No. 681,314. Patented Aug. 27, 1901.

W. W. HARRIS.

REFRIGERATING APPARATUS.

(Application filed Dec. 6, 1900.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1

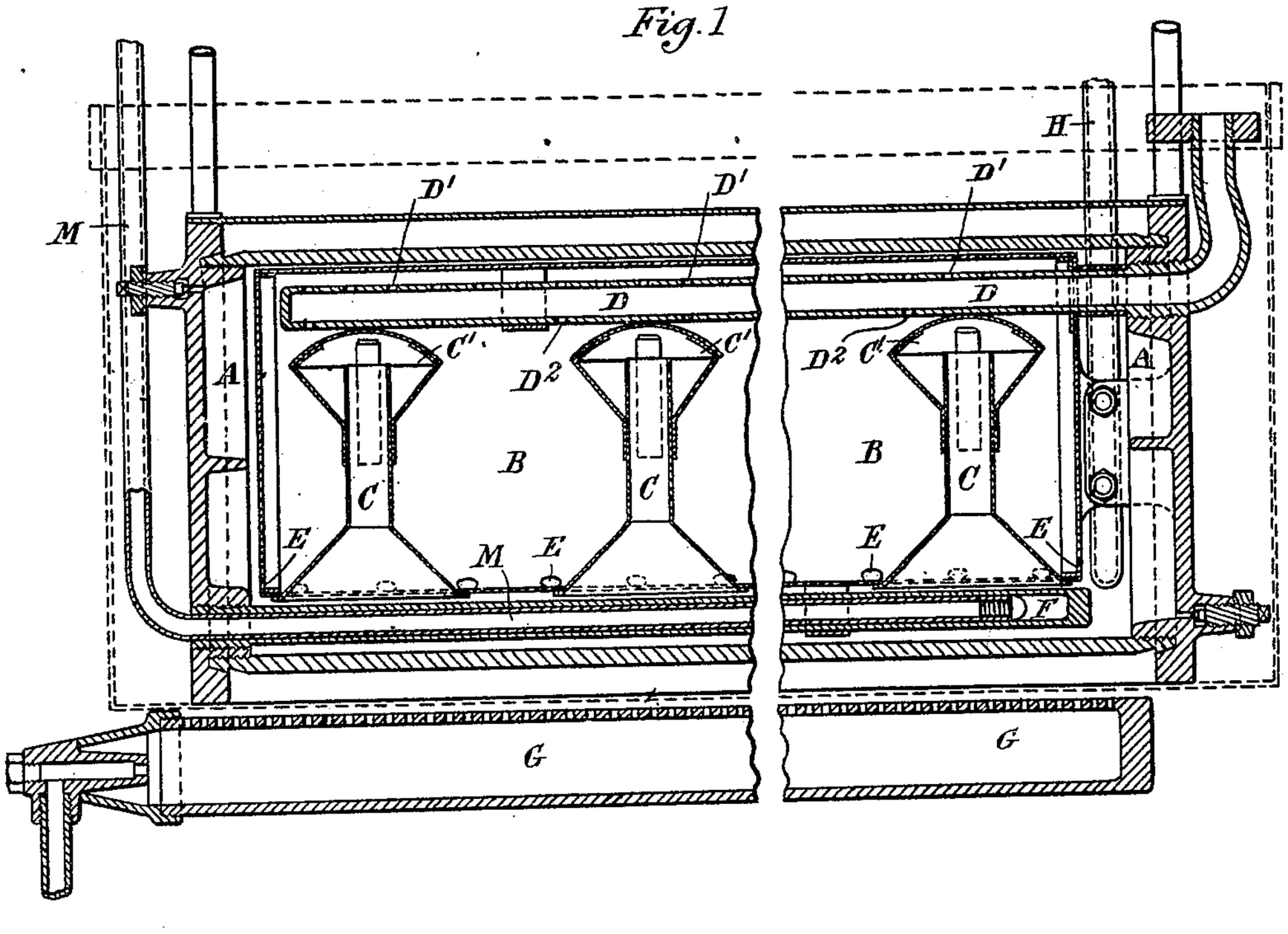


Fig. 2.

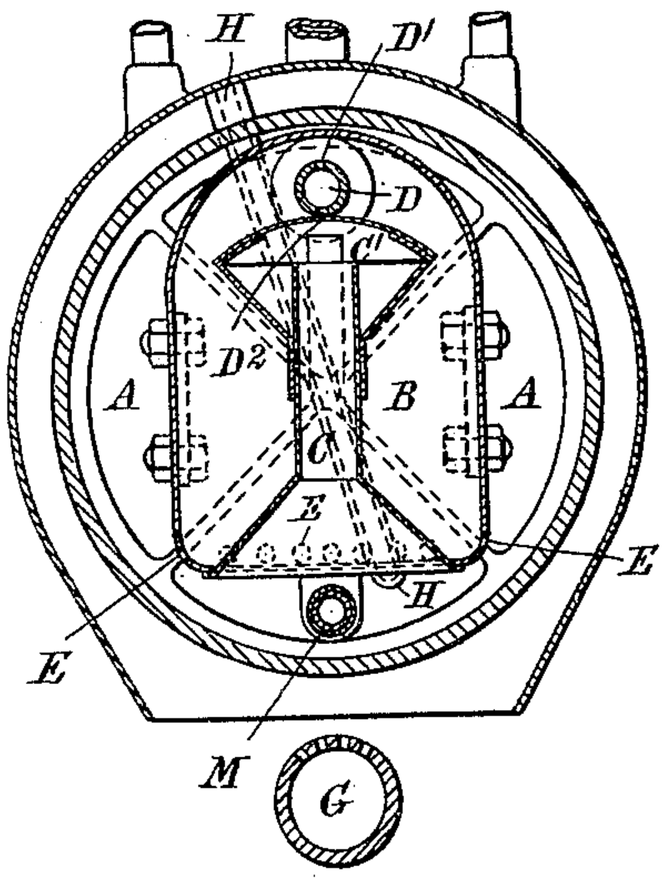
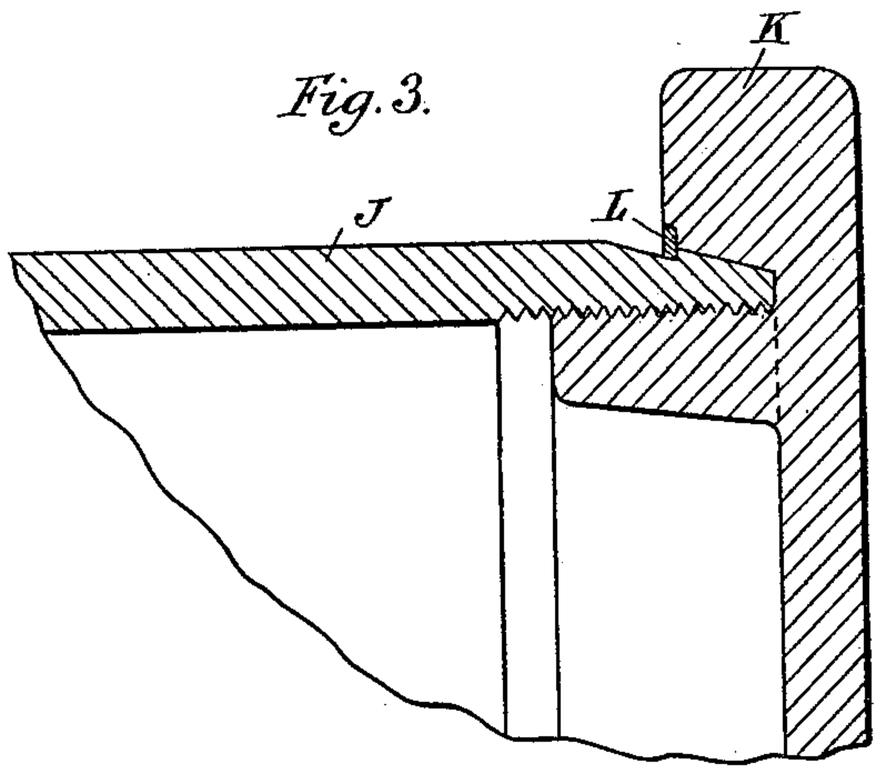


Fig. 3.



Witnesses
E. A. Bullock.
A. M. Parkins

Inventor
Wm. W. Harris
By his Attorneys
Baldwin, Davidson & Wright.

No. 681,314. Patented Aug. 27, 1901.

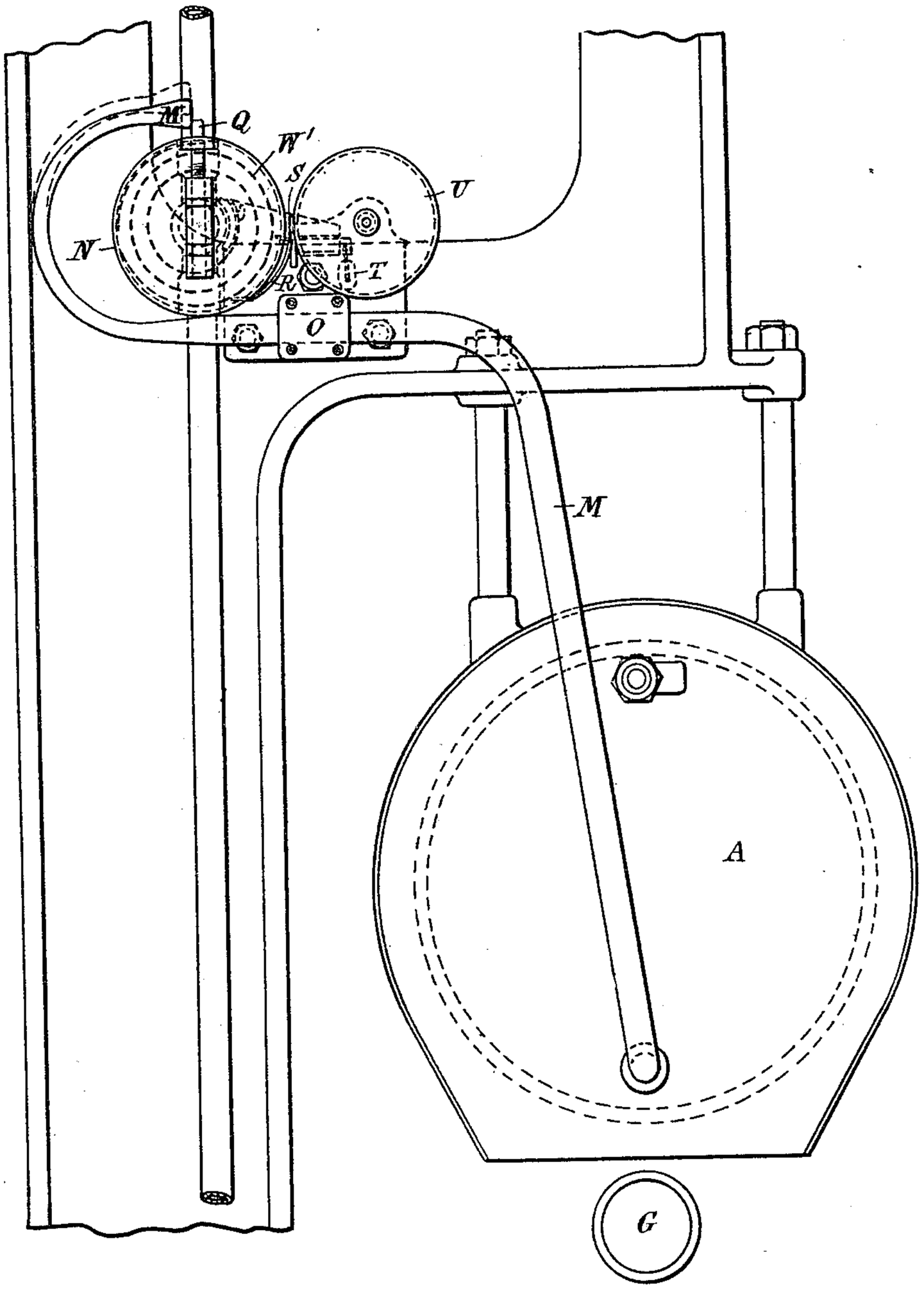
W. W. HARRIS.

REFRIGERATING APPARATUS.

(Application filed Dec. 6, 1900.)

(No Model.) 4 Sheets—Sheet 2.

Fig. 4.



Witnesses
E. A. Bullock
A. M. Parkins.

Inventor
Wm. W. Harris
By his Attorneys
Baldwin Davidson & Wright

No. 681,314. Patented Aug. 27, 1901.

W. W. HARRIS.

REFRIGERATING APPARATUS.

(Application filed Dec. 6, 1900.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 5.

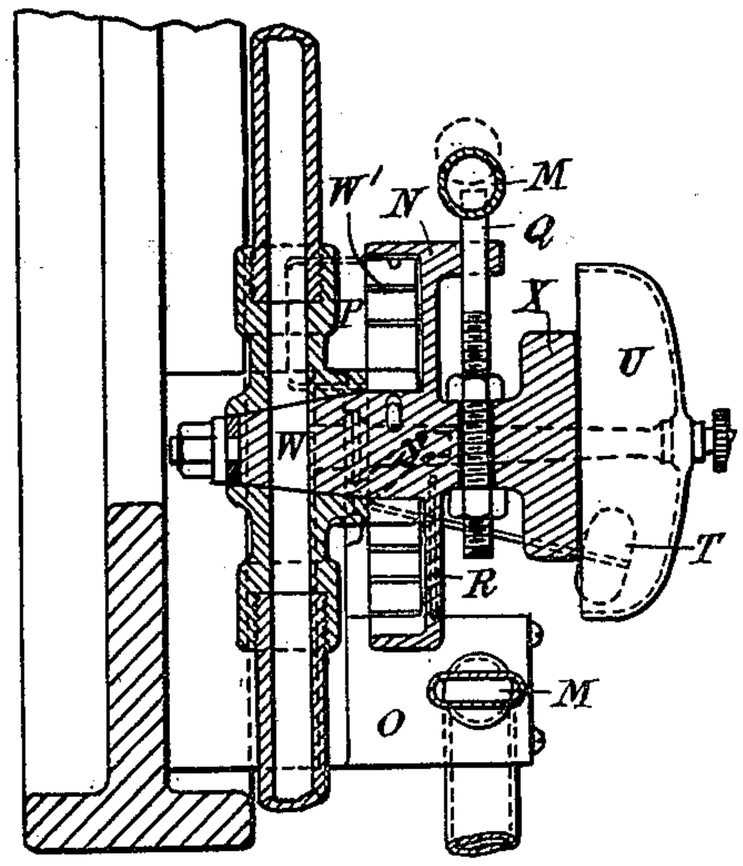
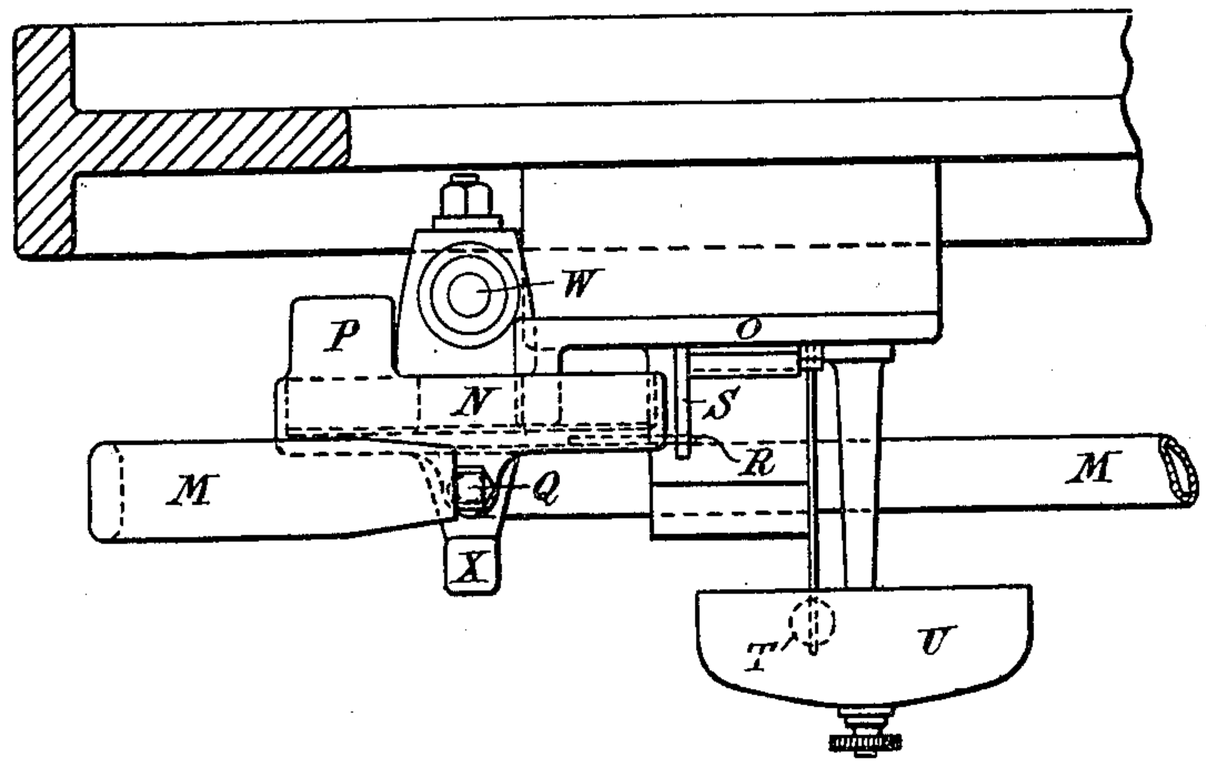


Fig. 6.



Witnesses
E. A. Bullock
A. M. Parkins

Inventor
Wm. W. Harris
By his Attorneys
Baldwin Davidson & Wright

No. 681,314. Patented Aug. 27, 1901.

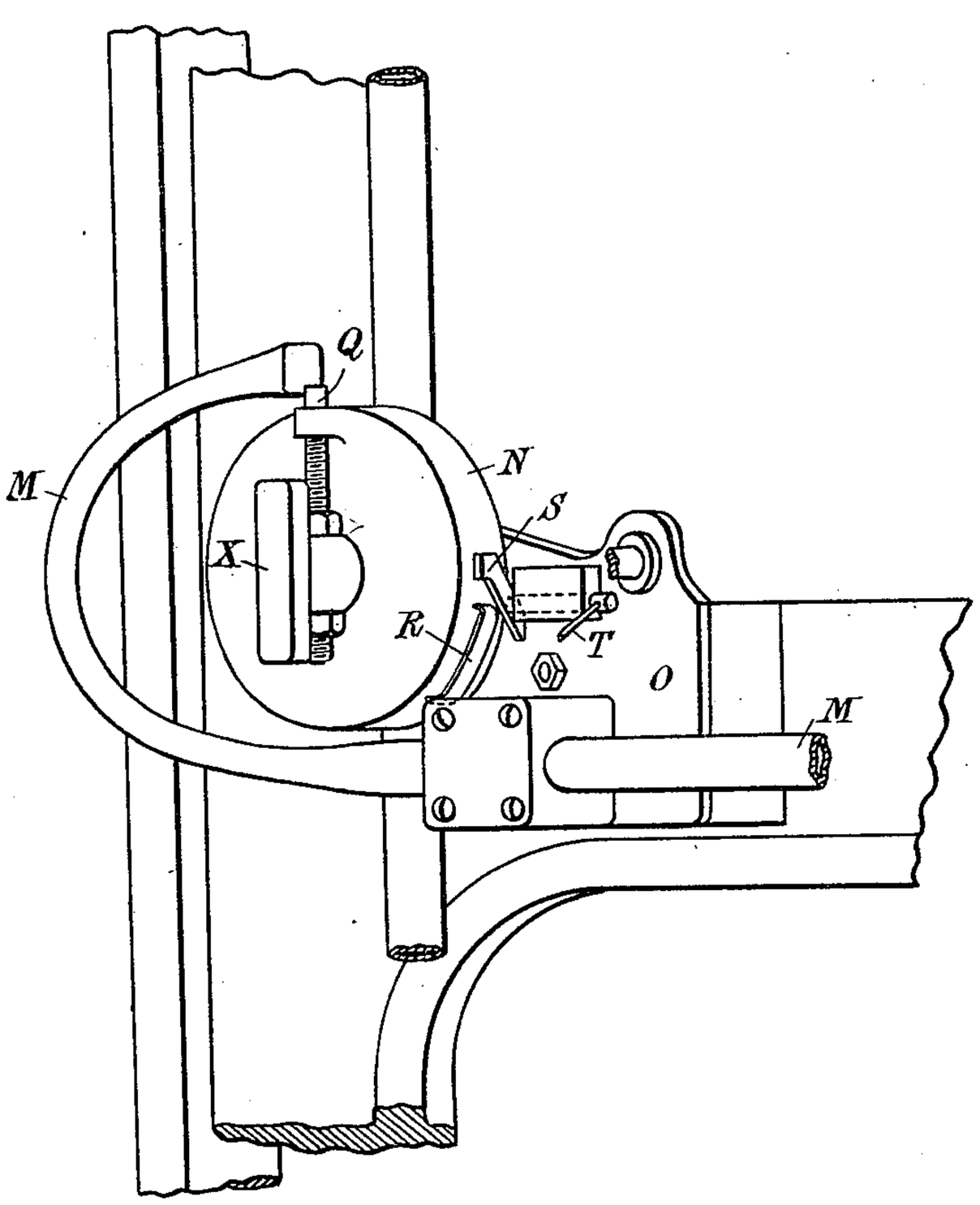
W. W. HARRIS.

REFRIGERATING APPARATUS.

(Application filed Dec. 6, 1900.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 7.



Witnesses
A. M. Parkins.
E. A. Babcock.

Inventor
William H. Harris,
By his Attorneys,
Baldwin, Davidson & Wright

UNITED STATES PATENT OFFICE.

WILLIAM WALLINGTON HARRIS, OF LONDON, ENGLAND, ASSIGNOR TO PAUL PFLEIDERER, OF MIDDLESEX COUNTY, ENGLAND.

REFRIGERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 681,314, dated August 27, 1901.

Application filed December 6, 1900. Serial No. 38,871. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WALLINGTON HARRIS, engineer, a subject of the Queen of Great Britain, residing at 43 Regent Square, Gray's Inn road, London, in the county of Middlesex, England, have invented certain new and useful Improvements in Refrigerating Apparatus, of which the following is a specification.

This invention has for its object improvements in the construction of ammonia-absorption refrigerating apparatus of the class in which there is a combined separator and absorber, consisting of two chambers, one within the other, communicating at the bottom, the outer chamber being closed at the top, while the top of the inner chamber communicates with the coils. The action of an apparatus of this class is well known. It is first heated, which has the effect of driving ammonia solution from the outer chamber into the inner one and of separating the ammonia (in the form of gas) from the water. The ammonia liquefies in the coils, and when the heating ceases it evaporates again, producing cold, the gas being reabsorbed in the water in the combined separator and absorber. There being also now more or less of a vacuum in the outer chamber, the ammonia solution is drawn into it from the inner chamber. When all the gas has evaporated and been absorbed, the apparatus is again heated, and so on.

This invention relates to the method of constructing and the manner of heating the combined separator and absorber.

Figure 1 is a longitudinal section of the separator and absorber. Fig. 2 is a transverse section of the same. Fig. 3 is a section to a larger scale of joint at the cylinder ends. Fig. 4 is a side elevation of the automatic heat-controlling gear. Fig. 5 is a vertical section through the valve. Fig. 6 is a plan of the same. Fig. 7 is a perspective view, on an enlarged scale, of the valve-controlling mechanism.

In Figs. 1 and 2, A is the outer and B the inner chamber of separator and absober. C represents circulating-tubes in the form of inverted funnels, which pass the hot liquid from the bottom of the outer chamber to the top of the liquid-level in the inner and which keep the whole mass of solution in a constant state of circulation during the heating period. This circulating action facilitates the separation of the gas and prevents priming. C′ represents hoods above the pipes C, and D is a gas-collecting tube which extends the whole length of the inner chamber and conducts the gas to the other part of the apparatus, which is of ordinary construction and is not shown in the drawings. This pipe is perforated along the top side with a number of small holes D′ for the purpose of collecting the gas from all parts. The holes D^2 on the under side are intended to allow any condensed moisture that may have passed over with the gas to drop back again into the chamber. E is a series of holes at the lower edge of the inner chamber. They extend round the entire periphery. These holes allow the hot liquid while circulating to pass from the inner to the outer chamber during the heating and the gas to return into the water during the absorption period. These holes are always submerged either on one side or the other when heating or cooling. F is a stopped end tube in the lower part of the outside chamber, in which is inserted an automatic tube for controlling the duration and intensity of the heating period. G is an atmospheric-gas burner which heats the separator. In apparatus of large size either steam or gas can be used for heating. H is a stopped end tube inserted in the outer chamber to receive a thermometer. It is of sufficient length to allow the bulb of a thermometer to reach below the surface of the hot liquid to ascertain its temperature.

In Fig. 3, J is the screwed and coned end of cylinder, K the end cover recessed for cone, and L is a line of calking. By means of this outer cone a tight joint and clean flat surface can be obtained, on which to calk, so that very slight calking is sufficient to obtain absolute soundness. Should it be needed for any reason to take the joint apart, this can easily be done, as at the first turning movement the cone slacks out of the recess, and the thread has not been touched or damaged in any way by the calking. The joint can thus be separated and put together again for any reasonable number of times.

In Figs. 1, 2, 4, 5, and 6, M is a stopped end Bourdon tube containing a proper quantity of liquid. The dotted lines at the flattened end, Figs. 4 and 5, show the movement obtained from internal pressure derived from the expansion of the liquid when heated, the liquid in the tube being practically hermetically sealed. N is a revolving disk on the plug W of the valve, which is fitted with a coiled spring W′, one end of which is attached to the carrying-bracket O and the other to the rim of the disk. A projection P on the rim of the disk acts as a stop, limiting the revolving motion of the valve to about one-quarter turn, which is the amount that is required to pass from full open to closed. Q is an adjustable stop which can be raised or lowered by the screwed end till the top of the stop and the under side of the Bourdon tube exactly coincide at a certain temperature. Any increase of temperature beyond this causes the tube to rise above the stop and release it. The spring then comes into play, turns the valve, and shuts off the source of heat. R is a spring-catch on the rim of the disk, so placed that it strikes and lifts the trigger S as the disk revolves, but which closes in against the rim, so that it can pass the trigger as the disk is turned back on the valve being again opened. T is a hammer which is raised by the trigger S and strikes the gong V, giving notice that the heating is concluded, and X the handle by which the valve is opened when it is desired to again turn on the heat. When the valve is opened, the stop Q is made to bear against the end of the tube M, as shown in Fig. 7. When the temperature has increased to a predetermined amount, the end of the tube rises, releasing the stop, and the spring W′ instantaneously turns the valve W and shuts off the supply of gas to the burner.

What I claim is—

1. In a combined separator and absorber the combination of a horizontal cylindrical outer chamber, an inner chamber within and communicating at the bottom with it, a series of vertical pipes in the inner chamber opening into the lower part of the outer chamber, hoods above the pipes and a pipe leading from the top of the inner chamber.

2. In a combined separator and absorber the combination of a horizontal cylindrical outer chamber, an inner chamber within and communicating at the bottom with it, a series of vertical pipes in the form of inverted funnels in the inner chamber opening into the lower part of the outer chamber, hoods above the pipes and a pipe leading from the top of the inner chamber.

3. In a combined separator and absorber the combination of a horizontal cylindrical outer chamber, an inner chamber within and communicating at the bottom with it, a series of vertical pipes in the inner chamber opening into the lower part of the outer chamber, hoods above the pipes and a perforated gas-collecting pipe at the top of the inner chamber extending from end to end of it one end of which is led to the outside.

4. In a combined separator and absorber the combination of a horizontal cylindrical outer chamber, an inner chamber within and communicating at the bottom with it, a series of vertical pipes in the form of inverted funnels in the inner chamber opening into the lower part of the outer chamber, hoods above the pipes and a perforated gas-collecting pipe at the top of the inner chamber extending from end to end of it one end of which is led to the outside.

5. In a combined separator and absorber an outer casing consisting of a cylindrical body externally coned and internally screw-threaded at the end and a cover having in it an annular recess to receive the end of the body the inner wall of which is cylindrical and screw-threaded and the outer wall is conical, an annular groove for calking being cut around the junction of the body and end.

6. The combination of a combined separator and absorber, a source of heat, a valve controlling the same, a spring actuating the valve to close it, and a hermetically-sealed Bourdon tube exposed to the heat of the separator and absorber but not opening into it and controlling the valve.

WILLIAM WALLINGTON HARRIS.

Witnesses:
WILFRED CARPMAEL,
JOHN H. WHITEHEAD.