

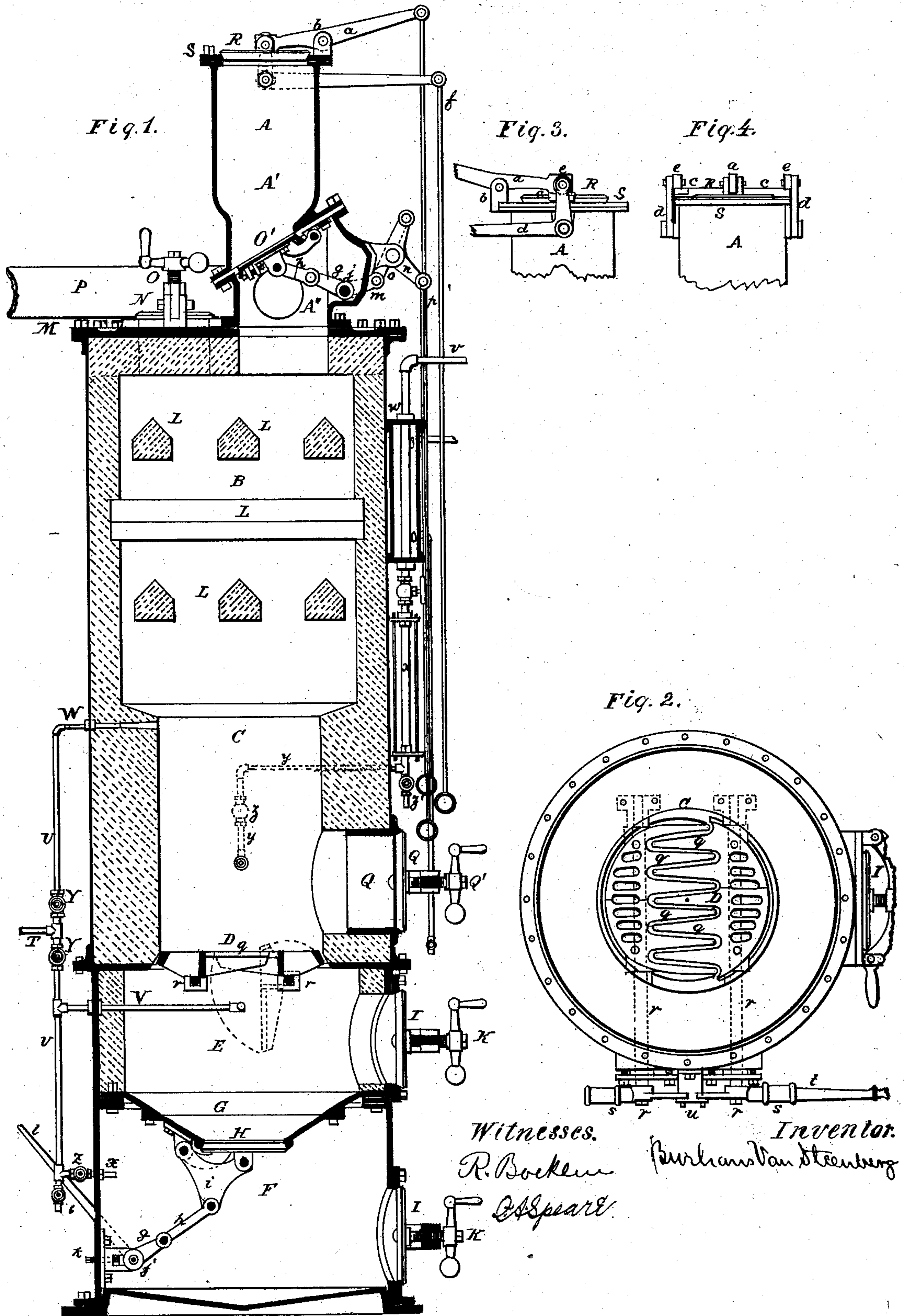
(No Model.)

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PROCESS OF AND APPARATUS FOR GENERATING WATER GAS.

No. 248,070.

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UNITED STATES PATENT OFFICE.

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PROCESS OF AND APPARATUS FOR GENERATING WATER-GAS.

SPECIFICATION forming part of Letters Patent No. 248,070, dated October 11, 1881.

Application filed February 24, 1881. (No model.)

To all whom it may concern:

Be it known that I, BURHAUS VAN STEENBERGH, of the town of Goshen, in the county of Orange and State of New York, have invented new and useful Improvements in Process of and Apparatus for Generating Water-Gas, of which the following is a specification.

In the water-gas generators now in use, in which the superheated steam and oleaginous matter are introduced into the incandescent fuel at all times in the same portions of said fuel, and in which a double-sealed hopper and ash-pit are used, the fuel, although gaining briskness at the upper portion or place at which the gas is discharged, loses its life and decomposing property at the place where the steam is introduced very rapidly, so that generation of gas by the decomposition of steam soon becomes inactive, and almost entirely ceases before any new supply of fuel is desirable.

The invention relates, first, to the improved process for manufacturing gas, having for its object the correction of the above-mentioned defects; and to this end it consists in introducing the steam into the decomposing-chamber alternately above and below the body of incandescent carbonaceous decomposing material, and at the same time introducing the oleaginous matter centrally into such body of decomposing material, whereby the heat thereof is better maintained and decomposition better effected.

The invention relates, secondly, to the novel apparatus for carrying out the process, and consists in the devices and combinations of parts below described, and as particularly pointed out in the claims.

In the annexed drawings, forming part of this specification, Figure 1 represents a vertical central section of the generator with my improvements. Fig. 2 is a horizontal section of the same, taken at the level of the grate. Fig. 3 is a detached side view of the lock of the hopper-top seal. Fig. 4 is a front view of the same.

A represents the hopper of the generator; B, the fixing-chamber of the same. C is the incandescent-fuel chamber; D, the grate; E, the top chamber of the ash-pit, and F the bottom chamber of the same. Said chambers of the ash-pit are separated by the cone-bottom G

and the central bottom valve or seal, H, pivoted to said bottom G.

The chambers E and F have each a screw-seal door, I, on the side of the chamber, for the delivery of ashes and to give access to their inside, and to close them properly tight each has a cross-bar guided in lugs and provided with a tightening-screw, K.

The grate D is arranged centrally at the bottom of the fuel-chamber C, and the fixing-chamber B is over the fuel-chamber. Both chambers are cased with iron outside and have a fire-brick lining. This lining of the fuel-chamber is made nearly twice as thick as that of the fixing-chamber, thereby allowing the gas to expand from the fuel into the fixing-chamber, the room in the latter being larger, by which means the generator is relieved of pressure. To cause a suitable superheating and fixing of the gas, the said fixing-chamber is furnished with several rows of tiles, L, arranged apart and across the chamber to intercept the passage of the gas. Said tiles, being highly heated or in an incandescent state, cause by their interception a suitable fixing of the gas. The top plate, M, of the generator is also lined with fire-brick, as shown. The hopper A is secured thereupon, and it is furnished with a lid, N, having a cross-bar and clamping-screw, O, and for both the hopper and said lid said plate has for each a proper opening through it.

The hopper is divided into the top compartment, A', and the bottom compartment, A'', and a valve or seal, O', is employed between them to close their communication during the time of feeding the top compartment, A'.

To the side of the hopper, below its valve or seal O', is connected the gas-main P, by which the gas is taken from the generator to the wash-box, and thence passed through the scrubbers and purifier into the holder, in the usual way.

The gas-main P is preferably connected on the side of the hopper; but it may be on the top plate, and by it the gas is conducted from the retort to the wash-box.

The fuel-chamber is provided on the side with an opening having a valve or seal, Q, over it, to give access to the chamber close over the grate for taking out cinders and repairing the grate or lining. Said valve Q is furnished with the usual cross-bar and clamp-

ing-screw, *Q'*, guided on lugs provided on the seat of the valve.

The top of the hopper has the valve *R*, provided with a proper seat to close the said top air-tight.

The mechanism to operate both hopper-valves *R* and *O'* and the valve *H* is provided with locking devices, so as to open and close them with a quick motion.

The hopper-valves have rods to operate them from below at the base of the generator.

The mechanism for operating the valve *R* consists of a two-armed lever, *a*, which is pivoted between the lugs *b*, cast to the valve-seat *S*. The short end of the lever *a* is loosely attached to the top of the valve *R*, and the long end of said lever has a rod suspended down to the base portion of the generator. By means of this lever *a* the valve is readily raised or lowered from and to its seat from below at the base of the generator.

The mechanism consists, further, of a pair of arms, *c*, on the valve and two opposite locking-levers, *d d*, pivoted to the opposite sides of the hopper, and furnished each with a friction-roller, *e*, on its short vertical arm. The friction-rollers *e* overlap the arms *c*, of which each is made with an inclined plane for the roller to pass readily upon it and cause a powerful pressure for properly tightening the valve upon its seat and hold it locked. Each of said levers *d* has a long horizontal arm, on which a rod, *f*, is suspended to operate the lever from below at the base of the generator, all clearly shown in Figs. 1, 3, and 4.

The valves *H* and *O'* are both loosely hinged to their seats to open downward. The mechanism for opening and closing them is constructed with toggle-joint devices, consisting of the crank *g* and link *h*, connected with a central pivot on the valve, and arranged so that the crank *g*, when located to its dead-center, will hold the valve in a closed position on its seat. The crank *g* in each is secured upon a horizontal arbor, *j*, which passes through the casing, and is furnished with a stuffing-box in the casing to keep a tight joint around said arbor.

The link *h* of the gear of the valve *H* is pivoted indirectly with the valve, having an intermediate arm, *i*, pivoted on the fulcrum of the valve, to transmit the motion of the crank *g*, and to provide against lost motion from wear or other cause the bearing of the arbor *j* close to the crank is made with an adjustable bearing-box and a set-screw, *k*, shown on the outside of the base of the generator from which it is turned. Said arbor *j* of this valve is furnished on its outside end with a suitable hand-lever, *l*, for operating the arbor, which is turned one-quarter of a revolution for completely opening or closing the valve *H*.

The arbor *j* of the valve *O'* is furnished on its outer end with a secondary crank, *m*, and a two-armed lever, *n*, is connected with the crank *m* by means of the link *o* to one of the

arms of said lever, to the second arm of which is suspended a rod, *p*, by which the valve is operated.

The grate *D* is constructed in two equal portions, each having a rock-shaft, *r*, to which it is connected, and which has its bearings in the metal case of the lower part or base of the generator. Each of said rock-shafts passes through the base of the generator, and is furnished with a stuffing-box at the outside to provide for a properly tight joint on the rock-shaft; and the semi portions of the grate are each made toward each other with tongues *q* projecting into the spaces of the other between its tongues, as shown, so that each of the semi portions may be turned to dump independently, and either may be operated for raking the coal independently, or they may be operated together. Each of the shafts *r* has on its outer end, secured firmly, a socket-arm, *s*, into which the shaking-bar *t* is applied; and to hold the grate stationary the said arm *s* has a flat projection, which passes in a slotted central standard, *u*, employed between said shafts, to which standard each of the arms *s* is locked by a bolt inserted through the arm and standard. By means of having the grate constructed in semi portions, for each a fulcrum or rock-shaft, the raking of the coal is done with facility. To have the said shafts *r* properly connected in a powerful durable manner, each grate portion has hubs to fit over the shaft, with a square opening, and the shaft has its shank passing through said hubs also made square.

T represents the steam-pipe, which is supplied with superheated steam from a suitable superheater. It delivers the steam into the vertical steam-pipe *U*, which has two main branches, *V* and *W*, and a third branch, *X*; and said pipe *U* is furnished with a stop-valve, *Y*, for each of the branches *V* and *W*, and a stop-valve, *Z*, is applied on the branch *X*, which connects with the bottom chamber of the ash-pit.

By means of the steam-branch *X* and valve *Z* steam may be admitted into the bottom chamber for the purpose of expelling the air from it. When the grate is raked the ashes drop into the chamber *E* upon the valve *H*, which is closed during the raking of the grate. After the grates are raked the ashes are dropped into the chamber *F* by opening the valve *H*. The screw-seal *I* of the chamber *F* is always kept closed during this time; but after the ashes are dropped into the chamber *F* and the valve *H* is closed, the said screw-seal *I* is opened to remove the ashes from the retort entirely, and now, after the ashes are removed, the air having been admitted during the removal of the ashes is expelled by opening the valve *Z* and filling the chamber *F* with steam before closing said chamber with the seal *I*. Whenever the steam is passed into the said bottom chamber the seal of the same to the exterior is opened to allow the air to escape. The branch *V* connects with the up-

per ash-pit chamber and delivers the steam under the grate into the fuel-chamber. The branch W delivers the steam into the upper part of the fuel-chamber, and by means of the valves Y either of the branches V or W may be stopped and the other may be opened, or either may be used alternately.

The oil or naphtha is furnished from a suitable tank by means of the oil-pipe *v*, which pipe passes through a heating-pipe or vaporizer, *w*; and from the heating-pipe *w* it connects with a glass tube, *x*, which connects with the central portion of the fuel-chamber by means of a pipe, *y*, so that the oil or vapor thereof passes through the pipe *v* and vaporizer *w*, and becomes visible in passing through the glass tube *x*, from which it passes into the fuel-chamber.

The vaporizer *w* is constructed of a large tube, through which the oil-pipe *v* passes with tight joints around it, and the space between both tubes is connected with the steam-pipe from the boiler.

The pipe *y* is furnished with a stop-valve, *z*, for regulating the flow of the oil or vapor to carburet the hydrogen for giving it the proper illuminating properties. A drip and proof faucet, *z'*, is also employed on said pipe *y* to test the flow of the oil.

Frequently in generators of this class a pressure in the generating-retort stops the flow of the oil or its vapor, and it is on that account that measures for testing the flow of the vapor or oil are of importance to carry on a successful generation of the gas. By introducing the steam into the incandescent fuel at the same portion of the fuel for a continuous period the fuel loses its vitality or heat so rapidly that the generation becomes almost entirely inactive; the portion of the fuel at which the generated gas passes off gains activity or briskness. By means of introducing the steam alternately at either portion of the fuel the generation of the gas is continued for a great deal longer time in nearly full activity.

What I claim, and desire to secure by Letters Patent, is—

1. The process of manufacturing gas which consists in introducing oleaginous matter centrally within a body of incandescent carbonaceous material, and introducing steam into the decomposing-chamber alternately above and below such body of carbonaceous material, whereby the heat thereof is better maintained and decomposition is better effected, as specified.

2. In a gas-generator, the fuel-chamber C, in combination with steam-pipes V and W, having valves Y connected with the decomposing-chamber, substantially as described, and the oil-supply pipe *y*, entering the chamber C centrally, for the purpose specified.

3. In water-gas generators, the combination of the fuel-chamber C, the fixing-chamber B,

the grate D, the tiles L, with the central oil nozzles or pipes, and the alternately-operating steam pipes, branches, and valves V, W, and Y, and the gas-main P, substantially as and for the purpose herein set forth.

4. The combination of the fuel-chamber C, and the fixing-chamber B and its tiles L, the grate D, the chambers E and F, with the steam-pipes V and W and valves Y, the seal or valve H, and the gas-main P, substantially as and for the purpose herein described and shown.

5. The combination of the fuel-chamber C, the grate D, the seals N and Q, and the chamber B and its tiles L, substantially as described.

6. The combination of the bottom chamber, F, with the steam-branch X and the valve H, the chamber E, the fuel-chamber C, and fixing-chamber B, substantially as and for the purpose herein mentioned.

7. The combination of the chambers B, C, E, and F with the valves H and O', and the steam-pipes V and W and valves Y, the gas-main P, and hopper A, substantially as and for the purpose herein set forth.

8. The combination of the fuel-chamber C, the fixing-chamber B, and the hopper A, and the incandescent tiles L, the grate D, and the top and bottom chamber of the ash-pit, and the valves H and O', with the oil-pipe *y*, and the steam-pipe U, and branches V and W, and their stop-valves Y, substantially as and for the purpose herein set forth.

9. The combination of the hopper A, having valves R and O', the chambers B, C, E, and F, and the grate D, the valve H, and seals N, Q, and I, the gas-main P, the steam-pipes V and W, and valves Y, substantially as and for the purpose herein set forth.

10. The combination of the hopper A, with its chambers and valves R and O', and the fixing-chamber B and its tiles L, the fuel-chamber C, with its seal Q, its oil-pipe *y*, the steam-branches V and W, and stop-valves Y, the ash-pit chambers E and F, the steam-pipe U, and branch X, and grate D, substantially as and for the purpose herein mentioned.

11. The combination, in a water-gas generator, of the fuel-chamber C, the grate D, with its independent rock-shafts *rr*, their opposite tongues, and arranged to rake and dump, as described, with the chambers E and F, and the seals or lids I and Q, substantially as and for the purpose herein set forth.

12. The hopper-top valve R, with its arms *cc*, in combination with the locking-levers *dd* and the lever *a*, substantially as and for the purpose herein described.

In witness whereof I hereunto set my hand this 24th day of February, 1881.

BURHAUS VAN STEENBERGH.

In presence of—

R. BOECKLEN,
F. A. SPEARE.