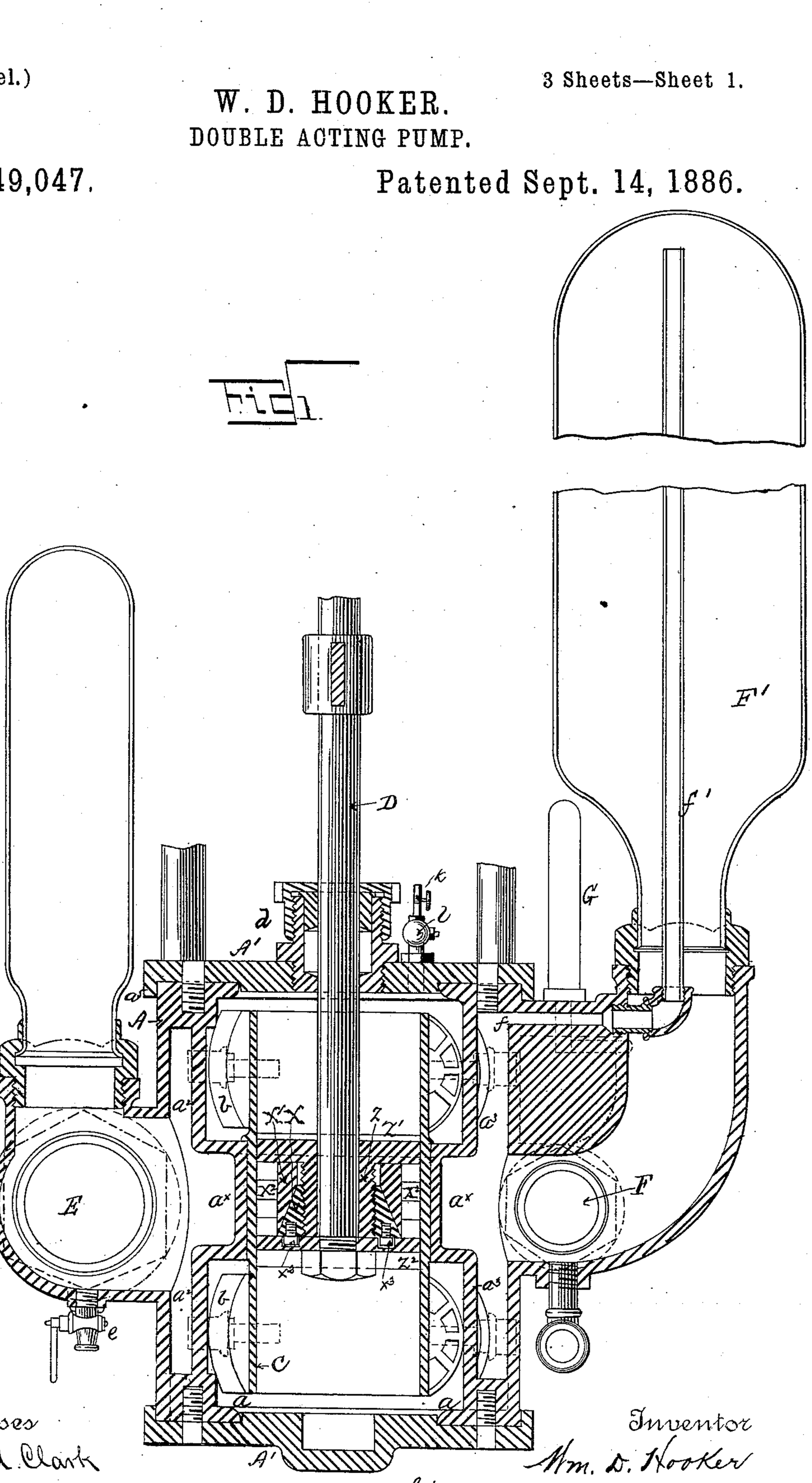
(No Model.)

3 Sheets—Sheet 1.

W. D. HOOKER.

DOUBLE ACTING PUMP.

No. 349,047. Patented Sept. 14, 1886.



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(No Model.) 3 Sheets—Sheet 2.

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DOUBLE ACTING PUMP.

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Fig. 2.

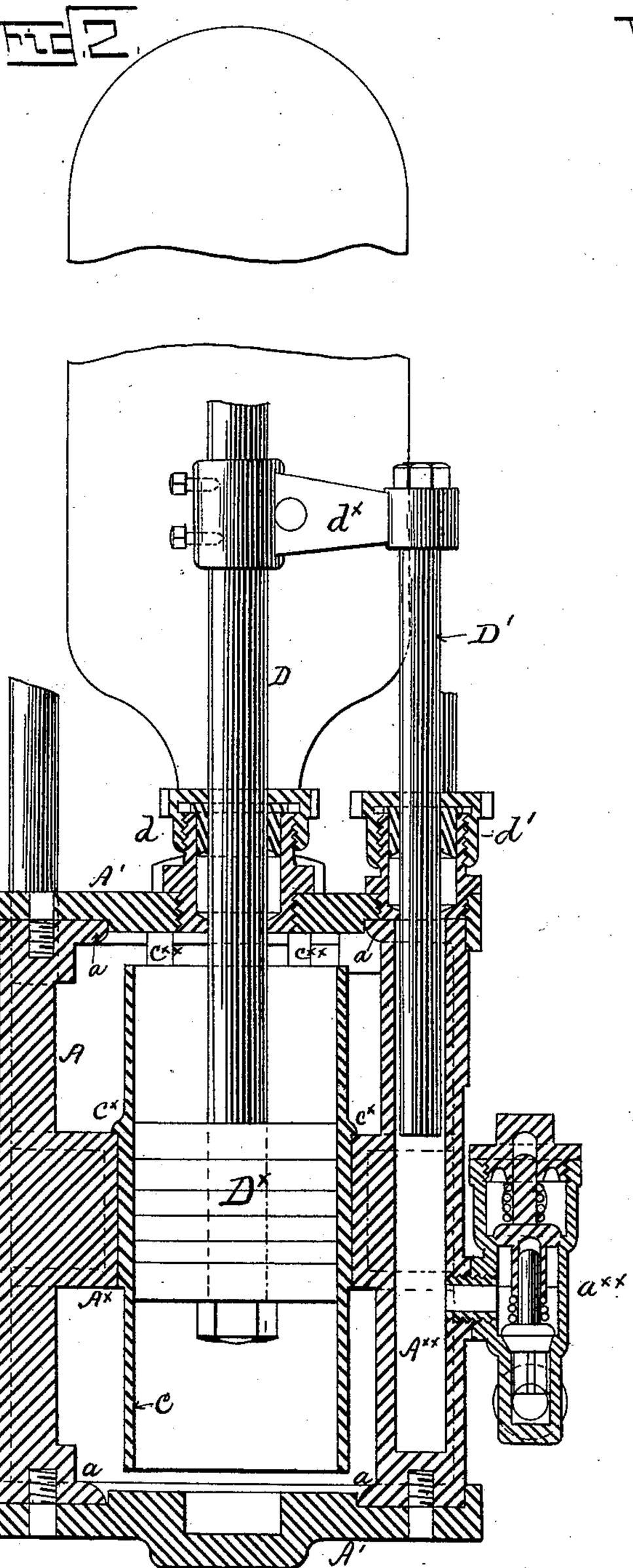


Fig. 3.

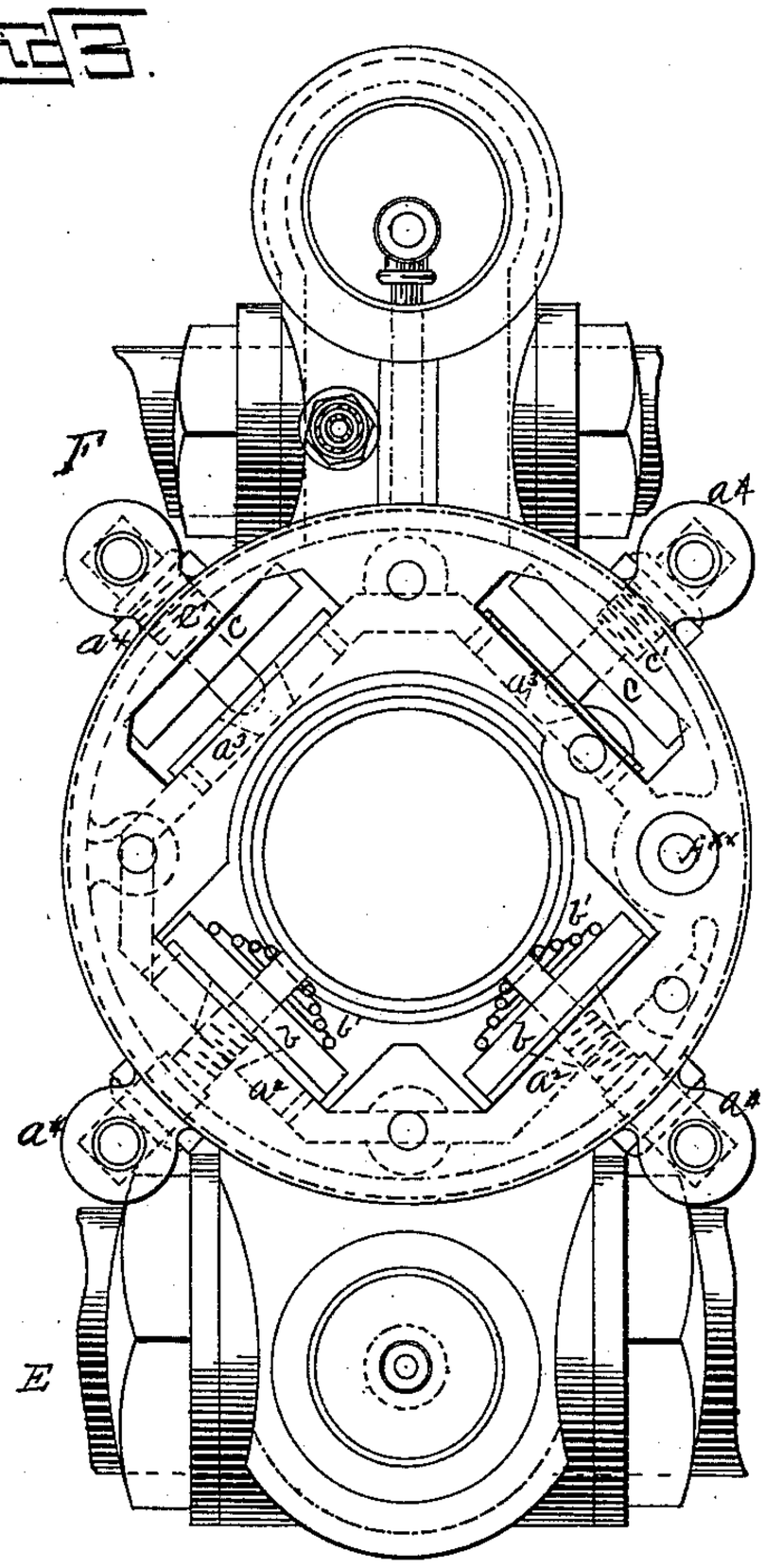
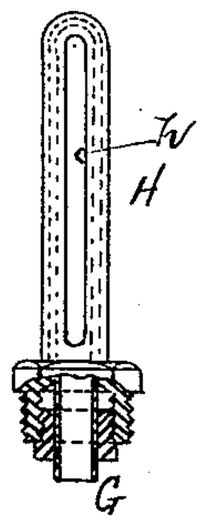


Fig. 4.



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3 Sheets—Sheet 3.

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DOUBLE ACTING PUMP.

No. 349,047. Patented Sept. 14, 1886.

FIG. 5.

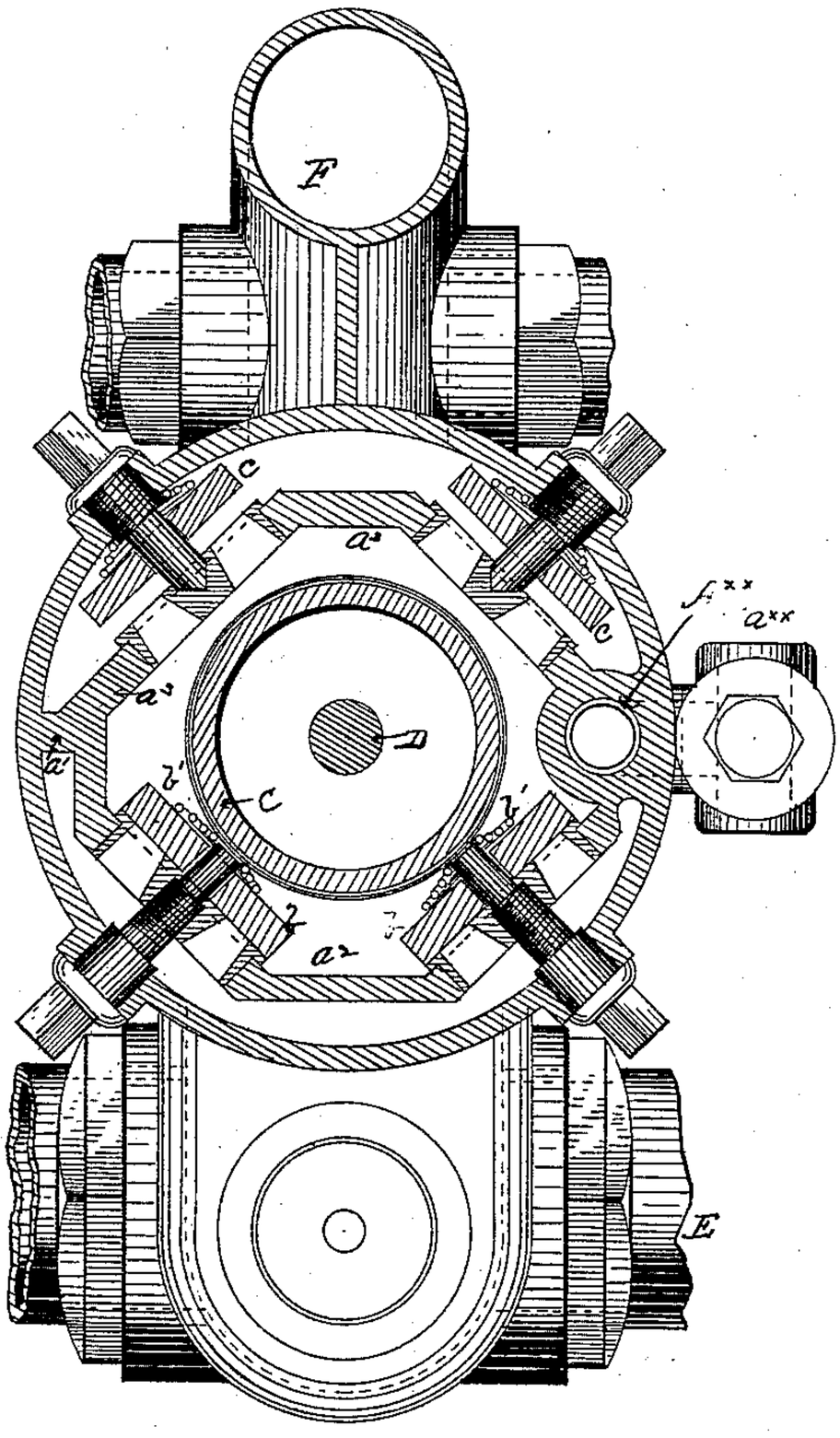
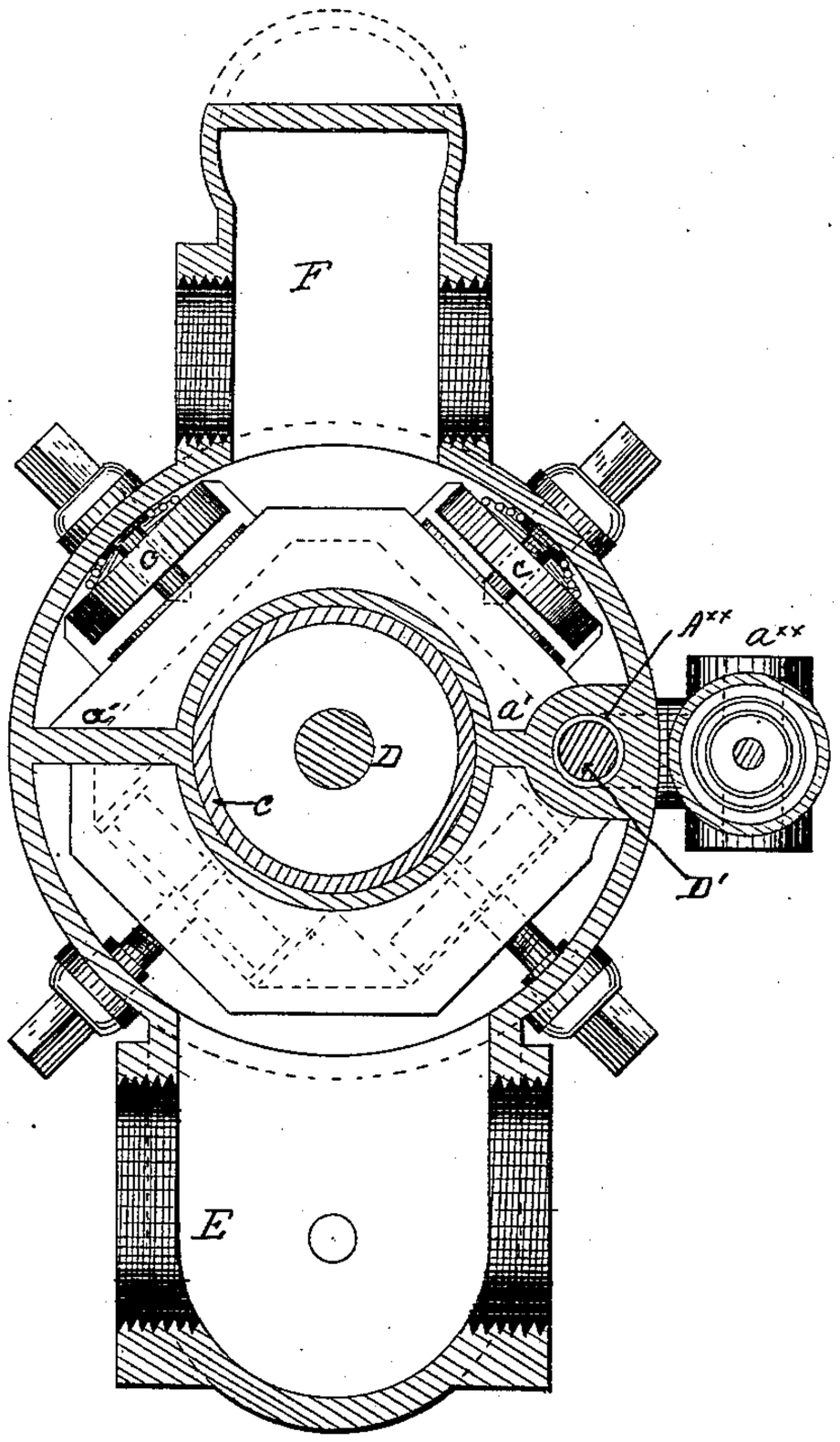


FIG. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM DAVIS HOOKER, OF ST. LOUIS, MISSOURI.

DOUBLE-ACTING PUMP.

SPECIFICATION forming part of Letters Patent No. 349,047, dated September 14, 1886.

Application filed February 6, 1886. Serial No. 190,987. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM DAVIS HOOKER, a citizen of the United States, residing in the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Double-Acting Pumps; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to double-acting pumps, and is designed more especially for fire-engines.

The object of my invention is to produce a powerful, simple, and efficient double-acting pump capable of producing a very high vacuum and to run at a very high speed, which are points of great importance and utility in steam fire-engines, where rapidity of action is essential to good work. To accomplish these ends I proceed to construct and combine the mechanism hereinafter set forth, and pointed out in the claims.

The accompanying drawings illustrate what I consider the best means for carrying my invention into practice.

Figure 1 is a vertical section of the pump, taken through the center of the induction and eduction passages. Fig. 2 is a vertical central section of the pump, taken at right angles to Fig. 1. Fig. 3 is a plan view with the cover and pistons removed, and the valve-chest of the boiler feed-pump removed to accommodate the figure to the sheet. Fig. 4 is a detail of the water-gage. Fig. 5 is a transverse section of the pump through the upper set of valves. Fig. 6 is a transverse section of the pump, taken just below the upper valves.

Similar letters of reference indicate corresponding parts in all the views where they occur.

A is the body or cylinder of the pump, which is cast integral with the following-named parts: the ends *a a*, the partitions *a' a'*, which separate the induction from the eduction chamber, the valve-seat partitions a^2 a^2 a^3 a^3, the working-barrel $A^{\times\times}$ of the boiler feed-pump, and in the same piece is made the central projection or bored portion, A^*, of the body, in which the barrel is held, and which affords enlarged annular spaces a^* in the pump-cylinder opposite the induction and eduction ports, to allow free entrance and exit of the water.

The valves *b b* are the induction-valves, and held against their seats by springs *b' b'*, tending to keep the valves always closed, but permitting them to open to admit water at the proper time. These valves are arranged at the top (or near the top) of the pump, and at or near the bottom also, so as to make the pump double-acting. The eduction-valves (marked *c c*) are similarly arranged, but are equipped with springs *c' c'*, which rest against the back of the valves, and tend to force them in toward the center of the pump.

Openings are made in the shell of the pump, through which the valve-stems mounted upon plugs a^4, for covering said openings, are inserted. Through these openings the valve-seat partitions are trued and prepared to receive the valve-seats.

The ends of the pump are marked *a a*, and, as above stated, are cast integral with the pump-body. Over these ends, which are trued and faced up, are placed the covers A', which are provided with projecting edges or flanges a^5, and are fitted over the ends and properly secured. The flanges or projecting edges prevent the packing from being blown out from between the head or cover and the ends. The cover at one end is provided with two stuffing-boxes, *d d'*, the former being for the piston-rod D of the main pump, and the latter, *d'*, for the piston-rod D' of the boiler feed-pump.

The main pump-barrel C is a separate piece from the body of the pump, and is provided with a shoulder, C^*, which bears against the edge or rim of extension or projection A^*, which is bored true to receive it. The upper end of the barrel is provided with lugs $C^{\times\times}$, which rest under the cover A' at the upper end of the pump, and are pressed upon by said cover, and the barrel C is held firmly between the cover and the part $A^\times$.

The barrel $A^{\times\times}$ of the boiler feed-pump is cast in the partition of the pump-body integral therewith, and gives not only a reliable and compact structure, but simplifies the construction and renders it unnecessary to bolt the same to the pump-body, as is usually done.

The piston-rods D D′ are yoked together, as shown at d^*. The valve-chest a^{**}, which is secured to the body of the pump in proper relation to the barrel A**, contains the usual induction and eduction valves, as shown, and operates in the manner well known in single-acting pumps. This pump connects with a suitable water-supply and with the boiler, and gives the force-feed to the circulation, as described in an application filed by me on the 27th day of January, 1886, Serial No. 189,944.

The piston D*, which is attached to rod D and works in barrel C, is formed with a threaded hub, Z, formed with one of the end plates, Z′. Upon this hub screws a cone, X, which is internally screw-threaded. A reverse cone, X′, is set upon the exterior of cone X, and serves to expand the packing-rings X^2. Both the packing-rings and the cone X′ are split or cut into two or more part circles, so as to be readily expanded. The cone X is integral. In the ends of cone X are placed two or more pins, x^3, which enter holes in follower or plate Z^2 and prevent the cone X from being turned by the movement and work of the parts. Outside of the follower or plate Z^2 the end of the piston-rod is provided with a nut or nuts, as shown, to hold the piston upon the piston-rod. By screwing cone X farther up on the hub the packing is spread and its wear compensated for.

E is the induction or suction port, and F is the eduction or discharge port.

The air-charging device is applied to the discharge side of the pump.

Recognizing the principle by which air always seeks to rise above water, being the lighter of the two fluids, I have connected the top of the discharge portion or side of the pump with the top of the air-chamber F′ by first an opening or bore, *f*, and a tube, *f′*, suitably formed and jointed, extending up into the air-chamber to near its top. The air which is introduced into the pump in the water will be driven into the air-chamber, which will become filled with compressed air, and will take all the pulsations and movements of the water and prevent the same from being communicated to the water in the hose, thereby causing throbs or pulsations in the hose, and causing the stream thrown from the nozzle to be unsteady and irregular, as is so observable in most fire-engines.

In my device the pulsations and throbs in the hose and the unevenness of the stream are entirely overcome and a steady strong stream is maintained. As will be noticed, the discharge-passage F connects with the discharge side of the pump about mid-height thereof, so that the opening *f* into the air-tube *f′* is above said discharge-opening. This prevents any air from flowing out with the water, but it will all rise through the air-tube into the air-chamber. The air-passage *f f′* is connected to the extreme top of the discharge-chamber of the pump, while the air-chamber F is set over the discharge-opening, which, as stated, connects to the discharge-chamber at a point down its length. Now, the air which is in the water which is passing through the pump will collect at the top of the discharge-chamber, and in my invention it is allowed to pass off into the top of the air-chamber, so that no air will pass out of the discharge-chamber at the opening made for the water, but will all flow up into the top of the air-chamber through the passage *f f′*. In pumps which depend upon the escape of air from the water as it is passing out through the discharge-opening—that is, such as have an air-chamber over the discharge-opening, as mine is, but without the air-passage *f f′*, leading from the top of the discharge-chamber to the top of the air-chamber—and in pumps in which the air-passage into the air-chamber is connected to the discharge-chamber at some point below the top of the discharge-chamber, the separation of the air from the water is not complete, and the operation of the hose is not easy and even, but the air still remaining in the water will cause it to throb and pulsate and give an irregular stream. To admit the requisite air for charging this air device, I place a small air-cock in the suction of the pump, which may be opened to admit air with the inflowing water. This cock is marked *e*, and is shown under the suction-pipe in Fig. 1.

To ascertain when the air in chamber F′ is at proper compression and a sufficient body is therein contained to effect the desired end above mentioned, I place a gage or test tube in the discharge side and connect it therewith at the proper height to insure that when the water falls below it there is the proper amount and compression of air in the chamber F′. This gage consists of a glass tube, G, closed at the top and provided with a metallic base, which may be screwed into the pump and bring said tube G into communication with the discharge side of the pump. A metal case, H, with a longitudinal slit, *h*, is placed over the glass tube, in which the glass tube is packed at the bottom, so as to make a water-tight joint. The metallic base which screws into the pump is preferably formed with or upon the metallic case, as shown in Fig. 4. The packing is held in said parts in the manner shown in Fig. 4. Now, with this gage secured in place, as shown, and the air-charging device in operation, the height of the water in the tube G can be observed through slit *h*, and when the water sinks below the mouth or entrance to the tube the water from said tube will flow out and the tube be filled with air. When thus conditioned, the amount and degree of compression of air in the chamber is just right to destroy and avoid the pulsations in the hose and the unsteadiness of the stream before referred to, and the cock *e* can be closed, to be again opened when the water again rises in tube G. This air-charging device and test-tube can be used with good effect upon any pump.

In case the pump is drafting from a hydrant

where the water is under pressure the air-cock *e* would leak water and not admit air. To prevent this, I place the air-cock in the top of the cylinder-cover and provide a check-valve which will automatically close against the egress of water, but will admit the air. The check-valve is located between the air-valve and the cover, as shown in Fig. 1, where *k* represents the air-valve, and *l* the check-valve.

It is evident that many modifications and alterations may be made in my device without affecting its working materially. Some of the parts can be used without the others. As already stated, the air charging and testing devices are applicable to other pumps. A different form of valve might be used or a different means of mounting said valves employed.

I preferably divide the packing and the split cone into four part circles to get the best expansive effect. The packing-rings are preferably of fibrous material with soft elastic rubber backs to allow for any inequalities from a true circle as the split cone is pressed out against the packing.

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

1. In a double-acting pump, the combination, with the outer and inner shells cast integral and having a central inward projection forming on the interior of the inner shell a support for the pumping-barrel and a division between the upper and lower valves, and upon the exterior of said inner shell enlarged openings, as *a* a**, for the suction and discharge of the pump, of the pump-barrel, as described, and the pump-heads, one of which holds said barrel in place.

2. In a double-acting cylindrical pump, the combination, with the discharge-chamber common to both actions of the pump, and a discharge-opening at about mid-height of said chamber, of the air-chamber located over the discharge-opening, and an air-passage, as *f f'*, connecting the extreme top of the discharge-chamber with the top of the air-chamber, whereby the air in the water will all escape through said passage *f f'* without passing with the water out through the discharge-opening, as set forth.

3. The combination, with the pump-cylinder having the discharge-opening below the top of the discharge-chamber, and the air-chamber, as described, of the tube and opening or passage connecting the top of the discharge-chamber with the top of the air-chamber, and a glass test-tube open at the bottom and closed at the top and sides, and connected with the discharge of the pump at a point below the tube or opening, as and for the purpose set forth.

4. A pump having its ends cast integral with the shell, and also having a barrel for the boiler feed-water pump formed directly in the body of the pump and integral therewith in one of the dividing-partitions, and a valve-chest for said feed-water pump, secured upon the outside of the pump.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM DAVIS HOOKER.

Witnesses:
CHARLES MAGEE,
C. D. GREENE, Jr.