(No Model.)

2 Sheets—Sheet 1.

H. B. ROELKER.

RETURN AIR COOLER.

No. 540,028. Patented May 28, 1895.

Fig: 1.

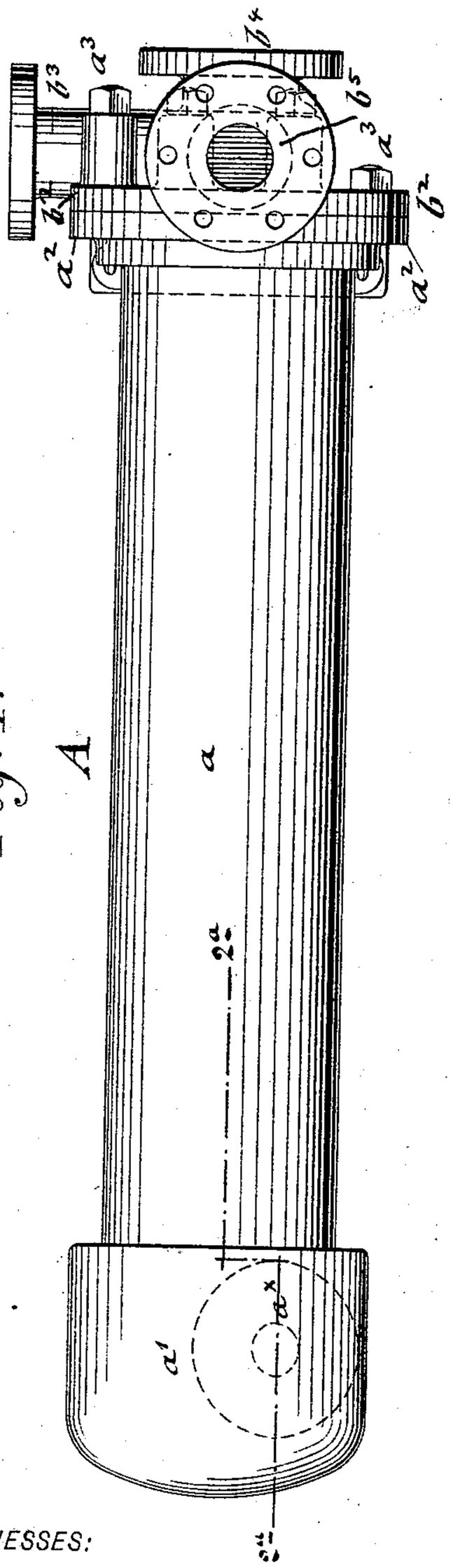
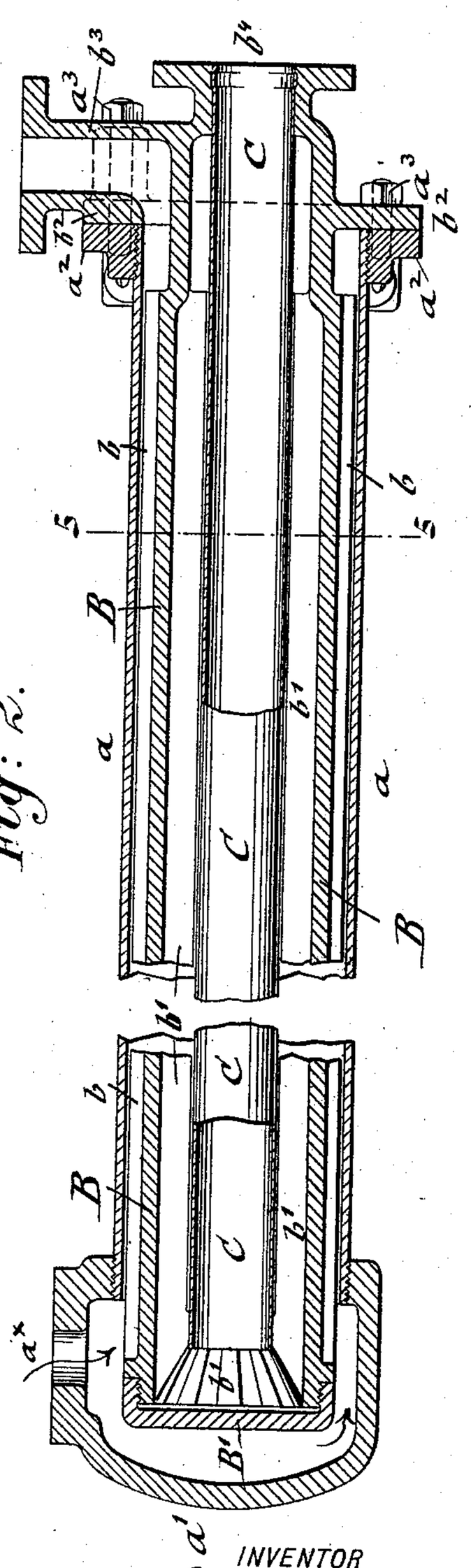


Fig: 2.



WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

H. B. ROELKER.

RETURN AIR COOLER.

No. 540,028. Patented May 28, 1895.

Fig: 3.

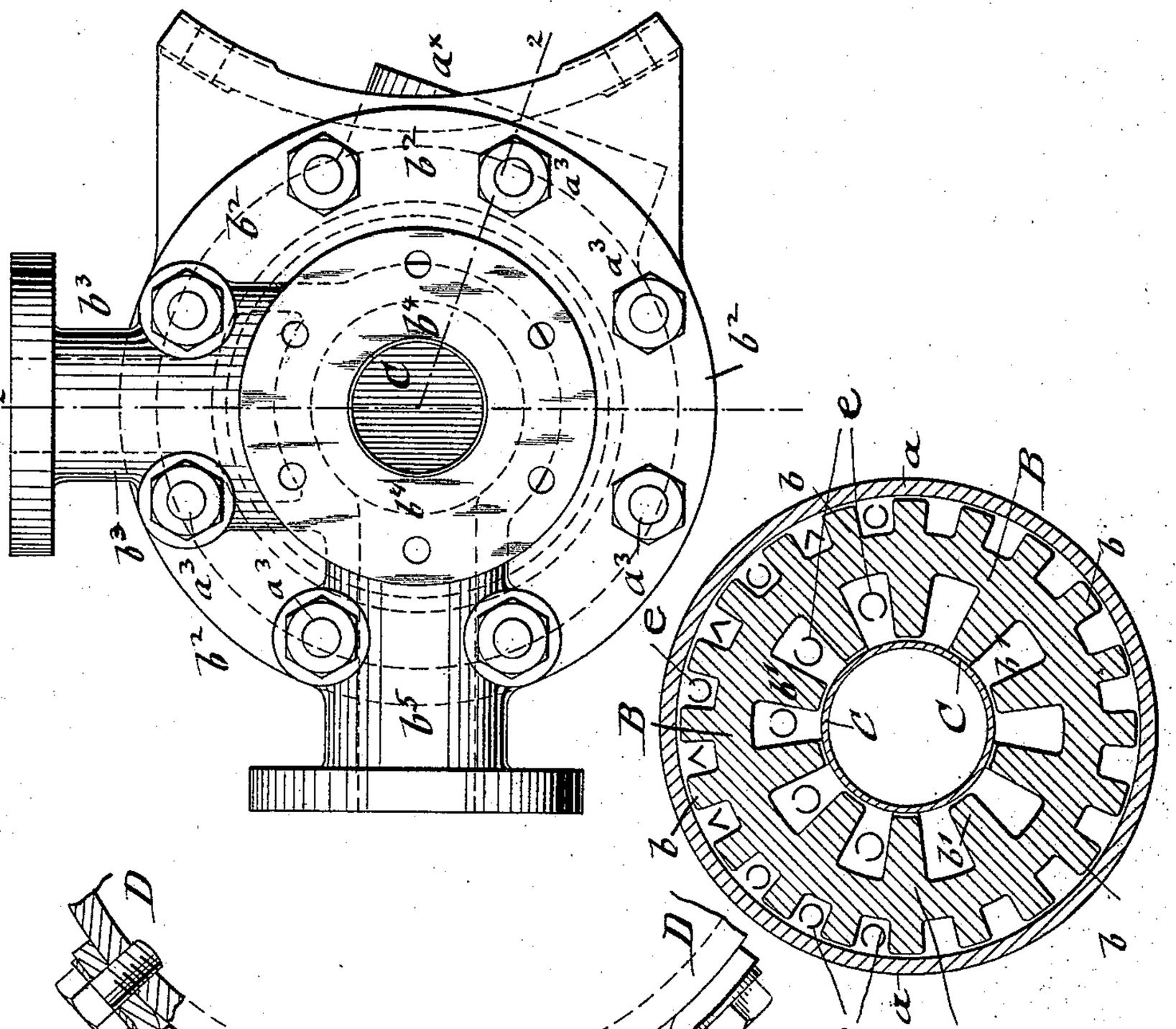


Fig: 4.

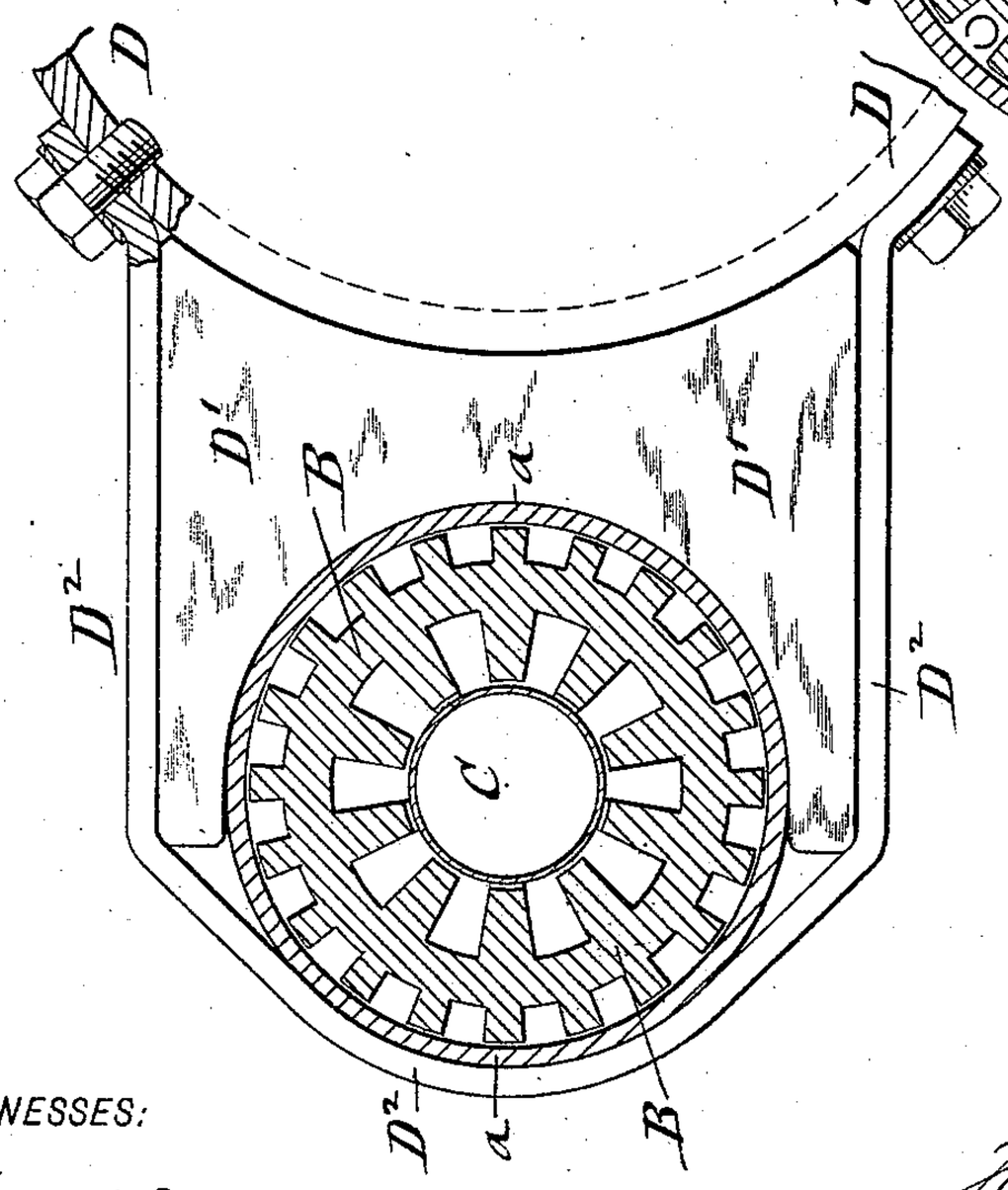
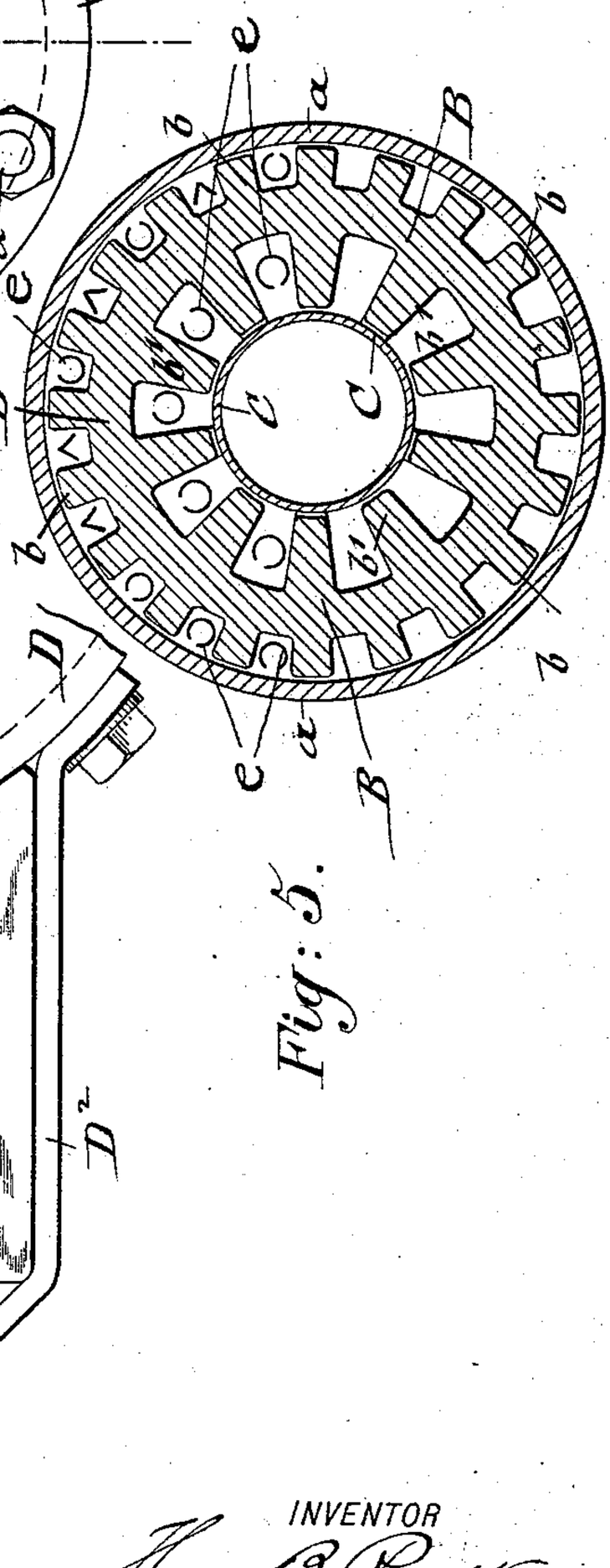


Fig: 5.



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UNITED STATES PATENT OFFICE.

HUGO B. ROELKER, OF NEW YORK, N. Y.

RETURN-AIR COOLER.

SPECIFICATION forming part of Letters Patent No. 540,028, dated May 28, 1895.

Application filed August 31, 1894. Serial No. 521,796. (No model.)

To all whom it may concern:

Be it known that I, HUGO B. ROELKER, a citizen of the United States, residing at New York city, in the county of New York, State of New York, have invented certain new and useful Improvements in Return-Air Coolers, of which the following is a specification.

In Letters Patent No. 484,979, granted to me on October 25, 1892, an improved construction of a return air cooler is shown, which is used in connection with an Allen dense-air refrigerating-machine, for which Letters Patent of the United States were granted to Leicester Allen, No. 252,921, dated January 31, 1882. This return air cooler was mainly adapted for the larger sizes of refrigerating machines, in which large contact-surfaces for the passage of the return-air and the utilization of the cold still in the same are necessary. While this return air-cooler was well adapted for the larger sizes of dense-air refrigerating-machines, it was found in practice that for the smaller sizes a simpler and cheaper construction of return-air cooler would give better and more satisfactory results.

The object of my invention, therefore, is to furnish a simple and cheap return-air cooler, by which the cold remaining in the air after it has performed its refrigerating work is utilized for intensifying the cold of the compressed air after the same has passed through the cooler and before it is taken up and pushed out into the system by the expanding engine; and the invention consists of a return-air cooler, composed of an exterior air-tight shell, an interior air-tight tube provided with a number of exterior and interior ribs or projections, forming longitudinal passages respectively for the highly-compressed air and for the return-air, heads at the ends of the exterior shell and interior tube, and connections formed with the exterior shell, and interior tube and with the return-pipe, compressor, main-cooler and expanding-engine, as will be fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 represents a side elevation of my improved return-air cooler. Fig. 2 is partly a horizontal section on line 2^a 2^a, Fig. 1, and partly a vertical longitudinal section on line 2 2, Fig. 3. Fig. 3 is an elevation of one end of the cooler, showing its connection. Fig. 4 is a vertical transverse section of the cooler, showing the blocks and straps by which it is connected with the main cooler; and Fig. 5 is a vertical transverse section on line 5 5, Fig. 1, showing the interior parts of the air-cooler drawn on a larger scale.

Similar letters of reference indicate corresponding parts.

In the drawings, A represents my improved return-air cooler, which is interposed in the usual manner between the main cooler, expanding-engine, compressor and the return-pipe of a system of refrigerating-pipes, which are connected with the expanding-engine. In the return-air cooler, the returning air, which is considerably colder than the water used for cooling the air in the main air-cooler, is employed for imparting a still lower degree of temperature to the air that has been compressed in the compressor and deprived of its heat of compression in the main-cooler, so that the air is conducted at a lower temperature than heretofore to the expanding-engine and into the system of refrigerating-pipes connected therewith.

My improved return-air cooler A consists more especially of an exterior air-tight cylinder or shell a, which is closed tightly at one end by a head a', having a connection $a^\times$. The other end is provided with a flange a^2 and bolts a^3, by which the shell a is fastened to the inner tube B. The inner air-tight tube B is provided with a number of longitudinal exterior and interior ribs or projections b b', which form a series of exterior and interior channels for the separate passage of the compressed air on the one side and for the return-air on the other side. The end of the inner tube B is closed by an air-tight head B', while the other end is formed into a flange b^2 which abuts against the flange a^2 of the outer shell a. The flange b^2 has also formed on it a number of necks b^3, b^4, b^5 by which the highly compressed air and the return-air are conducted to the channels of the inner tube B, as shown in Figs. 1 and 2. The contracted neck b^4 of the tube B supports a central leading tube C, which separates the inlet and outlet necks of the inner tube B. All the necks are formed with flanges, by which they are connected with the pipes which lead the air

from the main-cooler to the return-air cooler and from it to the expanding-engine, and the pipes which lead the return-air through the channels formed by the ribs of the inner tube of the return-air cooler. The return-pipe is connected with the neck b^5, so that the return-air is passed first through the inner longitudinal channels of the tube B to the tapering ends of the inner ribs b of the same, then through the central tube C to the contracted neck b^4 of the inner tube B and then back to the compressor. By its passage through the interior channels formed by the inner tube B, the cold still contained in the return-air is communicated to the surface of the outer channels of the inner tube B, through which the highly-compressed air that is passed from the main-cooler to the expanding-engine is conducted. As the highly-compressed air is thus subjected to the lower temperature of the return-air, its temperature is still more reduced, as it passes through the return-air cooler to the expanding-engine whereby the cold still contained in the return-air is utilized in a very effective manner.

The return-air cooler A is supported alongside of the main air cooler D by means of wooden blocks D′ and straps D^2, that are bolted to the main air-cooler, as shown in Fig. 4. Whenever it is desired to increase the metallic surface with which the passing air is placed in contact, loose bars or strips e which are bent into angular, circular or other suitable shape, are inserted in the channels formed by the outer and inner ribs of the tube B with the exterior shell a and the central tube C, as shown in Fig. 5. These bars or strips act in the same manner as the strips shown in my prior patent, No. 484,979, referred to, and furnish in connection with the channels formed by the ribs of the inner tube, the outer shell and the central tube, a comparatively simple, cheap and very effective return-air cooler for use with the refrigerating machines referred to.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a dynamic refrigerating apparatus, a return-air cooler, composed of an exterior air-tight shell, an interior air-tight tube provided with exterior and interior longitudinal ribs or projections, forming a number of separated channels for the highly-compressed air and the return-air, heads at the ends of the exterior shell and the interior tube, and connections formed respectively between the exterior shell and the interior tube, substantially as set forth.

2. In a dynamic refrigerating-apparatus, a return-air cooler, composed of an exterior air-tight shell, an inner air-tight tube provided with longitudinal exterior and interior ribs or projections, forming a number of separated channels respectively for the highly-compressed air, and the return-air, heads at the ends of the exterior shell and inner tube, a central tube at the inside of the inner tube, and connections formed respectively with the exterior shell and inner tube, and with the return-pipe, compressor, main-cooler and expanding-engine, substantially as set forth.

3. In a dynamic refrigerating machine, a return-air cooler, composed of an exterior shell, an inner tube, provided with longitudinal exterior and interior ribs or projections forming channels, a central tube within the inner tube, loose bars or strips inserted into said channels, heads at the ends of the exterior shell and inner tube, and connections formed respectively with the exterior shell and the inner tube, and with the return-pipe, compressor and expanding-engine of the refrigerating machine, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

HUGO B. ROELKER.

Witnesses:
S. E. SMITH,
K. R. BRENNAN.