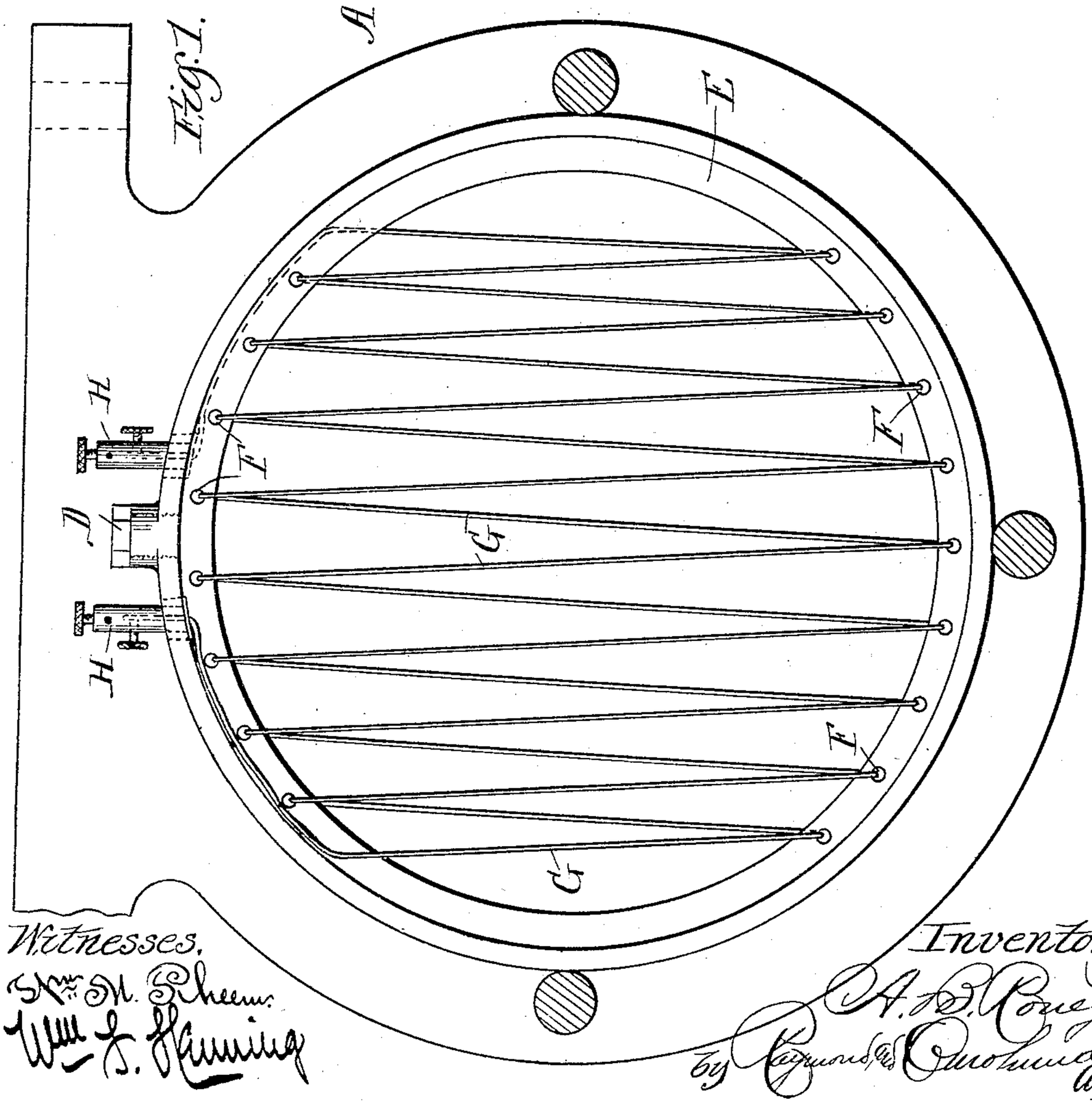


Fig. 1.



Witnesses,
Wm. M. Sheem.
Wm. L. Fleming

Inventor:
A. B. Roney
by Cagwin & Cagwin
Atty's

(No Model.)

2 Sheets—Sheet 2.

A. B. RONEY.

CAR BRAKE.

No. 552,486. Patented Dec. 31, 1895.

Fig. 3.

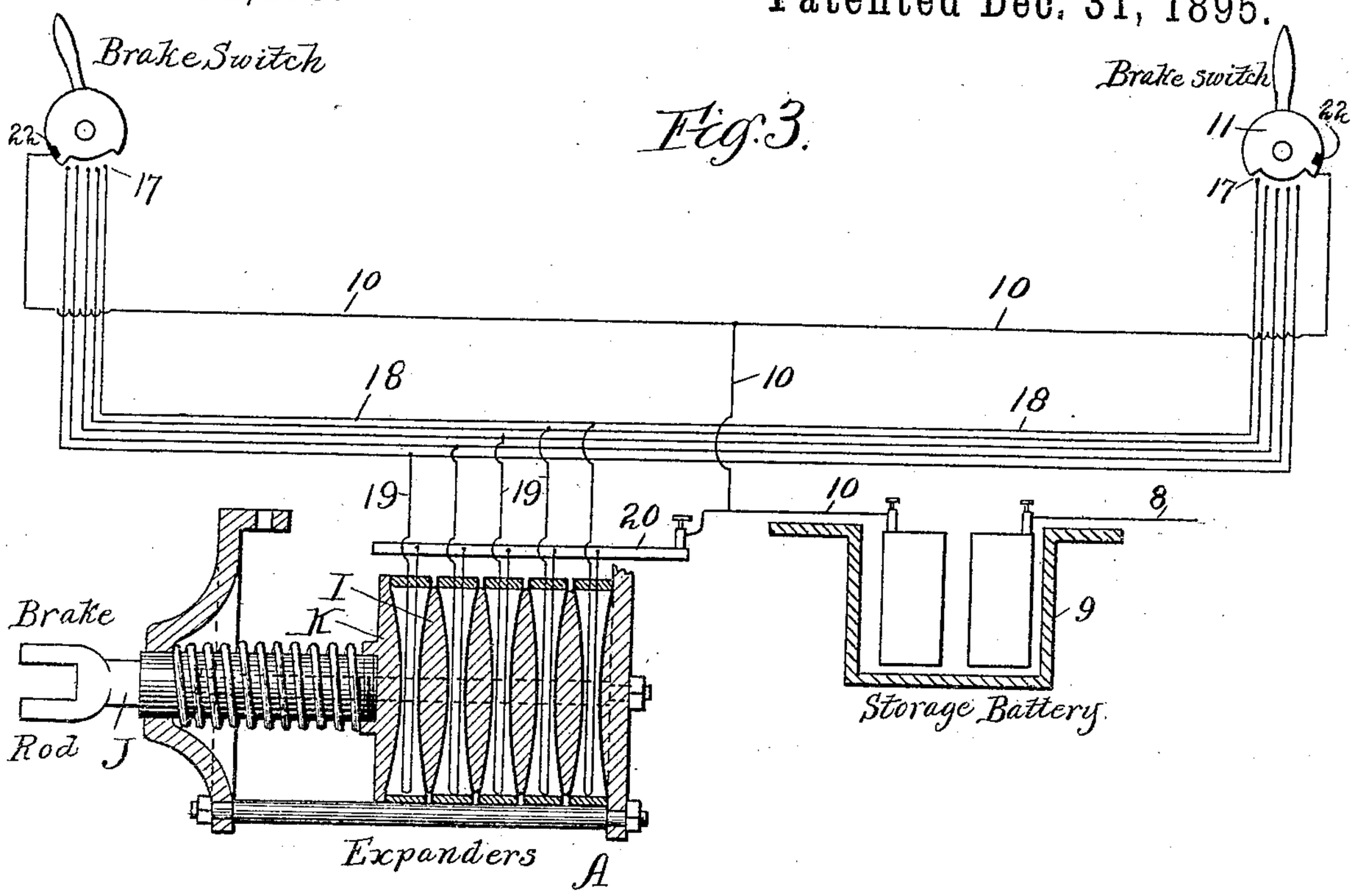
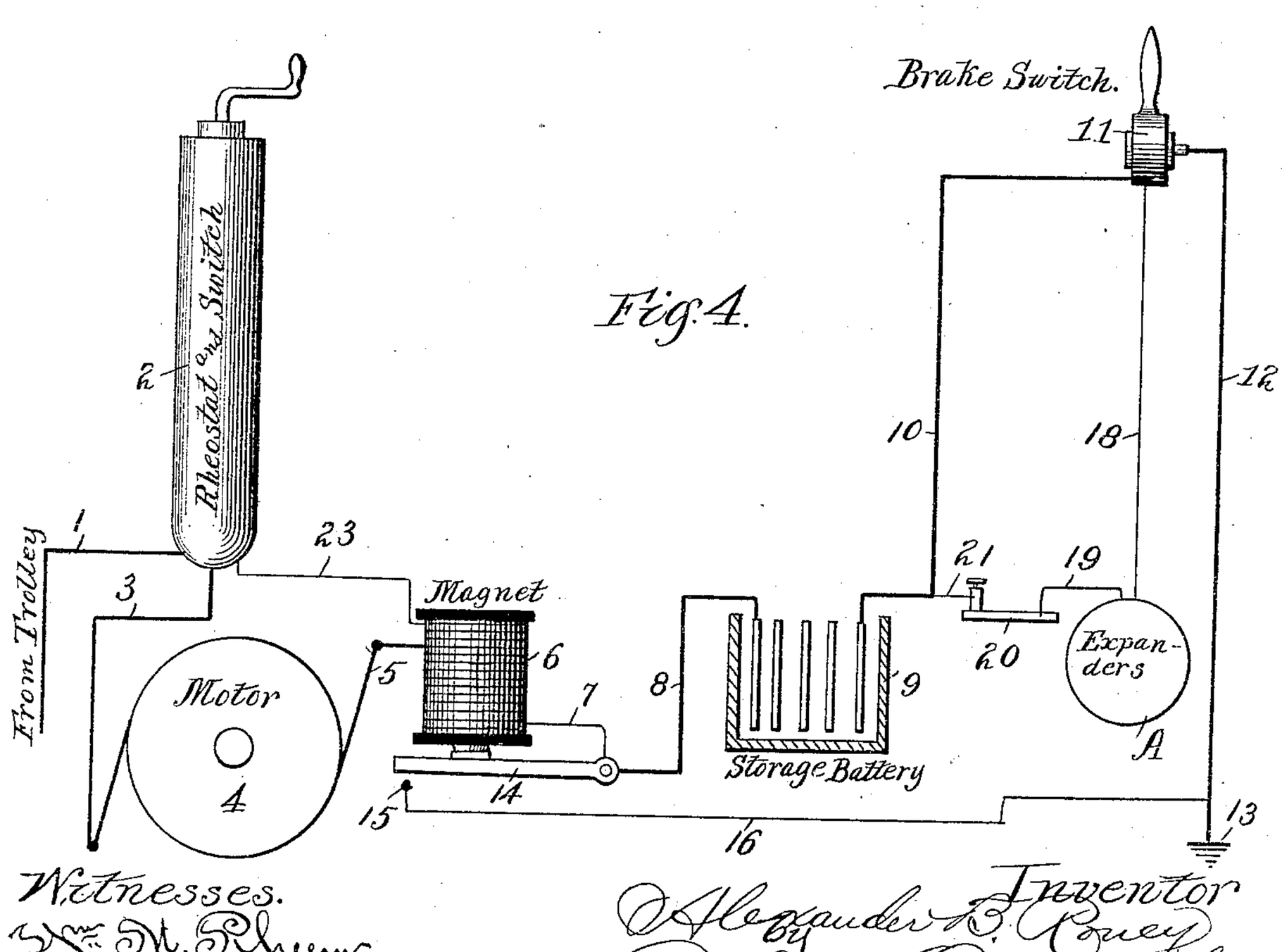


Fig. 4.



Witnesses.
Wm. M. Rheem.
Wm. J. Fleming

Inventor
Alexander B. Roney
by Raymond & Quohundro Atty's

UNITED STATES PATENT OFFICE.

ALEXANDER B. RONEY, OF CHICAGO, ILLINOIS, ASSIGNOR TO PHILIP OPPER, OF SAME PLACE.

CAR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 552,486, dated December 31, 1895.

Application filed December 8, 1894. Serial No. 531,239. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER B. RONEY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Car-Brakes, of which the following is a full, clear, and accurate description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates more particularly to improvements in car-brakes, but is equally applicable to many other uses—such as for operating gates, operating power-presses and the like—where variable power or considerable power and movement are required.

The prime object of this invention is to enable the immediate application of the whole or of any predetermined part of the maximum power at the will of the operator.

Another object is to have such devices controlled and energized by electricity conveniently and completely under the control of the motorman or operator, whereby he may vary the power applied according to the necessity or emergency of the occasion.

A further object is to have the actuating devices included in the motor-circuit of an electrically-propelled car in such manner that the brakes may be applied in conjunction with or independent of such current, and in such manner that the brakes may be applied while the motor is in operation, or when the motor is cut out, or when the motor-circuit or main-line circuit is broken by accident or design.

These and such other objects as hereinafter appear are attained by the devices illustrated in the accompanying drawings, in which—

Figure 1 represents a face view of one form of expander embodying my invention with the near diaphragm removed. Fig. 2 represents a central vertical section thereof, and Figs. 3 and 4 are diagrammatic views illustrating the circuits for the electric current.

Similar letters and numerals of reference indicate the same parts in the several figures of the drawings.

Referring by letters and numerals to the accompanying drawings, A indicates the vessels which I term "expanders," of which there is a series of any desired number and of any desired construction. These expanders in general consist of a closed vessel having double diaphragms for sides, and are filled with naphtha-oil or any other suitable fluid that will volatilize under heat, and each vessel incloses an electrical heater of some suitable construction, which, when the current is turned on, will instantly become heated and, being submerged in the naphtha-oil or other suitable fluid, will volatilize the same and cause it to expand with force against the diaphragms of the vessel, thereby distending said diaphragms laterally. The fundamental principle of my invention is to utilize this expansion or lateral distention of the diaphragms for applying pressure to various contrivances, such as to the brakes of a car, and more particularly to the brakes of street-cars.

In Figs. 1 and 2 I have illustrated one form of expander capable of carrying out my invention; but I desire to here state that my invention is not limited to any particular form of expander, for obviously many different forms and constructions may be employed without departing from the spirit of my invention.

In the expander shown B represents an annulus or ring, preferably composed of metal for strength, and C indicates two sheet-metal or other suitable diaphragms bent to suitable form and rigidly secured by bolts or otherwise to the edges of the ring B, so as to form an air-tight chamber of the vessel. The ring is suitably tapped and fitted with a screw-plug D, or equivalent device, to afford a means for filling the vessel. Within the ring B is immovably fitted or secured a ring E, of some suitable insulating material, such as earthenware or terra-cotta. This ring is provided with a series of perforations F, through which is strung, in any suitable manner, the electrical conducting-wires G, the terminals of which are secured to the binding-posts H, projecting through the ring B. As shown in the drawings, the conducting-wire is led from one of the binding-posts to one of the end perforations in the ring E, and from thence is threaded in a zigzag manner through the remainder of the perforations, and from the last perforation is led back to the other binding-post. The wire strung on the ring E is either

enameled or plain or insulated in any desired manner and of sufficient cross-section for strength, heating and cooling effects.

The sealed vessel and the heater or the equivalents thereof constitute what I call an "expander," and a series of these expanders are mounted in a suitable frame, as illustrated in Fig. 3, and between the expanders are placed filling-blocks I, the office of which is to transmit the movement of each diaphragm of each expander to the adjacent expander for the purpose of actuating the brake-rod J, which is provided with a suitable shaped head K, opposing the diaphragm of the end expander next adjacent to the brake-rod. The expansive force of the first expander—say the one at the right in Fig. 3—will act upon all of the other expanders and brake-rod, moving them a distance corresponding to the expansion thereof. The next expander adds its movement to that of the first expander, thereby causing a movement of the brake-rod double that caused by the first expander, and so on through the series. Hence it will be readily understood that the movement of the brake-rod, and consequently the power applied to the brakes, goes through any suitable system of levers, which it is not necessary to herein illustrate, and may be controlled and graduated with nicety, and any degree of pressure from the maximum to the minimum in predetermined amount may be instantly applied.

In the use of this brake upon cars not electrically propelled a storage or primary battery may be alone depended upon to energize the expanders; but in the use of the brake upon electrically-propelled cars I prefer to have the same so connected with the main-line circuit that the brakes can be applied while the motor is still in operation or while the motor is cut out, utilizing the main-line current in both instances to produce the desired result, or the brakes may be applied with the main-line current broken or cut out either by accident or design, the power in this instance being supplied by a storage-battery automatically thrown into circuit, but under control of the operator. To these ends I have shown a system of wiring in the diagram views, Figs. 3 and 4, which is simple and accomplishes the desired result. I will first trace out the circuit when the motor is in operation. The current comes in from the trolley over wire 1, through the rheostat 2 and the wire 3, to the motor 4, thence by wire 5 to the magnet 6, and by wires 7 and 8 to the storage-battery 9. From the storage-battery we proceed by wire 10 to the brake-switch 11, and from said switch by wire 12 to the ground 13. With the circuit as above traced the motor is in operation, driving the car with the varying speeds determined by the rheostat, and in passing through the magnet 6 energizes the same so as to raise the armature 14 thereof clear of the contact-point 15, which latter is connected by wire 16 with the ground wire 12, so as to form a short circuit through the storage-battery for the purpose described farther on. The current in passing to the earth also passes through and charges the storage-battery, so that at all times the said battery is ready for instant operation. In this position of the parts also the expanders are cut out of the circuit at the brake-switch 11, and consequently all of them are inactive. It will be understood, however, that the expanders, although grouped together side by side, are wired in multiple, and that either one or more of them can be cut into the circuit. This is accomplished by means of a series of contact-points 17, with which the brake-switch 11 successively makes contact after breaking contact with the direct connection 10 from the storage-battery. Each of these contact-points 17 (which may be duplicated at either end of the car) is connected by wires 18 and 19 with one terminal of one of the heater-wires G, the other terminal of the heater-wire being connected with a bus-plate 20, which in turn is connected by a wire 21 with the direct wire 10. Hence it will be understood that when the brake-switch is thrown over so as to complete a circuit with one or more of the contacts 17 the main-line current will follow the circuit, as before described, except that instead of going to the earth from the storage-battery through wire 10, brake-switch 11 and wire 12, it will go to the earth through wires 21, bus-plate 20, through the heater-wire of one of more of the expanders, wires 18, contact-points 17, brake-switch 11 and wire 12. It will, of course, be understood that only one of the brake-switches is in use at a time, and each of the brake-switches is provided with an insulated portion 22, so that the switch not in use may be thrown to the position that will break the circuit through this switch and hence cut out that end of the car, leaving the sole control to the other switch.

Obviously, one or more of the expanders may be energized and the brakes applied with any desired force while the motor is in operation, the current at such time traversing the circuit last described. Now, when the motorman cuts out the motor in stopping the car, it is desirable to still use the main-line current for applying the brakes, and to this end I provide a shunt-wire 23 (see Fig. 4) between the rheostat and switch 2 and the magnet 6, which wire is preferably thrown into the circuit only when the motor is cut out, thereby restoring the main-line circuit through the magnet, storage-battery, expanders and brake-switch, which would have otherwise been destroyed by the cutting out of the motor. In the event, however, that the main line or main circuit be broken, either by accident or design—for instance, in the case of the trolley jumping the line-wire, or where a fuse is burned out—and especially when the car is on a downgrade it is even more important to be able to apply the brakes, and it is at this time that the storage-battery

comes into play. The instant the main-line circuit is broken the magnet 6 becomes demagnetized and inert and allows the armature 14 thereof, which is held in contact with the poles of the magnet while the latter is energized, to drop away from the poles, either by gravity or spring force, and make contact with the point 15, thus completing a short circuit for the storage-battery by connecting the wire 8 leading from one pole thereof with the wire 12 through the wire 16, the completion of this circuit being entirely automatic, but for braking purposes controlled by and dependent upon the motorman, who will, of course, instantly throw the brake-switch so as to connect all of the expanders or as many as he sees fit into the circuit, and the current will now flow from one pole of the storage-battery by wires 10 21, bus-plate 20, heater-wires, wires 19 and 18, contact-points 17, brake-switch 11, wires 12 and 16, contact-point 15, armature 14, and wire 8, back to the other pole of the battery. It will thus be seen that while the motor is disabled for the lack of current the brakes are in full working order, and are now independent of any current from the line. Of course, as soon as the main-line circuit is re-established, the storage-battery will be recharged by the current passing therethrough, and will thus at all times, save when in operation as just described, be charged with the maximum power, to be utilized as occasion requires.

Car-brakes constructed and operating in the manner herein described have practically the same capabilities in the application of braking-pressure as the automatic air-brakes have, in so far as they provide for the gradual application of brake-pressure in making ordinary service stops, or in slowing down speed, or in the instant application of the maximum braking-power in an emergency, giving the operator as complete control of his braking apparatus as he would have with either air-brakes or hand-brakes, and with no greater effort or skill than in the use of air-brakes. So far as I am aware, this variable action or pressure on the brake-shoes is new in the arts where pressure is obtained by the expansion of a volatile fluid in a closed vessel having a flexible diaphragm or diaphragms, whether the same be heated internally or externally, or by electricity, steam, hot air or other means. The use of the internal submerged electrical heaters is preferred, however, because by having the conductor or heater wires of a high resistance they will heat quickly and almost instantly to the desired degree, will cool quickly, and the expanders will give off the heat quickly to the atmosphere, thus not only condensing and restoring the volatile fluid to its original state, but also enabling prompt release of the brakes. The use of naphtha-oil is also preferred as the filling of volatile fluid for the heater, because it is a non-conductor of electricity, will not short-circuit the heating-wires, is easily and highly volatile, and, when heated in a closed vessel, is not explosive.

By the employment of a number of expanders the movement of the diaphragms of each individual expander necessary to produce a given maximum movement is rendered very small, while the degree of graduation—that is, the degree of power less than the maximum applicable to the brakes—will depend upon the number of expanders employed, and the sum of the expansion of the diaphragms of all of the expanders produces the movement necessary to apply the maximum power required. Of course the power for any given movement of the diaphragm will vary with the diameter of the diaphragm, and any movement required may be divided between as many expanders as is deemed advisable to produce the best results, both of which conditions must be varied to a greater or less extent, according to the system of brake-levers employed between the brake-rod and the brake-shoes.

The brake-switch illustrated in the drawings is simply diagrammatic, because its construction may be varied materially, and its use is so well understood as not to require any detailed explanation or illustration. As shown in the drawings, there is a circular metallic hub with an insulated handle mounted axially and having a segment of its circle removed at a point opposing the contact-points 17, so that the circuit through the switch is completed only when the solid portion thereof is brought into connection with said contact-points.

In the use of my brake it is not necessary to introduce any new brake-rigging, but, on the contrary, it is adapted for use in connection with any of the brake-riggings now commonly employed.

While I have shown and described my invention in connection with car-brakes, obviously it is applicable to many other machines, devices and apparatus, such as for operating railroad-gates and in power-presses of various kinds, as well as in other machines wherever a graduated or considerable pressure and considerable movement is required, for it is immaterial whether the rod J, which I have designated as a "brake-rod," is coupled to the brake-levers in a system of car-brakes or whether the power transmitted to said rods from the expanders is applied to any other use; and it is equally apparent without illustration that the expanders may be permitted to move in both directions and exert power in both directions, as well as in the one direction shown, and any suitable means may be employed for limiting the maximum movement of the expanders to prevent rupture of their diaphragms—such, for instance, as the limitations imposed by the frame in which the expanders are contained.

While in the specification and claims I have referred to the rod J as a brake-rod obviously in other uses such a rod or its equivalent must be employed, and such equivalent

device is comprehended by the term "brake-rod," which I have employed only because I have illustrated and described my invention principally in connection with car-brakes.

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

1. In a car-brake, the combination with a brake-rod, of a series of expanders, each comprising a closed vessel containing a volatile fluid, and an electric heater also contained in said vessel and submerged in said fluid, said electric heaters being wired in multiple, an electric circuit and means for successively or simultaneously cutting said heaters into said circuit, substantially as described.

2. In a car-brake, the combination with a car, a brake-rod, an electric motor, mounted on said car for propelling the same, of a series of expanders, each comprising a closed vessel containing a volatile fluid, and an electric heater submerged in said fluid, said heaters being connected in multiple in the motor-circuit, and a brake-switch for successively cutting said heaters in the circuit, substantially as described.

3. In a car-brake, the combination with a car, a brake-rod, an electric motor mounted on said car for propelling the same, of a series of expanders, each comprising a closed vessel containing a volatile fluid, and an electric heater submerged in said fluid, said heaters being connected in multiple with the motor-circuit, a brake-switch for successively introducing said heaters into the motor-circuit, and a storage battery, also included in said circuit, substantially as described.

4. In a car-brake, the combination with a car, a brake-rod, and an electric motor on said car for propelling the same, of a series of expanders, each comprising a closed vessel containing a volatile fluid, and an electric heater submerged in said fluid, said heaters being connected in multiple in the motor-circuit, a brake-switch for successively introducing said heaters into the motor-circuit, a storage battery also included in the motor-circuit, a shunt around the motor, and a rheostat and switch for alternately closing the circuit through the motor and shunt, substantially as described.

5. In a car-brake, the combination with a car, a brake-rod, and an electric motor mounted on said car for propelling the same, of a series of expanders, each comprising a closed vessel containing a volatile fluid, and an electric heater submerged in said fluid, said heaters being connected in multiple in the motor-circuit, a brake-switch for successively introducing said heaters into the motor-circuit, a storage battery also included in the motor-circuit, a battery-circuit including said battery, expanders and brake-switch, and an electro-magnet included in the motor-circuit for automatically making and breaking said battery-circuit, upon the making and breaking of the main-line-circuit, substantially as described.

6. In a car-brake, the combination with a car, a brake-rod, and an electric motor mounted upon said car for propelling the same, of a series of expanders, each comprising a closed vessel containing a volatile fluid and an electric heater submerged in said fluid, said heaters being connected in multiple or series with the motor-circuit, a brake-switch for successively introducing said heaters into the motor-circuit, a storage battery also included in the motor-circuit, including said battery, expanders and brake-switch, an electro-magnet included in the motor-circuit, for automatically making and breaking said battery-circuit, upon the making and breaking of the main-line-circuit, a shunt around the motor, and a rheostat and switch for alternately closing the main circuit through the motor and shunt, substantially as described.

ALEXANDER B. RONEY.

Witnesses:
M. E. SHIELDS,
CHAS. B. BOWEN.