

AIR PUMP.

APPLICATION FILED MAY 26, 1909.

952,440.

Patented Mar. 15, 1910.

2 SHEETS—SHEET 1.

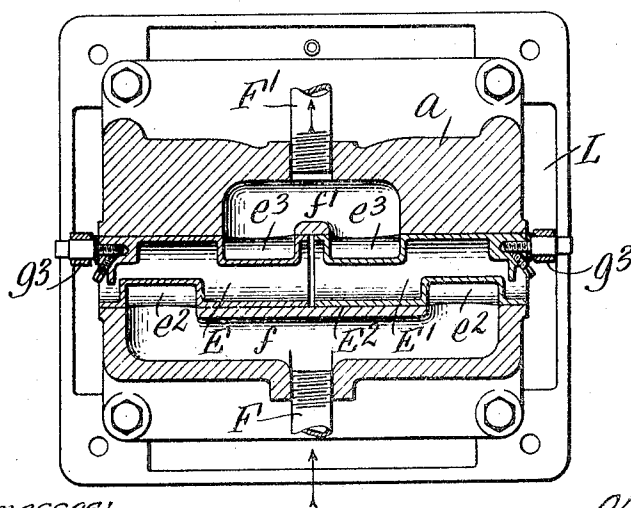
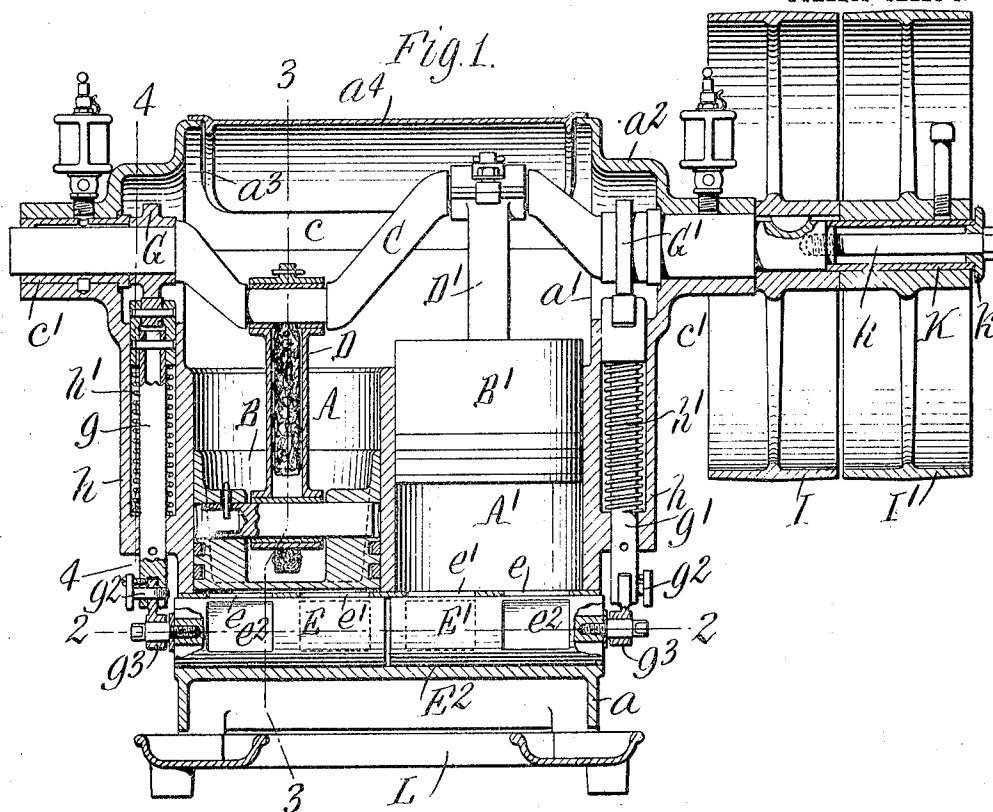


Fig. 2.

Witnesses!

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2 SHEETS—SHEET 2.

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Fig. 3.

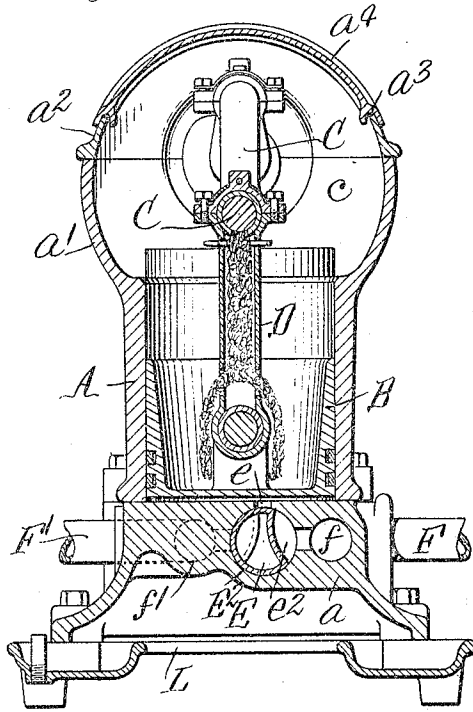


Fig. 4.

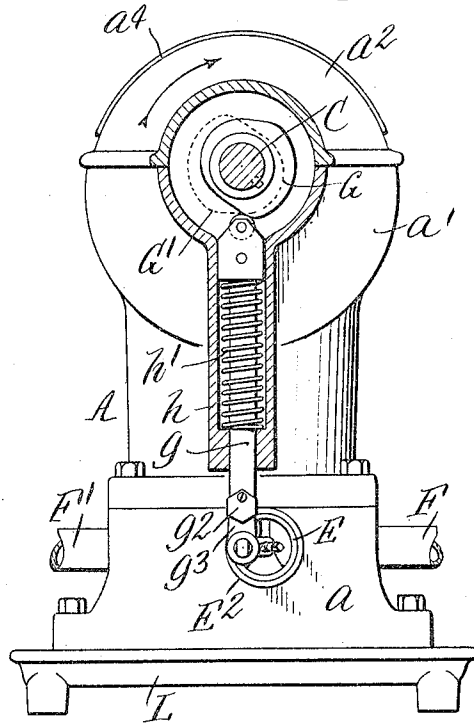


Fig. 5.

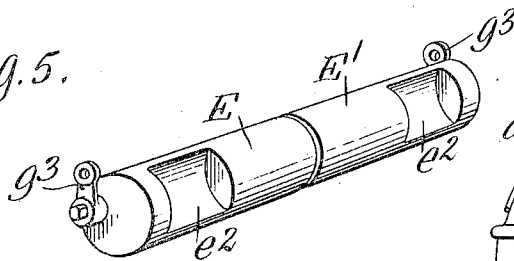
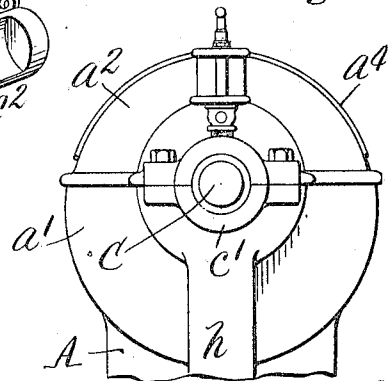


Fig. 6.



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UNITED STATES PATENT OFFICE.

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AIR-PUMP.

952,440.

Specification of Letters Patent. Patented Mar. 15, 1910.

Application filed May 26, 1909. Serial No. 498,497.

To all whom it may concern:

Be it known that I, CHARLES B. DALZELL, a citizen of the United States, residing at Little Falls, in the county of Herkimer and State of New York, have invented a new and useful Improvement in Air-Pumps, of which the following is a specification.

This invention relates more particularly to improvements in vacuum pumps and has for one of its objects to produce an efficient and desirable pump which is of simple and durable construction and involves the minimum number of parts.

Other objects of the invention are to so construct the pump that access can be readily had to the working parts thereof, and that the valves can be quickly and easily removed, or the pump taken apart for cleaning, repairing or replacing any of the parts thereof without disturbing the pipe connections; and also to so construct and arrange the valves and their operating mechanism that while the operating mechanism is mainly inclosed in the pump casing, where it can be kept clean and thoroughly lubricated, the connections between the valves and their operating mechanism are located so as to be accessible and allow the valves to be removed and replaced with the least delay and work.

In the accompanying drawings, consisting of two sheets: Figure 1 is a longitudinal sectional elevation of a vacuum pump embodying the invention. Fig. 2 is a sectional plan of the base thereof in line 2—2, Fig. 1. Fig. 3 is a transverse sectional elevation of the pump in line 3—3, Fig. 1. Fig. 4 is an end elevation thereof, partly in section, in line 4—4, Fig. 1. Fig. 5 is a perspective view of the valves detached. Fig. 6 is a fragmentary end elevation of the pump.

Like reference characters refer to like parts in the several figures.

A multiple cylinder pump is shown in the drawings. A and A' represent the cylinders, B and B' the pistons, C the crank shaft having opposite crank portions connected to the pistons by pitmen D and D', and E and E' are combined inlet and outlet valves for the cylinders A and A', respectively.

The pump casing or body comprises base, intermediate and top sections a , a' and a'' , respectively, which are separate from each other and are bolted or otherwise detachably secured together. The cylinders A A' are

formed in the intermediate section a' . Their lower ends are closed by the base section a and their upper ends open into a crank chamber c formed by the upper end of the intermediate section and the top section a'' . An opening a^3 is provided in the top of the casing through which access can be had to the crank chamber and cylinders, and which is closed by a loose cover plate a^4 .

The crank shaft C is journaled at its ends in bearings c' at the opposite sides of the casing, formed partly by the intermediate section a' and partly by the top section a'' , so that the crank shaft is released and with the pistons can be lifted out of the casing when the top section a'' is removed.

The valves E and E', which are of the oscillating piston type, are arranged end to end in a cylindrical chamber or opening E² which extends through the base a parallel with the crank shaft and is open at its opposite ends. The valves are of uniform diameter throughout their length and can be inserted into and removed from the valve chamber through the open ends thereof. This valve chamber is located beneath and in close proximity to the cylinders A A' and communicates with each cylinder through ports e and e' controlled by the valves E and E'. In the position of the valves shown in the drawings, which they occupy when the pistons are at the ends of their strokes, the ports e and e' are closed. By rocking the valves in one direction from this position, notches e^2 therein connect the ports e with an inlet passage f in the base to admit the air to the cylinders, while by rocking the valves in the opposite direction, notches e^3 therein connect the ports e' with an outlet passage f' in the base to exhaust the cylinders. Thus both the inlet of air to and the outlet of air from each cylinder is controlled by a single oscillating valve. The inlet and outlet passages f and f' lead respectively to inlet and outlet pipes F and F' which are connected to the base section a of the pump casing.

The valves are operated by cams G G' which are secured to the ends of the crank shaft within the crank chamber c and bear against antifriction rollers at the upper ends of vertical push rods g and g' , which are detachably connected at their lower ends by bolts g^2 , or by other suitable means, to links g^3 connected to the outer ends of the valves

E and E', respectively. The push rods *g* and *g'* are arranged to slide endwise in guide pockets *h* in the opposite ends of the pump casing parallel with the cylinders. Springs *h'* surrounding the push rods in the guide pockets serve to hold the rods against the cams and to return the valves to the position from which they are rocked in one direction by the cams. The upper ends of the rods project from the guide pockets into the crank chamber for engagement with the cams, while the lower ends of the rods extend from the guide pockets outside of the pump casing for connection with the outer ends of the valves. By this arrangement the cams and upper ends of the push rods are inclosed in the pump casing where they are protected from dust and kept thoroughly lubricated by the oil running down from the crank-shaft bearings, but the connections between the lower ends of the rods and the valves are located outside of the casing so that the valves can be readily disconnected from the rods and pulled endwise out of the valve chamber E² without disturbing the push rods or other parts of the pump when this is necessary for cleaning the valves, or for any other reason.

The operation of the pump is as follows: The cams G G' are arranged on the crank shaft as shown in Fig. 4, which indicates their position when the pistons are at the ends of their strokes, and the ports *e* and *e'* are closed by the valves. The crank shaft turns in the direction indicated by the arrow in Fig. 4. The cam G rocks the valve E and starts to open the port *e* to the inlet passage *f* as soon as the piston B starts on its up stroke, and the cam is so shaped that the valve is opened wide when the piston has moved but a very short distance and is held wide open until the piston nearly reaches the end of its up stroke, when the cam allows the valve to be closed gradually by its spring *h'*, the valve not being fully closed, however, until the piston starts on its down stroke. During the down stroke of the piston the cam allows the spring *h'* to rock the valve farther in the return direction so as to gradually open the port *e'* to the outlet passage *f'*. As the piston approaches the end of its down stroke the cam moves the valve to again close the outlet port *e'*. The valve for the other cylinder is operated in the same manner. By thus holding the inlet open until the piston has actually begun its return stroke the inertia of the incoming air is utilized to fill the cylinder, and as the valve does not open the outlet port *e'* until the piston reaches that point in its down stroke at which the air in the cylinder has been compressed to atmospheric pressure, there is no tendency for the air to rush into the cylinder when the outlet is opened and thereby increase the work of the pump.

The cam permits only a very gradual return movement of the valve by the spring, and the cam and spring-operated valve work very smoothly at high speeds of the pump.

By the described construction of the pump with the valves in the base and the pipes connecting with the base section independently of the valves, the crank shaft, pistons and valve-operating devices are very accessible and can be examined and cleaned at any time by simply removing the loose cover plate *a'*, and if it is necessary to remove the crank shaft and pistons it is only necessary to detach the top section *a'* of the casing and lift the shaft and pistons out of the casing. This could not be done if the pump were inverted or arranged with the valves and pipe connections at the top of the casing. To remove the valves it is only necessary to detach their links from the push rods and slip the valves endwise out of the open-ended valve chamber, and neither the pipe connections nor any other parts of the pump have to be disturbed.

In the pump shown, the crank shaft is provided with tight and loose pulleys I I', the latter being journaled on a detachable extension of the shaft consisting of a sleeve K secured to the end of the shaft proper by a cap screw *k* and end plate *k'*. When the loose pulley is not required, the extension sleeve K is detached and the end plate *k'* is secured to the end of the crank shaft by a short screw. This construction may be employed or not, as desired.

L represents an oil drip pan which is provided beneath the base section *a* of the casing.

I claim as my invention:

1. In a pump, the combination of a casing provided with a cylinder and with connections for the fluid at the base portion of the pump, a piston in said cylinder, a crank shaft removably journaled in the casing above the cylinder and connected to the piston, a valve for the pump removably seated in the base portion thereof, an operating device for said valve mounted on the crank shaft, and a connecting device actuated by said device on the crank shaft and detachably connected to the valve outside of the casing, whereby the crank shaft and piston and the valve can be removed from the pump without disturbing said fluid connections, and said valve can be removed when detached from said connecting device without disturbing the other parts of the pump, substantially as set forth.

2. In a pump, the combination of a casing provided with a cylinder and with connections for the fluid at the base portion of the pump, a piston in said cylinder, a crank shaft removably journaled in the casing above the cylinder and connected to the piston, an oscillating valve for the pump re-

movably seated in the base portion thereof, an operating cam for said valve mounted on the crank shaft inside of the casing, and a push rod mounted on said casing and having its upper end entering the casing for engagement with said cam and its lower end extending outside of the casing and detachably connected to the valve, whereby the crank shaft and piston and the valve can be removed from the pump without disturbing said fluid connections, and said valve can be removed when detached from said push rod without disturbing the other parts of the pump, substantially as set forth.

3. In a pump, the combination of a casing provided with upright cylinders, and with fluid connections at the base portion of the pump, pistons in said cylinders, a crank shaft removably journaled in the casing above the cylinders and connected to the pistons, inlet and outlet valves removably seated in the base portion of the pump, operating cams for said valves mounted on the opposite ends of said crank shaft inside of the casing, and push rods mounted in bearings on the opposite sides of the casing and having their upper ends entering the casing for engagement with said cams and their lower ends extending outside of the casing and detachably connected to the outer ends of said valves, whereby the crank shaft and pistons and said valves can be removed from the pump without disturbing said fluid connections, and said valves can be removed when detached from said push rods without disturbing the other parts of the pump, substantially as set forth.

4. In a pump, the combination of a casing provided with parallel upright cylinders, pistons in the cylinders, a crank shaft jour-

naled in the casing above the cylinders and connected to the pistons, the casing having an upper part which is detachable to permit the removal of the crank shaft and pistons, inlet and outlet valves for the cylinders removably seated in the base portion of the casing, operating cams for said valves mounted on the opposite ends of the crank shaft inside of the casing, push rods arranged at the opposite sides of said casing which are actuated by said cams and are detachably connected to said valves, and pipe connections for the pump at the base thereof, substantially as set forth.

5. In a pump, the combination of a casing having detachably connected top, bottom and intermediate sections, said intermediate section having a cylinder, and said bottom section having an open-ended valve chamber, a piston in the cylinder, a crank shaft journaled in the casing above the cylinder and being removable therefrom by detaching the top section of the casing, an oscillating valve in said valve chamber and removable through the open end thereof, an operating cam for said valve on the crank shaft, a push rod which is actuated by said cam and is detachably connected outside of the casing with said valve, and pipes connecting with said base section of the casing, whereby the crank shaft, piston and valve can be removed without disturbing the pipe connections, substantially as set forth.

Witness my hand, this 19th day of May, 1909.

CHARLES B. DALZEIL.

Witnesses:

GEO. W. BELLINGER,
SAMUEL HOUPP.