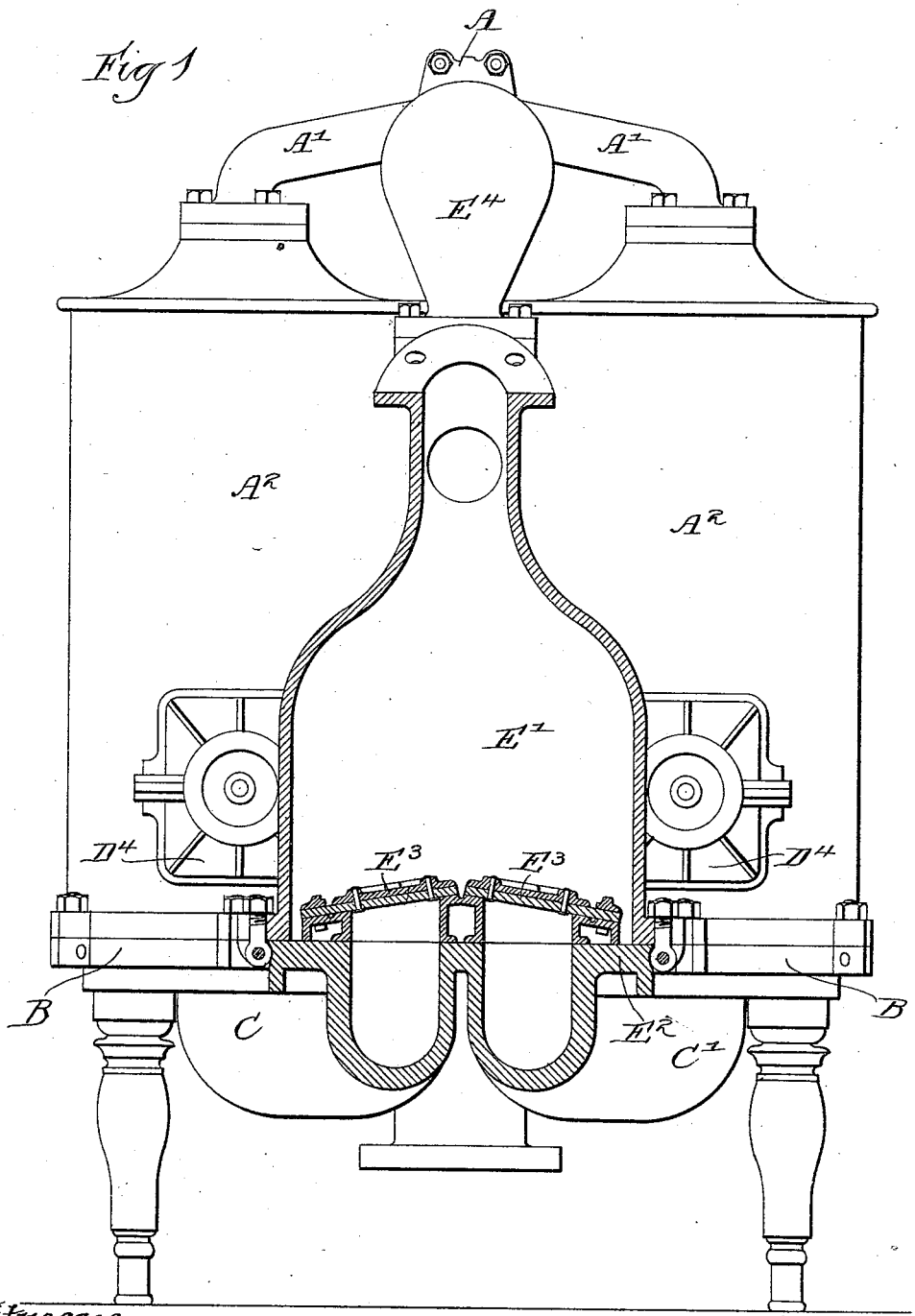
(No Model.) 4 Sheets—Sheet 1.

G. H. ZSCHECH & W. H. SUMBLING.

STEAM VACUUM PUMP.

No. 526,067. Patented Sept. 18, 1894.

Fig 1



Witnesses
Wm. J. Fleming
Wm. H. Sheen

Inventors
Gustavus H. Zschech
William H. Sumbling.
by Bruce W. Baker, Atty

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Fig. 2.

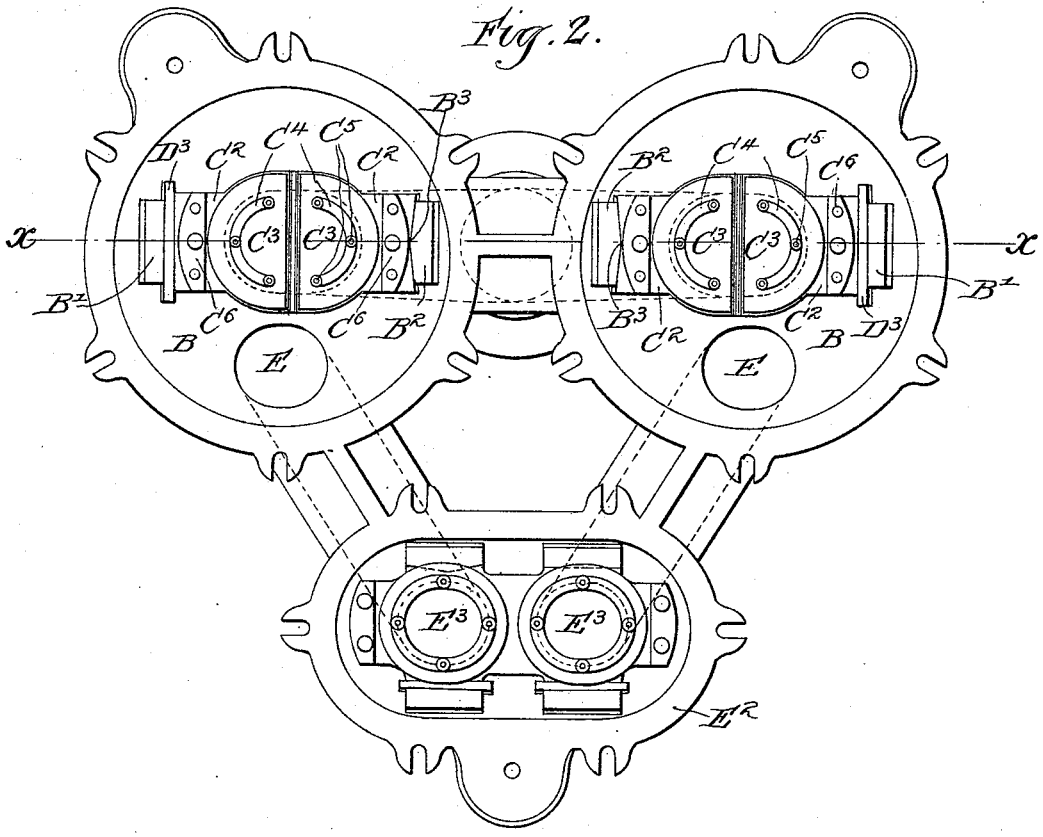
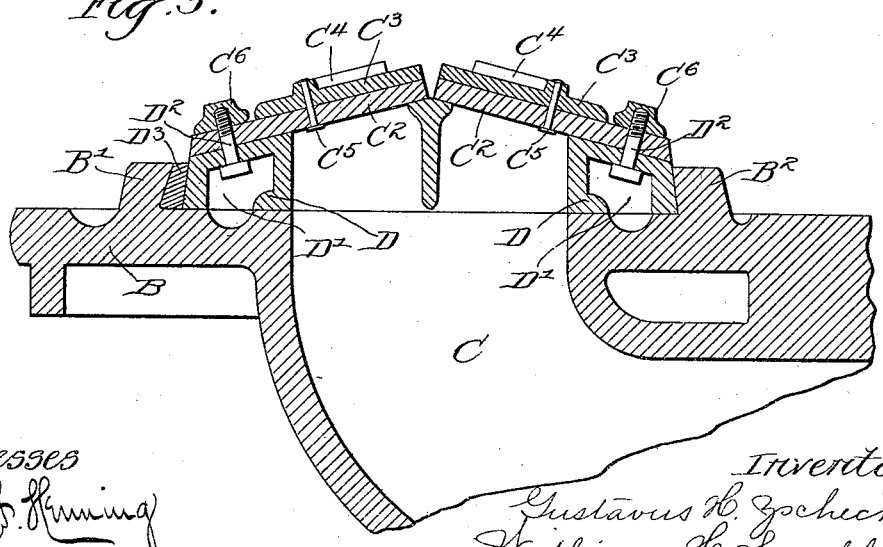


Fig. 3.



Witnesses
Wm. L. Fleming
Wm. M. Sheem

Inventors
Gustavus H. Zschech
William H. Sumbling.
by Francis W. Parker, Atty.

(No Model.) 4 Sheets—Sheet 3.

G. H. ZSCHECH & W. H. SUMBLING.

STEAM VACUUM PUMP.

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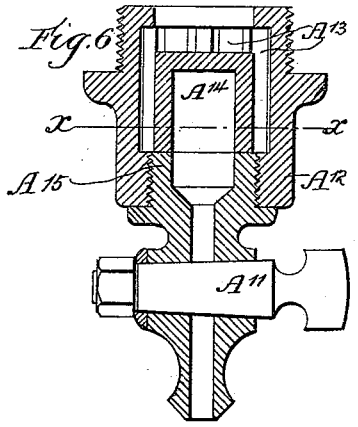

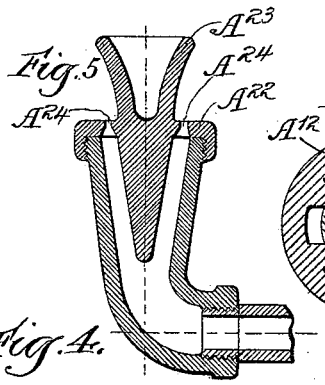

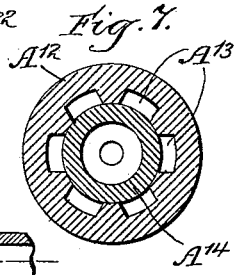

Witnesses
Wm. L. Fleming
Wm. M. Rheem.

Inventors.
Gustavus H. Zschech
William H. Sumbling
by Lacey W. Parker, Atty.

(No Model.) 4 Sheets—Sheet 4.

G. H. ZSCHECH & W. H. SUMBLING.

STEAM VACUUM PUMP.

No. 526,067. Patented Sept. 18, 1894.

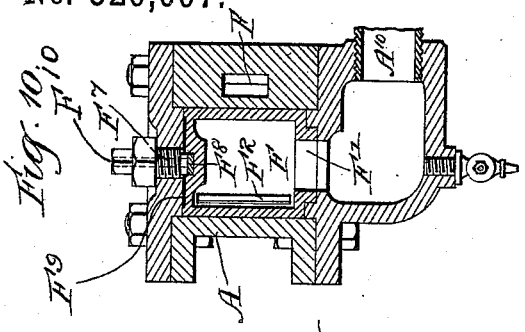

Fig. 10.

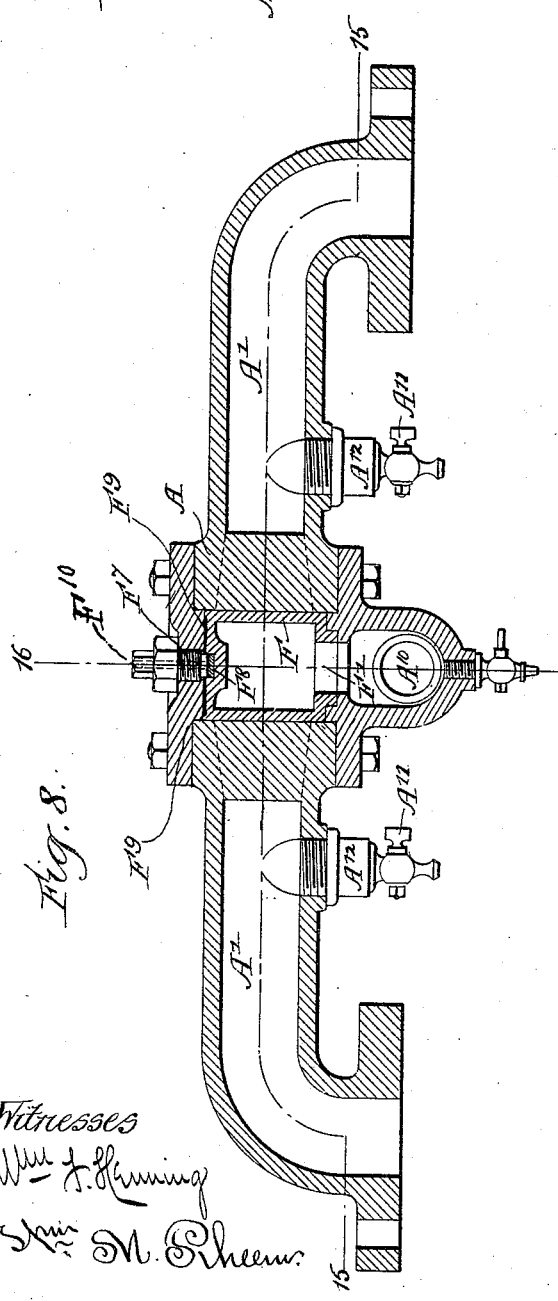

Fig. 8.

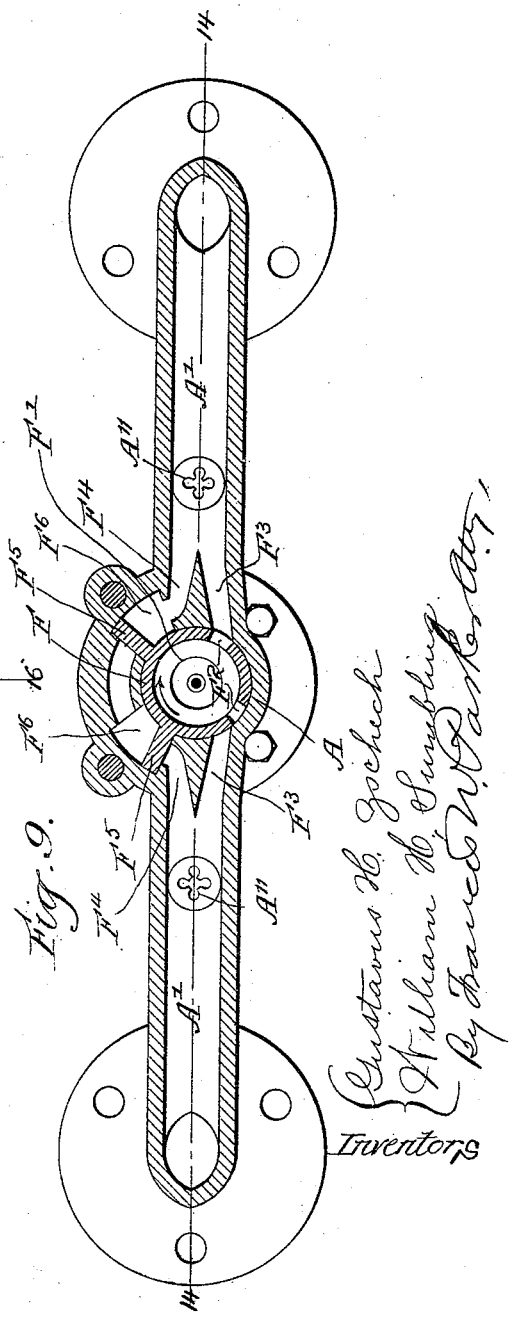

Fig. 9.

Witnesses
Wm. T. Fleming
Thos. N. Sheem.

Inventors
Gustavus H. Zschech
William H. Sumbling
By Farrell & Co's Attys.

UNITED STATES PATENT OFFICE.

GUSTAVUS H. ZSCHECH AND WILLIAM H. SUMBLING, OF CHICAGO, ILLINOIS.

STEAM VACUUM-PUMP.

SPECIFICATION forming part of Letters Patent No. 526,067, dated September 18, 1894.

Application filed July 14, 1893. Serial No. 480,543. (No model.)

To all whom it may concern:

Be it known that we, GUSTAVUS H. ZSCHECH and WILLIAM H. SUMBLING, citizens of the United States, residing at Chicago, Cook county, Illinois, have invented a new and useful Improvement in Steam Vacuum-Pumps, of which the following is a specification.

Our invention relates to improvements in steam vacuum pumps for pumping water impregnated with sand or other matter.

The object of our invention is to supply an improved pump for this purpose, that will be free from many of the objections to which such pumps as now made are subject, as the wear on valves and valve attachments, &c.

Referring to the accompanying drawings, Figure 1 is an elevation in part section. Fig. 2 is a plan view of base of pump. Fig. 3 is a section through the base of one cylinder on line *x*, *x*, Fig. 2. Fig. 4 is a vertical section through the pump cylinders. Fig. 10 is a plan view of the cap for same. Fig. 5 is a section through one of the condensing jet nozzles. Fig. 6 is a vertical section through one of the air valves. Fig. 7 is a section on line *x*, *x*, Fig. 6. Figs. 8, 9 and 10 are detailed views of the steam admission valve.

Like parts are indicated by like letters throughout.

The steam chest A is connected by the pipes A′, A′, with the cylinders A^2, A^2, which are fastened to the base B. Within the steam chest A is a cylindrical cavity containing the valve body or valve F.

The steam valves are preferably made of some non-corroding metal, as gun metal, so that when the pump is out of use, they will not corrode and stick to the steam chest.

The passages A′, A′, are divided into two branches A^8, A^9, when they leave the steam chest, the branches A^9 entering the steam chest above the valve as shown. Steam enters the steam chest through the pipe A^{10}. The passages A′ are each provided with the air valves, which are regulated by the stop cocks A^{11}. One of these valves is shown in detail in Figs. 6 and 7, and consists of the outer cup shaped portion or case A^{12}, containing the grooves A^{13}, and the cup-shaped valve A^{14}, resting on the valve seat A^{15}. It will be seen that in this device there are two cup shaped portions opening in opposite directions. The passages A′ are provided at their ends with the spray baskets A^{16}, having convex bottoms and provided with the slots A^{17}. A pipe A^{18} supplies the condensing nozzles A^{19}, A^{19} with water.

Fig. 5 is a modified form of the condensing nozzle, in which there is no valve. The top or cap A^{22} is provided with the bell A^{23}, as shown, which catches any dropping particles, and prevents them from entering the holes A^{24}. These holes get larger as they descend, so that if anything does get into them, it will not stop up the passage. The bell A^{22} also scatters the jets of water throughout the cylinder.

Lugs B′, B′ and B^2, B^2 are cast on the base B, so as to come within the steam cylinders A^2, A^2, each lug being beveled as shown in Fig. 3. The lugs B^2, B^2 have each one side consisting of two beveled surfaces which cut each other at the middle of said side and form a point or projection B^3 as shown in Fig. 2.

The mouths of the pipes C, C′, through which the water and impurities are admitted to the cylinders, A^2, A^2, are covered with the valves C^2 C^2, or rubber or some similar material. These valves are covered with the semicircular cast iron plates C^3, provided with the annular lugs C^3, and fastened to the said valves by the rivets C^5. These valves rest upon a removable valve seat D, the top of which is composed of two inclined planes, upon each of which rests a valve. (See Fig. 3.) These valve seats are provided with the cavities or hollow portions D′, D′, for the reception of the heads of the screw bolts D^2, D^2, which pass through the rubber valves C^2 and are screwed into threaded holes in the pieces C^6. These bolts hold the said valves in position, the rubber bending at the point between the iron pieces C^3 and C^6 when the valve is moved. By this arrangement, the heads of the securing bolts D^2, D^2 are out of reach of the sand or other destructive matter, and therefore are not worn so as to make it impossible to remove them with a wrench, which is the case when they are exposed as in the ordinary pump. These valve seats are provided with beveled ends, and have grooves into which fit the projections B^3 on the lugs B^2. The said valve seats are held in place by the

keys, D^3, tapered both ways as shown to hold the valve seat firmly in place. D^4, D^4 are the covers for the hand holes, through which the valves are reached.

E, E, are the openings of the discharge passages leading to the discharge chamber E', which is fastened to the base E^2. These discharge passages are controlled by the valves E^3, E^3, which are of the same pattern as the valve C^2, C^2, referred to above, but somewhat modified in form to utilize the space in the discharge chamber to the best advantage. An air chamber E^4 is secured to and communicates with the discharge chamber E'.

The portion of the base B, upon which the valve seats D rest, are raised so as to allow of their being smoothed up without smoothing the surface of such plate exposed to the action of the sand and other destructive matter, said surface being left in the rough as when cast, which prevents the sand and other material from wearing it away.

Referring to the modification of the steam admission valve represented in Figs. 8, 9, and 10. In this case, the valve F is a hollow cylinder, having the opening F', through which steam from the boiler enters, and the openings F^2, F^2, through which steam is admitted to the passages A', A', and hence, cylinders A^2, A^2. The passages A', A' are divided into the passages F^3, F^3 and F^4. The passage F^4 is continuous between the two passages A', A', but is closed by the pieces F^5, F^5, projecting from the valve F, and is enlarged at F^6, F^6, so as to allow a sufficient motion of said pieces, and hence, the valve F, to open and close the passages F^3, F^3. One piece F^5 may be used alone and would be situated between the two pieces F^5 shown in the drawings. A bolt F^7 passes through the top of the steam chest A, the lower end of said bolt entering a hole in the center of the top of the valve F, and bearing upon the hard metallic piece F^8 at the bottom of said hole. The end of this bolt acts as a pivot on which the valve rotates the upward pressure of the steam, keeping the said valve in contact with the bolt. By this arrangement, we get a very small bearing surface and hence, a small amount of friction, thus allowing the valve to be readily moved. The bolt F^7 can be adjusted to take up the wear and prevent the valve from rubbing against the top of the steam chest.

F^{10} is an oil hole which supplies oil to the bearing of the valve by means of a hole through bolt F^7.

F^9 F^9 are grooves on the top of the valve F to allow lubrication of the sides of the valve.

The manner of working this valve is similar to that of the valve of which it is a modification, viz: When the condensing jet produces a partial vacuum in the right-hand cylinder, the pressure in the passage F^4 on the right becomes less than the pressure in said passage on the left, and the valve is moved in the direction of the arrow, cutting off steam from the right-hand cylinder, and admitting steam to the left-hand cylinder and vice versa.

The reason for making the passage F^4 continuous is to prevent a cushion of air in the enlargement F^6, which would impede the motion of the valve.

In the modification of the steam admission valve shown in Figs. 8, 9, and 10, the valve H contained in the steam chest A is a hollow rectangular shaped reciprocating valve. Steam is admitted into the hollow portion of the valve H' through the openings H^2, steam being supplied to the cylinders through the openings H^3, H^3. The upper part of the valve is provided at its center with a receptacle and bearings H^7 for the journals H^8 of a roller, H^4, which rolls along the adjustable plate H^5, in the upper part of the steam chest A'.

H^6 is an oil hole by which oil is applied to the bearings of the roller.

The particular form, construction and arrangement of these various parts may be altered or changed without departing from the spirit of my invention, and I therefore do not wish to be limited to the precise arrangement shown.

The use and operation of our invention are as follows: When the steam admission valve is in the position shown in Fig. 9, steam is being admitted into the pipe A' on the right through opening F^2 and hence into the right hand cylinder A^2 (see Fig. 4) which at this time would be full of sand and water. The entering steam is scattered by a spray basket A^{16} (shown in left hand cylinder Fig. 4) and its pressure evenly distributed over the surface of the sand and water which will be forced into the discharge E' and thence to the place where it is desired to lift it. When the level of the sand and water in the cylinder falls below the nozzle A^{19} of the condensing jet, a jet of water is forced up into the steam condensing it and producing a partial vacuum. The pressure in the passage F^4 on the right of the valve F (Fig. 9) becomes less, on account of the steam rushing rapidly through passage F^3 to fill up the vacuum in the cylinder, than the pressure in passage F^4 on the left, and hence said valve will be rotated so as to cut off steam from the right hand cylinder and admit steam to the left hand cylinder. The partial vacuum in said right hand cylinder causes the air to force the sand and water through pipe C, which raises valves C^2 C^2 and enters said cylinder. When the level of the sand and water rises above the jet nozzle A^{19} the jet ceases to play. In the mean time the water is being forced out of the left hand cylinder by the entering steam and when the level falls below the jet nozzle A^{19} a jet of water is forced up into the steam, condensing it and forming a partial vacuum. This causes the valve F to be rotated as described above, so as to cut off steam from the left hand cylinder and admit steam into right hand cylinder, when the same process is repeated as described above.

The air chamber E^4 gives the discharge streams a steady flow. When the valves C^2 are worn out, the key D^3 is driven out, the valve seat removed, the bolts D^2 taken out and new valves replaced. By this arrangement the heads of the bolts D^2 are not injured by the sand, and they can be readily removed, which is a great item in this sort of a pump. The manner in which the jet nozzles are arranged prevent sand, &c., from clogging and stopping the jet and insures a correct working of the pump. The air valves A^{12} prevent the sand and water from rising too high and filling up the passages A′ and F^4.

I claim—

1. In a steam vacuum pump, the combination of a cylinder with a valve and valve seat wholly within the cylinder, said valve seat removably secured to the bottom of the cylinder, and screws passing through said valve seat from beneath so as to secure the valve to the seat without being exposed to the inside of the cylinder.

2. A valve for a steam vacuum pump and the like consisting of a removable valve seat recessed below, a flexible valve body, and a plate, between which plate and the seat the flexible body is secured, and screw bolts which pass upwardly through the seat through the flexible body of the valve and into such securing plates so that no part of such screw bolts is exposed within the cylinder.

3. The combination of a cylinder with a valve, said valve entirely within the cylinder and consisting of a flexible portion, a strengthening plate secured thereto above the valve aperture, a securing plate placed at one end of the flexible portion, a valve seat and screw bolts projecting through such valve seat through the flexible portion and into the securing plate.

4. A condensing nozzle for steam vacuum pumps consisting of a nozzle projecting into the cylinder, and provided with passage-ways which continuously and regularly diminish in cross-sectional area to the point of opening, and a deflecting hollow inverted bell rigidly attached to said nozzle and disposed between such openings so as to guard said openings, and receive within itself, substances, which otherwise might be discharged upon such openings.

5. An admission valve for steam vacuum pumps consisting of a hollow cylindrical valve body closed at one end and having an opening at the other end for the admission of steam into the hollow portion of such valve body, and openings on the sides through which steam is admitted to the cylinders and a projecting piece or pieces on the outside of such valve body by which said valve body is rotated by the difference of pressure in the two cylinders.

6. An admission valve for steam vacuum pumps consisting of a hollow cylindrical valve body with an opening on one end for the admission of steam into such valve body and openings on the sides through which steam is admitted to the cylinders, and a projecting piece on the outside of said valve body, said valve body rotating on a pivot bearing in a hole at the center of its upper end.

GUSTAVUS H. ZSCHECH.
WILLIAM H. SUMBLING.

Witnesses:
D. M. CARTER,
WALTER J. GUNTHORP.