

(No Model.)

3 Sheets—Sheet 1.

E. A. SPERRY.

VALVE FOR STEAM ENGINES.

No. 266,217.

Patented Oct. 17, 1882.

FIG-1-

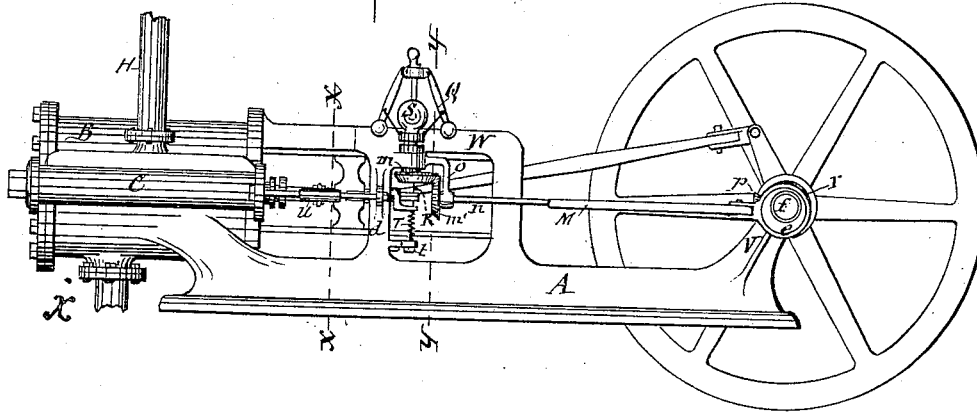


FIG-2-

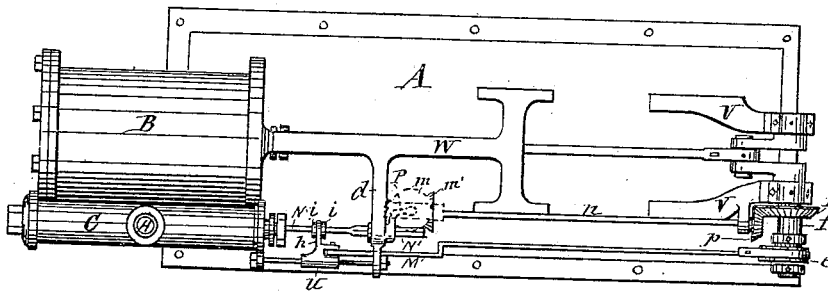


FIG-3-

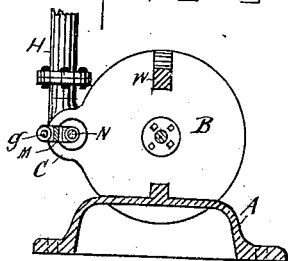
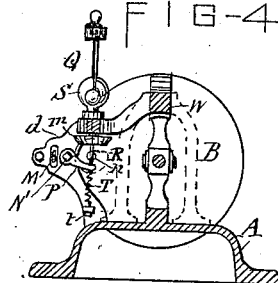


FIG-4-



WITNESSES—

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INVENTOR—

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per O. L. L. & Co.

his Attorney.

(No Model.)

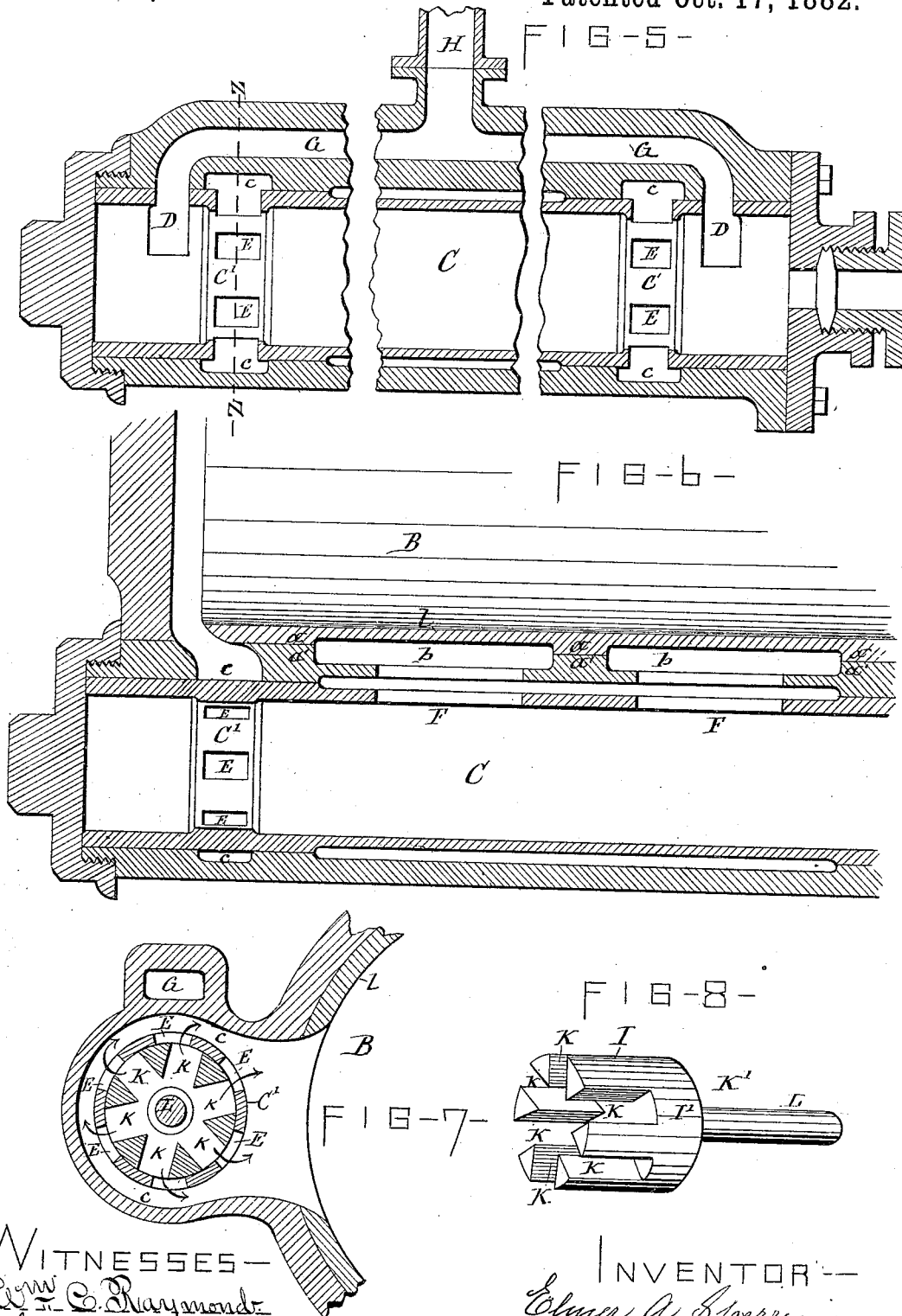
3 Sheets—Sheet 2.

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his Attys—

(No Model.)

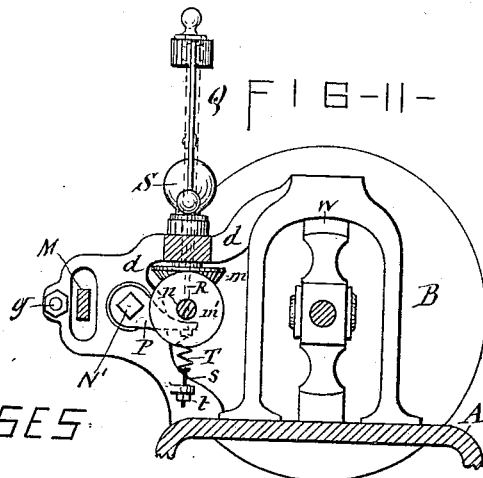
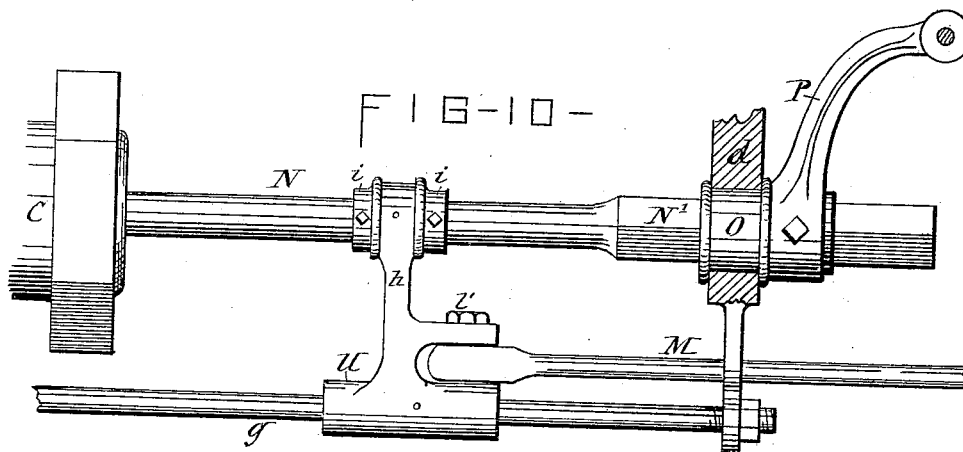
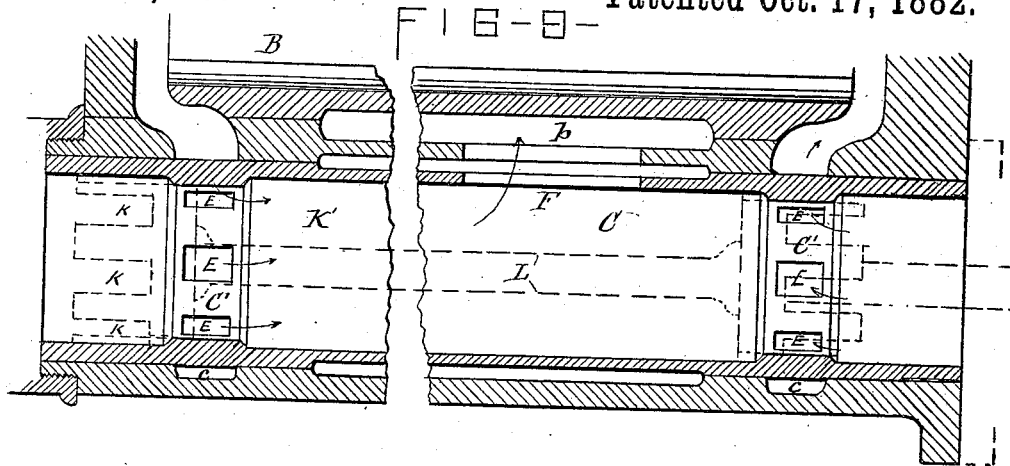
3 Sheets—Sheet 3.

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No. 266,217.

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WITNESSES

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UNITED STATES PATENT OFFICE.

ELMER A. SPERRY, OF CORTLAND, ASSIGNOR OF ONE-HALF TO ALVIN J. BELDEN, OF SYRACUSE, NEW YORK.

VALVE FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 266,217, dated October 17, 1882.

Application filed June 28, 1882. (No model.)

To all whom it may concern:

Be it known that I, ELMER A. SPERRY, of Cortland, in the county of Cortland, in the State of New York, have invented new and useful
5 Improvements in Valves for Steam-Engines, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to a novel construction and arrangement of a valve, which affords,
10 at a minimum motion, an invariably full and unimpeded exhaust, and in which the cut off of steam is regulated in the simplest and most effective manner.

15 The invention also relates to certain novel devices for imparting the requisite motion to the aforesaid valve, all as hereinafter more fully described, and set forth in the claims.

In the annexed drawings, Figure 1 is a side
20 elevation of a steam-engine provided with my improvements. Fig. 2 is a top view of the same, with the governor removed to better illustrate the subjacent mechanism, which co-operates with the governor. Fig. 3 is a vertical
25 transverse section on line *x x*; Fig. 4, a vertical transverse section on line *y y*. Fig. 5 is an enlarged vertical transverse section of the valve-chamber; Fig. 6, a longitudinal section of one end of the same. Fig. 7 is a vertical
30 transverse section on line *z z*. Fig. 8 is a perspective view of one end of the valve; Fig. 9, a horizontal section of the valve-chamber, illustrating the operation of the valve. Fig. 10 is an enlarged detail view of a portion of the devices for imparting the requisite motions to
35 the valve; and Fig. 11 is a vertical transverse section of the engine, taken in front of the guides of the cross-head.

Similar letters of reference indicate corresponding parts.

40 A denotes the engine-bed, which is cast in one piece with the cylinder B, cross-head guide W, and pillow-block or pedestal V, the engine being of the ordinary construction, and therefore not requiring a specific description.
45 The cylinder B, I construct of a main outer shell and of an inner shell or lining, *l*, which shells are fitted to each other by narrow circumferential facings *a a'*, projecting from their
50 adjacent surfaces at intervals of their length,

the intermediate portions of the shells being isolated from each other and forming on one side and on the bottom of the cylinder the exhaust-passage *b* as seen in Figs. 6 and 9 of the drawings.

The facings *a a'* are each of a straight cylindrical form; but each succeeding face is of a smaller diameter than the preceding face, so as to admit of readily inserting endwise into the cylinder the lining *l*, which is provided with
60 corresponding faces. The removal of the lining being equally as readily effected greatly facilitates the repairs or renewal of the lining, thus maintaining the main or outer shell of the cylinder intact and obviating the necessity
65 of renewing the same. That side of the cylinder B which is provided with the exhaust-passage *b* has on its exterior a small cylindrical chamber or steam-chest, C, extended the length of the main cylinder B, and constructed with
70 a similar interior lining.

The lining of the chamber C is provided near its two extremities with an annular raised valve-seat, C', in the form of a smooth circumferential contraction, having a series of ports,
75 E E, which communicate with a circumferential steam-passage, *c*, as shown in Fig. 7 of the drawings, around the exterior of the lining and extended to the end of the steam-cylinder B.

A steam-passage, G, is formed in an enlargement of the main or outer shell of the chamber C, which passage has connected to it the steam-pipe H, and is extended to opposite
80 ends of the chamber C and intersects the same by ports D at the outer end of the valve-seats C'. The central portion of the chamber C is provided on its side adjacent to the steam-cylinder B with one or more capacious exhaust-ports, F, which communicate with a channel
85 or channels, *b*, formed between the main or external shell of the steam-cylinder and its lining *l* and extended to the bottom portion thereof, at which latter point it is tapped by the exhaust-pipe X.

I represents the valve in the form of two cylindrical pistons, connected by a slender stem
95 or rod, L, which forms a circumferential depression between said pistons, for the purpose hereinafter explained. The pistons I are fitted closely to the faces of the cylindrical valve-
100

seats C', and have a solid portion, I', of proper width to cover the ports E E of the valve-seat, with the usual laps at the ends of the ports. At the outer end of the solid portion I' the aforesaid valve-pistons are provided with diametrical steam-passages K K, which are open to the end of the piston, and are of the same width and arranged in the same relative positions as the ports E of the valve-seat. The valve-stem proper, N, passes through the usual stuffing-box on the end of the chamber C, and has from its outer extremity part way back a square or polygonal portion, N', which passes through a correspondingly-shaped eye of a sleeve, O, which is loosely fitted in a supporting-bracket, d, cast on the engine-bed and cross-head guide. Said sleeve, while allowed to rotate, is prevented from moving longitudinally by flanges projecting therefrom and engaging opposite sides of the supporting-bracket d. The valve-stem N, thus guided and supported, receives a rectilinear reciprocating motion at a constantly or invariably full stroke by means of a pitman or eccentric-rod, M, actuated by an eccentric, e, connected to the crank-shaft f, as seen in Figs. 1 and 2 of the drawings. Said eccentric-rod is connected with the valve-stem by means of a slide, U, which is mounted on a guide-bar, g, arranged parallel with the valve-stem and firmly secured at one end to an ear projecting from the side of the chamber C and at the opposite end to an ear projecting from the side of the supporting-bracket d, before described. An arm, h, reaches from the slide U over to and loosely embraces the cylindrical part of the valve-stem N. By means of collars i i, clamped on the valve-stem at opposite sides of the arm h, the valve-stem is prevented from sliding longitudinally on said arm. The end of the eccentric-rod is inserted between the slide U and a lug, k, on the side of the arm h, and connected thereto by a hinge-pin, l', passing through said parts.

To the sleeve O, which encompasses the squared end N' of the valve-stem, is firmly connected a rock-arm, P, and over the free end of this arm is a centrifugal governor, Q, mounted on a suitable support projecting from the bracket d. The spindle or shaft of the governor projects below the aforesaid support, and has secured to its protruding end a miter or bevel gear, m, in which meshes another similar gear, m', connected to the end of a shaft, n, which is supported by a hanger, o, pendent from the before-described fixed support of the governor. The opposite end of the shaft n is journaled on a suitable support attached to the pillow-block V, and is provided with a miter-pinion, p, which engages with a miter-gear, r, on the crank-shaft f. The described shaft n, with its gears m' and r, thus transmit motion from the crank-shaft or main driving-shaft to the governor. The governor-rod R, which is actuated by the vibratory governor-arms, passes through the axis of the governor and its gear m, and is connected to the free end of the rock-arm P, so as to transmit thereto the motion imparted to the

governor-rod R by the vibrations of the governor-arms. The free end of the governor-arms being connected with the governor-rod R, as shown in Fig. 1 of the drawings, causes said rod to be drawn upward by the outward thrust or distension of the governor-arms incident to an increase in the velocity of the motion of the engine, and said motion of the rod R raises the free end of the rock-arm. This motion is to a certain extent resisted by a constant weight, S, applied to the upper end of the governor-rod, said weight serving to restore the arm P to its original position as the speed of the engine relaxes. In order to render the latter action of the arm P adjustable, I connect to the under side thereof a tension-spring, T, the lower extremity of which is attached to a screw, s, which passes through a lug cast on the side of the bracket d, and is provided on the under side of said lug with a nut, t, by means of which the screw s can be drawn down, and thus the tension of the spring T increased, as may be desired.

The before-described raising and lowering of the arm P imparts a partial rotation to the valve-stem N and valve I connected therewith, and by the turning of the latter the steam-channels K of the valve I are thrown to a greater or less degree out of coincidence with the ports E E of the valve-seat, and consequently the ingress of steam to the cylinder B is reduced proportionately. The eccentric-rod M imparts to the valve a rectilinear reciprocating motion at an invariably full stroke, as hereinbefore described, and this motion carries the solid portion I' of one of the valve-pistons I away from the ports E of its seat and toward the center of the chamber C, and thereby allows the steam to pass from the passage G through the valve-channels K and ports E into one end of the cylinder B. Simultaneously with the aforesaid action of one of the valve-pistons I the other valve-piston is carried toward the end of the chamber C and its solid portion drawn away from the ports E E, so as to allow the exhaust-steam to escape from that end of the cylinder B, said steam passing through the ports E toward the center of the chamber C, and thence out through the ports F to the passage b, around the cylinder and to the exhaust-pipe X. The absence of the solid portions of the valve-piston between the channels K at the back of the valve gives free vent to the exhaust-steam from the ports E to the ports F.

If desired, the channels K of the valve and the ports E of the seat, instead of being rectangular, may be formed with oblique ends, so as to render more gradual the cut off by the partial rotation of the valve over its seat. This arrangement, however, requires a longer stroke of the valve, and is therefore objectionable.

One of the salient features of my invention is the construction and arrangement of the cylindrical valve-seat having a series of ports arranged around the periphery thereof, and communicating with the end of the cylinder, and a valve consisting of a cylindrical piston

having radial steam-channels extended to the end of the piston, said ports and channels being so proportioned and spaced that by a partial rotation of the valve the solid portions between the channels of said valve are capable of closing and opening to the fullest extent the ports of the seat, thereby producing a very sensitive and most effective cut-off valve, which is comparatively free of friction.

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

1. The combination of a cylindrical valve-seat having a series of ports arranged around 15 the periphery thereof and communicating with the end of the cylinder of the engine, and a slide-valve consisting of a cylindrical piston having radial steam-channels extended to one end of said piston, said ports and channels 20 being so proportioned and spaced that by a partial rotation of the valve the solid portions between the channels of said valve are capable of closing and opening to the fullest extent the ports of the seat, substantially as specified and 25 shown.

2. The combination, with a steam-chest having two cylindrical valve-seats provided with radial ports communicating with opposite ends of the cylinder, of a valve composed of 30 two pistons connected by a central stem, and provided with corresponding radial passages on the live-steam side only of said piston, and adapted to control the induction of steam to the cylinder by a combined reciprocating and 35 partial rotating movement of said valve, substantially as set forth and shown.

3. A valve composed of two pistons connected with each other and having radial steam-passages open to the end of the piston, 40 in combination with a steam-chest having steam-receiving ports at its two extremities, cylindrical valve-seats with radial ports between the steam-receiving ports and in proximity thereto, and an exhaust port or ports in 45 the center of the length of the steam-chest, and mechanism for imparting to said valve a rectilinear reciprocating and partial rotary motion, substantially as specified and shown.

4. In combination with the cylindrical cham-

ber C, provided with the steam-induction ports 50 D D, ports E E, and exhaust-ports F F, in the manner shown, the valve composed of the pistons I I, connected by the stem L, and provided with the radial steam-passages K K, the valve-stem N, having a square or polyg- 55 onal end, N', the sleeve O, rock-arm P, governor Q, and the pitman or eccentric-rod M, connected with the valve-stem by a coupling loosely embracing said stem and confined longitudinally thereon, substantially as described 60 and shown.

5. In combination with the cylindrical valve-chamber C, having near its opposite ends the valve-seats C', with ports E E therein, and provided with the steam-induction channel at 65 the outer side of the valve-seat, and with the exhaust-port F between the two seats, the valve consisting of pistons I, united by a stem or rod, L, and having a solid portion, I', adapted to cover the ports E E, and provided 70 at the outer end of said solid portion with diametrical steam-passages K K, and mechanisms for imparting to said valve respectively a constant or invariable rectilinear reciprocating stroke, and a variable partial rotary motion, 75 substantially as set forth and shown.

6. In combination with the cylindrical valve-seats C' and cylindrical valves I I, having diametrical steam-passages K at opposite ends, and circumferential depression K' intermedi- 80 ately of its length, the valve-stem N, having the square or polygonal end N', the sleeve O, rock-arm P, governor Q, governor-rod R, connected to the rock-arm, and provided with the constant weight S and the adjustable tension- 85 spring T, the slide U, coupled with the valve-stem, and the pitman or eccentric-rod M, all as and for the purpose set forth.

In testimony whereof I have hereunto signed my name and affixed my seal, in the presence 90 of two attesting witnesses, at Syracuse, in the county of Onondaga, in the State of New York, this 20th day of June, 1882.

ELMER A. SPERRY. [L. S.]

Witnesses:

C. H. DUELL,

WM. C. RAYMOND.