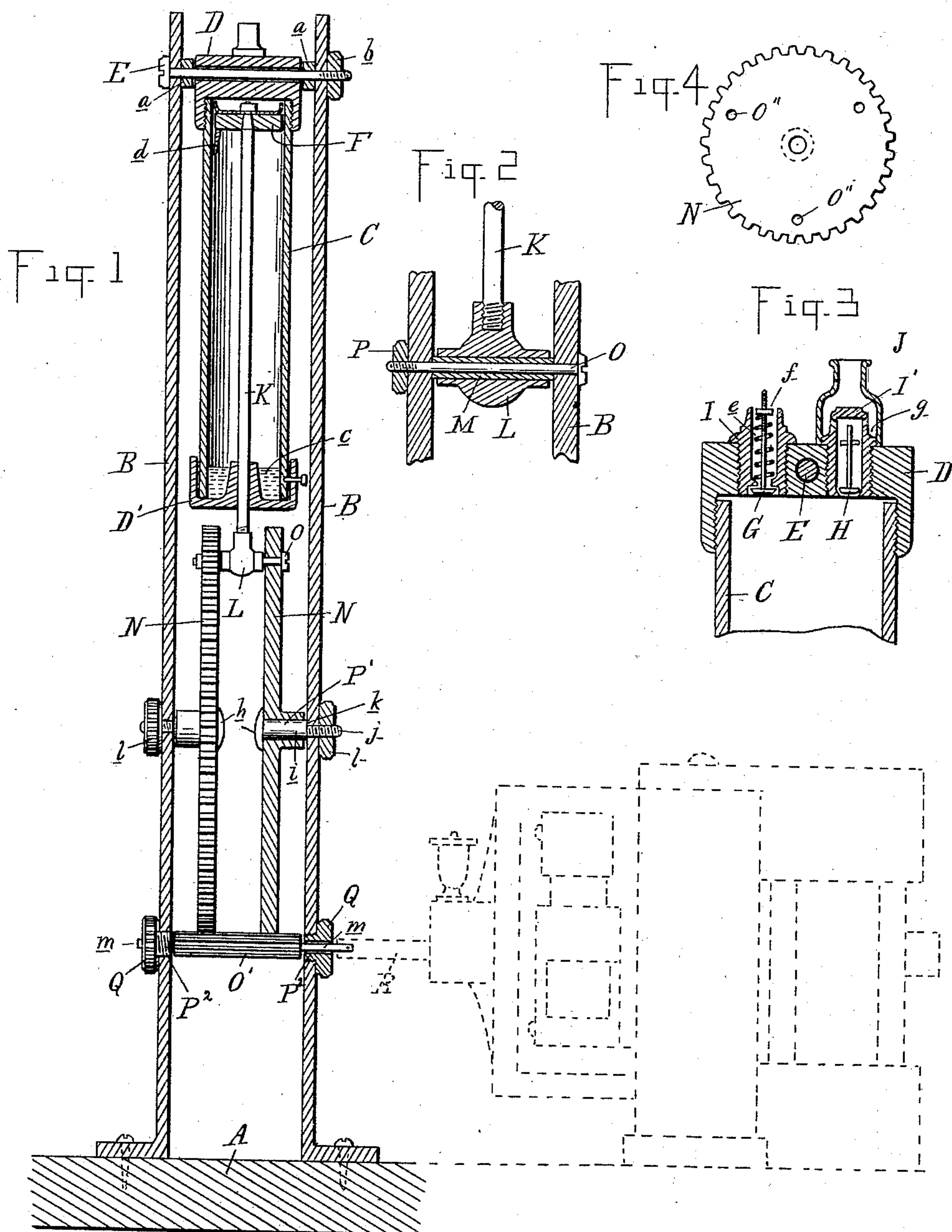


(No Model.)

J. C. KENNEDY.
AIR PUMP.

No. 409,844.

Patented Aug. 27, 1889.



Witnesses:

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UNITED STATES PATENT OFFICE.

JOHN C. KENNEDY, OF DETROIT, MICHIGAN.

AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 409,844, dated August 27, 1889.

Application filed February 11, 1889. Serial No. 299,485. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. KENNEDY, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Air-Pumps, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to new and useful improvements in air-pumps, and the invention has especial reference to that class of air-pumps principally designed to furnish compressed air for use in laboratories or for medical use, such as in apparatus for medicating air or for similar use.

The object of my invention is to construct an air-pump of this kind that is especially adapted to be operated by high speed, whereby the motive power of electricity as obtained by the use of small electrical motors becomes available. Pumps of this kind as at present constructed are not well adapted to be operated at high speed, and, if used in connection with electric motors, they soon become inoperative.

To this end my invention consists in an improved construction of various parts, all as more fully hereinafter described, and shown in the accompanying drawings, in which—

Figure 1 is a vertical central section through my improved air-pump. Fig. 2 is an enlarged section through the wrist-pin connection of the pump-rod. Fig. 3 is an enlarged vertical section through the induction and eduction ports in the pump-head. Fig. 4 is a detail elevation of one of the crank-wheels.

A is a suitable base supporting the pump by means of two parallel standards B, secured thereon and preferably formed of metal.

C is the pump-cylinder, screw-threaded upon its end.

D and D' are the respective heads, provided with sockets, by means of which they are detachably secured to the pump-cylinder, the head D by means of a screw-thread and the head D' by means of a set-screw or set-screws.

E is a pivot-pin by means of which the pump is suspended from the top of the standards B. This pivot-pin is of steel and passes loosely through a solid portion of the head D

of the pump in the axis thereof, and thereby forms an extended bearing on which the pump oscillates. Suitable washers *a* are interposed between the head and the standards, and a milled screw-nut *b* secures the pivot-pin detachably in place.

The lower head D' is cup-shaped to form a well *c* for containing a lubricant.

The piston F is provided with a suitable air-tight packing and has secured to it a downwardly-projecting brush *d*, adapted to dip into the lubricant contained in the lower head, and by contact transfers the same to the inner walls of the pump-cylinder, from which it is distributed by the motion of the piston.

G is the induction and H is the eduction valve in the pump-head D, and these are arranged in as close proximity as possible to the top of the pump-chamber for the purpose of avoiding dead-air spaces. The valve-seat of the induction-valve is formed in the lower end of the bushing I, secured into the top of the head, and which is provided with a central bore in which the coil-spring *e* is confined by a projecting shoulder in the lower end of the bushing and by an adjustable collar *f* upon the screw-threaded valve-stem of the valve to hold the latter adjustably to the seat. The valve-seat of the eduction-valve is formed at the lower end of the central bore of a bushing I', secured in the top of the head D, and the head D is guided in its vertical motion by a suitable guide through which the valve-stem passes, or by a suitable spider on the valve-stem.

J is a nipple secured over the top of the bushing I' to form with its upper end a suitable connection with an eduction-pipe or flexible tube and forming with its lower end a well *g*, in which any lubricant liable to be carried up along the inner-wall bushing I' may be dropped without to prevent it from passing into the eduction-pipe. The lower end of the piston-rod K is provided with a cross-head L, in which the wrist-pin M is loosely secured. This pin consists of a tubular piece of steel, and is secured between the crank-wheels N by a steel pin O, passing through it and clamping it between the crank-wheels by means of the clamp-nut P.

N are the actuating crank-wheels of the pump. These are peripherally geared to en-

gage with the drive-pinion O' and revolve upon the stub-shafts P' , which project laterally from the standards A . Each stub-shaft is provided with the head h and with the shank ij , the portion i of which is smooth and on which the crank-wheels are journaled. Between the portions ij is a shoulder k , which bears against the inner face of the standard, while the screw-threaded portion j passes through the standard and is detachably secured thereto by means of the nut l . The drive-pinion O' is preferably of steel and provided upon its ends with the bearings m , by means of which the pinion is journaled in bushings P'' , which are screwed into the standards and preferably provided with milled heads Q . One of the standards m projects through its bushing a suitable distance to permit of coupling it in any suitable manner to the shaft R of the electric motor, which is shown in dotted outlines in Fig. 1, or to any other motive power in any way desired.

The advantages which I derive from my construction are that the parts, even if operated at very fast speed, are not liable to become detached or loose, which in the ordinary construction of air-pumps is such a frequent source of annoyance if attempted to be run at high speed. If the parts in my pump shall become loose, they are arranged to be readily tightened, as they are secured by bolts provided with milled nuts. All the parts in the whole pump are also perfectly balanced at each side of a central line, so that no detrimental side motion or strain is created, and should any part become worn out it can be readily removed or replaced without dismounting the pump.

The parts most liable to get out of order in the ordinary constructions are the crank and its connection with the piston-rod. This I have remedied by the special construction of a central crank formed between the two gear-wheels, to both of which the power is applied from the same drive-pinion, so that they must operate as one, being furthermore firmly yoked together by the tubular crank or wrist-pin and its clamping-bolt.

The power being applied peripherally to the crank-wheels, there are no troublesome bearings as in the use of a crank-shaft to which the power is applied, and the expedient of journaling the crank-wheels independently of each other on stub-shafts provides for larger bearings and also for readily changing the relative engagement of the crank-wheels with the pinion in case the cogs should wear unequally. To this end I provide in each crank-wheel a corresponding series of holes O'' , preferably three, either one of which may be used to receive the bolt O for the wrist-pin. Thus, if the cogs of the crank-wheel (or the cogs of the pinion) become worn at a certain spot the relative engagement of the crank wheels and pinion may be changed to bring the wear upon other parts.

The drive-pinion is preferably cut of steel

with a steel pin for journal-bearings, and the bushings in which it is journaled are preferably made of fiber or phosphor-bronze.

The lower head of the pump-cylinder is made readily detachable from the cylinder for the purpose of filling it with the lubricant when needed.

What I claim as my invention is—

1. In an air-pump, the combination of the uprights B and the drive-pinion O' , journaled therein and connected with the actuating-shaft of a motor, of the crank-wheels N , engaging with said drive-pinion and journaled upon stub-shafts secured to the uprights B , the wrist-pin M , clamped between these crank-wheels, the reciprocating piston-rod K , provided with the cross-head L , engaging with said wrist-pin, and the oscillating cylinder C , substantially as described.

2. The combination, with the cylinder C , of the reciprocating piston F , provided with the brush d and the lower head D' , forming the well c for the reception of a lubricant, substantially as described.

3. The combination, with the head D , of the bushing I' , provided with the eduction-valve H , and the nipple J , secured thereto and forming the well g , substantially as described.

4. The combination of the standards B , the drive-pinion O' , the bushings Q , in which the pinion is journaled, the crank-wheels N , engaging with the pinion, the stub-shafts P' , provided with the head h , the cylindrical portion i , the shoulder k , the screw-threaded portion j , and the nuts l , the wrist-pin M , the clamping-bolt O , provided with the nut P , the reciprocating piston-rod K , provided with the cross-head L , the cylinder C , provided with the heads D and D' , and the bolt E , detachably secured through the standards A and head D and provided with the washers a , substantially as described.

5. In an air-pump, the combination, with the oscillating cylinder and piston, of the actuating crank-wheels N , the tubular wrist-pin M , secured between these crank-wheels, the clamping-bolt O , provided with the nut P , securing the wrist-pin between the crank-wheels, and the piston-rod K , provided with the cross-head L , loosely engaging with said wrist-pin, substantially as described.

6. The combination, in an air-pump, of the two vertical standards, a cylinder oscillatingly suspended between said standards, a reciprocating piston-rod provided at its lower end with a cross-head, two crank-wheels peripherally geared and journaled upon stub-shafts secured to the standards, a wrist-pin carried between the two crank-wheels and engaging with the cross-head of the piston, and a single drive-pinion journaled in the standards below said crank-wheels and engaging with both of them, substantially as described.

7. The combination, with the reciprocating piston of an oscillating air-pump, of two actuating crank-wheels journaled upon opposite

sides of the piston and peripherally geared,
a drive-pinion engaging therewith, a wrist-
pin detachably secured between these crank-
wheels, and a series of corresponding adjust-
5 ing-holes in said crank-wheels for varying the
adjustment of the wrist-pin, substantially as
described.

In testimony whereof I affix my signature, in
presence of two witnesses, this 31st day of
January, 1889.

JOHN C. KENNEDY.

Witnesses:

J. PAUL MAYER,
A. B. EATON.