No. 709,126. Patented Sept. 16, 1902.

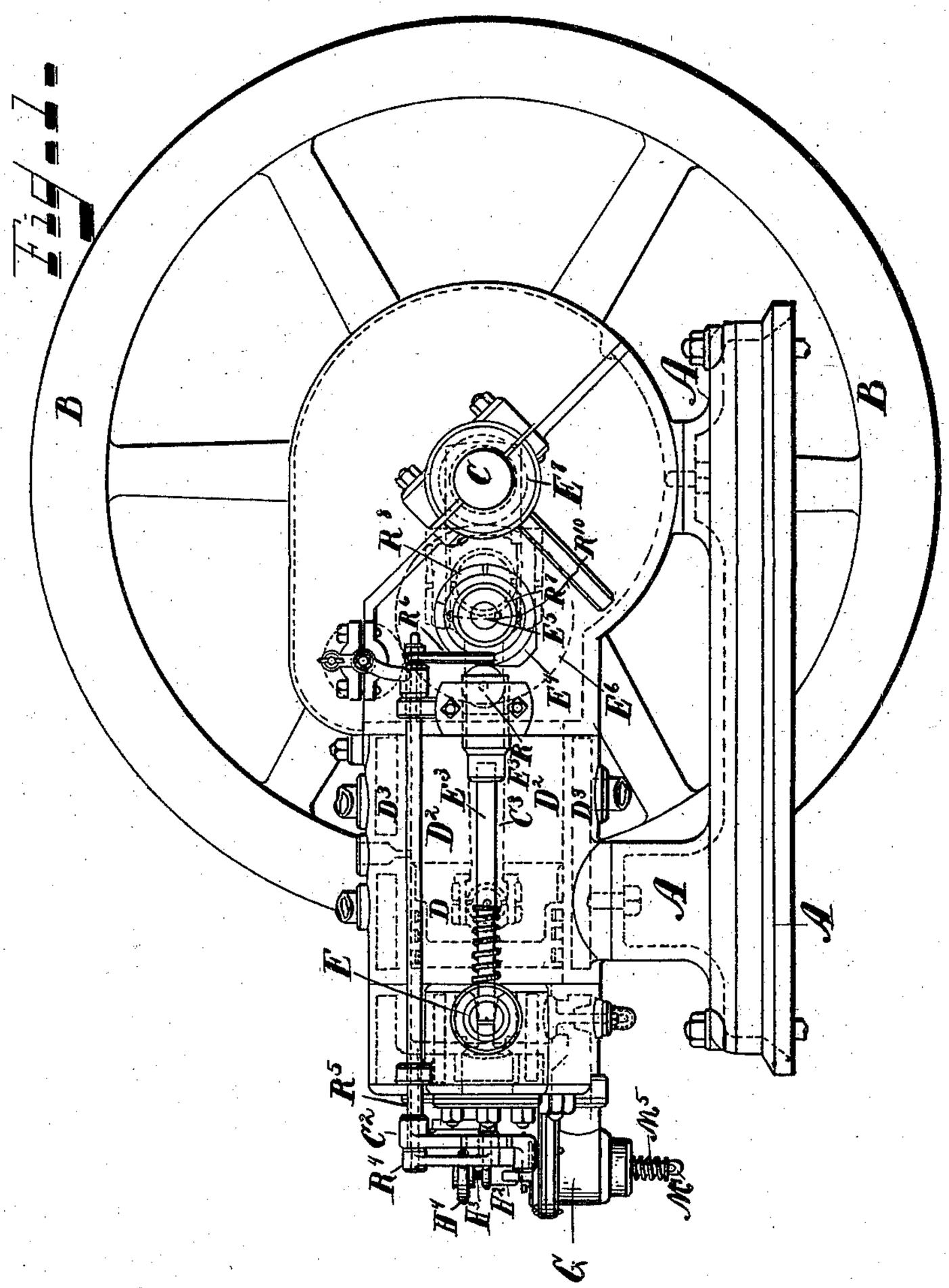
B. C. VANDUZEN.

VAPORIZING DEVICE FOR EXPLOSIVE ENGINES.

(Application filed July 13, 1896.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



Witnesses.

Samuel A. West

K. Smith

Inventor.

Benjamin C. Vanduzen

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 709,126. Patented Sept. 16, 1902.

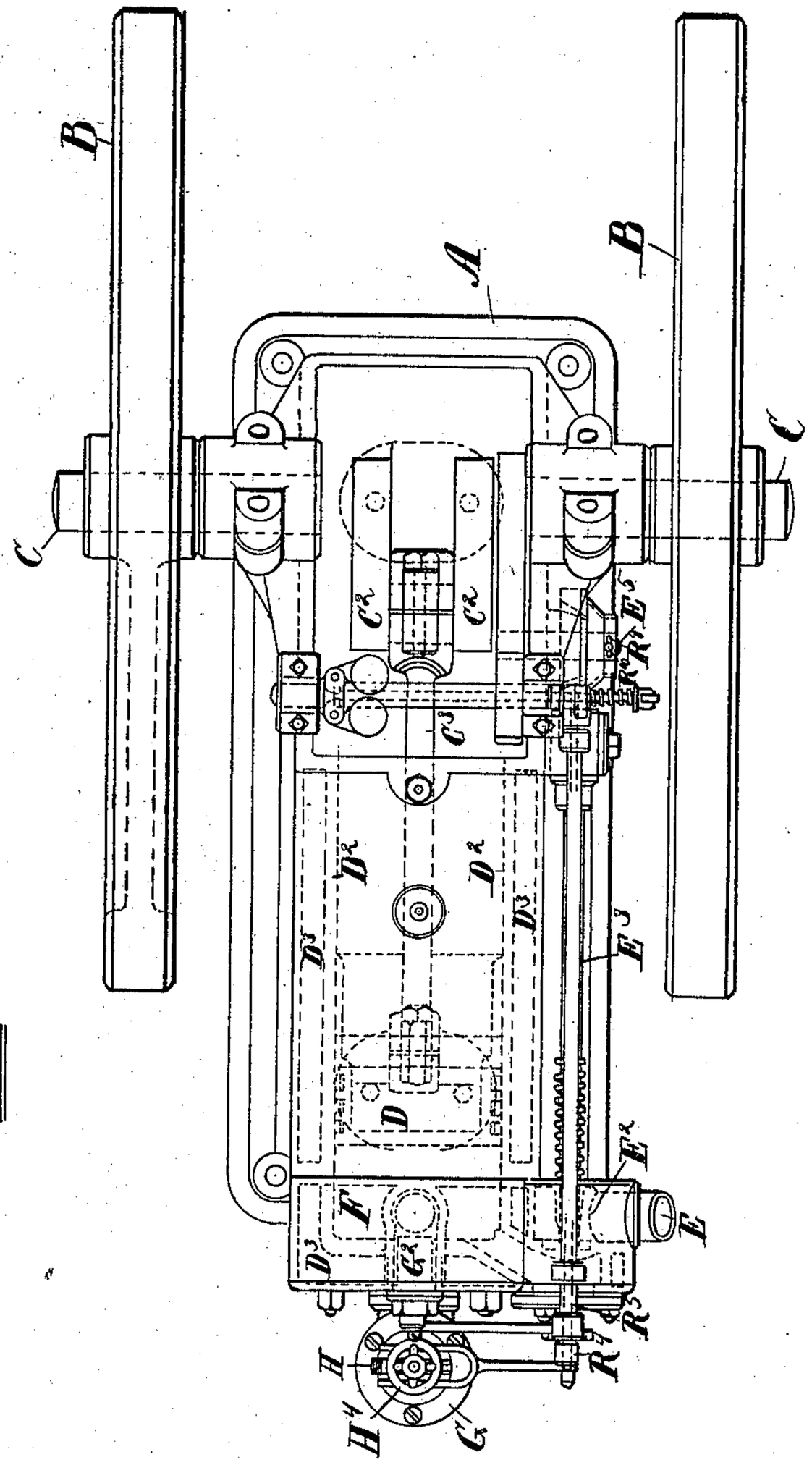
B. C. VANDUZEN.

VAPORIZING DEVICE FOR EXPLOSIVE ENGINES.

(Application filed July 13, 1896.)

(No Model.) 4 Sheets—Sheet 2.

Fig. 2.



Witnesses.
Samuel A. West.
K. Smith.

Inventor.
Benjamin C Vanduzen.

No. 709,126. Patented Sept. 16, 1902.

B. C. VANDUZEN.

VAPORIZING DEVICE FOR EXPLOSIVE ENGINES.

(Application filed July 13, 1896.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 3.

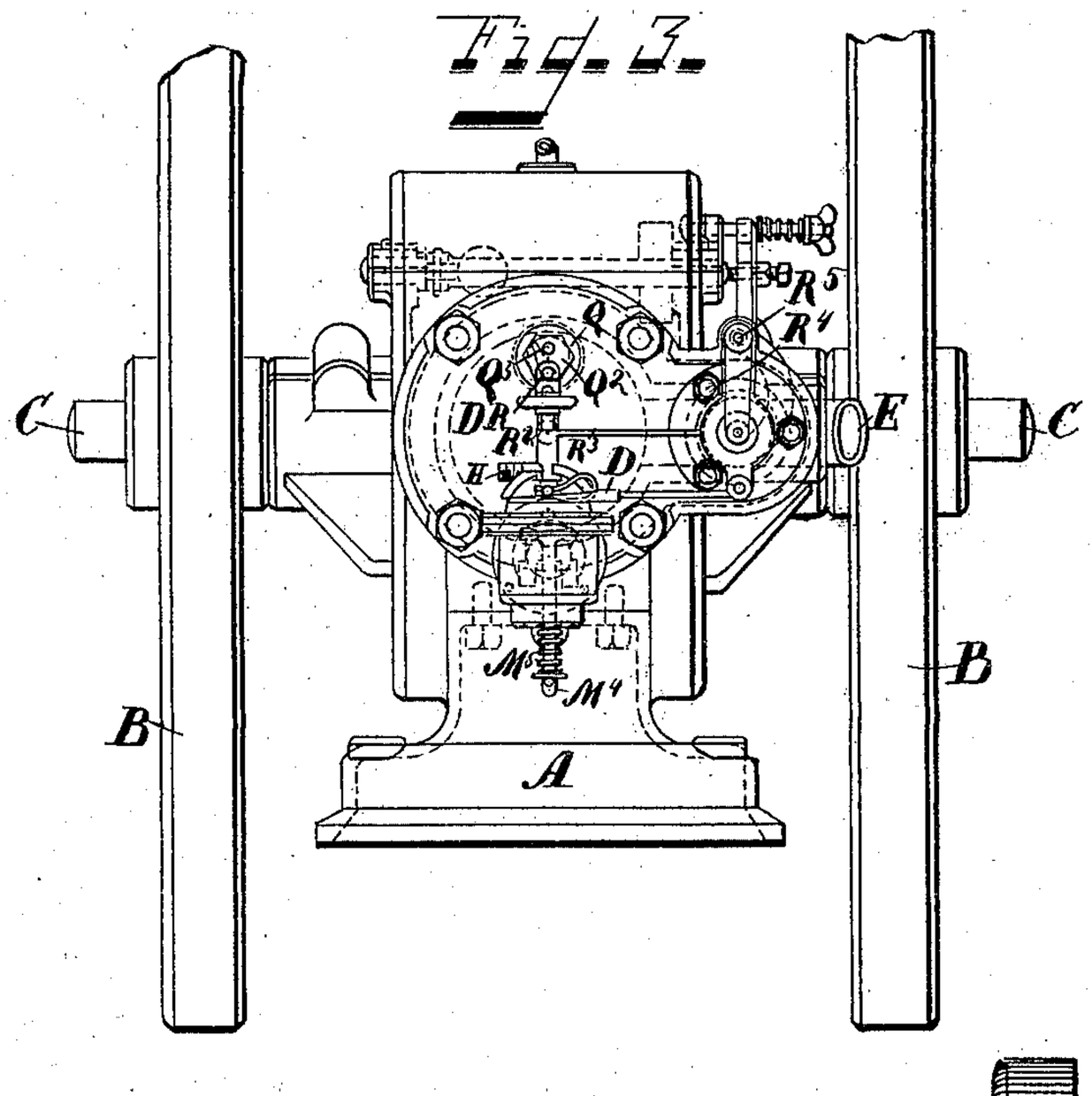
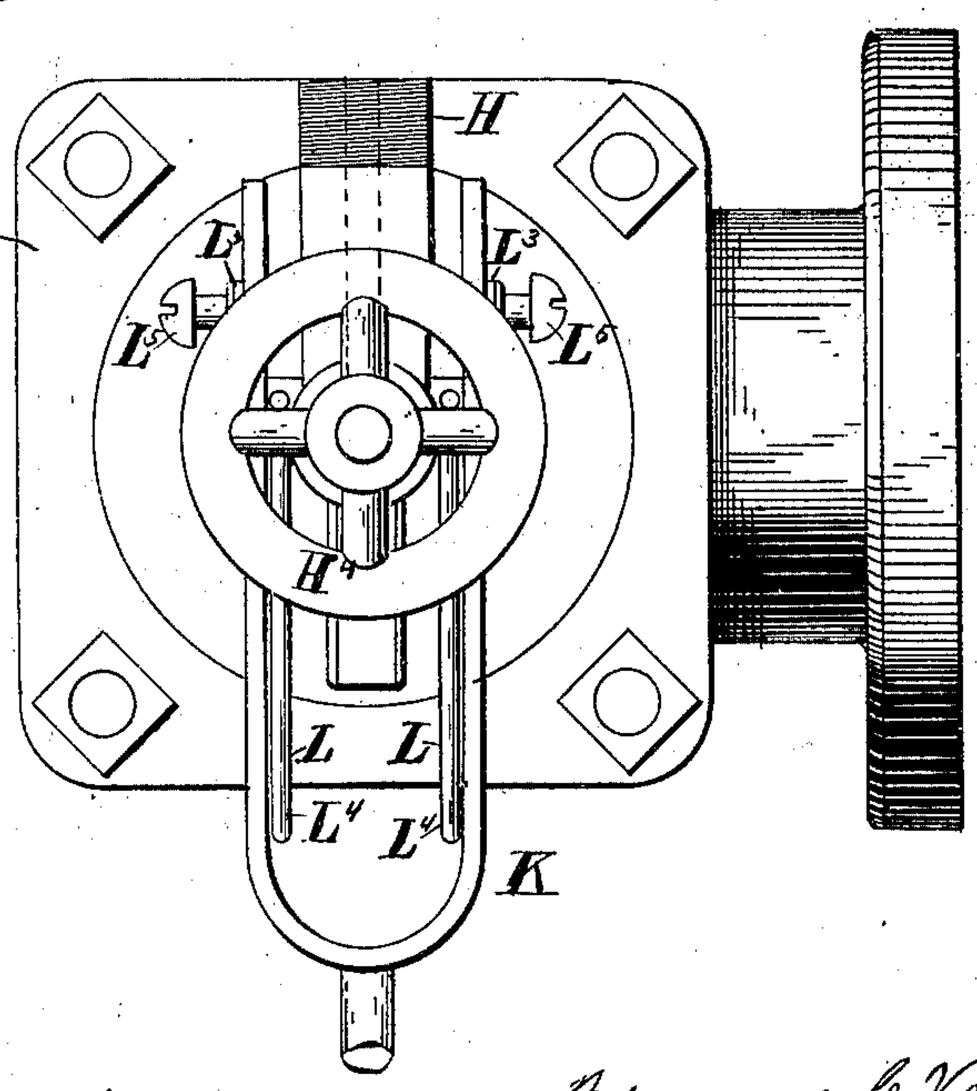


Fig. 4.



Witnesses.

Samuel A. West

H. Smith.

Inventor.

Benjamin C. Vanduzen

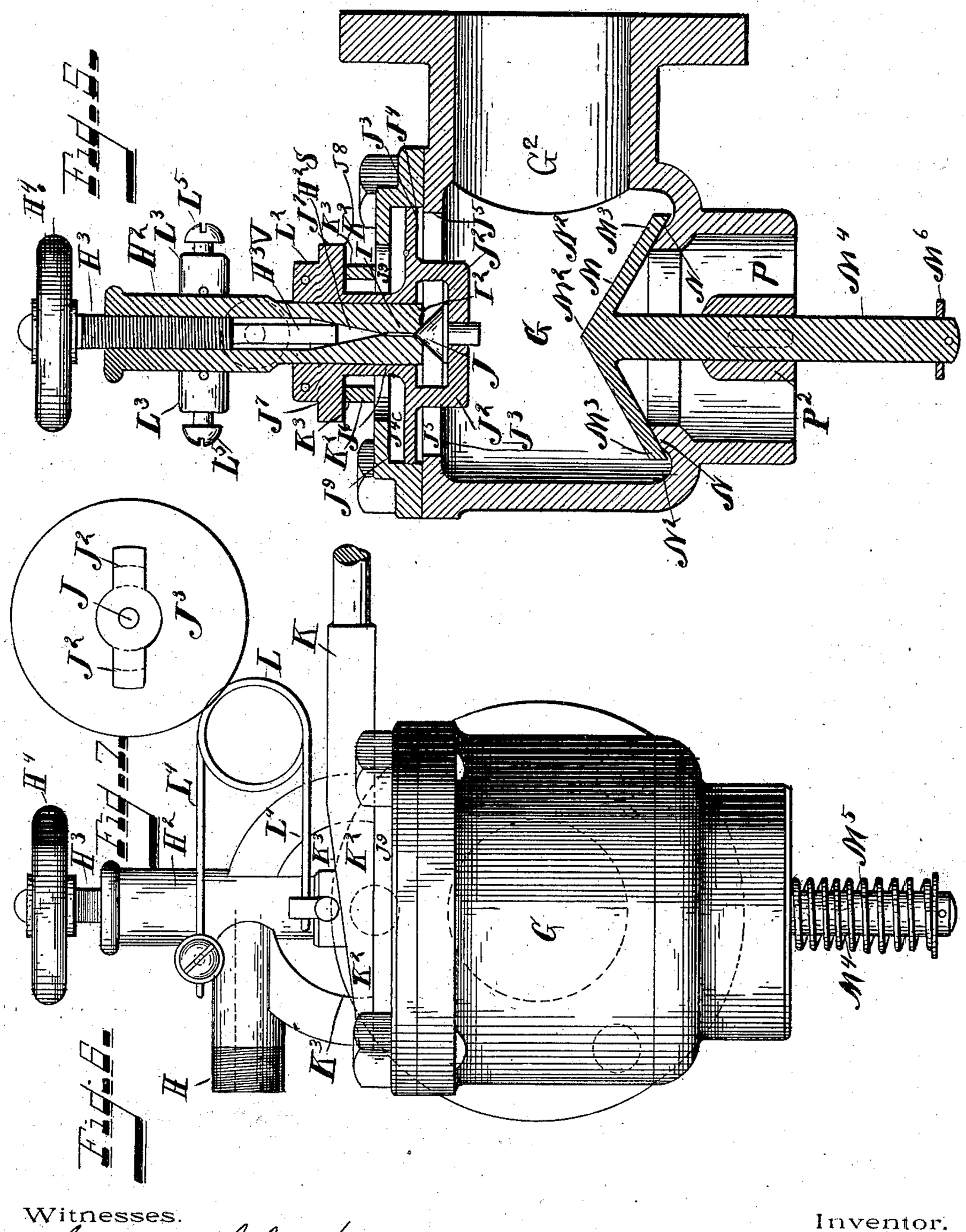
No. 709,126. Patented Sept. 16, 1902.

B. C. VANDUZEN.

VAPORIZING DEVICE FOR EXPLOSIVE ENGINES.

(Application filed July 13, 1896.)

(No Model.) 4 Sheets—Sheet 4.



Witnesses.
Samuel A. Merk.
H. Smith

Inventor.
Benjamin C. Vanduzen

UNITED STATES PATENT OFFICE.

BENJAMIN C. VANDUZEN, OF WINTON PLACE, OHIO.

VAPORIZING DEVICE FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 709,126, dated September 16, 1902.

Application filed July 13, 1896. Serial No. 598,958. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN C. VANDUZEN, a citizen of the United States, and a resident of the village of Winton Place, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Gasolene-Engines, of which the following is a specification.

The several features of my invention and the various advantages resulting from their use, conjointly or otherwise, will be apparent from the following description and claims.

Referring to the accompanying drawings, making a part of this specification, and to which reference is hereby made, on Sheet 1 Figure 1 represents a side elevation of a machine embodying my invention. Fig. 2, Sheet 2, represents a top view of the same machine. Fig. 3, Sheet 3, represents an end view of the same. Fig. 4, same sheet, and Figs. 5 and 6 of Sheet 4 are enlarged views of the mixing-chamber and valves whereby air and gas are admitted to the chamber and duly mixed. Fig. 7, Sheet 4, is a view of the under side of the lower valve of the diaphragm of the mixing-chamber. Fig. 8, Sheet 1, shows enlarged an edge view of certain cams respectively used for operating the exhaust-valve and the electric lighter.

There is present for this engine a suitable base and frame A, one or more fly-wheels B, shaft C thereof, operated by a crank C^2, connected by a connecting-rod C^3 to the piston D, reciprocating within a cylinder D^2. The latter is preferably provided, as shown, with the customary water-spaces, as D^3, forming a water-jacket, through which cool water passes and keeps the cylinder cool. The cylinder has an exhaust-pipe E, whose valve E^2 is duly operated through agency of the rod E^3 by the cam E^4 on shaft E^5, duly operated by gear E^6 E^7 from the crank-shaft C or other suitable source. One end of the rod E^3 carries a roller E^3R, which bearing on the cam E^4 reduces the friction between the cam and the rod. The cylinder has the usual chamber F in it, in which is compressed the mixed gas and air, and this chamber communicates with the mixing and valve chamber G. As many novel features of construction are found here and in connection therewith and for the operations thereof, such parts and their accessories will now receive particular description.

H is the gasolene-inlet pipe, conveying the gasolene to and into the vertical pipe H^2. This pipe has a regulating-screw H^3, carrying a valve H^3V, operated by hand-wheel H^4. By screwing the valve H^3V downward the opening for the passage of gasolene can be diminished at will, and by elevating it the opening is enlarged. The conduit H^2 is gradually narrowed at H^2S, forming a valve-seat for the valve H^3V. The conduit H^2 is finally contracted to a minute orifice I, through which the gasolene in minute quantities passes down. The lower part of the orifice is conically enlarged at I^2 into a valve-seat. Below this seat is a conical valve J, fitting said seat and supported by strap or bracket J^2 J^2 from a piston J^3, whose edge (periphery) fits against the side J^4 of an annular chamber J^4C. A ledge J^5, below the edge of the piston, operates as a stop to prevent the piston from falling too far. The piston is connected above with means for raising it, and the preferred means for this purpose are two lugs J^7, connected to the piston J^3 by means of a sleeve J^6, surrounding the conduit H^2. The under faces J^8 of these lugs, as shown, engage the inclined faces K^3 of the tines K^2 of the bifurcated rod K, longitudinally reciprocated by the governor, as hereinafter mentioned. The advance of the rod K limits the descent of the piston J^3. The rod K rests upon an abutment J^9, preferably the roof of the chamber. The necessary amount of gasolene for running the engine at the desired rate of speed having been ascertained, the wedge is fixed in connection with the governor. When the engine is going too fast, the governor interposes more of the wedge K^2 of the rod K beneath the lugs J^7, and thus diminishes the supply of gasolene to the mixing-chamber and raises the piston J^3, and as the wedge K^2 is still farther interposed the valve J is lifted into its seat in the lower portion of the conduit I, thereby stopping the flow of gasolene through this conduit I. As the engine slows down the wedge is more and more withdrawn and the valve J is lowered more and more, and the supply of gasolene to the mixing-chamber is correspondingly increased. In

this way the governor governs the admission of gasolene into the mixing-chamber, and thus controls the power and speed of the engine. The piston will remain elevated through the agency of the springs L L until the formation of a vacuum more or less perfect causes the pressure of the atmosphere external to the piston to press the latter down. At such a time the valve J is dropped and gasolene through the orifice I is free to enter the mixing-chamber. Each spring L is at one end connected to a lug L^2 or the like of the piston connections and at the other end to a stud L^3 on the pipe H^2. The limbs L^4 L^4 of the spring are respectively located in holes, one in the lug L^2 and one in the stud L^3, and are capable of sliding adjustably through the same. The distance the limbs L^4 project through their respective holes having been decided upon, they are held there by the set-screw L^5 of stud L^3, screwed into the latter and bearing against the adjacent limb of the spring. By setting the spring farther forward or backward I am enabled to increase or diminish the elastic tension of the spring, and thus regulate the amount of atmospheric pressure required to open (or drop) the piston.

In the bottom of the mixing-chamber is a large discal valve M of a conical form. The convex center M^2 of this valve M is in a vertical line beneath the orifice I, while the edge of this valve overlaps the upper face N of the edge of conduit P, whereby air is admitted to the mixing-chamber. These faces N incline from the axis of the conduit P outward and downward, and the under face M^3 of the edge portion of the valve is likewise inclined from its edge upward and inward. These meeting faces M^3 and N form when together a tight joint. When the air-valve M lifts, the piston drops and valve J drops, and gasolene is by the latter valve admitted to the mixing-chamber, and as it falls down across the chamber it is met by the uprushing air admitted through valve M and is vaporized. Any gasolene not thus vaporized drops down on the central portion of the valve M and running down the face of the valve and off the edge gathers in the channel N^2 at the foot of the inclined face. When the air-valve M is lifted, the air from pipe P enters between the face M^3 of the valve and face N of the seat and catches and mingles with the gasolene dripping from the edge of the valve and also rushes down into and takes up any gasolene in the channel N^2. The rapid current or intake of the air thus brought into contact with the gasolene causes the gasolene to be immediately and thoroughly converted into a hydrocarbon gas mixed with a suitable quantity of air.

The preferred mode of holding the air-valve M in alinement is by means of a sleeve P^2, fixed within conduit P. Through this sleeve a stem M^4 of the valve M passes and projects below. A coiled spring M^5 embraces the rod below the sleeve P^2 and above the pins or lugs M^6, the sleeve P^2 and the lugs M^6 being the abutments between which the spring is compressed. In order to open the valve, the vacuum within the mixing-chamber must be such as to cause the pressure of the atmosphere without to overcome the force of the spring. Then the valve, restrained by the spring M^5, lifts sufficiently to allow the air from pipe P to enter.

The mixing-chamber is connected to the cylinder-space over the piston by conduit or interconnecting chamber G^2. The chamber G, provided with the valve M in its lower portion and the valve J, strap J^2, and piston J^3 at its upper portion, constitutes the mixing-chamber.

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

1. The combination of the mixing-chamber G, piston in chamber or guideway J^4, stop below the piston, valve J, gasolene-inlet conduit H^2 constricted at I, and conical valve H^3 for regulating the passage of gasolene through the conduit H^2, and having a conical seat in the said conduit-pipe, springs L, having one branch connected to the piston and one branch to a fixed point as L^3, substantially as and for the purposes specified.

2. The combination of the mixing-chamber G, piston in chamber or guideway J^4, stop below the piston, valve J, gasolene-conduit H^2 constricted at I, and valve H^3 for regulating the passage of gasolene through the conduit H^2, and springs L, having one branch connected to and slidable through the extension L^2 of the piston, and the other branch connected to a stationary stud L^3, and having an opening through which the other branch L^4 of the spring is slidable, and set-screw for setting the adjustment of the spring, substantially as and for the purposes specified.

3. The combination of the mixing-chamber, gasolene-inlet conduit, dropable valve for controlling admission of gasolene therefrom to the mixing-chamber, sleeve connected to the piston and embracing the inlet-conduit, spring connected to the sleeve and to a fixed detent, the dropable valve supported by the piston, substantially as and for the purposes specified.

4. The combination of the mixing-chamber, inlet gasolene-conduit, movable piston, carrying valve, controlling the admission of gasolene through the conduit, abutment, wedge resting thereon, and abutments or lugs connected to the piston for engagement with the wedge, and the governor, and means for enabling the governor to reciprocate the wedge and control the drop of the piston, and elastic means for holding up the piston and valve, except when the suction in the mixing-chamber opens it, substantially as and for the purposes specified.

5. The combination of the mixing-chamber

and the air-inlet valve M, located directly below the gasolene-inlet valve, this air-valve M being conical above, the under side of its peripheral edge being inclined outward and downward and overlapping the edge of the air-inlet conduit, this latter edge being inclined outward and downward and terminating in the annular channel for the collection and aeration of gasolene, substantially as and for the purposes specified.

6. The combination of the mixing-chamber and the air-inlet valve conical above, and having its under outer edge inclined outward and downward, and the air-inlet conduit P having its upper end inclined outward and downward forming a tight seat for the valve M, when closed, and having an annular channel below and adjacent to the peripheral edge of the valve M, and an inlet gasolene conical valve, and a dropable valve supported by the piston, and in vertical line above the central portion of the air-inlet valve, substantially as and for the purposes specified.

BENJAMIN C. VANDUZEN.

Attest:
A. S. LUDLOW,
K. SMITH.