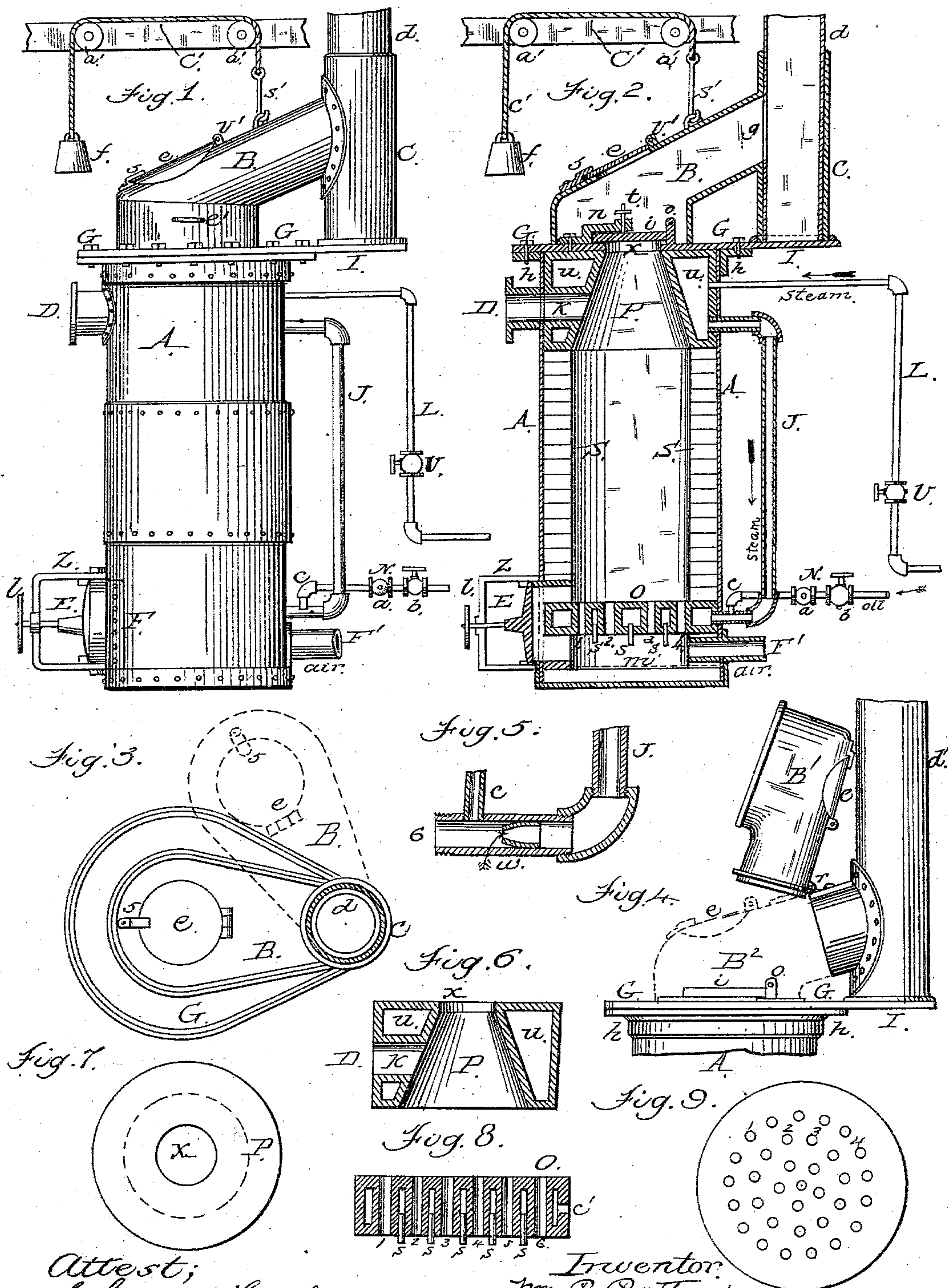


(No Model.)

W. P. PATTON.

APPARATUS FOR GENERATING ILLUMINATING OR HEATING GAS.
No. 281,127. Patented July 10, 1883.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR GENERATING ILLUMINATING OR HEATING GAS.

SPECIFICATION forming part of Letters Patent No. 281,127, dated July 10, 1883.

Application filed May 1, 1883. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM P. PATTON, of the city of Harrisburg, county of Dauphin, and State of Pennsylvania, have invented a new and improved gas apparatus for the rapid and economical generation of illuminating or heating gas from high-pressure steam and carbonaceous liquids, preferably "crude benzine," and I hereby declare the following to be a full, clear, and exact description of the same, reference being made to the accompanying drawings and the letters of reference marked thereon.

In the drawings, Figure 1 represents a side elevation of the generator. Fig. 2 is a view of the gas-generator in vertical section, taken through the center of the furnace from front to rear. Fig. 3 is a plan view of the generator. Fig. 4 is a side view of the top portion of the generator with a hinged draft-bonnet attachment to the smoke-stack. Fig. 5 is a view in section of a portion of the apparatus that will be hereinafter explained. Fig. 6 is a sectional view of the steam-superheating device that is also shown in Fig. 2. Fig. 7 is a top or plan view of the superheating device illustrated in Fig. 6. Figs. 8 and 9 are sectional and top views of the same portion of the gas-generator, which will be fully explained in the following specification.

In all the figures like letters designate like parts of the generator.

The shell or body A of the generator is made of boiler-plate iron of a sufficient thickness. It is a vertical cylindrical chamber, is riveted together, and has its seams calked to make gas-tight joints. A plate-iron bottom is rigidly secured in place, as shown in Fig. 1. The angle-iron ring or flange *h h* is attached to the upper end of the shell A, as shown. It is made preferably of cast-iron, and has its horizontal face made level.

The cap-plate G G, that is placed upon the flange *h h*, is made of cast-iron, and has its bearing-surface made true, so that a gas-tight joint is obtained at its point of contact with the flange *h h*, it being securely bolted thereto. A circular orifice or coal-stoking hole, *x*, (see Fig. 2,) is made in the cap-plate G G at a point central to the shell A. The part of the

plate G G surrounding this hole is raised slightly above the upper surface of the same. The face of this projection is made true, so as to effect a gas-tight joint with the lid *i*, Figs. 2 and 4.

The cover *i* is made of a proper thickness to stand the action of heat without warping, and of a sufficient size to cover the projection upon which it lies. The lid *i* is hinged at *o*, Figs. 2 and 4, so as to permit it to be readily opened and closed, its connection with the plate G G being maintained. When closed it is secured by the swing-bar *n* and screw *t*. (See Fig. 2.)

The generator-shell A is lined up inside with fire-brick of a proper thickness, the bottom being similarly protected. (See S S, Fig. 2.) At a proper height from the bottom a cast-iron chamber, O, is placed, resting upon the lining-wall S S. It is circular in form, having its top and bottom parallel. Its diameter is smaller than the shell A, so as to enter same easily. I designate this chamber O as a "mixing-retort." Its walls are of proper thickness to sustain weight upon them, as this device takes the place of grate-bars. A sufficient number of annular walled orifices 1 2 3 4 are made to perforate the upper and lower faces of the retort O. The cylindrical walls of these perforations prevent access to the interior of retort O, and serve to conduct an air-blast through them from the sub-chamber or ash-pit *m* below the retort into the fire-bed above it. Figs. 2, 8, and 9 show the form of the retort O. Through the lower plate or bottom of O a proper number of gas-escape holes, *s s s*, are made. These perforations allow superheated steam or crude hydrocarbon gas that is introduced into or is generated in the interior cavity of the retort, to be forced by accumulating pressure downward into the ash-pit *m*, and consequently upward through the blast-holes 1 2 3 4. The pipe J, that is made to communicate with the inside of the retort O, and also with the interior of the steam-superheating chamber P, is designed to convey the highly-heated steam from said chamber P to the mixing-retort O. It is essential that the pipe J be properly jacketed or protected with a non-conducting covering, so that the superheated steam is not

lowered in temperature in passing through it. The steam-superheating chamber P is located immediately below the cap-plate G G, and is supported in position by the lining-wall S S.

5 It is made of cast-iron, and is annular in form, as shown in Fig. 7, which is a top view of same. The outside diameter is of a size to permit its easy introduction into the interior of the generator-shell A. (See Fig. 2.) It is
10 made with an interior cavity or steam-space, *u u*. The inner wall of chamber P is made conical, or converging regularly from the base to the upper edge of same, the upper aperture conforming in diameter to the size of the stoking-hole in the cap-plate G G. (See Fig. 2.)
15 A gas-outlet, *k*, is made in and through the side of the retort or chamber P, a neck or short flanged pipe, D, being securely bolted or riveted upon the outside of the generator-shell A in an axial line with the aperture *k*. (See Fig. 2.) A steam-pipe, L, for conveying high-pressure steam from a steam-boiler to the chamber P, is connected therewith, as shown in Fig. 2, a valve, *v*, being placed in a
20 convenient position for access to same.

The pipe N, Fig. 2, is designed to convey crude benzine or oil from an elevated supply-tank (not shown) to the point of junction *c* of said pipe with the steam-pipe J. A check-valve, *a*, and stop-valve *b* are introduced in
30 pipe N at a point near the place of attachment *c*. In Fig. 5 an enlarged view of the connecting steam-pipe J is seen, the lower end being shown to exhibit the conical or contracting nozzle *w*. This is placed in the horizontal
35 part of pipe J, immediately in the rear of the benzine-supply pipe N.

In the side of the shell A, below the retort O, is rigidly attached the air-blast pipe F'.
40 This is connected with a rotary fan located at a convenient point, and a stop gate or valve is placed in the connecting-pipe, so that all communication can be cut off when so desired. The blast-pipe F' projects into the ash-pit *m*,
45 as seen in Fig. 2. Upon the opposite side the door E is placed. This is secured by hinged joints to a stout cast-iron frame, F. (See Fig. 1.) This frame is riveted fast to the shell A. A bail-clamp, Z, is pivoted to this frame, so
50 as to swing away from or be placed in front of the door E, and thus permit the handled set-screw *l* to bear against the projection formed on the outside of the door E, securing it tightly against the true-faced joint on the
55 frame F, it being important that the door be made gas-tight. A portion of the frame F projects above the upper face of the retort O, and thus gives access to the fire-bed in the generator to remove ashes and clinker. Said
60 door and frame also extend below the retort O for a similar purpose. The cap-plate G G of the generator is extended in the rear of the shell A a sufficient distance to form a base or support for the draft-stack *d*.

65 In Figs. 1, 2, and 3 are shown views of the stack *d* and an adjustable bonnet, B. This

bonnet is made somewhat larger in diameter than the lid *i*, over which it stands, resting its lower end on the cap-plate G G, as seen in
70 Figs. 1 and 2. The body of the hood or bonnet B is bent at an obtuse angle, and is rigidly attached to a sleeve, C, that is placed upon the stack *d*. This is so proportioned in size to the stack as to allow it to fit neatly, and yet be moved in either a lateral or vertical di-
75 rection with ease. The dotted lines in Fig. 3 show the relative position of the bonnet B when removed from direct connection with the interior of the stack *d*. As will be noticed, a proper-sized opening, *g*, is made through the
80 wall of the stack *d*, so that when the hood B and its sleeve C are in correct position, and the lid *i* opened by access to it through the hole in the bonnet B immediately over it, a direct passage is formed from the interior of
85 the generator to the interior of the stack *d*. When the bonnet B is raised so as to clear the lid *i*, and is moved away from said lid, as shown in Fig. 3, the sleeve C covers the aper-
90 ture in the stack *d*. The bonnet B is provided with an opening in its top over the lid *i*. It is closed by a hinged lid, *e*, and catch 5. Its use has been just explained. The stack *d*, sleeve C, and bonnet B are made of plate-iron
95 of proper thickness to insure stability under the action of heat. A handle, *e'*, is placed upon each side of the bonnet B to raise it. A counterbalance-weight, *f*, chain *c'*, and pulleys
100 *a' a'* can be arranged to relieve a great portion of the weight, and thus aid the operation of removal of said bonnet B. Another style of attachment of the bonnet to the stack is shown
in Fig. 4, in which the bonnet B 1 is hinged, so as to be lifted up and retained in that posi-
105 tion and give access to the generator-lid *i* when desired. The object to be attained by these devices is to enable the gas-maker to have free access to the stoking-hole *x* to readily intro-
duce coal, and then by replacing the bonnet to bring the fire in the generator in direct con-
110 nection with the stack *d*, so that a fan-blast and continuous draft through the fire may be secured. The swinging away of the bonnet B is also necessary to allow the fireman to use a
long metallic bar through the stoking-hole *x*,
115 causing the same to penetrate downward through the bed of incandescent coals, and particularly along the surface of the fire-brick lining-wall, in order to break off the clinker that slags onto the same. By the free use of
120 said bar all the caked cinder may be broken up and taken out through the door E.

In using the generator to produce illuminating or heating gas, a fire of anthracite coal is started in the chamber A upon the upper
125 surface of retort O, a fan-blast being introduced at F' after the door E is closed and the lid *i* opened. It is evident that the mass of coals can soon be brought to a cherry-red heat on the upper surface, this being the proper
130 condition of the fire to effect free generation and fix the gas properly. The retort P will

be highly heated by the products of coal combustion passing upward through it into the bonnet B. The retort O will also be in a similar condition. The valve upon the blast-pipe F' must now be closed, as well as the lid *i*, the latter being secured by the clamp *n* and set-screw *t*. The valve that is attached to the gas-outlet D must now be opened. (Said valve not shown.) The steam-valve *v* being adjusted to permit a free flow of high-pressure steam into the superheating-chamber P, it will pass down through the pipe J and nozzle *w* into the retort O. Immediately after the steam is turned on, the valve *b* in the benzine-supply pipe N should be opened a proper distance to allow the requisite amount of carbonaceous liquid to flow through the check-valve *a* and into the pipe J at the point *c*. The superheated steam coming into contact with the benzine instantly vaporizes it, and the joined vapors are thoroughly blended and mixed together by forcible contact against the numerous pipes in the retort-cavity, so that partial dissociation of the superheated steam is effected by reason of the intimate contact of it and carbonaceous vapor in the highly-heated retort. The oxygen of the intensely-heated steam, combining with corresponding atoms of carbon, produces carbonic oxide. The hydrogen thus liberated by this dissociation and recombination takes up the remaining volume of carbon vapor and combines therewith, producing crude hydrocarbon gas. The whole volume of compound gas passes downward through the pipes or orifices *s s s* into the sub-chamber or ash-pit *m*, and the increasing pressure of rapid generation forces the same upward through the blast-holes 1 2 3 4, &c., into and through the fire-bed. The upward passage of the crude hydrocarbon gas through the incandescent bed of coals perfects the recombination of the constituent elements, and completely "fixes" the compound gas, which escapes through the outlet D, and is conveyed by a pipe to the gas washing and purifying apparatus.

In this generator the entire operation is conducted within the wall of one vertical chamber A, and such devices as supplementary coal-fires and superheating-chambers filled with refractory material for fixing the compound gas are dispensed with. My present improved gas-generator is compact, simple, and easy to operate, and generates high candle-power

fixed gas in large volume and in an economical and cheap manner.

I do not desire to claim, broadly, the use of a vertical chamber for a gas-generator; nor do I claim the use of a bed of incandescent coal for fixing the compound gas, for these have before been used in other patented devices. Neither do I claim to be the first to generate illuminating or heating gas from superheated steam and oil or benzine, as these materials have been so utilized before; but

What I do claim as new, of my own invention, and desire to secure by Letters Patent of the United States, is—

1. The vertical generator-shell A, in combination with the annular steam-superheating chamber P, connecting-pipe J, steam and hydrocarbon mixing retort O, and benzine-supply pipe N, constructed and operating substantially as is herein shown, and for the purpose set forth.

2. The combination of the removable cap-plate G G, lid *i*, annular steam-superheating chamber P, connecting-pipe J, mixing-retort O, benzine-supply pipe N, and vertical generator-shell A, the whole being constructed and operating substantially as shown, and for the purpose set forth.

3. A vertical gas-generator constructed with a removable or adjustable top plate, G G, that is made to project outward a sufficient distance from the side of the shell A, so as to form a base for the support of the draft-stack *d*, in combination with the hood and sleeve and the smoke-stack, as is herein shown, and for the purpose specified.

4. A vertical gas-generator constructed with a stack, *d*, adjustable bonnet B, extended cap-plate G G I, annular steam-superheating chamber P, connecting-pipe J, mixing-retort O, supply-pipe N, and shell A, the whole being combined and operating as is herein set forth.

5. The retort O, having its faces perforated and provided with the annular walled orifices 1 2 3 4, and gas-escape holes *s s s*, in combination with the ash-pit *m* below the retort and the fire-bed above it, all constructed to operate as and for the purpose herein set forth.

WM. P. PATTON. [L. S.]

Witnesses:

S. W. FLEMING,
ED. M. COOPER.