O. P. ORAKER.

AIR COMPRESSOR.

APPLICATION FILED MAY 6, 1907.

912,882. Patented Feb. 16, 1909.

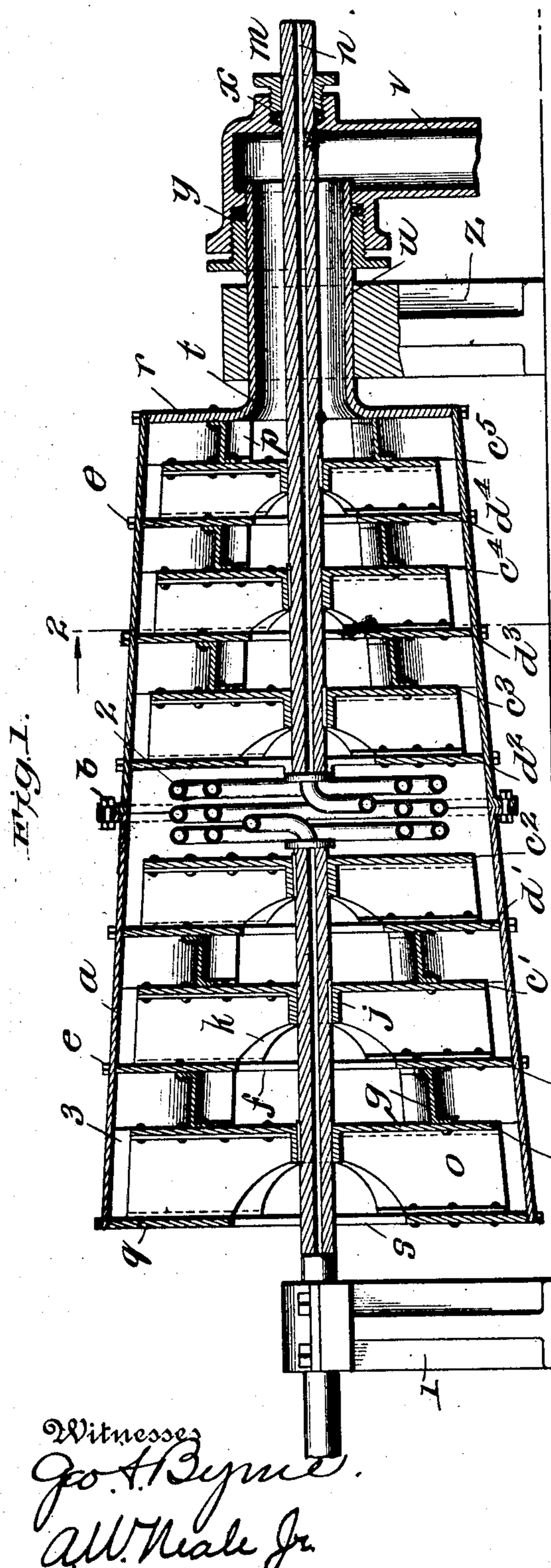

Fig. 1.

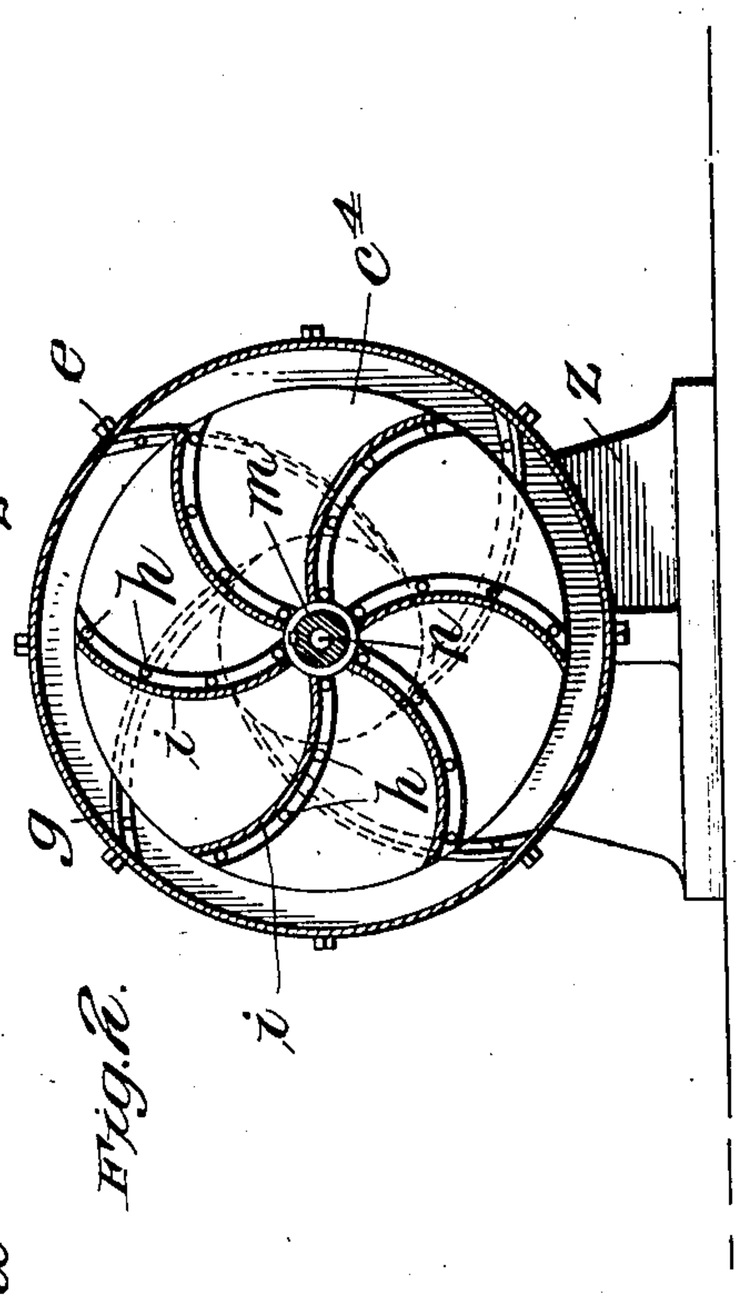

Fig. 2.

Witnesses:
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UNITED STATES PATENT OFFICE.

OLE P. ORAKER, OF THE UNITED STATES NAVY.

AIR-COMPRESSOR.

No. 912,882. Specification of Letters Patent. Patented Feb. 16, 1909.

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To all whom it may concern:

Be it known that I, OLE P. ORAKER, a citizen of the United States, and warrant machinist on board of U. S. S. *Milwaukee*, first rate, navy-yard, Mare Island, California, have invented certain new and useful Improvements in Air-Compressors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in air compressors. It is not limited to this use, however, as it may be used either with or without change as a steam turbine.

My invention is shown in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of my device, and Fig. 2 is a cross section thereof on the line 2—2.

The body of the air compressor is made in the form of a tapered cylinder or casing *a*, made up of two sections bolted together, as shown at *b*. Of course, this casing could be made in as many pieces, bolted together, as desired, and could be made cylindrical, instead of tapering, if desired. Within the cylinder is a fan structure consisting of plates *c*, *c'*, *c²*, *c³*, *c⁴* and *c⁵*, of slightly less diameter than the corresponding portion of the casing. Between these plates are located a number of plates *d*, *d'*, *d²*, *d³*, and *d⁴*, which completely fill the casing and are attached thereto by bolts *e* passing through the casing and into said plates. Each of these last-named plates is cut away at the center, as shown at *f*.

A series of fan blades, such as *g*, are bolted to the plates *c* and *d*, and extend outwardly to the interior wall of the casing. At the center these fan blades are cut away, leaving the opening *f* unobstructed. Each of the fan-blades *g* is provided on each edge with a projecting flange through which bolts *h* pass into the corresponding plate. On the other side of the plate *d*, and connecting it with the plate *c'*, is another series of fan blades *i*, bolted, as already described, to plates *c'* and *d*. These fan blades extend outwardly from a boss *j* on the plate *c'* and do not touch the interior of the casing *a*. These fan blades are also cut away, as shown at *k*, adjacent to the opening *f*, to allow an entrance for the air or steam. Each of the plates *c*, *c'*, *c²*, *c³*, *c⁴* and *c⁵* is provided with a boss similar to the boss *j* engaging the supporting shaft *m*, which is centrally perforated, as shown at *n*. These bosses are splined to the central shaft. The end series of fan blades *o* and *p* are bolted, respectively, to the plate *c* and one end *q* of the casing, and to the plate *c⁵* and the other end *r* of the casing. The end *q* of the casing is provided with an opening *s*, and the end *r* is provided with an opening *t*. The pipe *u* runs from the end *r* of the casing, forming a continuation of the opening *t*. This pipe is connected with a downwardly-projecting delivery pipe *v*, stuffing boxes *x* and *y* being provided to prevent leakage of the compressed air or steam. The whole structure is supported by means of supports *z* and 1, the pipe *u* running through the support *z*, and the shaft *m* running through a bearing in the support 1. Suitable means, not shown, are provided for revolving the whole structure, with the exception of the pipe *v*, the stuffing boxes and supports.

A space is left between the plates *c²* and *d²*, near the central part of this machine, and in this space is mounted a coiled pipe 2, which is connected to the two inner ends of the shaft *m*, which is made in two parts. This pipe is, of course, hollow, and communicates with the hollow bore *n* of the shaft *m*. A space 3 is left on the outer edge of each of the partitions or plates *c*, *c'*, *c²*, *c³*, *c⁴* and *c⁵* between these partitions and the casing, but the plates or partitions *d*, *d'*, *d²*, *d³*, and *d⁴* have their outer edges fastened to the casing, but are cut away at the center. The sets of fan blades *i* are curved in the opposite direction from that of the fan blades *g*, as clearly shown in Fig. 2.

The operation is as follows:—The shaft *m* being set in rapid motion, the air in front of the partition *c* is thrown outwardly by the fan blades *i*, a new supply entering through the openings *s*. The air is thus compressed and forced to passing through the passage 3, where it is caught by the fan blades *g* and drawn towards the center of the device, which still further compresses the air. This action is repeated from one end to the other of the device, the compression, owing to the tapering size of the casing, increasing proportionately. At the central part, the air is forced around the cooling pipe 2, so as not to unduly heat the apparatus. In the drawing I have shown the casing and the partitions which are attached to the shaft all re-

volving together. Obviously, however, the casing might be stationary and the shaft alone revolved. The form in the drawing, however, is preferable, as all friction between the revolving fan blades and the partitions is avoided.

My device can also be used as a steam turbine without change, the steam entering the pipe *v* and passing in the reverse direction to that already described. In such a case, of course, no water would be forced in through the pipe 2, because no cooling action is desired, and this pipe, therefore, could be omitted.

When used as an air compressor, the entrance openings to the sets of fan blades may be made successively decreasing in size as the pressure increases, so that the casing need not necessarily be tapered.

While I have thus described my invention, I do not wish to limit myself to the exact details shown and described, as these might be varied considerably without departing from the spirit of my invention.

When constructed for turbine use only, fan blades *i* will be constructed same as fan blades *g*, but bent in opposite direction as shown in Fig. 2. If turbine is wanted to run in reverse direction, fan blades *i* and *g* will be bent in reverse direction to those shown in Fig. 2. Steam always enters turbine through pipe *v* shown in figure.

I claim:—

1. The combination of a casing provided with centrally perforated partitions running toward the center thereof, each of said partitions being provided with curved fan blades, a two-part hollow shaft mounted in said casing and provided with partitions, each partition having a series of fan blades curved in the opposite direction to said first named fan blades, said fan blades on said shaft partitions being cut away to afford air passages, and a coiled pipe located centrally in said casing and having its ends connected to the adjacent ends of said shaft, substantially as described.

2. The combination of a casing made in the form of a tapered cylinder and provided with centrally perforated partitions running toward the center thereof, each of said partitions being provided with curved fan blades, a two-part hollow shaft mounted in said casing and provided with partitions, each partition having a series of fan blades curved in the opposite direction to said first named fan blades, the partition on said shaft extending out toward the periphery of said cylinder, but not touching it, thus affording air passages, said fan blades on said partition being cut away to afford air passages, and a coiled pipe located centrally in said casing and having its ends connected to the adjacent ends of said shaft, substantially as described.

3. The combination of a casing made in the form of a tapered cylinder and provided with centrally perforated partitions running towards the center thereof, said partitions being each provided with curved fan blades, a shaft mounted in said casing and provided with partitions, each partition having a series of fan blades curved in the opposite direction to said first-mentioned fan blades, said partitions on said shaft extending out towards the periphery of said cylinder, but not touching it, thus affording an air passage, said fan blades on said shaft partitions being cut away to afford air passages, and cooling means located centrally of said cylinder, substantially as described.

4. The combination of a tapered cylinder provided with centrally apertured partitions, each partition having curved fan blades secured thereto, a hollow shaft passing through said cylinder and having its central part cut away, a coiled pipe, the ends of which engage the cut away portions of said shaft, a series of partitions connected to said shaft, and each provided with a series of fan blades curved in the opposite direction to the fan blades on the cylinder partitions, the whole being united into a single revoluble structure, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

OLE P. ORAKER.

Witnesses:
F. GREEN,
NOAH HATHEWAY.