H. C. RANDALL.

FLUID OPERATED MOTOR.

APPLICATION FILED JUNE 24, 1914.

1,263,108.

Patented Apr. 16, 1918.

2 SHEETS—SHEET 1.

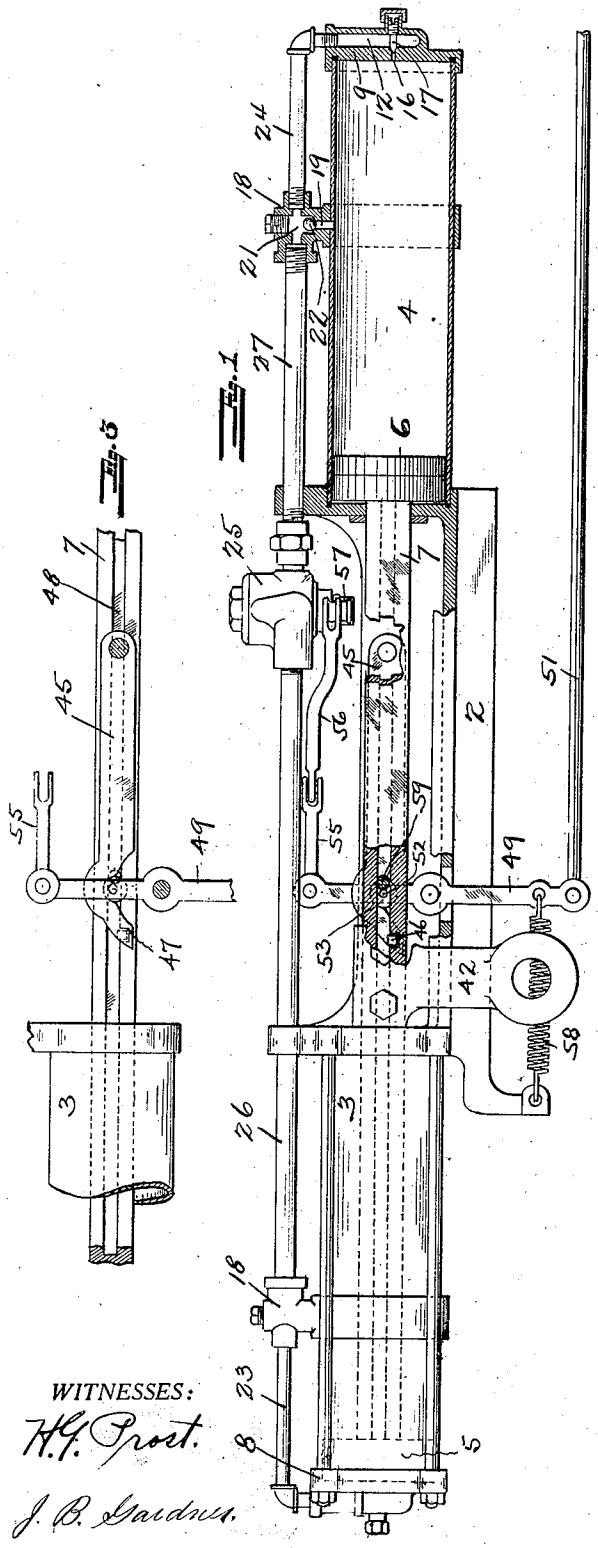


Fig. 1.

Fig. 3.

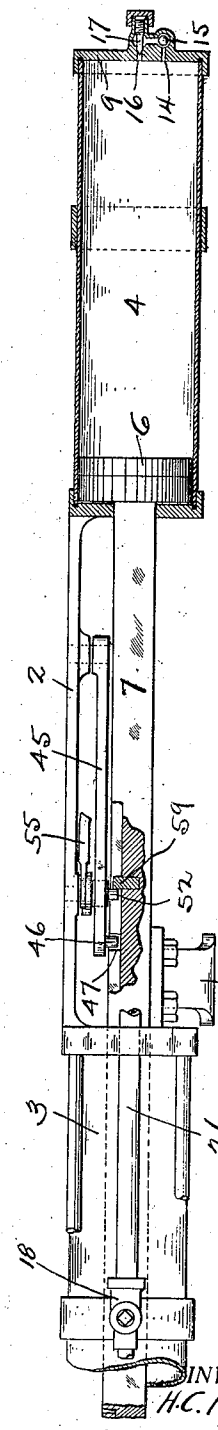


Fig. 2.

WITNESSES:

H. G. Frost.

J. B. Gardner.

INVENTOR.

H. C. RANDALL

BY Miller & White

his ATTORNEYS.

H. C. RANDALL.

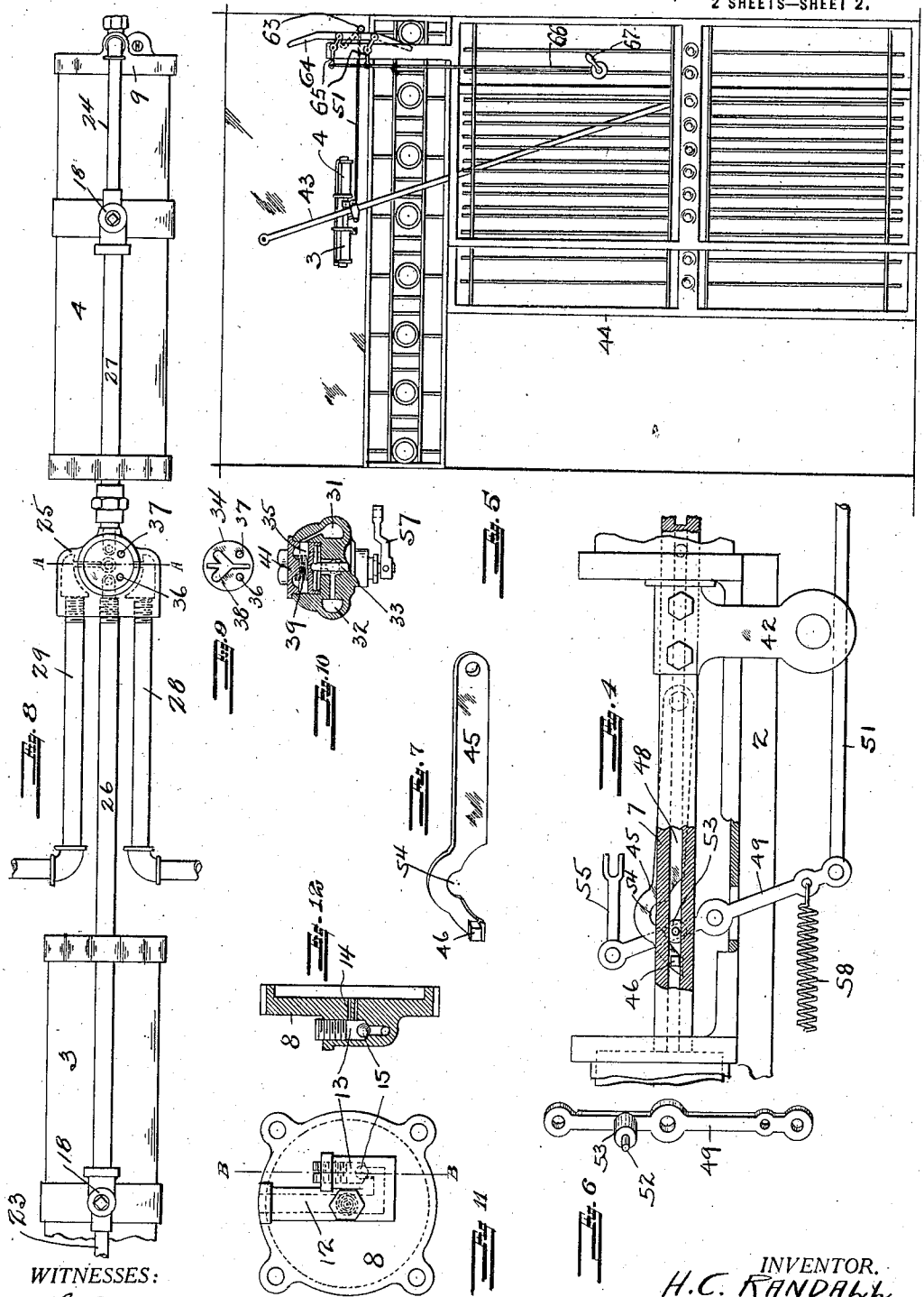
FLUID OPERATED MOTOR.

APPLICATION FILED JUNE 24, 1914.

1,263,108.

Patented Apr. 16, 1918.

2 SHEETS—SHEET 2.



WITNESSES:

H. G. Frost

J. B. Gardner.

INVENTOR.

H. C. RANDALL

BY Miller & White

his ATTORNEYS.

UNITED STATES PATENT OFFICE.

HORATIO C. RANDALL, OF SAN FRANCISCO, CALIFORNIA.

FLUID-OPERATED MOTOR.

1,263,108. Specification of Letters Patent. Patented Apr. 16, 1918.

Application filed June 24, 1914. Serial No. 846,990.

To all whom it may concern:

Be it known that I, HORATIO C. RANDALL, a citizen of the United States, and a resident of the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Fluid-Operated Motors, of which the following is a specification.

The invention relates to motors which are adapted to be operated by fluid under pressure, and particularly by compressed air.

An object of the invention is to provide a fluid operated motor of improved construction.

Another object of the invention is to provide a double-ended fluid operated motor which may be readily operated by hand in the event of a failure of the fluid supply.

Another object of the invention is to provide a double ended fluid operated motor in which no stuffing boxes are used and in which the final movement of the movable element operates to cut off the supply of fluid thereto and in which a controllable fluid cushion is provided which retards the movement of the movable element as it approaches the end of its movement.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the following description where I shall outline in full that form of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In the drawings I have shown only one specific form of my generic invention, but it is to be understood that I do not limit myself to such form because my invention may be embodied in a multiplicity of forms within the scope of the appended claims, each being a species of my said invention. It is also to be understood that by the claims succeeding the description of my invention, I desire to cover the invention in whatever form it may be embodied.

Referring to said drawings:

Figure 1 is a side view of one form of the motor of my invention, parts thereof being shown in section to more clearly illustrate its structure.

Fig. 2 is a top or plan view of a portion of the motor of my invention, a part thereof being broken away to reduce the size of the figure and a part thereof being shown in section.

Fig. 3 is a side view from the rear side from that shown in Fig. 1 of a portion of the motor showing the locking and releasing means.

Fig. 4 is a front side view of a portion of the motor showing the lock released and the movable element at the opposite end of its throw from the position shown in Fig. 1.

Fig. 5 is an elevation of an elevator door showing the application of the motor thereto.

Fig. 6 is a perspective view of the lock releasing and actuating lever.

Fig. 7 is a perspective view of the locking lever.

Fig. 8 is a plan or top view of a portion of the motor showing the arrangement of the fluid conduit.

Fig. 9 is a detail of the controlling valve disk.

Fig. 10 is a vertical section of the controlling valve taken on the line A—A Fig. 8.

Fig. 11 is an elevation of the cap or head closing the end of the cylinder.

Fig. 12 is a vertical section of the cap or head taken on the line B—B Fig. 11.

The motor of my invention is particularly adapted to be used in opening and closing elevator doors, using compressed air as the motive fluid, but it is to be understood that it is not limited to such use, although in such use it possesses many advantageous features, such as locking the door in the closed position and retarding the movement of the door as it reaches the end of its throw in either direction, thereby obviating all banging and jarring of the door. It frequently happens in elevator door control systems which are operated by compressed air, that the air compressor or some other part of the system breaks down or becomes out of order, in which instance it is impossible to open and close the doors by hand. By the use of the motor of my invention, however, should the motive fluid supply fail, the door may be readily opened and closed by hand, so that the elevator service is not interrupted.

The motor shown in the accompanying drawings comprises a frame 2 upon which are mounted the oppositely disposed cylinders 3—4 in which are respectively arranged the pistons 5—6. Mounted in the frame and extending into the cylinders 3—4 is a bar or rod 7, which is not connected to the pistons, but which normally contacts with both pistons, the length of the bar be-

ing such that it extends from one piston to the other when the pistons are in relatively corresponding positions in the cylinders. Closing the opposite ends of the cylinders are heads or caps 8—9 each of the same construction, and through which the motive fluid is admitted into the cylinder behind the piston. Each head is provided with a conduit 12 which extends downward and then turns upward into the chamber 13 which communicates with the interior of the cylinder through one or more small apertures or passages 14 extending through the body of the head. Arranged between the chamber 13 and the conduit 12 is a ball valve 15 which operates to permit the fluid to flow from conduit 12 into chamber 13 but to prevent its return flow. The head is provided with another small passage 16 establishing communication between the conduit 12 and the interior of the cylinder and the area of this passage is controlled by the adjustable needle 17, so that the rate at which the fluid may pass through the passage may be controlled.

Arranged on each cylinder intermediate its ends and preferably nearer the closed or remote ends is a valve 18 having a passage 19 extending into communication with the cylinder through the side wall thereof at a point removed from the closed end of the cylinder. The valve is provided with a passage 21 extending therethrough and communication between the passages 19 and 21 is normally shut off by means of the ball valve 22, seated in passage 19. The ball allows fluid to pass out of the cylinder through passage 19 but prevents it from entering the cylinder through such passage. The conduit 12 on cylinder 3 is connected to the passage 21 in valve 18 on the same cylinder by the pipe 23 and the conduit 12 and passage 21 on cylinder 4 are connected by the pipe 24. The other side of passage 21 in valve 18 on cylinder 3 is connected to one port of the controlling valve 25 by the pipe 26 and the other side of passage 21 of the valve 18 on cylinder 4 is connected to another port of valve 25 by a pipe 27. The controlling valve is provided with a supply port 31 to which is connected the fluid supply pipe 28 and with an exhaust port 32 to which is connected the exhaust pipe 29. The exhaust port 32 is in communication with a chamber surrounding the stem 33 of the valve, which stem is connected to the disk 34 so that the disk rotates with the stem. The supply port is in communication with the chamber 35 above the disk. The lower wall of the valve, below the disk, is provided with two apertures or passages which extend respectively into communication with the pipes 26 and 27. The disk is provided with two apertures 36—37 which are adapted to be moved respectively into alinement with the passages communicating with pipes 26 and 27. When aperture 36 is alined with the opening of pipe 26, the circuit from pipe 28 to pipe 26 is complete and with the disk in this position, the groove 38 in its under face which is in communication with the exhaust pipe 29 is alined with the opening of pipe 27, so that fluid may exhaust through said pipe. The disk 34 is held to its seat in the valve by the spring 39 engaging the removable cap 41. The disk may occupy a neutral position in which neither cylinder is charging or exhausting, and this is the normal inoperative position of the disk, or it may be moved so that either cylinder is charging and the other discharging.

Assuming the position of the parts as shown in Fig. 1, and assuming that it is desirable to move the bar 7 to the right, the valve 25 is operated to place pipe 26 in communication with the supply pipe 28 and pipe 27 in communication with the exhaust pipe 29. On the left end of the motor, the fluid passes through pipes 26 and 23, through conduit 12, into chamber 13 and through passages 14 into the cylinder, driving piston 5 to the right. Some fluid also passes into the cylinder directly from conduit 12 through the needle controlled passage 16.

The motion of piston 5 is conveyed through the bar 7 to piston 6, which is moved to the right, forcing the fluid in cylinder 4 out through passage 19 and passage 16, the ball 15 preventing an exhaust through passages 14. When the rear end of the piston 6, that is, the end adjacent the closed end of the cylinder, reaches passage 19, that exhaust port is covered, so that the remaining fluid in the cylinder must exhaust through the controllable aperture 16. This aperture is made sufficiently small to cause the fluid to exhaust slowly, thereby forming a cushion and retarding the movement of the bar as it approaches the end of its stroke.

Since the pistons are not attached to the bar 7 the bar may be moved independently of the pistons should the motive fluid supply fail, and since this may be accomplished without driving any fluid in or out through the various ports and pipes, the bar may be moved with ease. There are no stuffing boxes or close joints at the inner or adjacent ends of the cylinders, so that the air displaced by the moving bar offers no resistance. Should the motive fluid supply fail when the parts are in the position shown in Fig. 1, the bar is pushed to the right and the valve 25 is set to allow cylinder 4 to exhaust. The initial movement to the right requires some force to displace the air, but after the piston 6 has been moved to the end of its throw, it remains there and the bar can be readily moved to and fro, the pistons lying at the extreme ends of the cyl-

inders. This feature is particularly advantageous when the motor is used for operating elevator doors.

Attached to the bar 7 is a lug or bracket 42 to which the device to be moved is connected. In the application of the motor shown in Fig. 5 the lug 42 is pivoted to a lever 43 fulcrumed at its upper end and connected at its lower end to the elevator door 44. When the lug 42 is in the position shown in Fig. 1, the door is closed and when it is in the position shown in Fig. 4, the door is open.

Means are provided for locking the bar 7 and consequently the door 44 in the closed position or any other movable element attached to the bar in a predetermined position. Pivoted on the frame 2 behind the bar 7 is a dog 45 which is provided at its free end with a tooth or projection 46, which is adapted to seat in a cavity or slot 47 in the bar and lock it in position. The bar 7 is provided on its rear face with a longitudinal groove or slot 48 and the cavity or slot 47 opens into this groove 48. When the dog is raised, the tooth 46 is disposed in the slot, so that the bar is free to move. The movement of the dog is accomplished by means of an actuating lever 49, pivoted intermediate its ends to the frame, and provided at its lower end with an actuating rod 51. Secured to the lever 49 is a pin 52 which extends into the groove 48 in the bar, and mounted on the pin is a roller 53 which normally rests in a depression 54 in the dog, the depression being so formed that as the lever is rocked in either direction, the dog is raised to lift the tooth 46 out of the cavity 47. Attached to the upper end of the actuating lever 49 is a link 55 which is connected by the link 56, to the lever 57 secured to the valve stem 33.

The motor shown in Fig. 1 is arranged so that a movement of the lever 49 in a counter clockwise direction to the position indicated in Fig. 4, causes a movement of the bar 7 to the right. In the present instance the position of the bar in Fig. 1 corresponds to the closed position of the elevator door and the position shown in Fig. 4 corresponds to the open position of the elevator door 44. A movement of the actuating lever 49 therefore, in a counter clockwise direction from its neutral position, operates to open the door, and with the door open, a movement of the lever in a clockwise direction from its neutral position operates to close the door. With the lever in the position shown in Fig. 4, the door is held open. Attached to the lever 49 adjacent its lower end is a spring 58 which is attached at its other end to the frame 2. When the pull or pressure on rod 51 is released, the spring 58 moves the lever into the oppositely inclined position, in which position the valve 25 is set to cause a movement of the bar to the left. Arranged on the bar 7, preferably in the groove 48, is a pin or abutment 59, which, as the bar approaches the end of its throw toward the left, engages the pin 52 on lever 49 and moves the lever to its neutral position, thereby shutting off the supply of fluid to the cylinders. With the lever in this position, the dog 45 is free to drop and the tooth 46 drops into the cavity 47 and locks the bar.

When the motor is employed in connection with an elevator door, the rod 51 is provided with a lug 63 in a position, when the door is closed, to be engaged by a shoe 64 which is carried by the elevator car. The shoe is carried upon two pivotally mounted links 65 connected by a rod 66 to an operating lever 67 in the car. Operation of the lever 67 swings the links 65 about their pivots and effects a lateral shifting of the attached shoe 64. Normally during the travel of the elevator car the shoe is in the retracted position, so that as the car comes to rest in front of the door it is in engagement with the lug 63. Lateral movement of the shoe to its extended position, effected by operation of the control lever 67 in the car, moves the rod 57 and actuates the door opening mechanism as previously explained. When the operating lever 67 is moved to retract the shoe, the spring 58 draws the lever 49 back, setting in motion the door closing mechanism.

I claim:

1. In a fluid operated motor, a pair of oppositely disposed cylinders, pistons in said cylinders, a bar engaging said pistons and unattached thereto, a conductor connected to each cylinder at the end and at a point remote from the end, said latter connection being arranged to permit a discharge only of the fluid, and the end connections being arranged to permit inlet and discharge of the fluid, and a valve connected to said conductors adapted to be operated to control the passage of fluid through said conductors.

2. In a fluid operated motor, a pair of oppositely disposed cylinders, pistons in said cylinders adapted to be moved longitudinally independently of each other, a bar engaging said pistons, means for controlling the admission and discharge of fluid from said cylinders, and means for locking the bar at the end of its stroke.

3. In a fluid operated motor, a pair of oppositely disposed cylinders, pistons in said cylinders, said pistons being movable independently to the ends of said cylinders, a bar engaging said pistons, means for controlling the admission and discharge of fluid from said cylinders, means for locking the bar in a predetermined position, and means for releasing said lock and operating said fluid controlling means.

4. In a fluid operated motor, a cylinder, a piston in said cylinder, a bar engaging said piston provided with a longitudinal slot, a valve for controlling the admission and discharge of fluid from said cylinder, a lever for operating said valve, a pin on said lever extending into said slot, and an abutment in said slot adapted to contact with said pin and move the lever into neutral position.

5. In a fluid operated motor, a pair of oppositely disposed cylinders, pistons in said cylinders adapted to be moved independently to the ends of said cylinders, a bar engaging said pistons, a valve for controlling the admission and discharge of fluid from said cylinders, a lever for operating said valve, and means on the said bar arranged to move the lever into neutral position as the bar reaches the end of its stroke.

6. In a fluid operated motor, a cylinder, a piston in said cylinder, a bar engaging said piston having a depression therein, a valve for controlling the admission and discharge of fluid from said cylinder, a lever for operating said valve, a dog adapted to engage in the depression in the bar and lock it against movement, and means connecting said lever and dog so that a movement of the lever from neutral position disengages the dog from said bar.

7. In a fluid operated motor, a pair of oppositely disposed cylinders, pistons in said cylinders adapted to be moved independently to the ends of said cylinders, a bar engaging said pistons, a valve for controlling the admission and discharge of fluid from said cylinders, a lever connected to said valve, means for moving the lever to position the valve to allow one cylinder to charge and the other to discharge, and a spring for reversing the position of the valve.

8. In a fluid operated motor, a pair of oppositely disposed cylinders, pistons in said cylinders adapted to be moved apart independently of each other, a bar normally engaging said pistons, a valve for controlling the admission and discharge of fluid from said cylinders whereby one cylinder is charging while the other is discharging, and means for moving the valve to neutral position as the bar reaches the end of its stroke.

9. In a fluid operated motor, a pair of oppositely disposed cylinders closed at their remote ends and open at their adjacent ends, pistons in said cylinders adapted to be moved independently to the said remote ends, a bar arranged between said pistons, a valve for controlling the admission and discharge of fluid from said cylinders, a lever for controlling said valve, and means for moving said lever to the neutral inoperative position as the bar reaches the end of its stroke.

10. In a fluid operated motor, a pair of oppositely disposed cylinders closed at their remote ends and open at their adjacent ends, pistons in said cylinders adapted to be moved independently to the said remote ends, a bar arranged between said pistons, a valve for controlling the admission and discharge of fluid from said cylinders, a lever for controlling said valve, and means for moving said lever to the neutral inoperative position as the bar reaches the end of its stroke.

11. In a fluid operated motor, a pair of oppositely disposed cylinders, a piston in each cylinder and a bar arranged between said pistons and unattached thereto whereby one of the pistons moves the other when the direction of its movement is toward that other, said bar being adapted to be moved independently of said pistons.

12. In a fluid operated motor, a pair of oppositely disposed cylinders, a bar lying between and movable in said cylinders, and a piston in each cylinder adapted to abut against the end of said bar to move the same and the other piston, said bar being adapted to be moved independently of said pistons.

In testimony whereof, I have hereunto set my hand at San Francisco, California, this 17th day of June 1914

HORATIO C. RANDALL.

In presence of—
H. G. PROST,
P. S. PIDWELL.