

M. WENKEL.  
 HIGH SPEED COMPRESSION AND VACUUM PUMP.  
 APPLICATION FILED MAY 26, 1909.

947,536.

Patented Jan. 25, 1910.

FIG. 1.

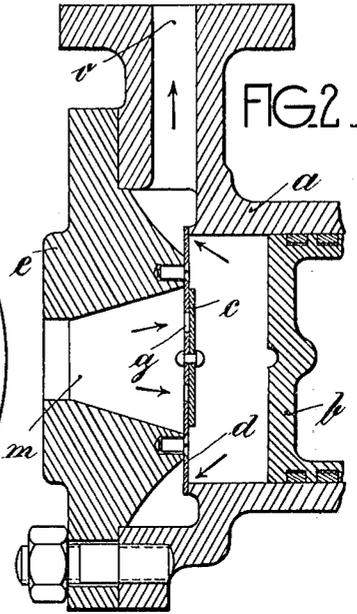
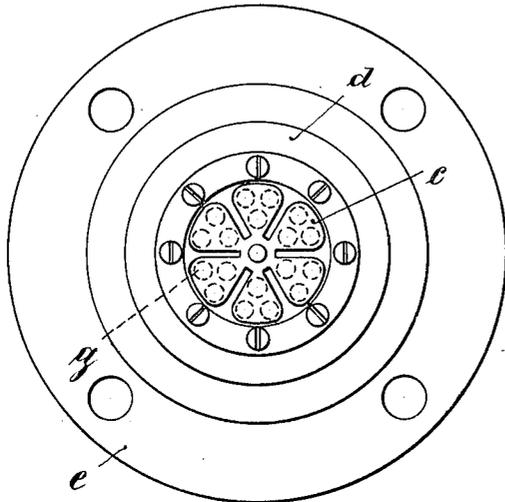


FIG. 2.

FIG. 3.

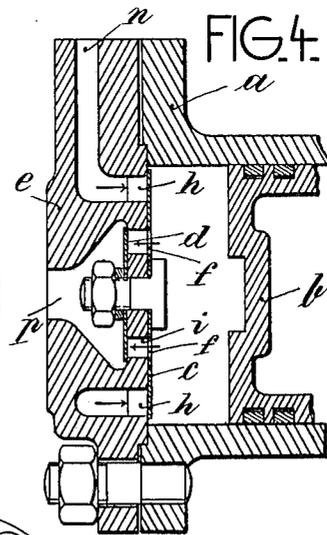
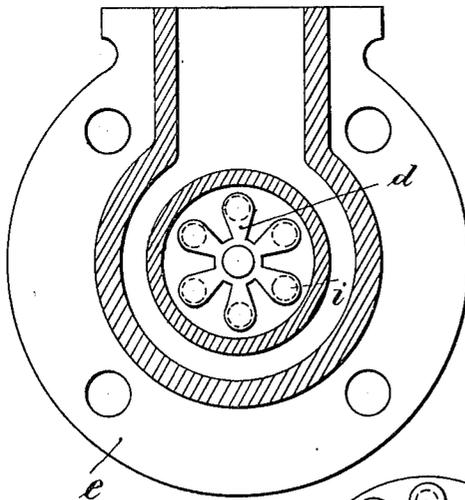
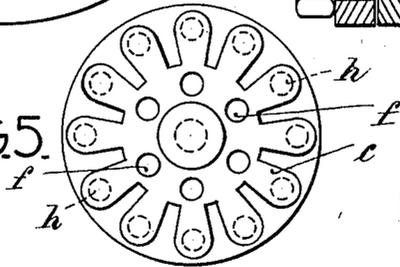


FIG. 4.

FIG. 5.



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# UNITED STATES PATENT OFFICE.

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HIGH-SPEED COMPRESSION AND VACUUM PUMP.

947,536.

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To all whom it may concern:

Be it known that I, MAX WENKEL, a subject of the German Emperor, residing at Schlottwitz, district of Dresden, German Empire, have invented certain new and useful Improvements in High-Speed Compression and Vacuum Pumps, of which the following is a specification.

This invention relates to machines, which are suitable for use as compressors for the production of compressed air and other compressible media for high pressure and as vacuum pumps, particularly the so-called "Kryszat" compressors and vacuum pumps. These machines are high speed machines, making 600 revolutions and more per minute. Nevertheless this number of revolutions is not sufficient for enabling the machines to be coupled directly with high speed electric motors without any gearing such as spur wheels or the like; an endeavor to effect which is general in cases where electric motors are employed for driving. In order to enable pumps of the kind mentioned, as well as compressors generally to effect 1,000 revolutions and more per minute, it is necessary that the valves should be suitably constructed and arranged and caused to act in coöperation, thus that they should be as light and have as small a stroke as possible, without their stability being thereby impaired. The present invention is an attempt to solve this problem.

Accordingly the invention consists in the particular arrangement as hereafter described of two plates made of metal or other material acting in conjunction in a special manner as suction and pressure valves, which are flexible and are combined with one another in a special manner without the employment of special adjusting springs.

In Figures 1 and 2 and 3 to 5 two forms of the invention are illustrated.

$a$  is the cylinder,  $b$  the pressure or suction piston,  $c$  the suction and  $d$  the pressure valves,  $e$  the valve support serving as the cylinder cover,  $f$  the valve openings of the suction or pressure valves,  $h, i$ , the air passages in the cylinder cover,  $m, n, o, p$  the air inlet and air outlets in the machine. The arrows indicate the directions which the suction and compressed air take.

In the form of the invention as seen in Figs. 1 and 2 the two valve plates  $c, d$  are joined together by means of a rivet or the

like, and the pressure valve  $d$  which serves as a seat for the suction valve  $c$  is screwed to the cylinder cover, which is suitably formed for the purpose. The outer edge of the opening in the cylinder and in conjunction with the suction-valve  $c$  closes the cylinder through the medium of the cylinder cover. The pressure valve  $d$  has through passages for the suction air and for any other kind of gas. The valve plates  $c, d$  in the present case are round and are formed with excisions and perforations as seen in Fig. 1 in order that they may be as light and as flexible as possible. The action of the valve system is as follows:—When the piston  $b$  moves forward the air is drawn in through the passage  $m$  in the cover  $e$  and in consequence of the plate  $c$  being flexible, said plate is raised from  $d$  and the air passes through the openings  $g$  and between the two valve plates into the cylinder. During this suction stroke the valve plate  $d$  is pressed against the edge of the cylinder. On the return stroke of the piston the valve plate  $c$  is pressed against the through openings  $g$ , completely closing them, and, as the margin of the valve plate  $d$  is raised from the edge of the cylinder, the air passes out through the passage  $o$  arranged in the cylinder. The advantages of this form of construction over existing forms do not consist merely in the extremely simple and reliable action of the valves and in the insuring of an exceedingly small objectionable space but also in the arrangement whereby in consequence of the simplicity of construction and the easy flexible mobility of the valve plates and their smallness, a wearing out of the valves is well nigh impossible and in connection therewith a high speed can be attained. A further advantage exists in the convenient manner in which the valves are built in, they being simply screwed on to the cylinder cover that serves as valve bearer and therefore when the valve bearer is removed can be easily removed and exchanged.

In the form of the invention as in Figs. 3 to 5 a modification of that just previously described is shown, in which the cylinder cover  $e$  serves as a seat for both valves  $d, c$  the latter being once more united in the middle and acting together, similar to the arrangement according to Figs. 1 and 2. The air is drawn in through openings  $h$  in

the cylinder cover, passes through openings *f* in the valve-plate *e* and openings *i* in the cover, lifts the edge of the plate *d* and passes out through the passage *p* in the cylinder cover.

In order that there may be no objectionable space in the first form of the invention and that in the second form this space may be limited to that which is formed by the openings *i* in the cylinder cover, the piston *b* is suitably recessed on the end that lies against the cylinder cover and the valve plate, or is furnished with a suitably profiled piece. The present invention may also be suitably applied in connection with large compressors, in large numbers to the cylinder between the latter and its cover or to special junctions arranged on the cylinder.

What I claim is:

1. The combination with a pump having an inlet and an outlet port, one surrounding the other, a stationary wall being interposed between the ports, of oppositely operating coacting flap valves respectively controlling the ports, one of the valves extending across both ports and having openings therethrough to permit the passage of the fluid through the port not controlled by it, and a fastening device passing centrally through both valves and securing the same together.

2. The combination with a pump including a cylinder, a piston operating therein and a head fixed to the cylinder and having concentrically arranged inlet and outlet ports, one surrounding the other, a stationary wall being interposed between the ports, of oppositely operating coacting flap valves having free marginal portions respectively controlling the ports, one of the valves extending across both ports and having an opening therethrough that permits the pas-

sage of fluid through the port not controlled by said valve, the other valve controlling such passage of fluid, and a fastening device passing centrally through the valves and disposed axially to the ports.

3. The combination with a pump having an inlet and a discharge, one surrounding the other, of two flap valves having their central portions secured together against relative movement and having their marginal portions respectively controlling the inlet and discharge.

4. The combination with a pump having an inlet and a discharge, one surrounding the other, of two flexible oppositely acting flap valves secured against relative movement at their central points and respectively controlling the inlet and discharge, one of said valves having an opening through which the fluid passes in one direction and the other valve preventing its passage through the opening in an opposite direction.

5. The combination with a pump including a head having a central port and another port surrounding the central port, of a flexible flap valve having a free marginal portion that controls the outer port and also having an opening registering with the inner port, and another flap valve secured at its center to the first valve and having its marginal portions acting oppositely to the first valve to control the central port and prevent the passage of fluid in one direction through the opening in the first mentioned valve.

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

MAX WENKEL.

Witnesses:

PAUL ARRAS,  
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