W. McCLAVE.

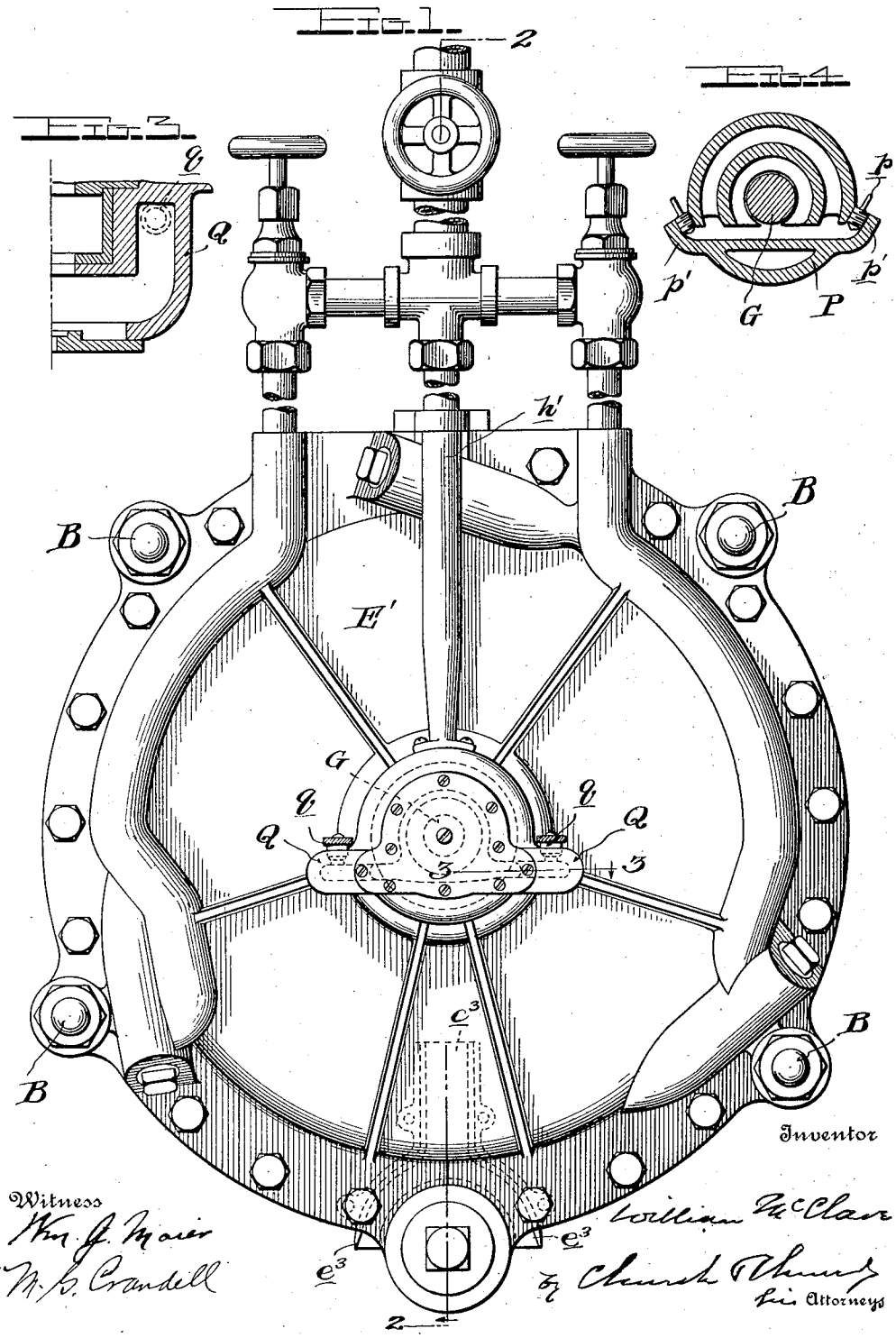
STEAM TURBINE BLOWER.

APPLICATION FILED SEPT. 25, 1917.

1,328,285.

Patented Jan. 20, 1920.

2 SHEETS—SHEET 1.



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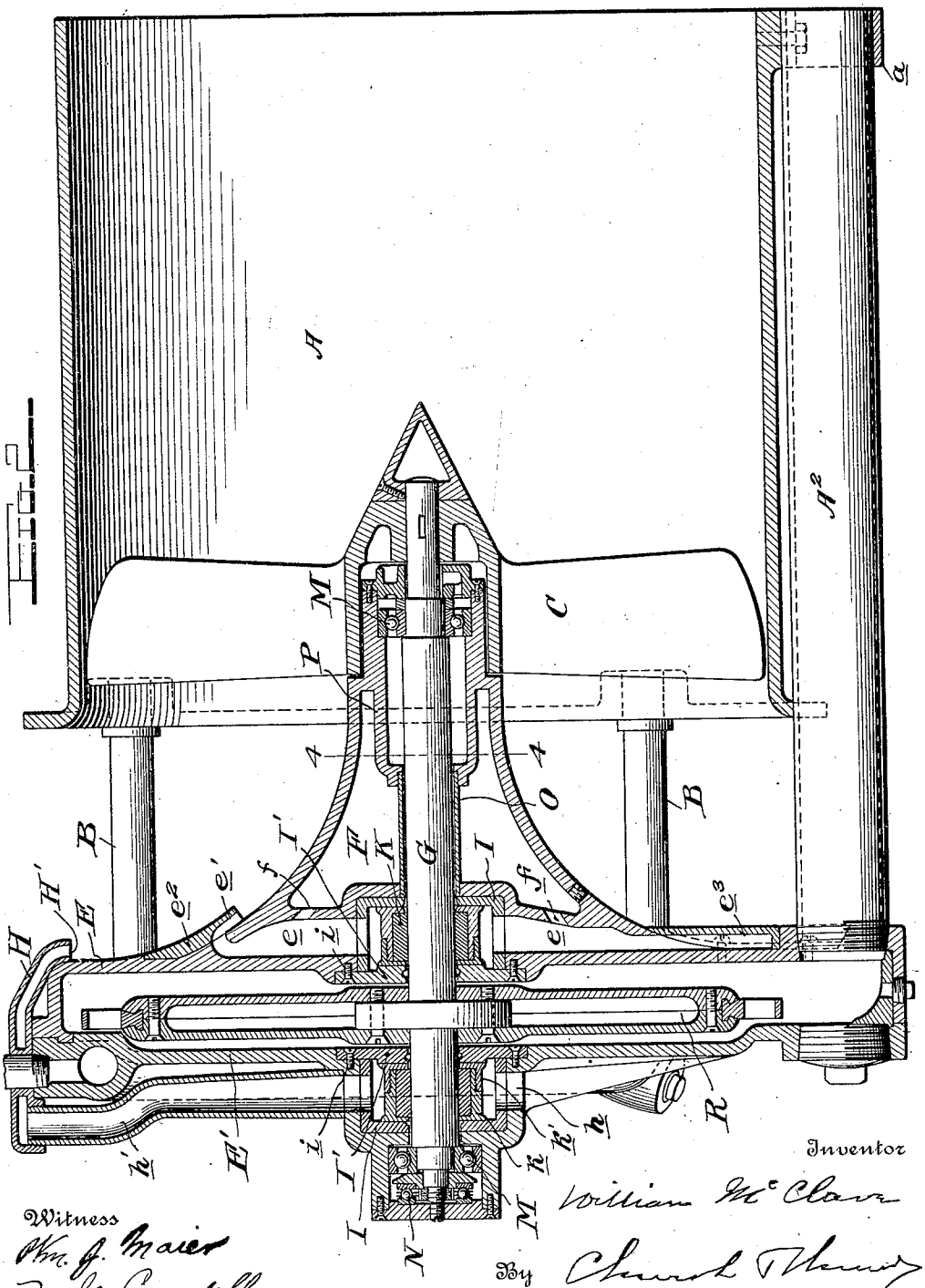
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Witness

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UNITED STATES PATENT OFFICE.

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STEAM-TURBINE BLOWER.

1,328,285. Specification of Letters Patent. Patented Jan. 20, 1920.

Application filed September 25, 1917. Serial No. 193,167.

To all whom it may concern:

Be it known that I, WILLIAM McCLAVE, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Turbine Blowers; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to steam turbine blowers of that type wherein the rotor of the turbine is rigidly connected with the impeller of the blower and rotates in unison therewith, the objects of the invention being to improve upon and overcome difficulties found to exist in the turbine blower disclosed in my prior Patent No. 1,165,796, dated Dec. 28, 1915.

The invention consists in certain novel details of construction and combinations and arrangements of parts all as will be hereinafter described and pointed out particularly in the appended claims.

Referring to the accompanying drawings,—

Figure 1 is a front elevation of a steam turbine blower embodying the present improvements.

Fig. 2 is a section of the same in a vertical plane longitudinally of the axis of the rotor and impeller shaft.

Fig. 3 is a detail section substantially in a plane indicated by the dotted line 3—3 Fig. 1.

Fig. 4 is a detail section in a vertical plane indicated by the dotted line 4—4 in Fig. 2.

Like reference characters in the several figures indicate the same parts.

The similarity of the structure illustrated in Figs. 1 and 2 to the structure illustrated in Figs. 1 and 2 of the patent before mentioned will be at once apparent from inspection and therefore it is thought unnecessary to herein enter into a detailed description of those parts which are common to the two structures, further than to say that the cylindrical casing A which is adapted to be built into the wall of a steam boiler furnace is in the present instance provided at its lower part with a bracket *a* for holding a forward end of the exhaust pipe A^2 which leads from the rotor chamber, and consequently the form of the casing A is somewhat simplified. The two-part rotor casing or housing is connected with the front flange of the casing A by distance posts B, and in the present instance the inner part E of the rotor housing is provided with a vertical duct *e* which communicates with the top and bottom of a chamber which surrounds the rotor and impeller shaft G, immediately adjacent the inner wall which defines the chamber for the rotor. The external face of the inner half of the rotor housing or that face toward the impeller C is curved in accordance with the principles set forth in the before mentioned patent, and is formed with an internal chamber F preferably communicating at its upper and lower portion through openings *f* with the duct *e*.

The object of the duct *e* as well as that of a somewhat similar duct on the outer side of the casing to be presently described, is to provide for the circulation of a current of air through the wall of the casing and around the shaft in order to keep the temperature of the parts down and to avoid the injurious consequences of heating by conduction or radiation from the rotor chamber under long continued and severe working conditions. To promote the circulation of air and in effect to provide for a forced circulation, the upper end of the duct *e* is provided with an ejector nozzle or aspirating discharge opening at *e'*. This may be conveniently formed by an insert e^2 which is secured in place and projects slightly above the curved wall of the rotor casing in a direction in which the currents of air flow to the impeller. In order that the intake of the duct *e* may be somewhat removed from the aspirating effect or effect of the vacuum created by the impeller, the intake end of the duct is extended by a bifurcated insert e^3 secured to the lower face of the rotor casing and preferably having its bifurcations extended down on each side of the boss into which the exhaust pipe A^2 screws as shown in Fig. 1 of the drawings. The front section E' of the rotor casing is provided on the outer side of the wall defining the rotor chamber with an air inlet opening or duct *h* at the bottom and an exhaust duct *h'* at the top, which latter communicates with an aspiration cap or nozzle H, the discharge end H' of which extends into the air intake channel above the nozzle *e'*. The nozzle H' is

adapted to operate as does the nozzle e' to forcibly draw air through the duct in large volumes to thereby secure the benefit of its cooling effect in that portion of the apparatus around the shaft immediately adjacent the front and back of the rotor chamber and between said chamber and the main bearings for the shaft.

In the preferred construction provision is made for preventing leakage along the shaft from the rotor chamber and, for convenience of manufacture and assembling, as well as to secure the advantages of a long life for the parts under continuous load and adverse conditions, the two sections of the rotor housing are formed with internal chambers around the openings for the shaft, and in these chambers there are mounted leakage prevention members which are conveniently duplicates of each other, and a description of one of which will suffice for both. Each chamber in the housing is formed for the reception of the cup-like member I having top and bottom openings registering with the ducts e or h as the case may be, and each cup-like member is provided with a cover or closure I′ adapted to be held in place and the cup-like member in position by fastening screws i passing into the rotor chamber walls. The cup-like member and its closure form a chamber having parallel radial inner faces and between these faces there is mounted a floating member, preferably held against rotation, but free to move laterally in unison with the shaft. This floating member is formed by a carbon block K which fits closely about the shaft, and a two part inclosing box, the sections k and k' of which are threaded together so as to closely embrace the carbon block at the ends and periphery and to themselves form tight sliding bearings working against the radial faces of the cup-like member and its closure. This construction provides for a relatively large radiating surface from which heat will be extracted by the air currents and at the same time it prevents steam leakage along the shaft, although it is obvious that any leakage that may escape will be at once carried off through the air ducts and will be discharged into the air flowing to the impeller.

The bearings which support the shaft are conveniently and preferably located at widely separated points, one being preferably located within the hollow hub of the impeller itself and the other at the outer end of the shaft. Said bearings, as shown, are radial ball bearings M, and in addition there is a thrust bearing N for taking up the thrust of the impeller, said thrust bearing being located at the outer end of the shaft, as in the patent hereinbefore referred to.

Between the inner bearing and the wall of the rotor chamber the shaft is preferably inclosed by a fixed shaft casing O which at its inner end seats in an extension P of the bearing housing. This extension P constitutes a lubricant reservoir and for this purpose the space around the shaft is enlarged and extended laterally as shown at p' in Fig. 4, to provide external openings through which lubricant may be supplied and the openings are conveniently closed by plugs p. The oil level is determined by the height of the openings laterally of the bearings and is preferably such that the lower portion of the movable parts of the bearings will dip into the lubricant. A somewhat similar construction is adopted in connection with the front or outer bearing. That is to say, as shown in Figs. 1 and 3, the housing for the bearing is extended laterally on each side, as shown at Q, and provided with openings through which lubricant can be supplied, which openings face upwardly and are adapted to be closed by screw plugs q. The lateral extensions of the bearing housing not only provide a convenient means for supplying the lubricant to the bearing but they constitute reservoirs which will hold a relatively large quantity of lubricant and have large radiating surfaces tending to dissipate any heat which might be injurious to the lubricant or the bearing.

The rotor which is preferably of the construction set forth in the hereinbefore mentioned patent is indicated by the reference letter R, and it will be understood that it is adapted to be actuated by steam jets one or all of which may be thrown into or out of action, as set forth in detail in said patent.

What is claimed is:

1. In a steam turbine blower, the combination with a rotor, an impeller spaced therefrom and a shaft common to the rotor and impeller, of a rotor housing and air ducts leading through the walls of said housing in proximity to the shaft and discharging into the intake for the impeller whereby cooling air will be drawn through said ducts.

2. In a steam turbine blower, the combination with a rotor, an impeller spaced therefrom, and a shaft common to the rotor and impeller, of a housing for the rotor, chambers formed in said housing in proximity to the shaft on each side of the rotor chamber, and air ducts communicating with said chambers and through which air is caused to circulate by the operation of the impeller.

3. In a steam turbine blower, the combination with a rotor, an impeller spaced therefrom, a shaft common to the rotor and impeller, and bearings in which said shaft is journaled, of a housing for the rotor, air circulating ducts in said housing intermediate the rotor chamber and shaft bearings,

and means under the control of the impeller for creating a circulation of air through said ducts.

4. In a steam turbine blower, the combination with a rotor, an impeller spaced therefrom, a shaft common to the rotor and impeller, a housing, bearings for the shaft mounted in said housing, said housing being provided with chambers surrounding the shaft intermediate the rotor and bearings, and ducts communicating with said chambers having their discharge openings in the impeller intake, whereby the operation of the impeller will cause a circulation of air through said duct and chamber.

5. In a blower, the combination of a steam chamber, an impeller spaced therefrom, an oil reservoir, a shaft for the impeller passing through said reservoir, means for preventing passage of fluid from the chamber to the reservoir and vice versa, and means dependent upon the impeller for cooling said passage preventing means.

6. In a steam turbine blower, the combination of a roller housing, an impeller casing, an air duct and a chamber between said housing and casing, and means for causing a circulation of air through said duct and said chamber.

WILLIAM McCLAVE.