L. H. NASH.

PUMP AND AIR COMPRESSOR.

APPLICATION FILED FEB. 24, 1910.

1,091,529.

Patented Mar. 31, 1914.

2 SHEETS—SHEET 1.

Fig. 1

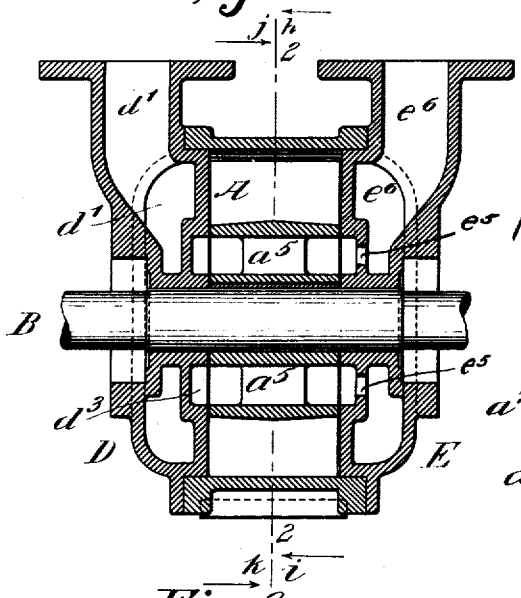


Fig. 2.

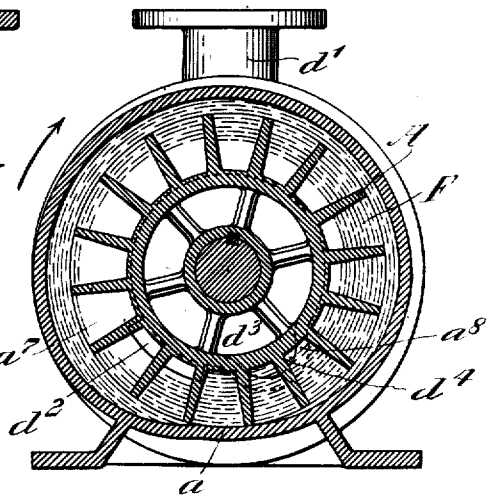


Fig. 3.

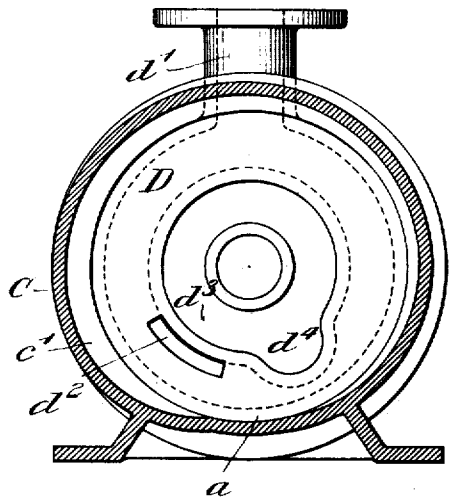
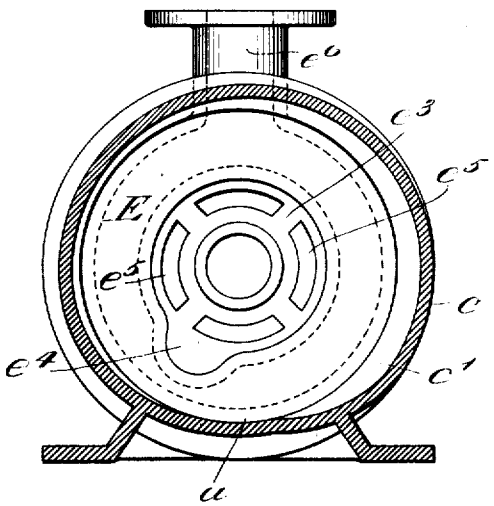


Fig. 4.



WITNESSES

Charles D. Jones.

C. H. Seymour

INVENTOR

Lewis Hallock Nash

by

Gifford & Bull

Attorneys

L. H. NASH.

PUMP AND AIR COMPRESSOR.

APPLICATION FILED FEB. 24, 1910.

1,091,529.

Patented Mar. 31, 1914.

2 SHEETS—SHEET 2.

Fig. 5.

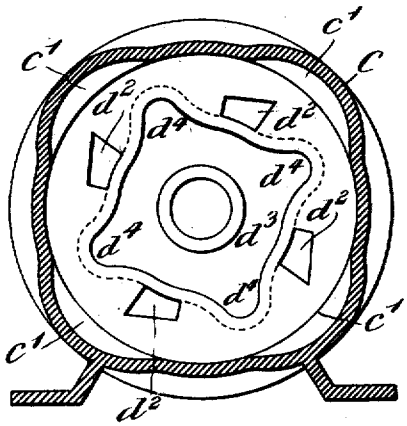


Fig. 6.

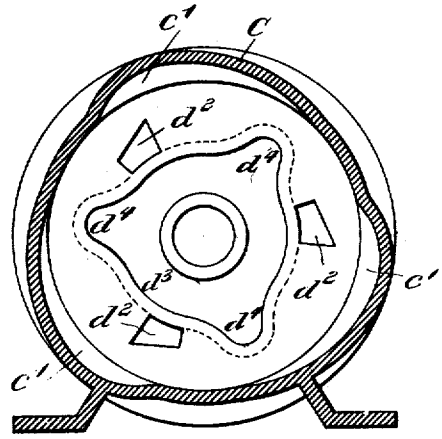


Fig. 7.

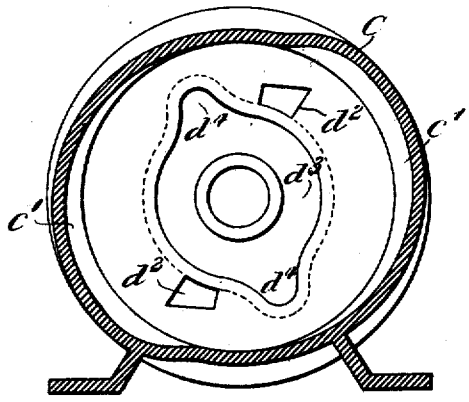
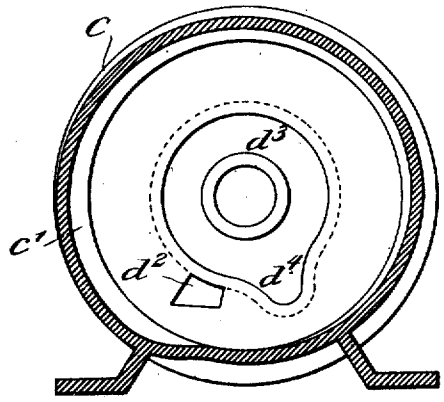


Fig. 8.



WITNESSES

Charles A. Jones.

C. F. Keyser

INVENTOR

Lewis Halleck Nash

by

Gifford & Bull Attorneys

UNITED STATES PATENT OFFICE.

LEWIS HALLOCK NASH, OF NEW YORK, N. Y., ASSIGNOR TO NASH ENGINEERING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

PUMP AND AIR-COMPRESSOR.

1,091,529. Specification of Letters Patent. Patented Mar. 31, 1914.

Application filed February 24, 1910. Serial No. 545,604.

To all whom it may concern:

Be it known that I, LEWIS HALLOCK NASH, a citizen of the United States, and a resident of New York city, borough of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Pumps and Air-Compressors, of which the following is a specification.

My invention relates to improvements in air compressors, vacuum pumps and similar devices, and consists in certain improvements, construction and operation all of which will be clearly pointed out in the specifications and claims.

Referring to the drawings, Figure 1 shows a longitudinal section through a device embodying my invention; Fig. 2 is a cross section taken on the line 2—2 of Fig. 1; Fig. 3 is a view similar to Fig. 2 with the impeller wheel removed; Fig. 4 is a view of the same case chamber looking from the other direction and showing the opposite head; Figs. 5, 6, 7 and 8 are modified forms of structure.

Referring to Figs. 1 and 2, the case chamber is formed of a cylindrical structure having a passage c' in its circumference. At each side are heads E and D which form the ends of the cylindrical chamber and have ports and passages for the inflow and outflow of the liquids. A wheel A is mounted upon a shaft B having bearings in the end heads so that the wheel revolves with its shaft within the case chamber in such a manner as to leave the passage c' between the outer edge of the wheel and the case walls. The wheel A is formed of a cylindrical hollow rim having a passage a^5 extending from end to end of said wheel. On the outside of said rim are formed extending blades which divide the exterior into a series of pockets or buckets open at their sides. The side edges of the blades and the ends of the rim of the wheel fit upon the heads of the case chamber so as to form a joint therewith and these parts coact with ports in the heads to control the entrance and discharge of the fluids into and out of the wheel buckets. The wheel fits the case at one point a and forms a joint while all the rest of the circumference of the case chamber is formed with a passage between the wheel and the case walls. Within the said case chamber is placed a fluid F which is caused to revolve by the motion of the wheel and in doing this it assumes a position substantially like that shown in Fig. 2 of the drawings. The head E has formed within it port e^4 and this port connects with a series of passages e^5 leading to the outlet passage e^6. Upon the opposite side of the case chamber the head D is formed with passage d' which connects with the port d^2 through which the fluids can enter the case chamber. The head D is also provided with a recess d^3 provided with an extension d^4 which communicates through the center of the wheel a^5 with the outlet passage in the opposite head.

The operation of the device is as follows: Suppose the wheel to be revolved in the direction of the arrow in Fig. 2 and that the case chamber is filled with water as shown by the broken lines. The bucket of the wheel in contact with the case at a is full of water but as the wheel advances this bucket or closure passes over an enlarged portion of the case chamber and the liquid is caused to flow out into said enlargement by the centrifugal force of the revolving wheel. This leaves an opening through which air or other gas can be drawn through the port d^2 and, as the wheel continues to advance until the bucket above referred to reaches the position shown at a^7, the water will have largely passed out into the enlarged portion or lobe of the case and the space will have been filled with air. At this point the air port d^2 is no longer in communication with the bucket when in the position shown at a^7. In the continued motion of the wheel the water revolves with the wheel and is forced to enter these buckets by the fact that the lobe begins to contract and the pressure produced upon the air is dependent upon the amount of force which the water is able to exert in such compression. The compressing action takes place throughout the complete motion of the wheel until it arrives at the point marked a^8 when it has reached its point of greatest compression. At this time the wheel passes over the extension d^4 which is the outlet port for the air compressed in the bucket and the compressed air escapes into the passages e^5 and e^6, during which time the air is being ejected by the water which continues to enter said bucket from the extended portion of the case and refills the bucket with water. The wheel now passes to the position at a when the operation is repeated. At the

same time the compressed air is being exhausted through the port d^4 it is also passing through the port e^4 in the opposite head, and this air passes through the center of the wheel, and so escapes to the outlet. The device, therefore, has ports on each end of the wheel and, as they are made of the same dimensions, the wheel is perfectly balanced against end pressure. It will also be observed that the ports e^5 are somewhat nearer the center than the inner rim of the wheel and that a certain amount of water is carried over into the center of the wheel and revolves in the portion d^3. This water, which may contain a certain amount of air, is thus caused to give up this air by centrifugal force, the air passing into the center of the revolving fluid and so out through the ports e^5. The air under pressure exerts its pressure upon the rotating film of water and this makes a joint between the edges of the center rim of the wheel and the end plates D and E so that water intervenes at the said joint and thus obstructs the flow of air, the effect of which is to very largely reduce the danger from leakage.

I will now more fully describe the form of the passage between the exterior of the wheel and the case walls. The object of this passage is to allow the water to flow out of one set of wheel buckets and then to pass around the case passage into another set of buckets. The force that causes this flow is the rotation of the wheel. The water is first drawn out into the passage by centrifugal force and inertia and then each blade of the wheel tends to drive it forward in the passage until the liquid is carried back into the buckets by the walls of the case chamber. As the pressure in the buckets increases as they revolve forward, some of the water will be forced into the buckets and therefore it is not necessary to have the water passage of the same width at all portions of the case; these walls are therefore made to approach nearer the wheel toward the outlet point and thus the form of the passage may be an approximate spiral. For this purpose I make the enlarging portion of the passage c' extend for a smaller arc of the circumference of the wheel and increase the length of the arc through which the contraction takes place. The advantage is that a greater number of blades act in pushing the water toward the outlet port and greater pressure is secured. The advantage of the spiral form of case consists in the fact that each blade of the wheel exerts a driving force upon the liquid in the lobe of the case and this driving force, therefore, increases progressively as the wheel revolves to the position of exhaust. The pressure due to this effect is taken advantage of to introduce more and more water into the bucket containing the compressed air, and this reduces the amount of water outside of the wheel buckets so that the case walls may be made to approach nearer and nearer as the effect progresses. The more blades which can be put into action the greater the effect produced in driving the liquid and the force exerted upon the liquid is transmitted to the gaseous body, as before described. It will be seen that in the preferred form shown in Fig. 2 the maximum depth of the passage c' occurs at a point only a short distance from the joint-forming surface a of the case and that the driving effect thereafter continues through the balance of the circumference. This construction gives the greatest possible effect to the driving force of the wheel.

In Figs. 5, 6, 7 and 8 four modifications of the case chamber are shown; Fig. 8 having one lobe, as shown in Fig. 3; Fig. 7 having two lobes; Fig. 6 having three lobes, and Fig. 5 having four lobes. The wheel operating in this case chamber would be the same as the one shown in Fig. 2 and the operation of the machine would differ in that previously described only in the fact that the wheel is double acting; that is, two volumes being discharged and two received on each revolution of the wheel. In Fig. 6 three volumes would be discharged and in Fig. 5 four volumes would be discharged. The more complete description of these modifications is deemed unnecessary in view of that already given in regard to Fig. 2.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In a compressor or vacuum pump, the combination of a wheel having extended blades for forming pockets at its periphery, and a case chamber comprising heads D, E and an intermediate part having an interior surface non-concentric with the wheel blades and forming a passage connecting said pockets, the wheel making a joint upon the heads D, E of the case so as to form with the case chamber a series of enlarging and contracting spaces, combined with ports in said heads for introducing the charge, and a passage in the center of said wheel operating substantially as described.

2. The combination in an air compressor or vacuum pump of a wheel having a central hub and blades extending therefrom forming pockets on the exterior of the same, of a case chamber adapted to contain a liquid and having a passage exterior to the wheel circumference connecting the pockets of the wheel with each other, combined with heads completing the case and containing ports controlled by the side edges of said wheel blades to admit and discharge the fluids into and out of said pockets.

3. The combination of a revolving wheel having peripheral blades forming pockets, a case chamber inclosing said wheel and

adapted to contain a liquid, said case chamber having inlet and discharge ports to control the inflow and outflow of gases to said pockets, and having a passage connecting the pockets of said wheel, said passage enlarging through a short arc of the wheel circumference at the inlet port and gradually reducing through a longer arc of the wheel circumference toward the discharge port.

4. In an air compressor or vacuum pump the combination of a revolving wheel having peripheral extensions forming pockets, a case chamber adapted to contain a liquid and having inclosing heads fitting the edges of the wheel to form a joint with the extensions thereof and complete said pockets, said chamber having inlet and discharge ports in the heads for controlling the flow of a gas into and out of said pockets, and said case chamber also having a passage connecting the pockets of said wheel, said passage enlarging through a short arc of the wheel circumference at the inlet port and gradually reducing through a longer arc of the wheel circumference toward the discharge port.

5. In a device as above described, the combination with the case and ports therefor of a wheel having an interior rim, making joint-forming connection with the walls of the ends of said chamber, and an interior portion forming a passage from end to end of said wheel combined with head ports for controlling the inflow and outflow of the gases from said device.

6. In a device of the character described, the combination of a wheel having pockets extending from a central rim portion, said wheel having a hollow interior, combined with a case chamber having a head, said head having a recess to receive a rotating fluid, and also having ports c^5 of less diameter than the said rim portion of the wheel so as to retain a portion of the revolving fluid in the interior of the wheel to form a joint between said wheel and the case chamber wall.

7. In a device of the character described, a case chamber adapted to contain a body of fluid, a revoluble wheel in the casing having peripheral pockets open at their sides, and said wheel having a hollow interior, the heads of the chamber on both sides of the wheel having depressions forming passages establishing communication between the discharging buckets through the open sides thereof and the interior of the wheel, the case chamber having an outlet from the interior of the wheel.

8. In a device of the character described, a case chamber adapted to contain a body of fluid, a revoluble wheel in the casing consisting of an imperforate hollow rim portion making contact with the casing heads, and having peripheral pockets, and a port in the casing wall establishing communication between the pockets and the interior of the wheels, the casing having a port connecting with the interior of the wheel.

9. In a device of the character described, a case chamber adapted to contain a body of fluid, a revoluble wheel in the casing consisting of an imperforate hollow rim portion making contact with the casing heads, and having peripheral pockets and a port in the casing wall establishing communication between the pockets and the interior of the wheel, the head of the casing having an outlet port located within the open end of the wheel.

10. In a device of the character described, a case chamber adapted to contain a body of fluid, a revoluble wheel in the casing consisting of an imperforate hollow rim portion making contact with the casing heads, and having peripheral pockets, and a port in the casing wall establishing communication between the pockets and the interior of the wheel, the head of the casing having an annular recess concentric with axis of the wheel and an outlet port located in the wall of said recess.

11. In a device of the character described, a case chamber adapted to contain a body of fluid, a revoluble wheel in the casing consisting of an imperforate hollow rim portion making contact with the casing heads, and having peripheral pockets, the casing having an inlet port exterior of the rim portion of the wheel, a port in the casing wall establishing communication between the pockets and the interior of the wheel, and the casing also having an outlet port from the interior of the wheel.

12. In a device of the character described, a case chamber adapted to contain a body of fluid, a revoluble wheel in the case consisting of a hollow rim portion making contact at its ends with the casing heads, and having peripheral pockets, an inlet in the casing exterior of the rim, an outlet from the casing located within the open end of the wheel, the casing having a port connecting the chamber exterior of the rim with the hollow interior of the latter.

13. In a device of the character described, the combination of a wheel having pockets extending from a central rim portion, said wheel having a hollow interior combined with a case chamber including a head having a recess to receive a rotating fluid, said head also having a port located wholly within the boundary of said rim portion and communicating with said hollow interior so as to retain a portion of the revolving fluid in the interior of the wheel to form a joint between said wheel and the case chamber wall.

14. In a compressor or vacuum pump, the combination of a wheel having extended blades for forming pockets at its periphery,

and a case chamber comprising heads D, E and an intermediate part having an interior surface non-concentric with the wheels blades and forming a passage connecting said pockets, the wheel making a joint upon the heads D, E of the case so as to form with the case chamber a series of enlarging and contracting spaces, combined with ports in said heads for introducing the charge, and an outlet passage.

15. The combination of a revolving wheel having peripheral blades forming pockets, a case chamber inclosing said wheel and adapted to contain a liquid, said case chamber having inlet and discharge ports to control the inflow and outflow of gases to said pockets, and having a passage connecting the pockets of the wheel and having its point of maximum capacity nearer the inlet port than the outlet port, for the purpose described.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

LEWIS HALLOCK NASH.

Witnesses:
M. E. McNINCH,
E. G. HEYLMEIR.

Corrections In Letters Patent No. 1,091,529.

It is hereby certified that in Letters Patent No. 1,091,529, granted March 31, 1914, upon the application of Lewis Hallock Nash, of New York, N. Y., for an improvement in "Pumps and Air-Compressors," errors appear in the printed specification requiring correction as follows: Page 3, line 123, for the word "hillow" read *hollow;* same page, line 67, and page 4, line 3, for the word "wheels" read *wheel;* and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of May, A. D., 1914.

[SEAL.]

J. T. NEWTON,

Acting Commissioner of Patents.