(No Model.)

3 Sheets—Sheet 1.

# T. J. HOGAN.

## AIR BRAKE.

No. 473,839. Patented Apr. 26, 1892.

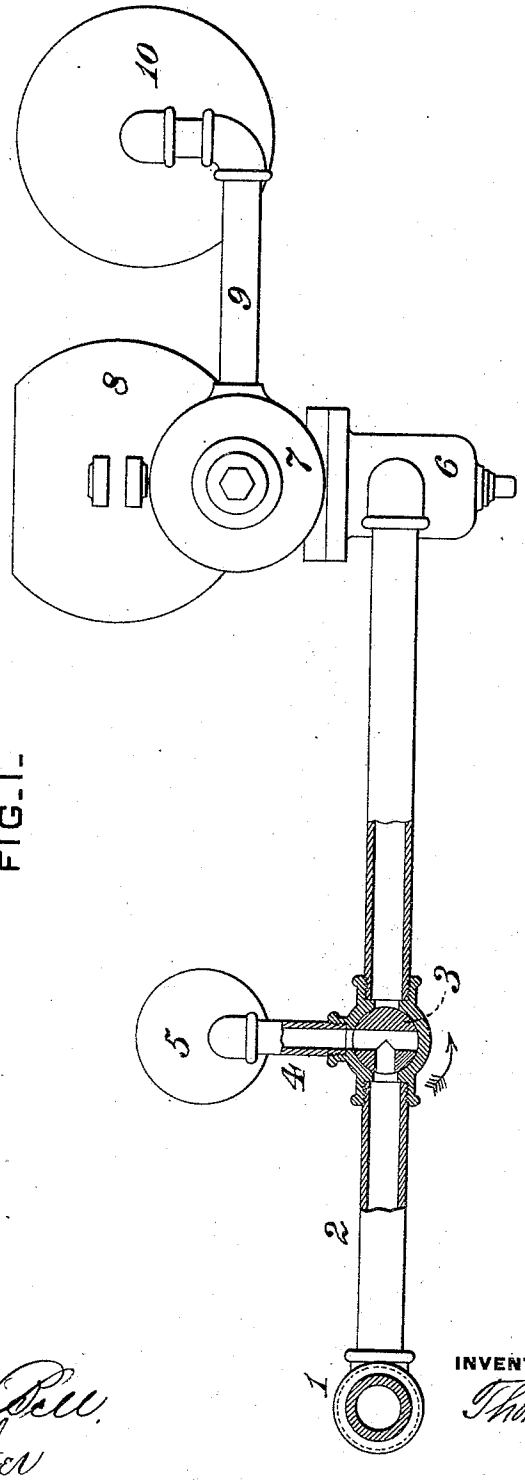


FIG. 1.

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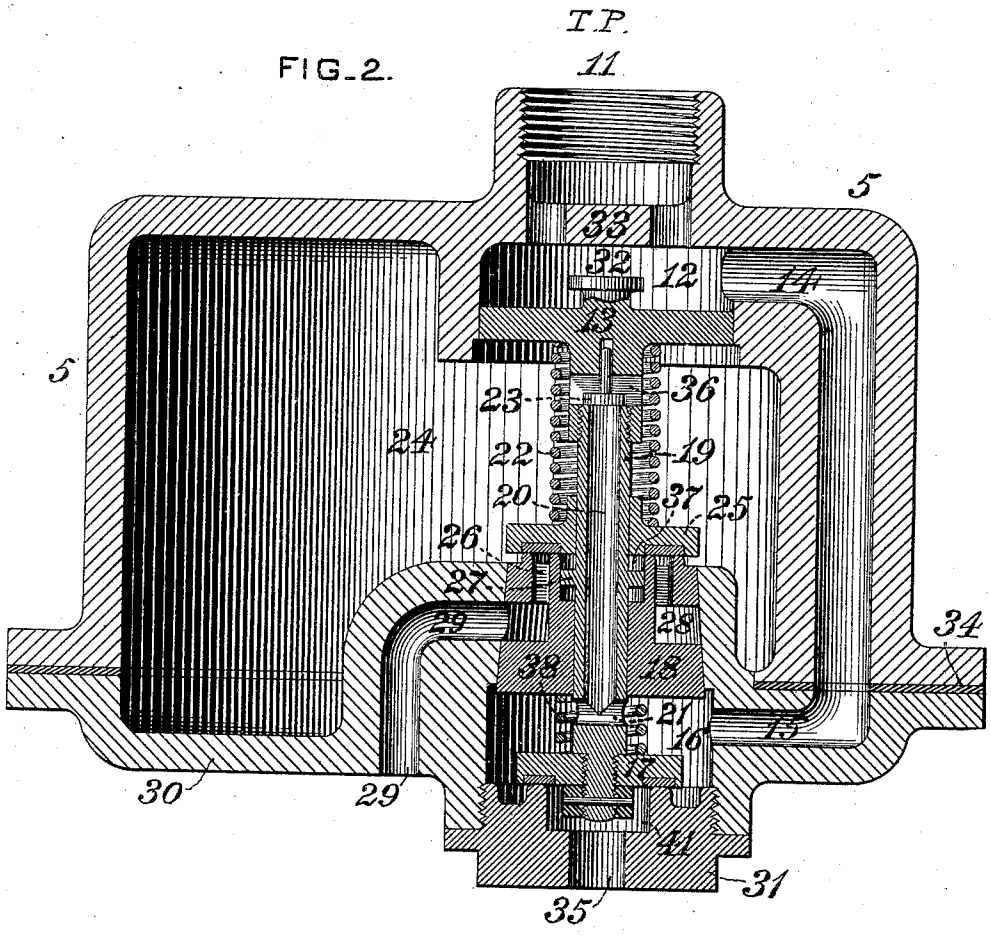
FIG. 2.

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3 Sheets—Sheet 3.

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## AIR BRAKE.

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FIG. 3.

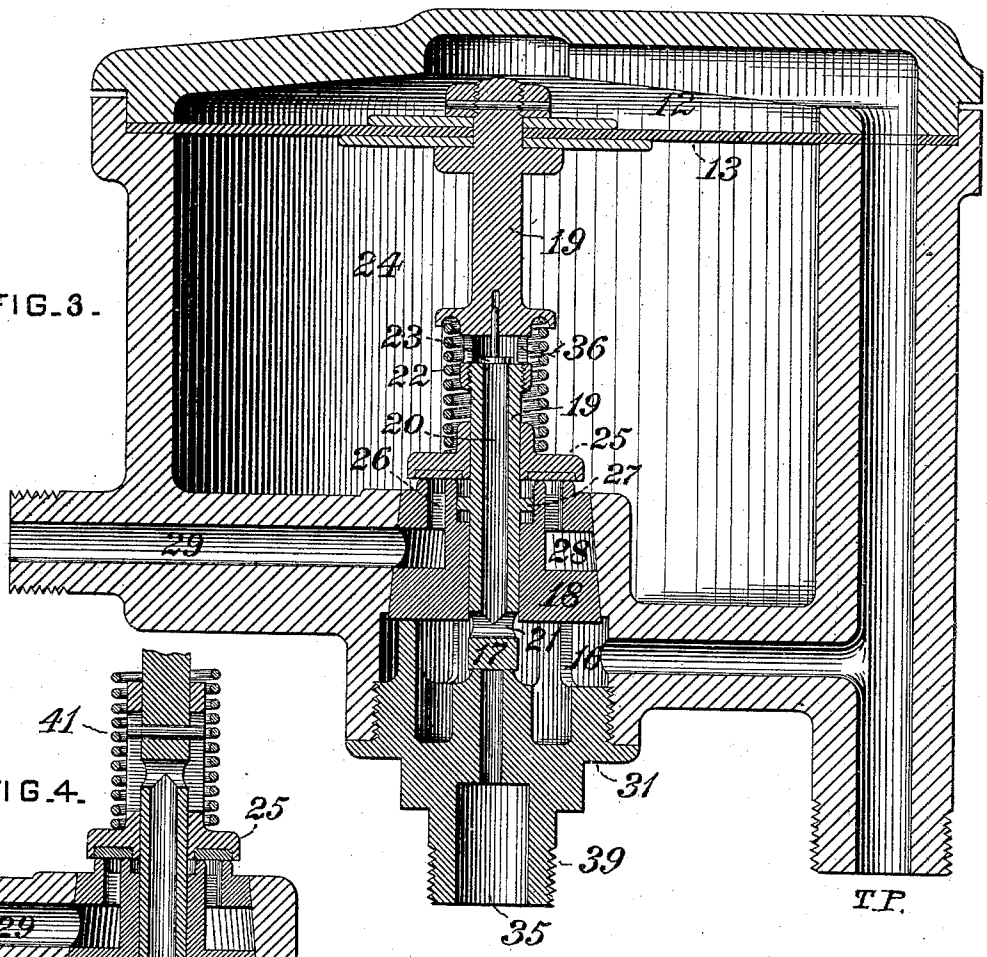
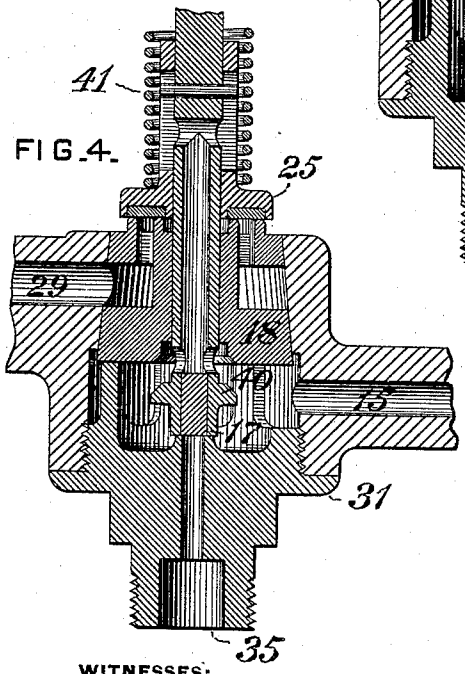



FIG. 4.

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# UNITED STATES PATENT OFFICE.

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## AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 473,839, dated April 26, 1892.

Application filed August 29, 1891. Serial No. 404,106. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS J. HOGAN, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Air-Brakes, of which improvements the following is a specification.

The object of my invention is to improve what is known as "quick-action automatic fluid-pressure brake systems" in which the quick action is obtained by an automatic reduction of train-pipe pressure under each car; and to this end my invention consists in improvements on the usual brake apparatus whereby the automatic reduction of pressure on each car may be obtained by means of a supplemental release-valve when the triple valve and the automatic train-pipe release-valve connected thereto are thrown out of action or disconnected from the train-pipe and whereby the supplemental release-valve may be thrown out of action or disconnected from the train-pipe when the usual automatic and quick-action devices are connected for operation.

My invention further consists in an improved valve device which is operated by variations of pressure in the train-pipe to cause a quick reduction of train-pipe pressure in making emergency applications of the brakes or for other purposes, such as operating pneumatic signals.

As is well known, the operation of quick-action release-valves in automatic quick-action brakes is caused by a greater reduction in the train-pipe pressure than is required for operating the triple valves in making ordinary service stops. To make an emergency application of the brakes this greater reduction of pressure is initiated by opening the engineer's valve, so that the air escapes freely to the atmosphere and causes a sufficient reduction of train-pipe pressure between the engineer's valve and the first quick-action release-valve to cause the first quick-action valve to operate and cause a still greater reduction of pressure in the train-pipe. It is this greater reduction of pressure which causes the next succeeding quick-action valve to operate, and so on throughout the train. There is a limit to the distance through which this reduction will operate to cause a proper action of the next quick-action valve. For example, suppose that in a train of fifty cars equipped with the quick-action automatic brake there should happen to be several adjoining cars on which the plug-valves in the branch pipes are closed, thereby cutting out the triple valves and quick-action release-valves. When this is the case, there will be no reduction of pressure made by the quick-action valves in the section of train so cut out, and the reduction of train-pipe pressure made in the section of train just in advance of the section having the valves cut out may not be great enough to extend beyond the cut-out section and create a sufficiently great and sudden reduction of pressure to operate the quick-action devices on the first car following the cut-out section. The result would be that the quick application of the brakes would not be made on the cars following the cut-out section.

The principal object of my invention is to remedy this defect, and for this purpose I provide a supplementary quick-action train-pipe release-valve, which is so arranged that when the usual quick-action release-valve is cut out or shut off from the train-pipe the supplementary release-valve is operatively connected therewith, in consequence of which the required reduction of train-pipe pressure is made on each car to operate the release-valves on the cars in the rear.

The means which I have shown for accomplishing this consists in connecting a supplemental release-valve—such as that shown in Fig. 2—to the branch pipe in such a position that it may be put in operative communication with the train-pipe or cut out by the same movement which disconnects or connects, respectively, the usual quick-action devices.

In the accompanying drawings, which illustrate my invention, Figure 1 is a general view showing the auxiliary reservoir, brake-cylinder, quick-action triple valve, and supplemental release-valve in end elevation and the train-pipe in cross-section, the branch pipe, by which the train-pipe is connected to the triple valve, being shown in side elevation, except where it is in section to show the con-

nections to the plug-valve which controls the communication between train-pipe and triple valve. Fig. 2 is a vertical central section of the supplemental release-valve. Fig. 3 is a central section of the release-valve so proportioned as to be adapted for use as a signal valve, and Fig. 4 is a modification also adapted for use as a signal-valve.

In the drawings, Fig. 1, the train-pipe 1, branch pipe 2, triple valve 7, brake-cylinder 8, and auxiliary reservoir 10 are of the usual form employed in the Westinghouse system of quick-action automatic brakes; but they may be of any of the forms employed in other similar systems.

Instead of employing a plug-cock with a single passage through it for opening and closing communication through the branch pipe 2, I employ a cock or valve such as that shown in the drawings, Fig. 1, and marked 3, whereby when the valve is in the position to close communication between the train-pipe and the quick-action valve it opens communication between the train-pipe and the supplemental release-valve 5 through the branch pipe or connection 4, and when the communication between the train-pipe and the usual quick-action devices is opened the communication between the train-pipe and the supplemental release-valve is closed. The valve is put in the latter position by turning it through an angle of ninety degrees in the direction of the arrow.

If desired, the valve may be turned in the direction of the arrow through an angle of one hundred and eighty degrees to cut off both the supplemental release-valve and the usual quick-acting devices from the train-pipe, or it may be turned in the opposite direction through an angle of ninety degrees from the position shown to open communication from the train-pipe to the supplemental valve and also through the branch pipe.

The supplemental valve may be employed to cause quick action with the plug-cock in the last-named position when employed with the old style of triple valve, which has no quick-action devices connected to it, or when the usual triple valve quick-action devices are so arranged that they may be separately cut off, as described in my pending application, Serial No. 396,937, filed June 20, 1891.

The plug-cock 3 being in position to open communication between the train-pipe and the supplemental release-valve, the operation of the supplemental release-valve (see Fig. 2) is as follows: The casing 5 of the supplemental release-valve is connected by the nozzle 11 to the branch pipe 4, so that the air under normal train-pipe pressure enters chamber 12, moves the piston 13 to the limit of its stroke, thereby seating valves 25 and 17, flows through passage 14 in the casing 5 and its connecting-passage 15 in the cap 30 of the casing, enters chamber 16, flows through passages 21 and 20 in the stem 19, lifts the check-valve 23, and flows through passages 36 into the chamber 24. The piston 13 and its connected valve 17 are so proportioned that the ordinary reductions of train-pipe pressure which occur in making service stops are not great enough to permit the pressure in chamber 24, acting on one side of piston 13, to overcome the reduced pressure acting on the other side of piston 13 and on the back of valve 17. The valves therefore remain seated; but when a sufficient reduction is made in the train-pipe pressure the piston 13 is moved by the pressure in chamber 24 and the valve 17 is lifted from its seat, which causes a greater reduction of train-pipe pressure through the opening of port 35, and the piston 13 continues its outward movement, causing the collar 27 on the stem 19 to come in contact with the valve 25 and lift it from its seat, thereby permitting the air to escape from chamber 24 through annular ports 26 and 28. The valve 25 will be lifted a sufficient distance from its seat to cause a full opening of the annular port 26, which is purposely made large enough to quickly exhaust the air from chamber 24, and as the air in chamber 24 is more quickly exhausted than the air in the train-pipe the train-pipe pressure is great enough to move piston 13 in again and seat valves 17 and 25. The pressure in the train-pipe then equalizes with the pressure in chamber 24. The result is that a sufficient reduction of train-pipe pressure is obtained without entirely exhausting the pressure from the train-pipe and the release-port to the atmosphere is closed, so that the train-pipe may be recharged to release the brakes without any waste of air.

The capacity of the chamber 24 is to be so proportioned that the expansion of the air therein, due to the outward movement of the piston 13, will not cause too great a reduction of the pressure in chamber 24 before the opening of valve 25.

The area of the chamber 41 and under side of valve 17, which is exposed to atmospheric pressure, is purposely made larger than the area of the outer portion of exhaust-port 35, thus forming a differential passage, in order to obtain a sufficient effective pressure on the back of the valve to assist in holding it to its seat without enlarging the outer opening to the atmosphere. The proportions depend on the train-pipe pressure employed and on the effective areas of the two sides of piston 13, as well as on the reduction of train-pipe pressure, at which it is desired that the valve shall be opened. The check-valve 23 is a plain light disk with a guiding-stem. The light spring 22 is intended to hold the valve 25 against its seat when no pressure exists in chamber 24 and against the collar 27 when the piston 13 is moved from the inner end of its stroke sufficiently to unseat valve 25. This insures the seating of valve 25 as soon as the collar 27 has passed into the recess 37 beyond the plane of the valve-seat. In order to insure the seating of valve 17 when there

is no pressure in the train-pipe, a spring 38 is placed between the plug or bushing 18 and the valve 17, as shown in Fig. 2. This spring may be placed between the piston 13 and the part 33 of the casing, and in some instances may be omitted.

The port 35 may open directly to the atmosphere, or it may have attached to it a pneumatic signal device, such as a whistle, which will sound whenever the train-pipe air is allowed to escape. The screw-plug 31 would then need to be furnished with means for attaching the signal device, such as the screw-thread 39 shown in Fig. 3. Fig. 3 is substantially the same construction as that shown in Fig. 2, but the proportions are different, the device shown in Fig. 3 being specially adapted for use as a signal-valve, which is operated by pressure in chamber 24 on a reduction of train-pipe pressure to release air from the train-pipe, the air so released being utilized to operate a signal. The greater area of diaphragm 13 in Fig. 3 as compared with the piston 13 in Fig. 2 is due to the smaller pressure employed in signal-lines of pipe. In either case the movable abutment 13 may be either a piston or diaphragm.

In Fig. 4 I have shown a modification of the valve devices shown in Figs. 2 and 3, which consists in adding the valve 40 to insure the closing of the passage between the chambers 16 and 24 when valve 17 is lifted from its seat. Fig. 4 also shows another arrangement for operating valve 25 by means of stem 19, the valve 25 being actuated by a bar or pin 41 instead of the collar 27.

The functions of all the modifications of my release-valve are the same no matter how used—that is, they are actuated by train-pipe pressure to close communication with the atmosphere from the train-pipe and from the chamber 24, and they are actuated by the pressure in chamber 24 on a reduction of train-pipe pressure to open these communications.

What I desire to claim as my invention and to secure by Letters Patent is—

1. In an automatic fluid-pressure brake system, the combination, with the triple valve and train-pipe and a supplemental release-valve, of a valve controlling passages from the train-pipe to the triple valve and from the train-pipe to said supplemental release-valve, respectively, substantially as set forth.

2. In an automatic fluid-pressure brake system, the combination, with a triple valve and quick-action devices for releasing the air from the train-pipe in making emergency stops, of a supplemental release-valve, substantially as set forth.

3. In an automatic fluid-pressure brake system, the combination, with a train-pipe, auxiliary reservoir, brake-cylinder, and quick-acting triple valve, of a supplemental release-valve adapted to be put into and out of operative communication with the train-pipe by means of a valve which controls communication between the train-pipe and quick-acting devices, substantially as set forth.

4. In an automatic fluid-pressure brake system, the combination, with the train-pipe, triple valve, and quick-action devices, of a supplemental release-valve and a cut-out valve controlling the passages from the train-pipe to the triple valve, quick-action devices, and supplemental release-valve, said cut-out valve being arranged so as to open communication from the train-pipe to the quick-action devices when it closes communication from the train-pipe to the supplemental release-valve and to open communication from the train-pipe to the supplemental release-valve when it closes communication from the train-pipe to the quick-action devices, substantially as set forth.

5. In an automatic fluid-pressure brake system, the combination, with a quick-acting triple valve and the passage by which it is connected to the train-pipe, of a supplemental release-valve and a cut-out valve, by means of which either the supplemental release-valve or quick-action devices may be cut out or both simultaneously put in communication with the train-pipe, substantially as set forth.

6. The combination, with a train-pipe, of a valve-casing connected thereto, a movable abutment in the casing, a passage from the train-pipe to an exhaust-port and to a storage-chamber, and valve devices operated by the movement of the abutment, controlling independent exhaust-ports, one from the train-pipe and one from the chamber directly to the atmosphere, substantially as set forth.

7. The combination, with a train-pipe, of a valve-casing, a movable abutment therein, a chamber having passages by which it may communicate with the atmosphere or with the train-pipe, and valve devices controlling the communication from the chamber directly to the atmosphere and a release-port from the train-pipe, said valve devices being operated by the movable abutment when said abutment is actuated by variations of pressure in the train-pipe and chamber, substantially as set forth.

8. The combination, with a train-pipe normally containing fluid under pressure, of a valve-casing having a chamber therein, a movable abutment exposed on one side to pressure in the train-pipe and on the other side to pressure in the chamber, and valve devices operated by movement of the abutment on a reduction of train-pipe pressure to release pressure from the chamber directly to the atmosphere and by a separate passage from the train-pipe to a signaling device, substantially as set forth.

9. The combination, with a valve-casing, of a movable abutment therein, a valve connected to and operated by the abutment, and a differential passage controlled by the valve, said differential passage having two different areas of cross-section, one next to the valve proportioned to the area of the valve which it

is desired shall be exposed to the pressure in the passage and the other proportioned to the volume or quantity of fluid which the passage is intended to convey.

10. The combination, in a valve device for controlling the passage of fluid, of a passage restricted in proportion to the desired flow of the fluid and a concentric enlargement of the passage between the restricted portion and the seat of the valve controlling the passage, substantially as set forth.

11. The combination, with a train-pipe, of a release-valve connected thereto, a movable abutment within the casing of the release-valve, a valve controlling a cylindrical port in the casing, and a valve through which the stem of the abutment passes, controlling an annular port, both valves being arranged to be operated by the movable abutment, substantially as set forth.

12. The combination, with a train-pipe, of an automatic release-valve device operated by variations in train-pipe pressure and containing a valve controlling a release-port from the train-pipe, and an annular valve controlling a port, opening from a chamber within the casing of the release-valve device to the atmosphere, substantially as set forth.

13. The combination, with a train-pipe, of a supplemental release-valve casing, a chamber within the casing, a movable abutment exposed on one side to pressure in the train-pipe and on the other side to pressure in the chamber, a valve operated by the movement of the abutment to open communication from the train-pipe to the atmosphere, and an annular valve operated by the abutment to open communication from the chamber to the atmosphere, the annular valve being opened and closed between the times of opening and closing the other valve, substantially as set forth.

14. The combination, with a train-pipe, of a supplemental release-valve casing, a movable abutment working therein and operating a valve controlling communication from the train-pipe to the atmosphere, and a valve controlling communication from a chamber within the casing to the atmosphere, the opening and closing of the train-pipe release-valve being controlled by the pressure within the chamber and its exhaust therefrom to the atmosphere, substantially as set forth.

15. The combination, with a train-pipe, of a supplemental release-valve casing, a chamber within the casing, a movable abutment operated by variations of pressure, a valve outside of the chamber, connected to and operated by the abutment, and a valve within the chamber, operated by movement of the abutment and controlling a port leading from the chamber to the atmosphere, substantially as set forth.

In testimony whereof I have hereunto set my hand.

THOMAS J. HOGAN.

Witnesses:
R. H. WHITTLESEY,
J. SNOWDEN BELL.