

(No Model.)

J. HAM.  
STEAM BOILER.

No. 458,049.

Patented Aug. 18, 1891.

Fig. 1.

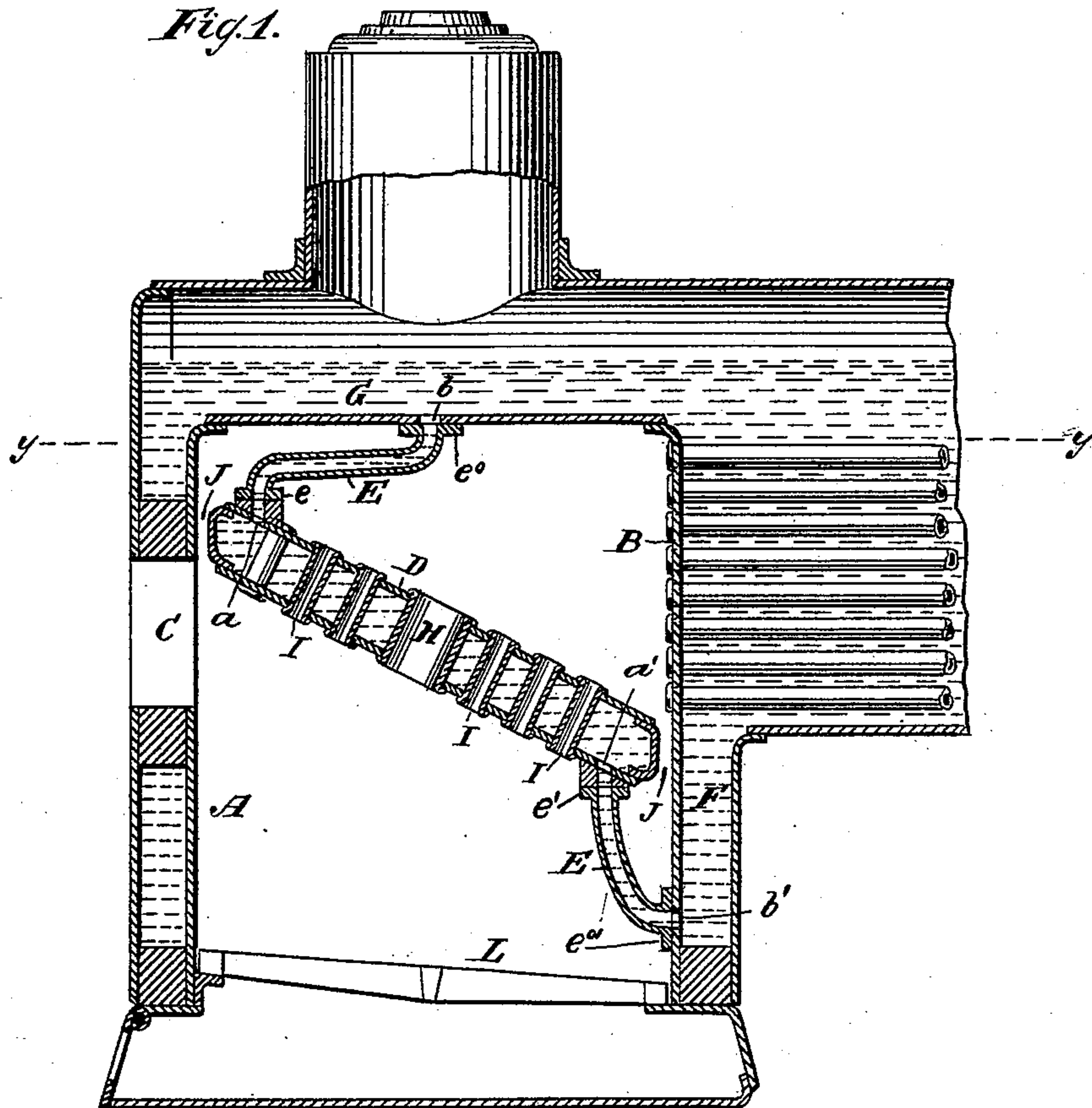
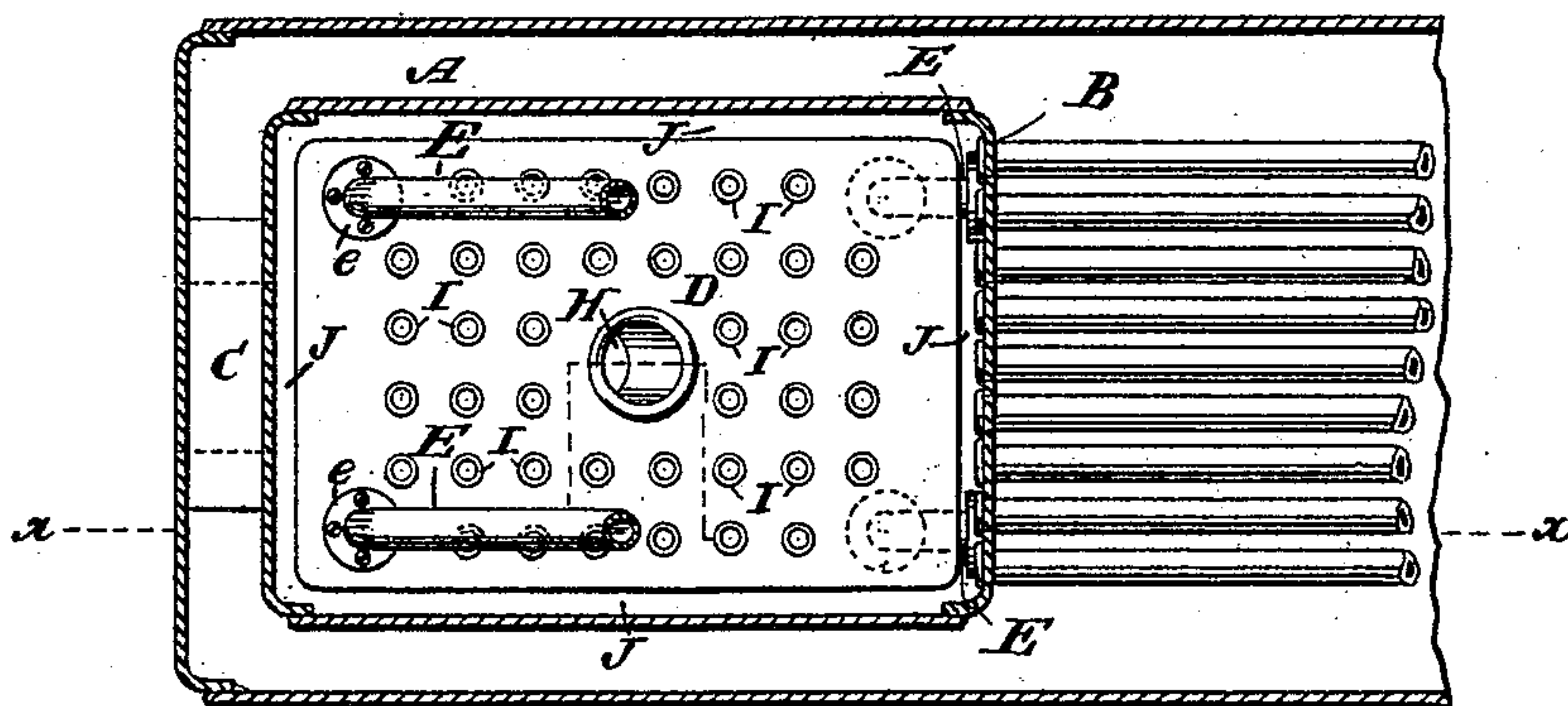


Fig. 2.



WITNESSES:

Eduard Wolff.  
William Miller

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ATTORNEYS

# UNITED STATES PATENT OFFICE.

JOHN HAM, OF BROOKLYN, NEW YORK, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO WARREN FOOTE, FRANCIS S. FOOTE, AND ABBY ANN HAM, ALL OF SAME PLACE.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 458,049, dated August 18, 1891.

Application filed August 15, 1889. Renewed March 12, 1891. Serial No. 384,720. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN HAM, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Steam-Boilers, of which the following is a specification.

This invention relates to a certain improvement in steam-boilers as pointed out in the following specification and claim, and illustrated in the accompanying drawings, in which—

Figure 1 represents a longitudinal vertical section in the plane  $x x$ , Fig. 2. Fig. 2 is a horizontal section in the plane  $y y$ , Fig. 1.

In the drawings the letter A designates a metallic fire-box of a steam-boiler.

B is the tube-sheet.

C is the fire-door, and L is the fire-grate, which consists of movable grate-bars, so that if these grate-bars are removed easy access can be had to the interior of the fire-box from below.

D is a hollow diaphragm made of strong metallic plates and secured in the interior of the fire-box in an inclined position, as seen in Fig. 1 of the drawings, the area of said diaphragm being such that when the diaphragm is in the proper position a narrow space J is left between its sides and the inner walls of the fire-box, as seen in Fig. 2. The diaphragm is held in the desired position by one or more pipes E above and by one or more pipes E' below. The pipes E are bent and secured to the diaphragm by means of flanges  $e$ , and to the top of the fire-box by means of flanges  $e^0$ , and they communicate with the interior of the diaphragm through openings  $a$  and with the water-space G above the fire-box through openings  $b$ . The pipes E' are fastened to the diaphragm by flanges  $e'$ , and to the lower part of the tube-sheet B by flanges  $e^{01}$ , and they communicate with the interior of the diaphragm through openings  $a'$  and with the water-space F of the boiler through openings  $b'$ . Through the diaphragm extends a large flue H, which serves as a passage for the

gases of combustion and which is made large enough to allow a workman to reach the flanges  $e^0$  above, so that he can secure the same in position by means of screw-bolts. In addition to the large flue H the diaphragm may also be provided with a number of hollow stay-bolts I.

It will be readily seen from this description that the diaphragm D forms a protection for the tube-sheet B, so that when the fire-door C is open the tube-sheet is not exposed to a cold draft, and, furthermore, the back-draft is prevented from driving the flame out of the fire-door. Furthermore, the heated gases of combustion are free to pass all round the diaphragm, through the annular space J, and through its interior by means of the flue H, so that all parts of said diaphragm are uniformly heated and the danger of leakage from unequal expansion is avoided. It will also be noticed that the pipes E, which connect the diaphragm with the top of the tube-sheet, are S-shaped, and the pipes E', which connect the diaphragm to the lower portion of the tube-sheet, are bent so that the same can accommodate themselves to some extent to any unequal expansion or contraction to which they may be subjected.

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

In a steam-boiler, the combination, with the metallic fire-box A, of the hollow diaphragm D, arranged in relation to the fire-box to provide a narrow space which entirely surrounds the sides and ends of the diaphragm, the bent pipes E E', communicating with the interior of the diaphragm and with the water-spaces G F of the boiler, and the large flue H, through which access is obtained for securing the pipes E in the fire-box, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN HAM.

Witnesses:

J. VAN SANTVOORD,  
W. HAUFF.