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AIR BRAKE APPARATUS.

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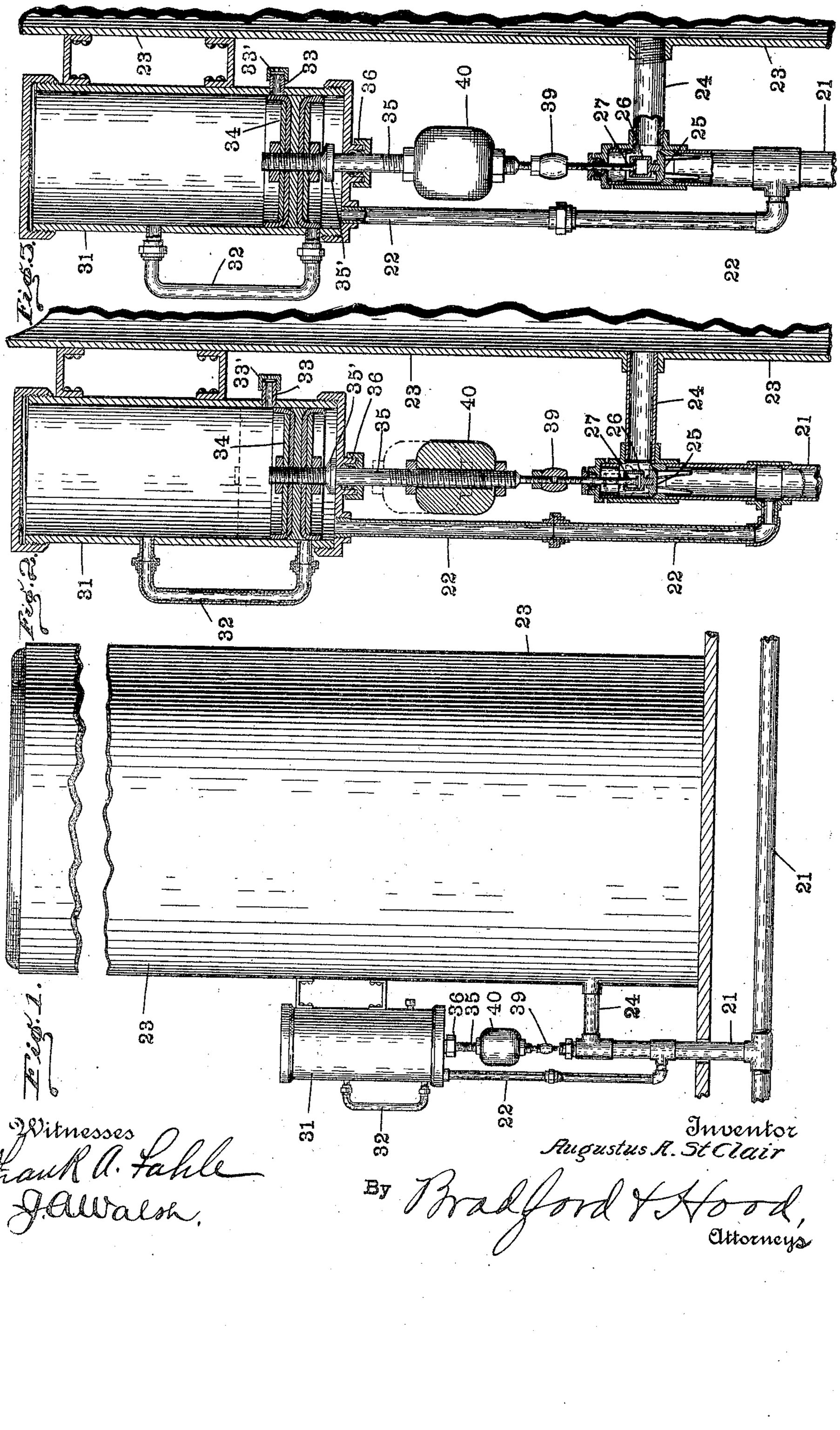

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AIR-BRAKE APPARATUS.

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To all whom it may concern:

Be it known that I, AUGUSTUS A. ST. CLAIR, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Air-Brake Apparatus, of which the following is a specification.

In the use of air-brakes on railway-trains the brakes are commonly set by a reduction in the train-line pressure and released by an increase or restoration of such pressure. These operations have commonly been performed by the locomotive engineer and have been accomplished by manipulation of the engineer's brake-valve, so that the operation has been that the releasing of the brakes has begun with the front car and has proceeded from car to car toward the rear of the train. In long trains especially, therefore, a considerable time has elapsed between the operation of the brakes on the cars at the front end of the train and the operation of the brakes on the cars at the rear end of the train. As is well known, this frequently results in considerable damage to the cars, particularly to their coupling equipment. This is especially true in cases where great haste in releasing the brakes is desired (on account of some emergency in the train service requiring prompt movement) and where the engineer consequently is under the necessity of starting as quickly as possible. In such cases he may misjudge the time necessary to effect the release of the brakes on the rear cars and is likely to start a little too quickly, with the result of pulling out draw-bars or otherwise crippling some of the cars in the train.

The principal object of my invention is to provide an apparatus by means of which the brakes on the cars in the rear portion of the train may be released with substantially the same promptness as those at the front end of the train, or, in other words, by the use of which the release of brakes at the rear end of the train may begin at practically the same instant that the release of brakes at the front end of the train begins, and said invention principally consists in providing a reservoir for air on the way-car or other car at the rear of the train and providing the same with a system of valves by means of which the air therein may be turned into the train-line at practically the same time that air is turned into the front end of the train-line, so that the release of brakes may begin at both ends of the train substantially simultaneously. This reservoir I will hereinafter denominate a "supplemental" reservoir in order to distinguish it from the various reservoirs already forming a part of regular air-brake apparatus. My apparatus is also capable of such manipulation that by its use the brakes can all be released from the rear of the train when there is time to do so, which is obviously in itself a great advantage for reasons which are well understood by those skilled in the art.

This apparatus may be understood to be supplemental to the ordinary well-known air-brake apparatus as the same is now generally constructed and used, and such ordinary air-brake apparatus will not, therefore, be further described herein, except incidentally in describing my said invention.

The accompanying drawings illustrate an apparatus embodying my said invention.

Figure 1 is a side elevation showing one form of the supplemental reservoir, a fragment of the adjacent portion of the "train-line" of an ordinary air-brake system, suitable connections between said train-line and said reservoir, and means for controlling the passage of air from one to the other; Fig. 2, a central vertical sectional view of the working parts thereof, on an enlarged scale, the parts being shown in the position which they occupy when the apparatus is at rest, (after the brakes have been released,) so that the train is in running condition; and Fig. 3, a similar view with the parts in the position they occupy while the brakes are being released by means of my improved apparatus.

In such an apparatus the train-line 21 leads to (and is connected by means of a suitable inlet 22 with) the cylinder 31 of a piston-valve. A supplemental air-reservoir 23 is provided on a car in the rear portion of the train, which reservoir is of a suitable size to contain the proper quantity of air and is connected to the train-line 21 by suitable ingress and egress openings or opening. In the construction shown a branch pipe 24 (containing a check-valve 25) leads from the train-line to the reservoir and serves both as the ingress and egress passage.

The valve-cylinder 31 is provided with a by-pass 32, by means of which communication is established between the upper and lower ends thereof when the valve-piston is at the proper point, as will be presently described. It is also provided with an escape-

valve 33, which when open communicates with the outer air. Within the cylinder 31 is the piston-valve 34, having a valve-stem 35. Said stem passes through a stuffing-box 36 on a head of the cylinder 31, and its outer end is connected to the valve 25. The upward movement of the valve 34 will thus open the valve 25; but as the travel of valve 34 should be greater than the travel of valve 25 the parts 26 and 27, forming the connection, are so arranged that the latter will travel a certain distance before it engages the former. This permits the valve 34 to reach the position shown in Fig. 3 without opening the valve 25. The stem 35 is formed in part of a turnbuckle 39, by means of which its length may be accurately adjusted in order that the valve 25 may be operated to open at the right time and to the right extent. On the valve-stem 35 I place a collar 35′, which limits its downward movement, and the other construction serves to limit its upward movement. It is desirable (in operation) that this valve should move freely during the period of its descent, and I therefore make the stem and link heavy enough to overcome the friction of the valve, and this I prefer to do by placing upon the stem a weight 40, which may be exactly adjusted to the requirements of the situation.

In order to secure the proper elasticity above the valve 34, it is desirable that the space or chamber at that point shall be quite large. I therefore prolong the cylinder 31 a considerable distance beyond the point to which the valve 34 travels, and thus provide for a suitable space above said valve-piston in which the air may be compressed at the proper time in the operation to secure the proper result without creating an unduly high pressure, which would tend to make the movement more sluggish than is desirable. In order to secure exactly the right result under all conditions, I deem it desirable to provide for the more or less rapid escape of the air in this upper cylinder-space. This I do by varying the size of the escape-orifice 33. One means of doing this is to provide several of the caps 33′, having perforations of varying sizes, such caps being interchangeable.

I will now proceed to describe the operation of an air-brake apparatus embodying my invention. I first pump up the air until the predetermined pressure for operating the brakes is reached. This pressure (according to present practice) is about seventy pounds to the square inch, and at this pressure the brakes are held out of engagement with the wheels or in "released" position. During this operation the valve 34 stands in a position between the two mouths of the by-pass 32, so that said by-pass is open, enabling the air-pressure above and below said valve to become equalized. When the predetermined pressure has been reached and the operation of producing the same stops, the valve 34 will descend somewhat until the lower opening of the by-pass is covered, the escape-opening 33 being also covered. This slight descent of valve 34 makes the pressure above it slightly less than it is below, so that said valve will be held to this position (see Fig. 3) by the greater air-pressure beneath. The parts will remain in this position until the apparatus is operated. When the train-line pressure is reduced, the first effect upon the valve 34 is that it will be caused to descend until the collar 35′ rests against the inner surface of the head of the valve-cylinder. This uncovers the escape-opening 33, when the pressure above the valve will rapidly decrease until it becomes slightly lower than the pressure below, whereupon the valve will return to its former position, at which it closes both the escape-opening and the lower by-pass opening. When it is desired to set the brakes, as is well known, the engineer so manipulates his valve as to permit a part of the air in the train-line to escape, reducing the pressure therein and causing the brakes to be operated under the pressure from the air in the regular "auxiliary" reservoirs of the air-brake system in the usual and well-known manner. This reduction is usually about twenty pounds or from about seventy pounds to about fifty pounds, which is common pressure (in modern practice) used in operating air-brakes. With my apparatus, however, I prefer to reduce the pressure somewhat more than this in the train-line—say to forty-five pounds—which additional reduction, however, does not affect the pressure in the auxiliary reservoirs and brake-cylinders, but leaves a difference between the pressure therein and the train-line pressure, which may be utilized in operating my invention. I also (and for substantially the same purpose) make the diameter of my piston-valve 34 somewhat greater than the diameter of the pistons in the triple valves of the regular air-brake system which control the inlets to the auxiliary reservoirs, so that the area of the surface of said piston-valve 34, against which the train-line pressure comes in operation, is greater than the area of the corresponding surface in each of the triple valves. I may here remark that as constructed and arranged in the equipment illustrated and described herein my present invention has nothing to do with the setting of the brakes, but only with releasing them. Now when it is desired to release the brakes the engineer so manipulates his air-valve as to turn an additional pressure into the train-line, and if this pressure is less than that in the auxiliary reservoirs and brake-cylinders the first operation is to raise the valve 34 somewhat, and thus slightly open the valve 25. This permits the escape of air from the supplemental reservoir 23 into the train-line at its rear end, the first effect of which is to so increase the

pressure in the train-line as to incidentally raise the valve 34 to the limit of its movement, thus opening the valve 25 to its full capacity, whereupon the train-line is filled from said reservoir from the rear end of the train, with the well-known result of releasing the brakes, except that the release begins with the brakes on the cars at the rear of the train and proceeds car after car toward the front. If the engineer in performing this operation sets his air-valve in what is known as "running position," so that only a moderate quantity of air is forced into the train-line from the front, all (or nearly all) of the brakes on the train will be released from the rear under the effect of the air coming from the supplemental reservoir 23. If, however, it is desired to release the brakes as quickly as possible, the engineer will set his air-valve at the position known as "full release," with the result that the brakes will be released from both ends of the train, those in the front end being released in the ordinary manner and those in the rear end by my apparatus. It will thus be seen that in the first case I am enabled to release the brakes from the rear, and consequently insure that no possible harm shall result to the coupling equipment of the cars by the operation, and in the second case I am enabled to release all the brakes on the train in about one-half of the usual time and at the same time insure the cars in the rear end of the train against the damage to coupling equipment before spoken of. The second operation—that is, of releasing one-half the brakes from each end of the train—can be accomplished without reducing the pressure in the train-line below that at which the brakes ordinarily set. To get the full benefit of my apparatus, however, it is desirable to make this reduction a little greater in the train-line than it is in the auxiliary reservoirs and brake-cylinders, as has already been described. As will be readily understood, the discharge of air from my supplemental reservoir into the train-line not only operates to release the brakes, but also aids in restoring the "train-line pressure" or pressure in the train-line and auxiliary reservoirs, so that the air-brake apparatus as a whole is put in readiness or condition for further use much more quickly than it can be in the absence of my supplementary apparatus. In restoring the train-line pressure to the predetermined amount—say seventy pounds—it will also be restored to the same pressure in the supplemental reservoir 23, as the air will flow freely in through the branch pipe 24 and the check-valve 25 whenever the pressure in the train-line is greater than the pressure in said reservoir.

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

1. The combination, with an air-brake system embodying the usual train-line and individual air-brakes for the cars of the train, of a supplemental reservoir at the rear end of the train, connections between said reservoir and said train-line, and means controlled by the train-line pressure for releasing the air in said reservoir and discharging the same into the train-line, thereby producing the usual effect of increased train-line pressure upon the brakes on the cars connected to said train-line when it is desired to release the brakes.

2. The combination, with a railway-train, of the usual air-brake apparatus, a supplemental reservoir at the rear of the train, a branch between the train-line of said apparatus and said reservoir containing a check-valve, another branch leading from said reservoir to said train-line containing a valve, and a piston-valve operated by the train-line pressure for operating said last-mentioned valve, whereby the air stored in said reservoir may be released for the purpose of releasing the brakes.

3. The combination, in an air-brake system, of the train-line, a supplemental reservoir at the rear end of the train, connections between said reservoir and said train-line, a valve in the egress connection, and a piston-valve operated by the train-line pressure for controlling the same.

4. The combination, in an air-brake system, of the train-line, a supplemental air-reservoir, valves for controlling the ingress and egress of air from said reservoir, and a piston-valve for controlling the egress-valve, the cylinder whereof is provided with a by-pass and with an air-escape orifice both of which are arranged to be controlled by the movement of the piston of said valve.

5. The combination, in an air-brake system, of the train-line, a supplemental reservoir connected to the rear portion of said train-line, air ingress and egress passages connecting said reservoir and said train-line, a valve in said passages, and means controlled by a reversal of conditions in the train-line whereby the valve in the egress-passage is actuated.

6. The combination, in an air-brake system, of the train-line, a supplemental reservoir connected to the rear portion of said train-line, an ingress-passage whereby said reservoir is charged from said train-line, an egress-passage whereby the train-line may be charged from the reservoir when the pressure in the train-line has been reduced, a valve for controlling said last-named passage, a piston-valve for controlling said last-named valve, and a supplemental reservoir connected to the opposite end of the piston-valve from said egress-passage valve.

7. The combination, in an air-brake system, of the train-line, a supplemental reservoir connected to said train-line, a valve in the egress-passage from the reservoir to the

train-line, a piston-valve whereby said last-named valve may be controlled, the valve-stem of said piston-valve being provided with stops whereby its movement is limited, and the cylinder of said piston-valve being provided with a by-pass and an escape-orifice controlled by the positioning of said piston-valve.

8. The combination, in an air-brake system, of the train-line, a supplemental reservoir connected to said train-line, a valve in the egress connection between said reservoir and said train-line, and a piston-valve for controlling said last-named valve, the valve-stem of said piston-valve being weighted and the friction of said piston-valve thereby overcome in operation.

9. The combination, in an air-brake system, of the train-line, a supplemental reservoir connected to said train-line, a valve in the egress connection between said reservoir and said train-line, and a piston-valve for controlling said last-named valve the area of which is greater than that of the piston in the triple valve controlling the inlet to the auxiliary reservoir.

In witness whereof I have hereunto set my hand and seal at Indianapolis, Indiana, this 29th day of July, A. D. 1905.

AUGUSTUS A. ST. CLAIR. [L. S.]

Witnesses:
CHESTER BRADFORD,
JAMES A. WALSH.