No. 622,618. Patented Apr. 4, 1899.

W. GLASGOW.

SYSTEM FOR OVERHEAD ELECTRIC WIRES.

(Application filed Jan. 30, 1896.)

(No Model.) 3 Sheets—Sheet 1.

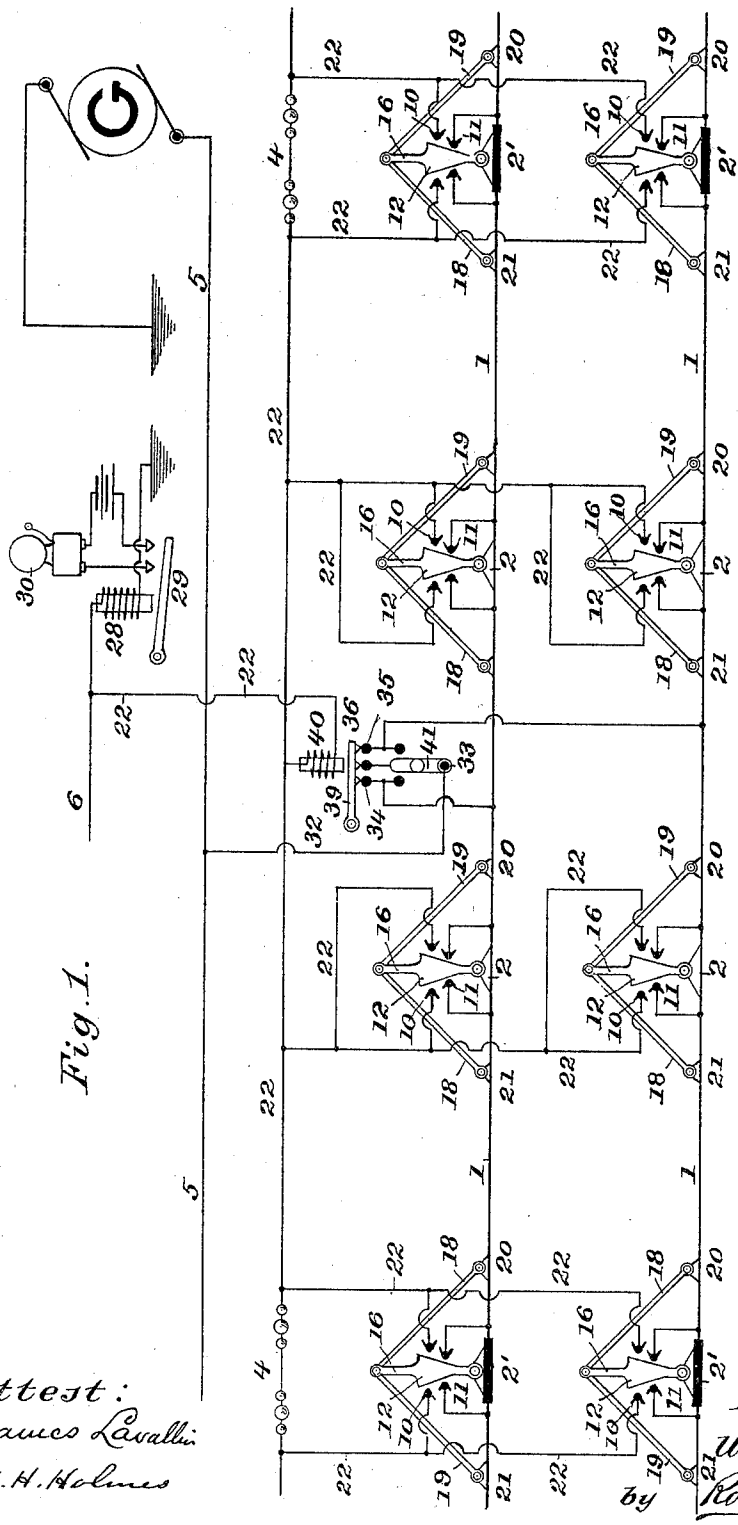

Fig. 1.

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Fig. 2.

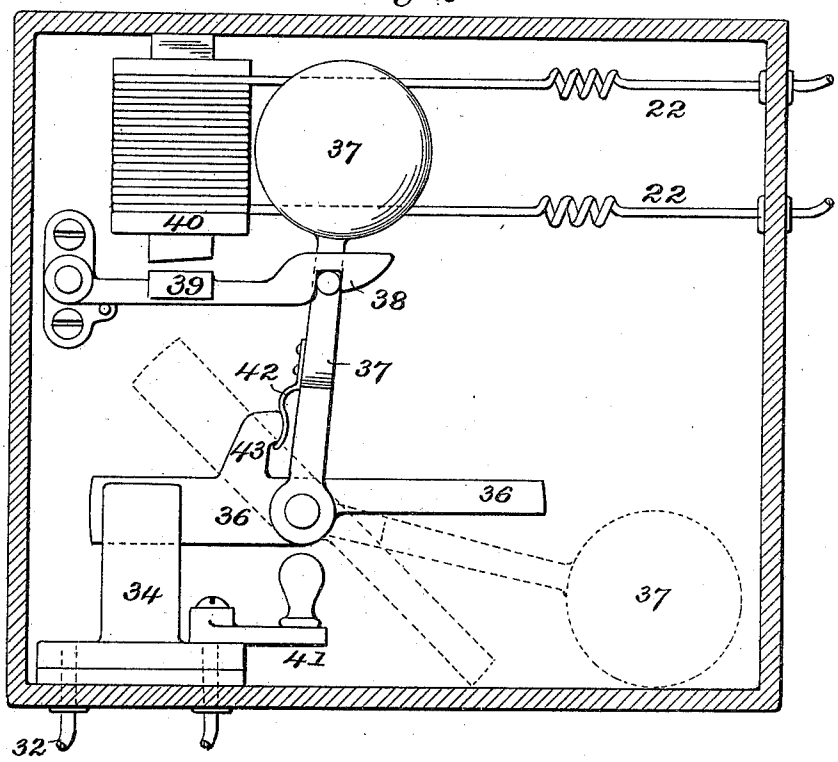
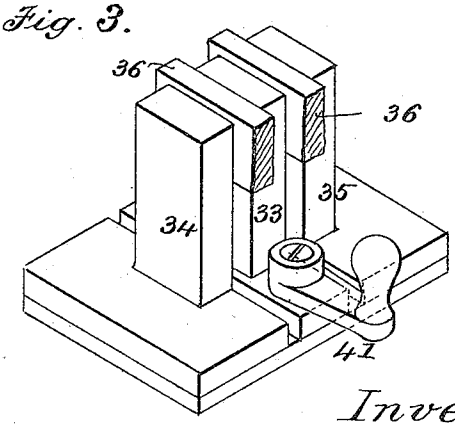


Fig. 3.



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3 Sheets—Sheet 3.

Fig. 6

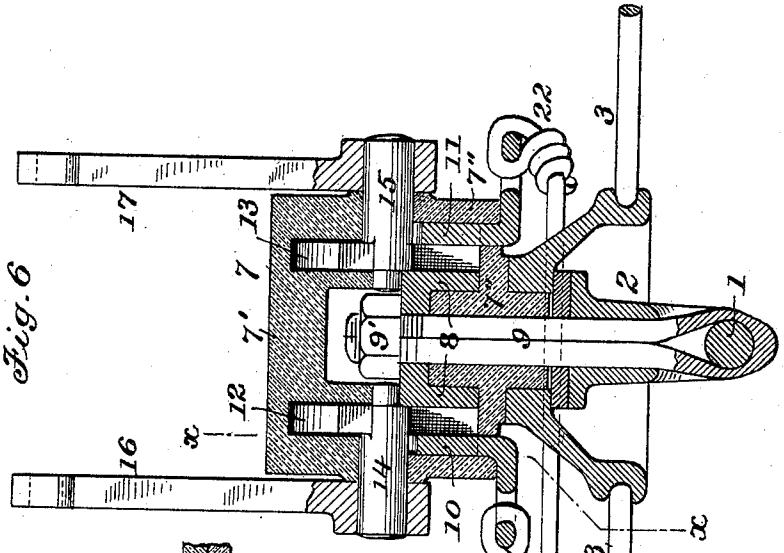


Fig. 5.

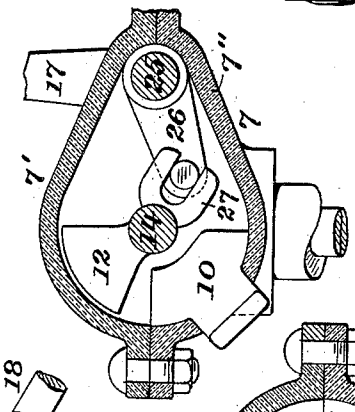
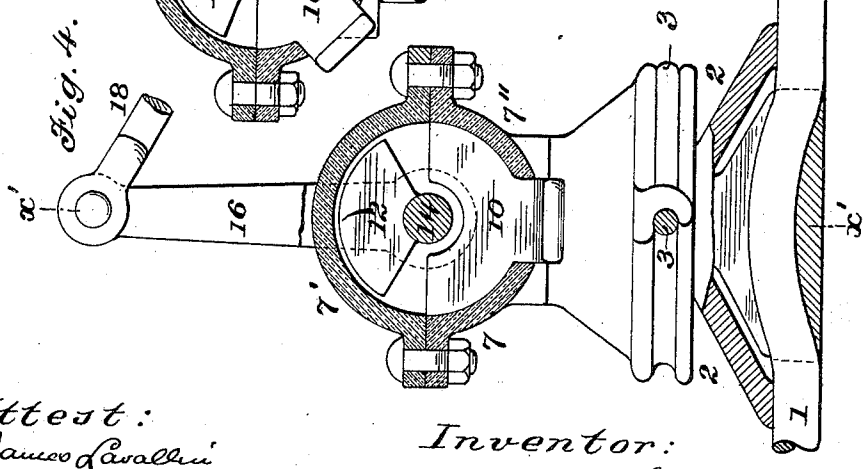


Fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM GLASGOW, OF CHICAGO, ILLINOIS.

SYSTEM FOR OVERHEAD ELECTRIC WIRES.

SPECIFICATION forming part of Letters Patent No. 622,618, dated April 4, 1899.

Application filed January 30, 1896. Serial No. 577,409. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM GLASGOW, 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 Safety Systems for Overhead Electric Wires; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

The present invention relates to a safety system for overhead electric wires that carry heavy currents and by which said wires are rendered harmless in case of accidental breakage of the same or upon the sagging of such wires so that the same are in dangerous proximity to the ground.

The object of the present improvement is to provide a simple, efficient, and automatic safety system for such wires in which the same are formed in a series of separate divisions and each of which divisions embraces a multiplicity of hangers each of which is provided with an automatically-operating switch, so that by the breakage or dangerous sagging of the overhead electric wire between any one of the said hangers the hanger-switches next adjacent to such break or undue sagging of the wire will act to ground the entire division in a direct manner or operate a secondary switch that will in turn cut the particular division in which the break occurs out of circuit, all as will hereinafter more fully appear and be more particularly pointed out in the claims.

A further object of the present improvement is to provide a simple and effective construction of switch for use in connection with the trolley-wire hanger, and which switch is adapted to be operated by the breaking or sagging of said trolley-wire, as will hereinafter more fully appear.

I attain such objects by the construction and arrangement of parts illustrated in the accompanying drawings, in which—

Figure 1 is a diagrammatic view illustrating the present invention applied to the overhead trolley-wires of an electric railway; Fig. 2, a sectional elevation of the automatic switch or cut-out for cutting out a trolley-wire division in the present system; Fig. 3, a detail perspective view of the switch portion proper of the same; Fig. 4, a detail longitudinal section at line $x\ x$, Fig. 5, of a trolley-wire hanger or suspension having the switch or cut-out of the present invention applied thereto; Fig. 5, a transverse section of the same at line $x'\ x'$, Fig. 4; Fig. 6, a detail longitudinal section of a modified form of the switch or cut-out shown in Fig. 4.

Similar numerals of reference indicate like parts in the several views.

Referring to the drawings, 1 represents the trolley wire or wires of an electric railway, which in the main portion of the present invention will be subdivided into a number of independently-supplied divisions, each of which divisions embraces a series or multiplicity of trolley-wire hangers that carry individual switches adapted to operate automatically upon the breaking or undue sagging of the trolley-wire adjacent to such individual hanger and hanger-switch, as will hereinafter more fully appear.

2 are the hangers or suspensions by which the trolley-wires are supported in an overhead position, such hangers being in turn supported by guy-wires 3 or other means and a series of trolley-posts 4, as shown.

When the trolley-line is arranged in separate divisions, as heretofore mentioned and as illustrated in Fig. 1, the ends of the trolley-wires of each division will be connected to the adjacent ends of the trolley-wires of the next adjacent divisions by means of the usual insulating hanger or suspension 2′.

5 is the electric supply-conductor by which the different divisions of the trolley-line are supplied from the central-station dynamo.

6 is a main return-wire for use when it is not desirable to connect the different individual return branches of the system directly to the ground.

In another part of the present invention each trolley-hanger is provided with a cut-out switch that is preferably of twofold nature, so as to have independent connection with the trolley-wire at each side of the hanger and be capable of independent operation by a break or sag of the trolley-wire at either side of the hanger.

In the construction shown in the drawings, 7 is an inclosed casing which is preferably

made of porcelain or other like non-conducting material and formed of upper and lower sections 7′ 7″, detachably secured together by bolts passing through side lugs on said sections, the whole being firmly attached to the upper end of the trolley-hanger 2.

8 is a yoke-shaped contact-plate arranged at the mid-width of the casing and having electric connection with the trolley-wire through the usual hanger-attaching shank 9, which is adapted to pass up through an orifice in the lower section 7″ of the casing 7 and through an orifice in the yoke 8, with the attaching-nut 9′ thereof bearing upon the top of such plate 8, as shown in Fig. 5, and in electrical contact therewith.

10 and 11 are side contact-plates secured in an insulated condition within the inclosing casing 7.

12 and 13 are rocking contact-arms or sector-plates supported upon independent carrying rock-shafts 14 and 15 and arranged between the respective side contact-plates 10 and 11 and the centrally-arranged yoke-shaped contact-plate 8, so as to be capable of moving between the same to make an electrical connection when required.

By making the inclosing casing 7′ and 7″ as shown a ready assemblage of the parts can be readily effected in that all parts can be put in place in the lower section and secured in place, after which the upper or cap portion 7′ can be finally put in place to protect and hold the parts in proper position.

16 and 17 are rock-arms secured to the rock-shafts 14 and 15 outside the housing 7 and having suitable connection, preferably by links 18 and 19, with the clips 20 and 21, secured to the trolley-wire 1, the construction being such that with the breakage or dangerous sagging of the trolley-wire 1 at either side of the above-mentioned switch mechanism the rock-arm 16 or 17 of that particular side will be pulled over to bring the particular rocking contact-plate 12 or 13 between the central contact-plate 8 and the side contact-plate 10 or 11 to electrically connect the two together and form a short circuit for the trolley-wires through such plates and the branch conductor 22 by either a ground or return metal circuit in the usual manner.

Where from particular circumstances a greater amplitude of movement in the rocking contact-arms or sector-plates 12 and 13 is desired, I prefer to arrange the same in manner illustrated in Fig. 6. In the construction shown in this figure, 25 is a counter-shaft carrying the rock-arm 17 or 18, that is connected to the trolley-wires by links 18 19 and clips 20 and 21, such counter-shaft being provided with a crank-arm 26, engaging a much smaller crank-arm 27 on the rock-shaft 14 or 15, that carries the rocking contact-arms 12 or 13 in manner similar to that described in connection with Figs. 4 and 5. By this means a small movement of the counter-shaft 25 will impart a comparatively large movement to the main rocking shaft that carries the contact-plates by which electric connection is made and broken.

In some cases it may be preferable to use a common return-wire 6, in that it enables a signal to be given at the generator or repair station that a break has taken place, such signal being effected by an electromagnet 28, in circuit with said return-wire 6, with its armature 29 adapted to close a local circuit in which is arranged an alarm-bell 30, as illustrated in Fig. 1.

Additional means for use in cases where a greater degree of safety is desired than is afforded by the above-described means for short-circuiting the trolley-wire, but which is only adapted for trolley-lines that are erected in independent divisions separately supplied from the central generating-station, as before mentioned, is shown in Figs. 1, 2, and 3 and consists in an automatically-operating circuit-breaker 31, inserted between the main feeder or supply-wire 5 and each separate line or trolley section. In the construction shown 32 is a branch wire extending from the main supply-wire to the central post 33 of the switch proper, and 34 and 35 are side posts insulated from the central post 33 and connected by separate branch wires to the respective trolley-wires of the line. 36 is the pivoted switch-lever, one end of which is adapted to fit between the posts 33, 34, and 35, so as to complete the electric circuit between the same and admit of the flow of the electric current from the main supply 5 to the trolley-wires, and which when withdrawn from between said posts breaks the circuit and cuts off the supply of electricity to the said trolley-wires. 37 is a weighted lever pivoted on the same arbor with the lever 36 and normally occupying an upright position, to which it is held by an engaging hook 38 on the pivoted armature 39 of an electric magnet 40, that is placed in circuit with the branch return-conductor 22, which is common to all of the plates 10 and 11 of the series of hanger-switches that are arranged in the particular division of the system, and which conductor 22 extends either to the ground or to the main return-wire 6, as heretofore described. In the construction illustrated in Fig. 3 the branch conductor 23 is similar in arrangement to that thus described in connection with the branch conductor 22 and is arranged in the next adjacent divisions of the system. With this construction upon the breakage or dangerous sagging of the trolley-wire the hanger-switch is operated to bring the plate 10 or 11 in circuit with the plate 8, so that the trolley-current will flow through the branch wire 22 to main return 6, energizing the electromagnet 40 to attract its armature 39 and release the operating-lever 37, which as it drops strikes the free end of the switch-lever to move the same into the position indicated in dotted lines in Fig. 2 and break the connection between the different contact-posts

33, 34, and 35 and wholly cutting off the supply of electricity to the particular section of the trolley-line in which a break, &c., occurs.

With the break of either trolley-wire of a section of the line both trolley-wires will have their supply cut off, and in cases where it is desirable to continue the electric supply to the unbroken one of the trolley-wires I have provided a supplementary hand-switch 41, pivoted to the base of the post 33 and in electrical connection therewith and which is adapted to be swung into contact with either of the side posts 34 or 35 to reëstablish a circuit with the particular trolley-wire that remains unbroken and which has connection with either the post 34 or 35.

42 is a cushion-spring arranged between the switch-lever 36 and the weighted lever 37, and which is in a state of compression when the lever 37 is engaged by the latch or hook 38 of the armature, so that when such lever is released such spring will tend to impart an initial downward movement to said weighted lever and so render its switch-operating movement more effective.

43 is a finger on the switch-lever 36, that is adapted to engage against the operating-lever 37 when the same is in its raised position, so that the switch-lever will be held from jarring loose from its engagement with the posts 33, 34, and 35.

While in the drawings I have shown my invention as applied to overhead trolley-wires of electric railways, it is equally adapted to any other class of overhead wires carrying heavy currents—such, for instance, as electric light or power lines—the arrangement being identical with that heretofore described in connection with the trolley-wires.

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

1. In a safety system for overhead electric wires, the combination of the line-wire divided into separate divisions of a continuous and unbroken nature, independently supplied with the electric current, a series of intermediate hangers supporting each division of the line-wire, switches supported by said hangers, switch-operating arms connected to the switches and to the line-wire, and adapted to operate the switches upon the breakage or undue sagging of said line-wire, said switches having branch connections with the line-wire and with a suitable return-conductor, substantially as set forth.

2. In a safety system for overhead electric wires, the combination of the line-wire divided into separate divisions of a continuous and unbroken nature, independently supplied with the electric current, a series of intermediate hangers supporting each division of the line-wire, a pair of independent switches supported by each of said hangers, switch-operating arms connected to the switches and to the line-wire, and adapted to operate the switches upon the breakage or undue sagging of said line-wire, said switches having branch connections with the line-wire and with a suitable return-conductor, substantially as set forth.

3. In a safety system for overhead electric wires, the combination of the line-wire divided into separate divisions of a continuous and unbroken nature, independently supplied with the electric current, a series of intermediate hangers supporting each division of such line-wire, switches supported by said hangers, switch-operating arms connected to the switches and to the line-wire, and adapted to operate the switches upon the breakage or undue sagging of the line-wire, a suitable return-circuit embracing said switches, and a signal arranged in such circuit, substantially as set forth.

4. In a safety system for overhead electric wires, the combination of the line-wire divided into separate divisions of a continuous and unbroken nature, independently supplied with the electric current, a series of intermediate hangers supporting each division of the line-wire, a pair of independent switches supported by each of said hangers, switch-operating arms connected to the switches and to the line-wire, and adapted to operate the switches upon the breakage or undue sagging of said line-wire, a suitable return-circuit embracing said switches, and a signal arranged in such circuit, substantially as set forth.

5. In a safety system for overhead electric wires, the combination of the line-wire divided into separate divisions of a continuous and unbroken nature, independently supplied with the electric current, a series of intermediate hangers supporting each division of the line-wire, switches supported by said hangers, switch-operating arms connected to the switches and to the line-wire, and adapted to operate the switches upon the breakage or undue sagging of the line-wire, a suitable return-circuit embracing such switches and an automatic circuit-breaker arranged in such circuit and controlled by such switches, substantially as set forth.

6. In a safety system for overhead electric wires, the combination of the line-wire divided into separate divisions of a continuous and unbroken nature, independently supplied with the electric current, a series of intermediate hangers supporting each division of the line-wire, a pair of independent switches supported by each of said hangers, switch-operating arms connected to the switches and to the line-wire, and adapted to operate the switches upon the breakage or undue sagging of said line-wire, a suitable return-circuit embracing such switches, and an automatic circuit-breaker arranged in such circuit and controlled by such switches, substantially as set forth.

7. In a safety system for overhead electric wires, the combination of a wire hanger, a pair of independent switches supported by said hanger, and operating-arms connected to

the switches and to the line-wire, the said switches comprising an inclosing casing 7, a central yoke-shaped contact-plate 8, side contact-plates 10 and 11, and rocking contact-arms 12 and 13, upon rock-shafts having bearing in the casing 7, substantially as set forth.

8. In a safety system for overhead electric wires, the combination of a wire hanger, a pair of independent switches supported by said hanger, and operating-arms connected to the switches and to the line-wire, the said switches comprising an inclosing casing 7, formed of upper and lower sections detachably secured together, a central yoke-shaped contact-plate 8, side contact-plates 10 and 11, and rocking contact-arms 12 and 13, upon rock-shafts having bearing in the casing 7, substantially as set forth.

9. In a safety system for overhead electric wires, that are arranged in independent sections, the combination of a switch, an automatic circuit-breaker controlled by said switch, and an operating-arm connected to the switch and to the line-wire, the said circuit-breaker comprising, insulated posts 33, 34 and 35, pivoted switch-lever 36, weighted operating-lever 37, armature 39, and electromagnet 40, substantially as set forth.

10. In a safety system for overhead electric wires, that are arranged in independent sections, the combination of a switch, an automatic circuit-breaker controlled by said switch, and an operating-arm connected to the switch and to the line-wire, the said circuit-breaker comprising, insulated posts 33, 34 and 35, pivoted switch-lever 36, weighted operating-lever 37, armature 39, electromagnet 40, and a hand-switch 41, substantially as set forth.

11. In a safety system for overhead electric wires, that are arranged in independent sections, the combination of a switch, an automatic circuit-breaker controlled by said switch, and an operating-arm connected to the switch and to the line-wire, the said circuit-breaker comprising, insulated posts 33, 34 and 35, pivoted switch-lever 36, weighted operating-lever 37, interposed spring 42, armature 39, and electromagnet 40, substantially as set forth.

12. In a safety system for overhead electric wires, that are arranged in independent sections, the combination of a switch, an automatic circuit-breaker controlled by said switch, and an operating-arm connected to the switch and to the line-wire, the said circuit-breaker comprising, insulated posts, 33, 34 and 35, pivoted switch-lever 36, having a holding-finger 43, weighted operating-lever 37, armature 39, and electromagnet 40, substantially as at forth.

In testimony whereof witness my hand this 28th day of January, 1896.

WILLIAM GLASGOW.

In presence of—
ROBERT BURNS,
HENRY A. NOTT.