

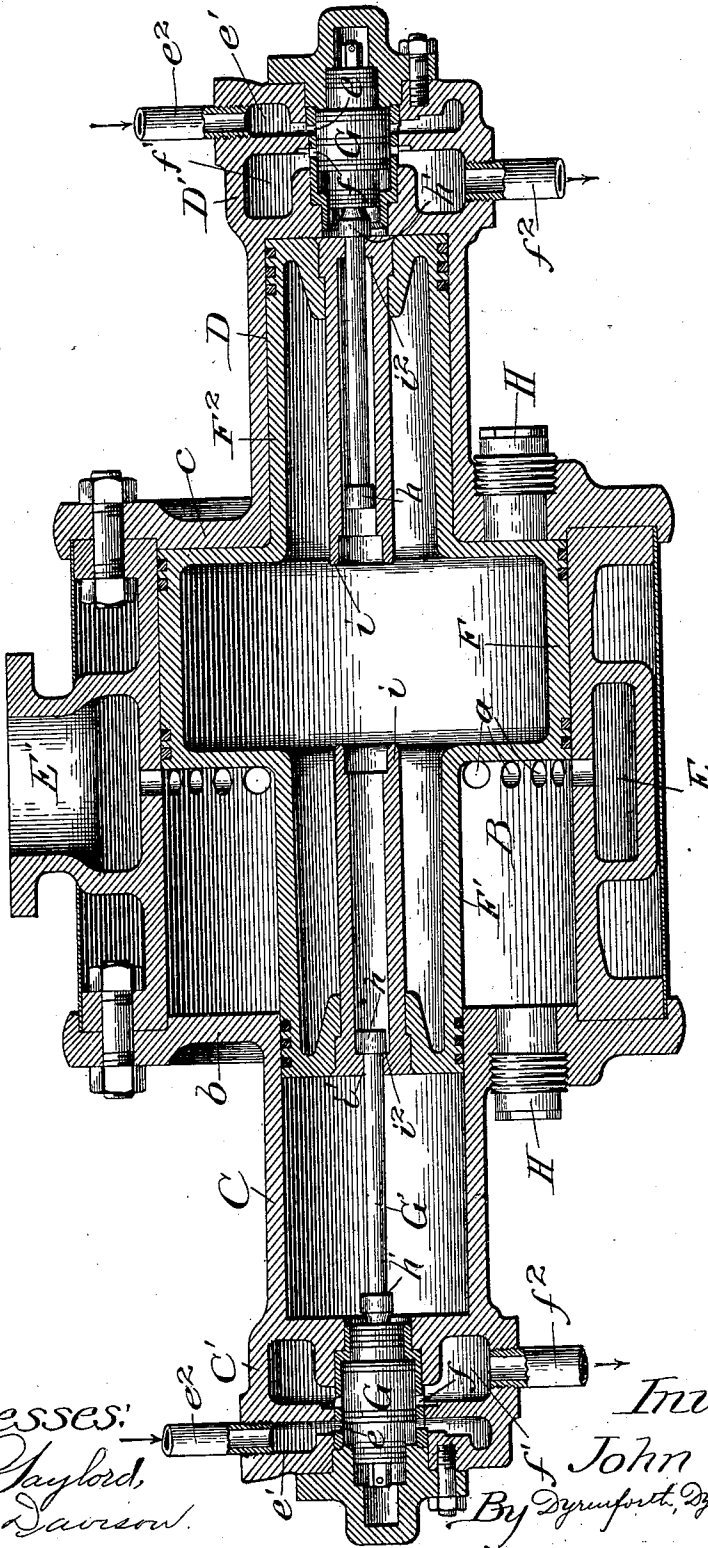
J. STUMPF.
VACUUM PUMP.

APPLICATION FILED OCT. 8, 1901.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
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Inventor:
John Stumpf,
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2 SHEETS—SHEET 2

Fig. 2.

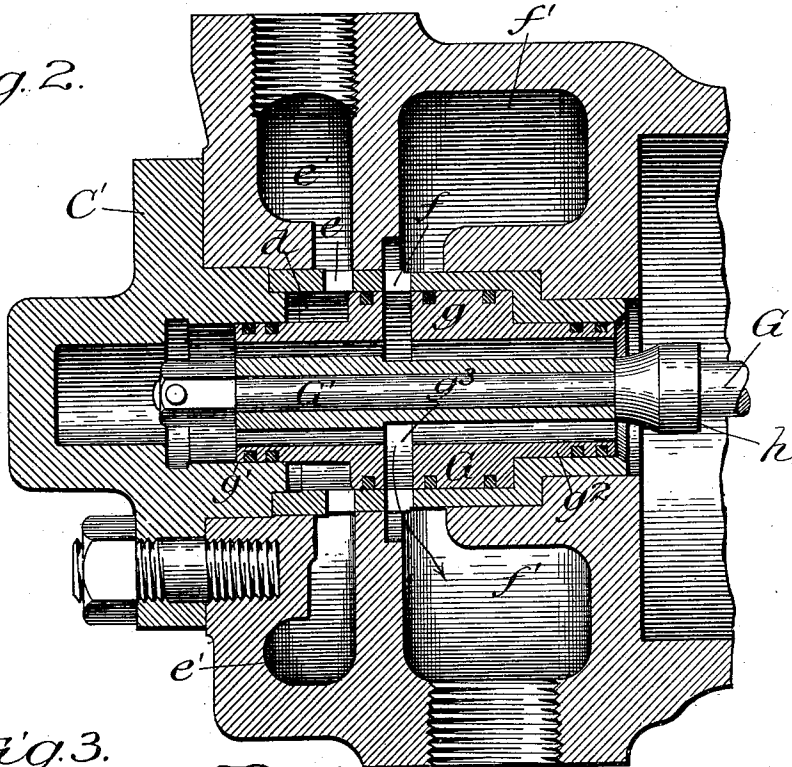


Fig. 3.

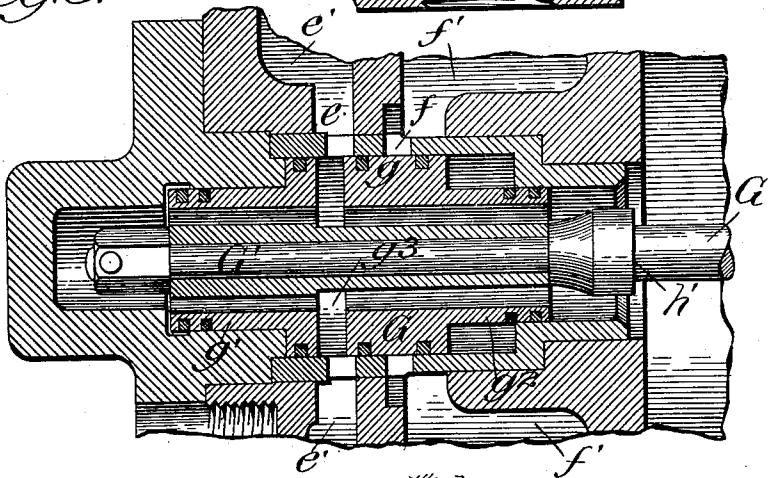
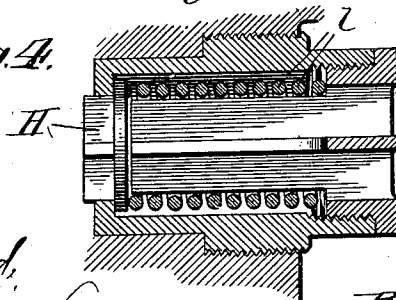


Fig. 4.



Witnesses:
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UNITED STATES PATENT OFFICE.

JOHN STUMPF, OF BERLIN, GERMANY.

VACUUM-PUMP.

SPECIFICATION forming part of Letters Patent No. 722,416, dated March 10, 1903.

Application filed October 8, 1901. Serial No. 78,006. (No model.)

To all whom it may concern:

Be it known that I, JOHN STUMPF, a subject of the King of Prussia, German Emperor, residing at Berlin, Kingdom of Prussia, German Empire, have invented a new and useful Improvement in Vacuum-Pumps, of which the following is a specification.

My invention relates to an improvement in vacuum-pumps for use in withdrawing air or gas, as from a chamber wherein it is desired to create or maintain a partial vacuum.

My object is to provide a steam-actuated double-acting vacuum-pump of simple and improved construction and having relatively great working capacity.

In the drawings, Figure 1 is a longitudinal section of a double-acting vacuum-pump of my improved construction; Fig. 2, a broken and enlarged section through one of the steam slide-valves, showing the valve in exhaust position; Fig. 3, a similar view of the same valve in the position of opening the steam-inlet port, and Fig. 4 a broken and enlarged section showing one of the air or gas outlet valves of the pump-cylinder.

A is a shell or casing, which may be constructed in sections, as shown, for convenience in placing the parts in position. The shell A incloses a pump-cylinder B and steam-cylinders C D. Surrounding the cylinder B is a cored chamber E, having an inlet E', and communicating with the interior of the cylinder B through an annular series of openings *a*, located exactly midway between the cylinder-heads *b c*. Working in the cylinder B is a hollow piston F, and formed integral therewith are hollow pistons F' F², working in the cylinders C D. On the outer ends of the cylinders C D are valve-chests C' D', respectively, each provided centrally with a cylindrical valve-chamber *d*, communicating through an annular series of ports *e* with an annular steam-inlet chamber *e'*, receiving steam through the pipe *e²*, and provided also with an annular series of exhaust-ports *f*, communicating with an annular exhaust-chamber *f'*, having an exhaust-pipe *f²*. In the chambers *d* are cylindrical slide-valves G. Each valve G is formed with a central enlarged part *g*, working in the chamber *d*, and reduced end portions *g'* *g²*, working in guide-openings at opposite ends of the cham-

ber *d*. The valve G is hollow and is provided through its enlarged part *g* with a steam inlet and exhaust opening *g³*. The valves G are on the ends of the valve-stems G', having heads *h* at their free ends and shoulders *h'* adjacent to the slide-valves. In the parts F' F² of the piston device are guide-tubes *i*, provided in their ends with guide-openings *i'* for the stems G'. In the guides *i* around the openings *i'* are annular shoulders *i²* to engage the heads *h*, as hereinafter described. The hollow slide-valves contain annular chambers *k* in open communication with the cylinders C D and with the steam-ports *g³*. H H are outwardly-opening exhaust-valves in the cylinder-heads *b c*. The valves H are held to their seats by springs *l*.

The piston F is of a length slightly less than one-half the length of the chamber of the cylinder B, whereby when moved to either cylinder-head *b c* it will just uncover the ports *a*. The pistons F' F² are preferably of about the same length as the chambers of the cylinders C D, though they may be somewhat shorter.

In practice the inlet-opening E' communicates with the chamber from which air or gas is to be withdrawn, and the valves H open to the surrounding atmosphere. Any air or gas in the chamber or the like to be exhausted will expand through the inlet E' to the annular chamber E. In the movement of the piston F to the position shown it has created a vacuum in that part of the cylinder B to the left of the ports *a*, so that when the piston has reached the position shown any air in the chamber E will expand into the cylinder. In the final movement of the piston F to the cylinder-head *c* air in that half of the cylinder has been discharged through the respective valve H, and the engagement of the head of the cylinder F² with the shoulder *h'* of the slide-valve stem has moved the slide-valve in the chest D' to the position shown, wherein the slide-valve port *g³* registers with the steam-inlet port *f*. Steam entering through the port *f* of the chest D' will force the piston F² and its integral parts F F' to the left in Fig. 1, first closing the ports *a*, and then when the air ahead of the piston is compressed above atmospheric it is discharged through the left-hand valve H. In

this movement of the piston a vacuum is created between it and the cylinder-head *c*, whereby when the ports *a* are uncovered the air or gas to be withdrawn will expand into the cylinder. In the final movement of the piston in either direction it engages the head *h* of the stem of one valve to open the steam-inlet and engages the stop *h'* of the stem of the other valve to close the steam-inlet port and open the steam-exhaust port. Thus the actions are repeated. In spite of the difference in area between the working faces of the piston *F* and the pistons *F'* *F''* as the resistance to movement is never greater than atmospheric pressure the steam-pressure need not be high. To give the pump the greatest capacity, there should be no clearance between the piston *F* and adjacent cylinder-head when the piston reaches the end of its stroke. The pump may be operated at any desired speed and may be caused to withdraw air or gas very rapidly.

While I prefer to construct my improvements throughout substantially as shown and described, they may be variously modified in the matter of details of construction without departing from my invention as defined by the claims.

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

1. In a vacuum-pump, the combination of a pump-cylinder provided in its ends with valved outlet-ports and midway between its

ends with an inlet-port, a pump-piston movable in the cylinder to the ends thereof without clearance and adapted at the end of its stroke in either direction to uncover the inlet-port, a steam-cylinder at each end of and concentric with the pump-cylinder, steam-pistons connected with the pump-piston and movable in the steam-cylinders, and steam-valves at the steam-cylinders movable to admit and exhaust the steam alternately at the steam-cylinders, said valves being controlled by the movement of the pistons.

2. In a vacuum-pump, the combination of a pump-cylinder provided in its ends with valved outlet-ports and midway between its ends with an annular series of openings forming the inlet-port, an inlet-chamber communicating with the series of openings, a pump-piston movable in the cylinder to the ends thereof without clearance and adapted at the end of its stroke in either direction to uncover the series of openings, a steam-cylinder at each end of and concentric with the pump-cylinder, steam-pistons connected with the pump-piston and movable in the steam-cylinders, a valve-chest at the end of each steam-cylinder, a slide-valve in each chest in axial alinement with the pistons, said valves being moved by movement of the pistons.

JOHN STUMPF.

In presence of—

HENRY HASPER,
WOLDEMAR HAUPT.