(No Model.)

3 Sheets—Sheet 1.

W. C. WHITACRE.
ENGINEER'S VALVE.

No. 524,154. Patented Aug. 7, 1894.

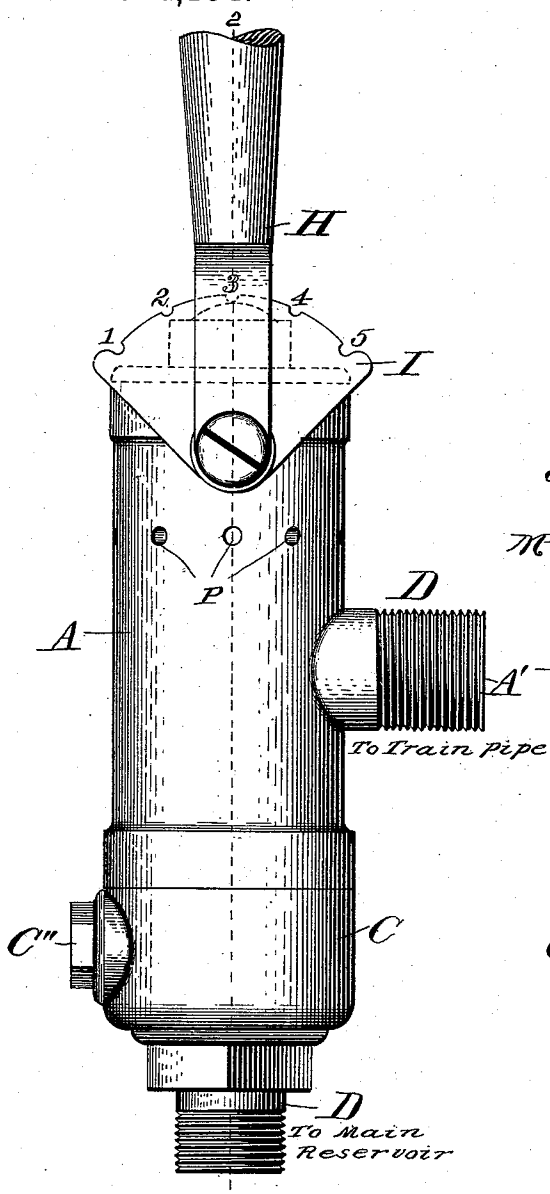

Fig. 1.

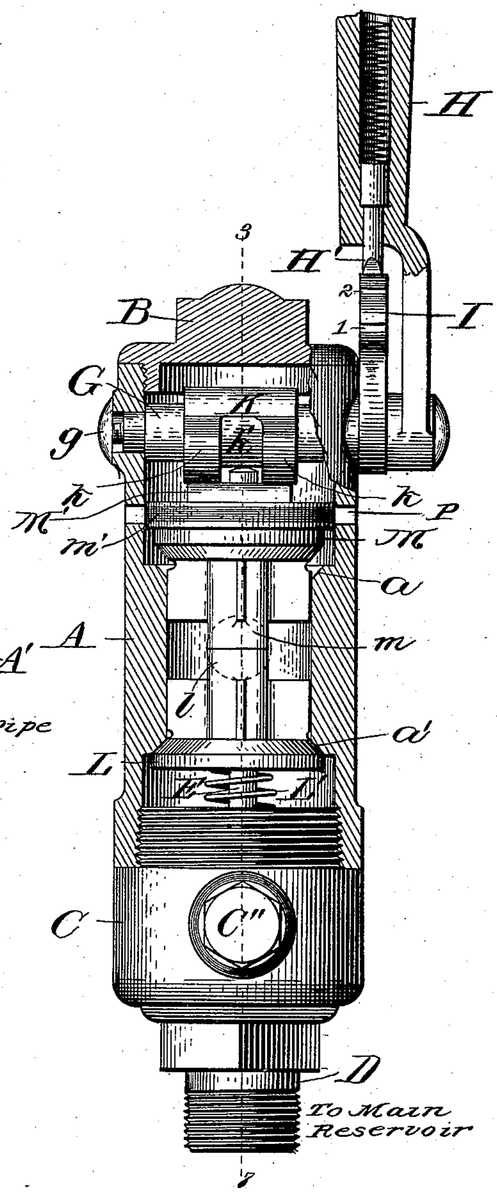

Fig. 2.

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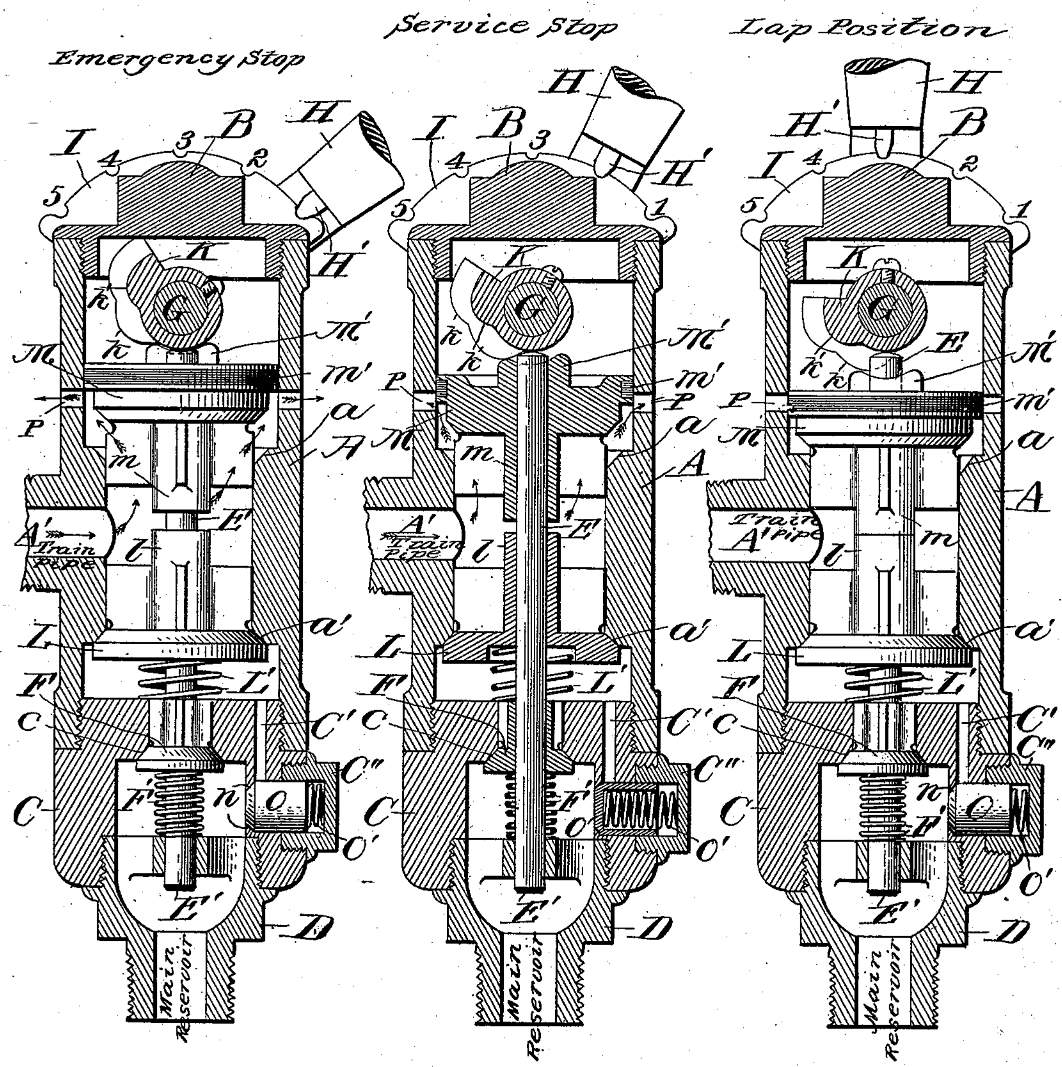

Fig. 3.

Fig. 4

Fig. 5.

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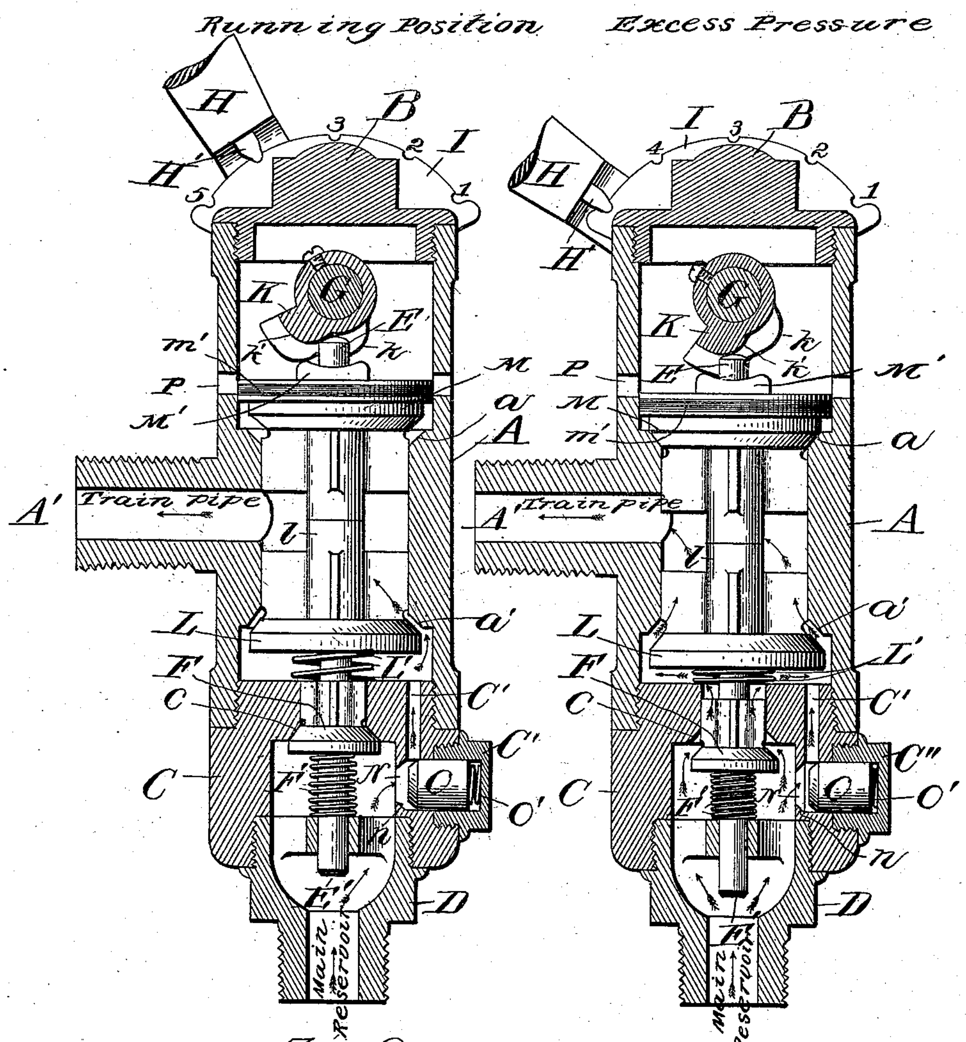

Fig. 6

Fig. 7

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UNITED STATES PATENT OFFICE.

WILLIAM C. WHITACRE, OF ST. LOUIS, MISSOURI.

ENGINEER'S VALVE.

SPECIFICATION forming part of Letters Patent No. 524,154, dated August 7, 1894.

Application filed March 7, 1893. Serial No. 464,958. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM C. WHITACRE, a citizen of the United States, residing in the city of St. Louis, State of Missouri, have invented a certain new and useful Improvement in Engineers' Valves, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which my invention relates to make and use the same, reference being had to the drawings forming a part of this specification.

My invention relates to devices to be used by engineers on locomotives for controlling the motive fluid for operating the brakes on trains in pneumatic brake systems, popularly known as "engineers' valves." More particularly, it relates to an "engineer's valve," the subject matter of an application filed by myself April 12, 1892, Serial No. 428,855—allowed January 23, 1893, and consists in features of improvement in the construction of the said valve and in the consequent method of operation.

In the practical operation of the engineer's valve, the subject of the aforementioned application, it was found lacking in some particulars:—It was found too sudden in its operation in the setting of the brakes, and there was no provision for partially setting the brakes, not allowing the full pressure in the auxiliary cylinder to act, and maintain that condition. The object of the present invention is to supply these wants, and effect the desirable consequent results.

In the accompanying drawings, in which like characters of reference denote like parts in the several views:—Figure 1 is a side elevational view of the valve as a whole. Fig. 2 is a longitudinal section, partly in elevation, taken on a diameter corresponding to the axis of the operating cam shaft, or as on the line 2—2 in Fig. 1. Figs. 3 to 7 are similar longitudinal diametrical sections taken as on the lines 3—7 in Fig. 2, on a diameter at right angles to the operating cam shaft, illustrating in the different figures, respectively, the position of the coacting parts corresponding to the several positions of the operating handle; Fig. 3 being for the position of the operating handle for "emergency stop;" Fig. 4 "service stop;" Fig. 5, "lap;" Fig. 6 "running," and Fig. 7 for "excess pressure."

As already stated, in a general way, after the engineer's valve, the subject of the aforementioned application, was given a practical test, it was found that it could be improved on, and indeed, required some changes in the construction and consequent method of operation. Primarily, the escape of the air from the train pipe through the valve, was too sudden, causing a too sudden application of the brakes, or rather, a too sudden setting; and again, it was found advisable to often set the brakes with a certain pressure, a part of the available pressure, and to hold that. In the old valve, the valve governing communication between the train pipe and the atmosphere, and the valve controlling the communicating opening between the train pipe and the main reservoir, being connected together on the same valve stem, this latter feature was practically impossible. In the present model I have sought to provide for these extra requirements in the form of construction which I will now describe.

A represents an open ended cylindrical valve casing, bored out or otherwise formed to two relatively different diameters, at least so that there is a middle portion of relatively smaller diameter than the two end portions, making use of the shoulders formed by the relatively reduced portions, as at a and a', for valve seats facing toward either end, respectively.

B represents a closing cap piece screwed into the upper end of the casing A.

C represents a cup-shaped end extension of the casing A, being screwed at its comparatively closed end into the lower end of the casing.

D represents a hollow plug-piece screwed into the projecting end of the extension piece C, screw threaded on its projecting end adapting a connecting pipe from the main reservoir to be screwed thereto. The upper closed end of the extension piece C is formed with a central perforation providing a direct communicating opening from the space in the valve casing above it, with the hollow space below the same, and adapted to receive a valve, described later, to control such opening, the lower circumferential edge of the perforation being beveled off, as at c to form a seat for the said valve. The piece C is also formed with a laterally extending opening N, (see Figs. 6 and 7) communication through which is controlled by a valve therefor, to be described later, and a communicating duct C' in the side wall thereof extending from the said lateral opening to the space in the valve casing above the piece C, around the direct central communicating opening already referred to. C''' represents a screw-cap for closing the outer end of the lateral opening described, and for providing a housing for the valve therefor.

The inner end of the hollow plug piece D is formed as a skeleton web, in the center of which is formed a guide for the lower or guide end of the valve stem E' of the winged, beveled flanged valve F which is used to close the central opening in the upper end of the cup-shaped extension piece C.

F represents a coil spring surrounding the stem E' for normally forcing the valve F to its seat c, to close the said perforation.

G represents a rod or shaft placed diametrically across the upper end of the valve casing A and having journal bearings formed therefor in the side walls of the casing and secured in place by the screw g. One end is made to project beyond the casing, and has secured thereto the operating handle H. The handle H is provided with a spring pawl H' which is adapted, in the movement of the handle H, about the axis of its rod or shaft G, to engage in notches 1, 2, 3, 4 and 5, formed in the circumferential edge of the segmental pawl rack I, thereby determining the different set positions of the handle H. The pawl rack I is secured to the side of the casing A with its curved notched edge concentric with the center of the axial shaft G, and to the shaft G, at approximately midway between the sides of the valve chamber, is rigidly secured the double compound cam-piece K, which comprises substantially three cams in one—a central one k, and two outside similar ones, see Fig. 2.

The casing A is formed with a lateral projection or nozzle A', the projecting end of which is screw-threaded to receive the end of the train pipe. This projection is hollowed or bored out, affording a lateral port from the central or relatively reduced portion of the valve casing.

In the side walls of the valve casing A are formed the several orifices or exit perforations P, from which communicate openings from the upper relatively enlarged portion of the valve casing to the exterior atmosphere.

In the lower relatively enlarged portion of the valve casing is fitted a beveled flanged winged main valve L for controlling communication from the main reservoir to the train pipe, which has an upwardly extending stem portion l, and is normally held seated or closed by the coil spring L', finding a bearing on the upper surface of the extension piece C. M is a valve similar to the valve L, except that it is made with the additional feature corresponding to a piston, with packing in it to fit the upper relatively enlarged portion of the casing A, and is relatively inserted. The valve casing M is also formed with a longitudinally projecting lug M' which is faced off on a curve substantially concentric with the axis of the cam shaft G, adapted to be engaged by the surfaces of the cams k. The valves L and M, and their respective stems G and m are concentrically bored out longitudinally to accommodate the upwardly extending valve operating stem E of the valve F, which is preferably of a length sufficient to normally project somewhat above the operative surfaces of the lug M' and between the same (see Fig. 2). The upper end of this valve stem E is adapted to be engaged and operated by the middle cam surface k' of the cam block K.

Into the laterally extending perforation N in the side wall of the extension piece C, is fitted the bevel ended cup valve O which is provided with a valve seat p formed by diametrically reducing the inner of the perforations, and is normally held closed by the internally disposed gaged coil spring O' (see Fig. 4) which finds an end bearing against the inner surface of the closing screw cap C''.

The cam surface k' comprises substantially a cam with five relatively diametrically different stepped faces by which means the valve M can be given five relatively different positions corresponding to as many different positions of the operating handle H, as determined by allowing the spring operated pawl to engage in the different notches 1 to 5 in the pawl rack I. Two of these relative longitudinal movements of the valve M are effected by the inclination of the cam surface between two diametrically different concentric portions (see Figs. 4 and 6).

The cam k' consists in a simple one-place cam projection at one point on a concentric hub portion, which engages with the projecting end of the valve stem E to depress the same longitudinally, and operate the valve F, in one of the extreme positions of the operating handle H (to the extreme left in Fig. 7, the right in Fig. 1). The position of this cam lug on the cam k' relative to the operative faces of the cam k is such that it is in engagement with the valve rod E when the cam surface of the cam k of the longest radial dimensions in engagement with the valve lug M' to seat the valve M, for reasons that will appear in the following description of the method of operation of my improved device.

The drawings (Figs. 3 to 7 inclusive) are almost self-explanatory of the method of operating the valve in train service, the co-relative position of the several parts being shown in the several figures, and the flow of the motive fluid consequent in such positions, being indicated by the small arrows.

The stems m and l of the valves M and L, are of such length that they will abut against each other, and in that way hold one of the valves M or L away from its seat at all times, and when the lower or spring seated valve L is closed, the piston part of the valve M will close the perforations P, as shown in Fig. 5. While the valves are in this position, a "lap" position as it is termed, the valve M can be forced down to unseat the valve L, without unseating the valve F, and thus cause the parts to assume a "running" position, as shown in Fig. 6, or one in which the relief valve O will permit the excess pressure in the main reservoir to pass into the train pipe. The different positions assumed by the different valves as shown in the drawings, may be classified as follows:

In Fig. 3, where the handle H is to the extreme right, the cam faces k and k' are away from the lugs M' and the operating stem E of the valve F. This causes the valve L to seat itself by reason of the pressure from the main reservoir, being at its back (this pressure obtaining access to the back of the valve through the port C', if it is great enough to compress the spring O') and the pressure of the spring L'. The valve M in this instance, being free to move up, will do so by reason of the back pressure from the air in the train pipe, which will not only unseat the valve from its seat a, but will cause its piston portion to pass beyond the exit ports P, and thereby open communication from the train pipe to the exterior atmosphere. This will reduce the pressure in the train pipe to atmospheric pressure, which will cause the brakes to be applied quickly and suddenly. This position I term the "emergency" stop.

In Fig. 4, the handle H has been moved one notch to the left, thereby bringing the first fluctuation in the cam faces k into contact with the lugs M' which will slightly depress the valve M, without changing the positions of the valves L, F and O. We will assume, in describing the effect of this position of the handle, that the train pipe has been previously charged, and that this position has just been taken. The valve M in this instance is raised from its seat a by the back pressure in the train pipe, and but partially uncovers the exit ports P, which will permit a gradual escape of the air, thereby causing a slow reduction of the pressure in the train pipe, consequently the application of the brakes is slow and gentle. This position, I term the "service" stop.

In Fig. 5, where the handle H occupies a central position, the first fluctuation on the cam surface k is in engagement with the lugs M' and has caused the piston portion of the valve M to entirely cover or lap the exit ports P, thereby preventing the escape of air therethrough, and as the cam surface k' has not yet reached the operating rod E for the valve F, and as the stem m of the valve M but lightly rests upon the stem l of the valve L, the valves L and F are seated. These positions of the different valves will prevent the passage of the air therethrough in either direction, and is termed a "lap" position.

In Fig. 6, the handle H occupies a position slightly to the left, and the cam surface k' has just come into contact with the piston stem E, but has not depressed it. The cam surface k, has by its second fluctuation, forced the valve M downwardly, and by the abutment of its stem m with the stem l, of the valve L, has unseated said valve partially, thus permitting the excess pressure in the main reservoir to flow through the port C', past the valve L, into the train pipe, thus raising the pressure of the latter to that of the main reservoir. Of course it will be understood in this connection, that the valve O is set to resist being unseated until a certain pressure is reached in the main reservoir. This, I term the "running" position.

In Fig. 7, the handle H has been turned to its extreme left position, forcing the valve M downward, by reason of its cam surface k, which valve by its contacting, or abutting stem, further unseats the valve L, and establishes an easy communication between the train pipe, and the space behind the valve. The cam surface k' has also forced the rod E downwardly, and has unseated the valve F, which opens communication between the main reservoir and the train pipe without the interposition of the relief valve O. This, I term a position of "excess pressure" and by it, the brakes are released, and the auxiliary reservoirs recharged.

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

1. In an engineer's valve, the combination with the valve casing having communication with a main reservoir, train pipe, and the exterior, of a valve for controlling the communication between the train pipe and the exterior atmosphere, means for operating said valve, a valve for controlling communication between the main reservoir and the train pipe, said latter valve being operated by the abutting contact of the first named valve when the same is operated, substantially as described.

2. In an engineer's valve, the combination with the valve casing having communication with the main reservoir, train pipe and the exterior atmosphere, of a main valve for controlling communication between the main reservoir and train pipe, a valve for controlling communication between the train pipe and the exterior atmosphere, a handle provided with a cam surface for operating the last named valve, which valve operates the valve which controls the communication between the main reservoir and train pipe, substantially as described.

3. In an engineer's valve, the combination with the valve casing having communication with a main reservoir at its lower end, a valve for controlling the passage of the air from the main reservoir to the train pipe, a valve located above the first named valve for controlling communication between the train pipe and the exterior atmosphere, said last

named valve being independently operative from the valve which controls the communication between the main reservoir and train pipe, and which is adapted to operate said first named valve by its contacting stem, and means for operating said valve, substantially as described.

4. In an engineer's valve, the combination with the valve casing having communication with the main reservoir, train pipe and exterior atmosphere, of a valve F and its stem, which valve establishes free communication between the main reservoir and the train pipe in conjunction with a main valve L mounted upon its stem, which latter valve positively controls the communication, a piston valve M mounted upon the stem E which controls the exit of the air from the train pipe, and which actuates the valve L in certain positions, and cam surfaces for operating the valves M and F, substantially as described.

5. In an engineer's valve, the combination with the valve casing having communication with the main reservoir, train pipe and the exterior atmosphere, of a main valve for controlling communication between the reservoir and the train pipe, a relief valve located between said main valve and the main reservoir, an excess pressure valve located between the main valve and the main reservoir, a stem on said valve, a piston valve slidingly mounted on said stem for controlling the reduction of the pressure in the train pipe, and cam surfaces for operating the piston valve (which in turn operates the main controlling valve between the reservoir and the train pipe in certain of its positions) and the excess pressure valve, substantially as described.

In testimony whereof I hereunto affix my signature, in presence of two witnesses, this 18th day of December, 1893.

WILLIAM C. WHITACRE.

Witnesses:
F. R. CORNWALL,
HUGH K. WAGNER.