(No Model.)

G. P. SCHNEIDER.

AIR DRYING APPARATUS.

No. 511,217. Patented Dec. 19, 1893.

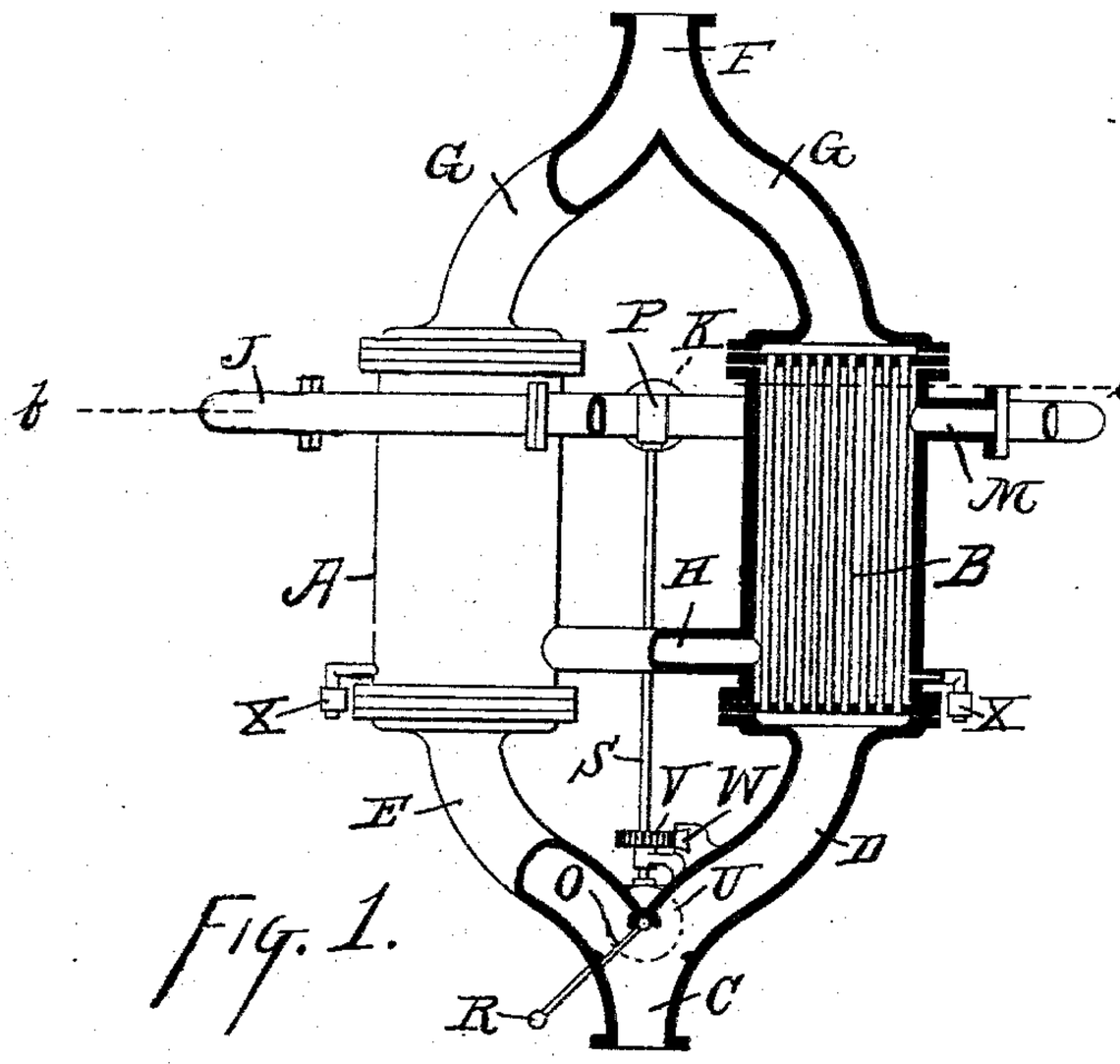

Fig. 1.

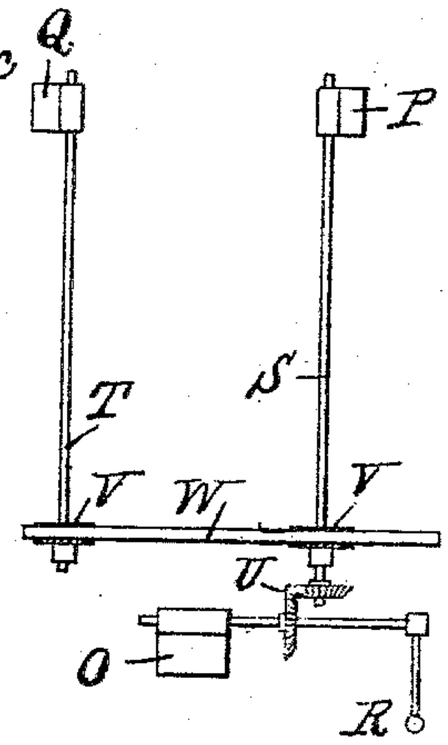

Fig. 3.

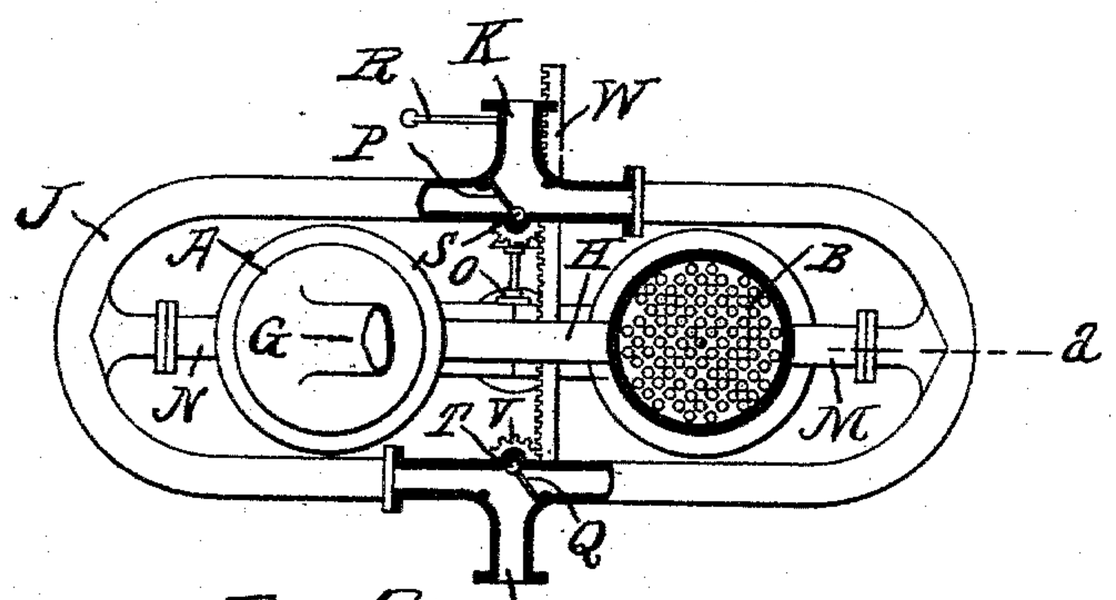

Fig. 2.

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GEORGE P. SCHNEIDER, OF CLEVELAND, OHIO.

AIR-DRYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 511,217, dated December 19, 1893.

Application filed February 11, 1893. Serial No. 461,938. (No model.)

To all whom it may concern:

Be it known that I, GEORGE P. SCHNEIDER, of Cleveland, Cuyahoga county, Ohio, have invented certain new and useful Improvements in Refrigerating Apparatus, of which the following is a specification.

In refrigerating apparatus operating by the compression of air the air is usually taken from the atmosphere and compressed and then cooled and then expanded to produce the reduction of temperature. The air taken from the atmosphere contains much moisture and when the compressed air is cooled and expanded its contained moisture congeals, and the frost thus formed produces serious trouble in the mechanism of the expanding apparatus and also in the expanding coils or refrigerating chamber where the cold air may be delivered.

It is the compass of my invention to produce an apparatus which will congeal the moisture in the air before the air is received by the compressing apparatus, thus delivering the air to the system comparatively free from moisture. I utilize the low temperature of the refrigerating system beyond the expander to effect the congelation of the moisture in the air supply to the air-compressing apparatus.

My improvements will be readily understood from the following description taken in connection with the accompanying drawings in which—

Figure 1, is a side elevation, part vertical section, of an air drying apparatus exemplifying my present invention, the vertical section of this view being taken in the plane of line "*a*" of Fig. 2; Fig. 2, a plan of the same, with parts appearing in horizontal section in the planes of lines "*b*" and "*c*" of Fig. 1; and Fig. 3, a side elevation of the valves and valve-operating apparatus shown detached.

In the drawings:—A, indicates a tight chamber provided with heads and tube-sheets and with tubes extending from tube-sheet to tube-sheet, the chamber thus having a number of vertical tubular passages through it; B, a similar chamber; C, a pipe to receive refrigerated air from the refrigerating system after the air has left the expansion apparatus of the system and before it has passed to the expansion coils or refrigerating chamber of the system; D, a pipe leading from inlet C to the lower end of tubular chamber B, air passing up through pipe D therefore passing up through the tubes of chamber B; E, a similar pipe leading from inlet C to the base of chamber A, pipes D and E forming practically two branches from inlet C; F, a pipe to lead to the expansion coils or refrigerating chamber of the system, cold expanded air entering at C going onward into the refrigerating apparatus from F after passing through the present apparatus; G, branches leading from the upper ends of chambers A and B to outlet F, air passing into pipe C therefore going through the tubes of the chambers and up and out at F; H, a pipe connecting the bases of the two chambers, so that the interiors of the two chambers, around the tubes, are in free communication with each other; J, a bustle-pipe surrounding the upper portions of the two chambers; K, a pipe to lead from this bustle-pipe to the air compressor of the apparatus; L, a pipe to lead into the bustle-pipe from the atmosphere, or, if desired, from the refrigerating chamber, the latter plan being followed when it is intended to supply to the air compressor of the apparatus spent air from the refrigerating chamber or expansion coil instead of the much warmer air from the atmosphere; M, a pipe placing the upper portion of chamber B in communication with the bustle-pipe at a point in its circuit intermediate between inlet L and outlet K of the bustle-pipe; N, a similar pipe connecting the bustle-pipe with chamber A; O, a valve at the juncture of pipes C with pipes D and E and serving to compel air entering at C to go entirely either to chamber A or B, alternately; P, a valve at the juncture of pipe K with the bustle-pipe and serving to prevent air coming through the bustle-pipe toward the outlet K in one direction from passing onward in the bustle-pipe; Q, a similar valve at the junction of pipe L with the bustle-pipe; R, a handle on the stem of valve O, to serve in operating that valve; S, the stem of valve P, projecting downwardly to near the stem of valve O; T, the downwardly projecting stem

of valve Q; U, bevel gearing connecting the stems of valves O and P; V, pinions on valve-stems S and T; W, a rack engaging these two pinions; and X, traps, of ordinary construction, connected with the bases of the two chambers and serving to trap off the water which may accumulate at those points.

It will be obvious from Fig. 3 that if valve O be reversed, valves P and Q will be simultaneously reversed, the stem of valve O turning the stem of valve P while rack W communicates motion to the stem of valve Q. This mechanism is merely exemplifying in character and is designed to illustrate a simple device for simultaneously reversing all of the valves, a preferable but not essential plan of operation.

The refrigerated air produced by the refrigerating apparatus, all or a portion of it, enters at C and traverses the tubes of one of the chambers and departs at F on its way to the expansion coils or refrigerating chamber. In its course it will obviously produce an extremely low temperature in whichever of the chambers its route traverses. In Fig. 1, the valve O is so set as to compel this refrigerated air to traverse the tubes of chamber B. If valve O be reversed the course of the air will be through the tubes of chamber A. Air, say from the atmosphere, enters at L and departs at K into the air-compressor. As valves P and Q are shown in Fig. 2, it will be seen that the atmospheric air entering at L must turn to the left into the bustle-pipe and that it cannot pass on around through the bustle-pipe to outlet K, being arrested by valve P. This air must therefore leave the bustle-pipe at pipe N and enter chamber A, around the tubes therein, and descend and go through pipe H to chamber B, around the tubes therein, and then ascend and go through pipe M to the bustle-pipe where it is at liberty to flow around back to outlet K. If valves P and Q were reversed, the atmospheric air, entering at L, would turn to the right in the bustle-pipe and would necessarily go first through chamber B and then through chamber A before it could reach outlet K. When valve O is reversed valves P and Q are also reversed.

Assume the valves to be set as in the drawings. Refrigerated air, passing through the tubes of chamber B, produces an extremely low temperature in that chamber around the tubes. Atmospheric air entering at L will pass through chamber A and will then pass through cold chamber B, around the tubes, and will pass through pipe M to the bustle-pipe and finally out at K and to the air compressor. This atmospheric air, in thus passing through chamber B, has its temperature so reduced as to congeal the moisture contained in the air, the moisture depositing as frost upon the exterior of the tubes in the chamber, and the dry air passing on out to the air compressor, the air compressor thus dealing with air so free from moisture that damage would be prevented in the subsequent operations of the refrigerating apparatus. In course of time the frost deposited upon the tubes of chamber B will become quite thick, and the chamber would eventually become so clogged around the tubes that air could not pass through it. Therefore, the use of chamber B as a congealer is to be abandoned and the valves are to be reversed. The refrigerated air which previously passed through the tubes of chamber B now becomes switched over to chamber A and chamber B becomes inert. The atmospheric air entering at L now, instead of first passing through chamber A, first goes to chamber B and then goes through chamber A, where it deposits its moisture upon the tubes, chamber A now being the congealing chamber. The comparatively warm air entering at L and going first to frosted chamber B, raises the temperature of that chamber and melts away the frost, the water thus formed finding its way to the bottom of the chamber where it leaves through the trap. In course of time chamber A will have become so frosted that its use must be abandoned as a congealer at which time the valves are again reversed, thus again putting the comparatively warm air through chamber A to melt the frost and then through chamber B to deposit its moisture.

I claim as my invention—

1. In refrigerating apparatus, the combination, substantially as set forth, of a pair of cooling chambers provided with air tubes, a pipe branched into connection with one end of the tubes of both chambers, a pipe communicating with the other ends of the tubes of both chambers, a pipe, as H, placing both chambers outside their tubes in direct communication with each other, a pipe leading to and from both chambers outside their tubes, and valves in the pipes to control the direction of flow therein.

2. In refrigerating apparatus, the combination, substantially as set forth, of two cooling chambers provided with air tubes, a pipe, as H, placing the two chambers outside their tubes in direct communication with each other, a branched pipe communicating with one end of the tubes of both chambers, a valve in such pipe to cause the flow of air there-through to the tubes of either chamber alternatively, a pipe connected with the other ends of the tubes of both chambers, a bustle-pipe surrounding the chambers and communicating with both of them outside their tubes and having an inlet connection and inlet valve between the chambers and an outlet connection and outlet valve between the chambers, said last-mentioned two valves being reversing valves.

3. In refrigerating apparatus, the combination, substantially as set forth, of a pair of cooling chambers provided with air tubes, a pipe communicating with one end of the tubes

of both chambers, a pipe communicating with the other ends of the tubes of both chambers, a pipe, as H, placing the chambers outside the tubes in direct communication with each other, a pipe placing the two chambers outside the tubes in communication with an outlet and inlet connection, reversing valves in the pipes to control the direction of flow, and mechanism connecting all the valves to cause their simultaneous reversal.

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Witnesses:
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