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PROCESS OF DEHYDRATING MOIST CHLORIN.

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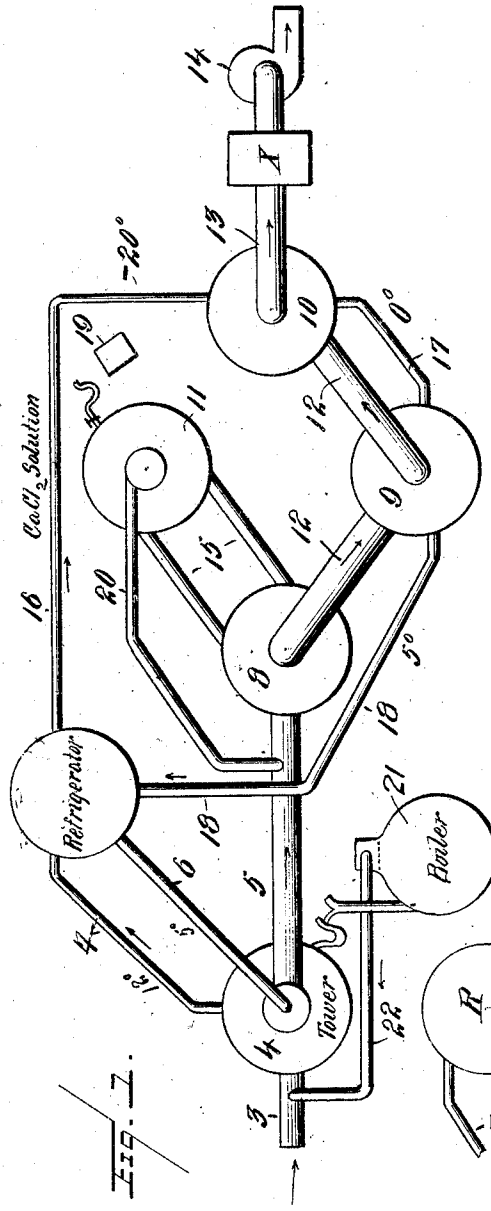


Fig. 1.

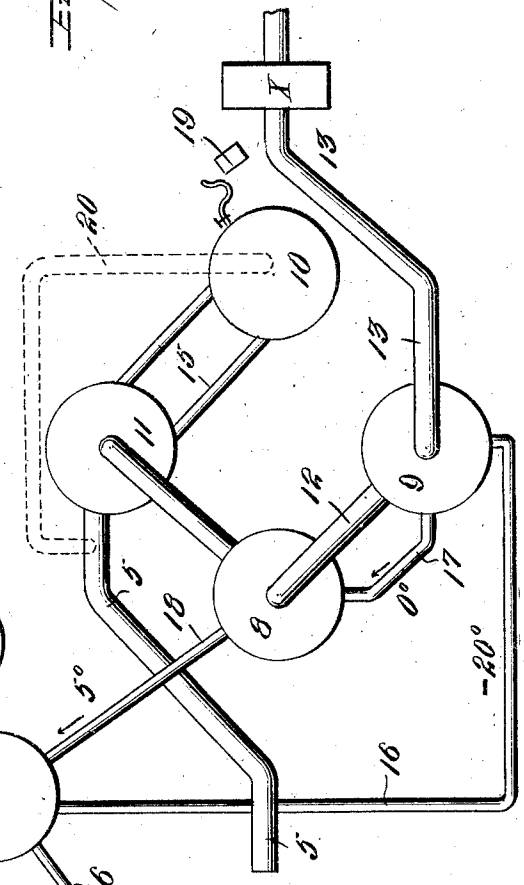


Fig. 2.

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PROCESS OF DEHYDRATING MOIST CHLORIN.

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To all whom it may concern:

Be it known that I, ELMER A. SPERRY, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Processes of Dehydrating Moist Chlorin, of which the following is a specification.

My invention relates to the method of drying chlorin or rendering same anhydrous. The raw material is supposed to be gaseous chlorin either pure or diluted, as, for instance, by moisture or by other gases or vapors.

The process consists in various steps and operations calculated to bring about the desired result.

To illustrate one form of apparatus with which the process may be carried out the accompanying drawings have been prepared in which similar characters of reference indicate like parts throughout.

Figure 1, of the drawings, represents a diagrammatic view of the apparatus. Fig. 2, represents the same view with a part of the units differently coupled.

Generally speaking chlorin is extremely difficult to dry and especially to render absolutely anhydrous. I have found that a very practical method for accomplishing the object is to refrigerate, but when this is accomplished the chambers where refrigeration takes place may become clogged with the solid hydrate produced and the process is thus interrupted. I have provided means whereby this difficulty is overcome and also whereby a number of desirable objects are attained in connection with the pre-chilling of the gas; also heat exchange between the incoming gas and product, and also recovering all the chlorin from the water and products to prevent waste of chlorin and also to prevent any obnoxious odors in and about the plant which would otherwise inevitably occur.

It is well known that an atmosphere containing one three millionth part chlorin is not suitable for breathing for any length of time, thus it is important to provide a process which will prevent escape of chlorin during operation.

Suppose chlorin to enter the apparatus at 3, from any suitable source of supply, for instance, electrolytic cells decomposing chlorids. The gas is preferably first led to a tower 4, or scrubber, through which it may pass in an upward direction, and from which it passes through pipe 5; encountering in its upward passage a downwardly flowing stream of a suitable refrigerant, for instance, water coming from the refrigerator so marked to the top of the tower 4, by pipe 6, and out at the bottom, returning to the refrigerator by pipe 7. From pipe 5, the chlorin passes to chamber 8, thence to chamber 9, and through this to chamber 10 by pipes 12. After it has left chamber 10, the pipe 13 carries the dried chlorin to any suitable reaction or other apparatus, as X, to the suction fan, or equivalent apparatus 14. The chamber 11 has its jacket coupled to that of the chamber which is first in series, viz. chamber 8, by pipe 15 and in this particular instance the chamber 11 is warming up, receiving its heat from the incoming gases as they pass chamber 8 by means of the fluid jacket circulation. By this operation chlorin hydrate is accumulated in each of the chambers 10, 9 and 8 in this order, which is in inverse ratio to the temperatures; these temperatures may be inferred by the temperature viz: minus 20° C. marked on the pipes 16 and 0° C. on the pipe 17 and 5° C. on pipe 18 respectively, connecting the refrigerator with the jackets of the various chambers, as will readily be understood. This is true where the series relation of the chambers is used but it is not important to essential features of my invention that this arrangement be always employed.

It will furthermore be noticed that the refrigeration received by the gases in chamber 8 is derived from the idle chamber 11. A receptacle 19 is shown as receiving the liquid discharge from the idle chamber. In Fig. 1 the idle chamber is coupled for discharge of the chlorin into the pipe 5 by pipe 20, whereupon it will be noted that the chlorin thus produced is again refrigerated to remove any remaining moisture. In Fig. 2 this pipe 20 is shown in dotted lines only and the melting of the hydrate is utilized to produce the two component liquids, chlorin and water, the water being eliminated or drawn off in receptacle 19 and the chlorin collected and utilized as liquid chlorin in either the idle vessel or transferred to other receptacles before using. The water drawn from the idle vessel may be added to the accumulation of water from the tower and is heated in chamber 21, whereupon the chlorin is driven off and is returned to pipe

3 through duct 22, which as will be seen, places the chamber 21 under negative pressure of exhauster 14.

Referring now to Fig. 2, it will be seen that the process is carried out in identically the same manner as in Fig. 1, but that the chamber 10 has become so filled with the hydrate that a change is necessary. At the same time chamber 11, which in Fig. 1 was idle, has now become the first in the series and coupled with the inlet pipe 5; chamber 10 becoming the idle chamber, should now receive heat to decompose the hydrate into the original chlorin and water so as to eliminate the latter. In this arrangement it will be noticed that chamber 9 has become the last of the series, which is always the coldest chamber, and will be next in order of rotation in the series to become idle and pass through the process of having its accumulation of hydrate treated.

From the location and connection of the fan, or equivalent exhausting apparatus 14, it is apparent that the whole connected system during operation may be kept at a reduced atmospheric or negative pressure, so that if any of the apparatus springs a leak the chlorin will not flow from the apparatus outwardly; but from the fact that the apparatus is inhalent, air will flow into the apparatus but no chlorin escape. The proportion of the chlorin which is converted into the hydrate may be regulated by the amount of moisture permitted to enter the system and therefore the chambers; as from boiler 21. It will thus be seen that all, or nearly all, of the chlorin may be thus converted if desired.

The chamber 10, in Fig. 2, if not coupled to the circuit as by the duct, shown in dotted lines at 20, will be found to be under positive pressure after sufficient heat has been supplied for melting the chlorin hydrate.

The use and operation of the apparatus has been carefully pointed out in its description and needs no further amplification to aid in the proper operation and manipulation of the system by those versed in the art to which it appertains. It will readily be understood that some of the steps may be omitted or altered and equivalents may be substituted, and the invention extends to such use.

I claim:

1. The process of dehydrating moist chlorin which consists in refrigerating the gas in a plurality of chambers, thereby producing chlorin hydrate in such chambers, disconnecting a part of such chambers from the system and treating the contents of such disconnected chambers for the separation of chlorin and water.

2. The process of dehydrating moist chlorin gas contained in a mixture of chlorin and other gas or gases or vapor, which consists in refrigerating the gas while in transit through a suitable chamber, thereby forming chlorin hydrate from the chlorin content of such gas and removing the other gas or gases from the chamber.

3. The process of dehydrating moist chlorin which consists in refrigerating the gas in a plurality of chambers, thereby producing chlorin hydrate in such chambers, disconnecting a part of such chambers from the system and treating the contents of such disconnected chambers for the liquefaction of the hydrate and the separation of the chlorin and water.

4. The process of dehydrating moist chlorin which consists in refrigerating the gas in a plurality of chambers coupled in a series, thereby producing chlorin hydrate in such chambers, disconnecting a part of such chambers from the series and treating the contents of such disconnected chambers for the separation of chlorin and water.

5. The process of dehydrating moist chlorin gas contained in a mixture of chlorin and other gas or gases or vapor, which consists in refrigerating the gas while in transit through a suitable chamber, thereby forming chlorin hydrate from the chlorin content of such gas and such moisture as is present and removing the other gas or gases together with the gaseous chlorin not so converted from the chambers.

6. The process of dehydrating moist chlorin which consists in refrigerating the gas in a plurality of chambers coupled in a series, thereby producing chlorin hydrate in such chambers, disconnecting a part of such chambers from the series and treating the contents of such disconnected chambers by heat abstracted from the incoming chlorin for the separation of chlorin and water.

7. The process of dehydrating moist gaseous chlorin which consists in adding moisture to the gas, refrigerating the gas in a plurality of chambers coupled in a series, thereby producing chlorin hydrate in such chambers, disconnecting a part of such chambers from such series and treating the contents of such disconnected chambers for the separation of chlorin and water.

8. The process of dehydrating moist chlorin which consists in refrigerating the gas in a suitable chamber or chambers, thereby forming chlorin hydrate in a part of such chambers, treating the contents of the chamber or chambers for the separation of chlorin and water and further separating chlorin from the water thus obtained, under conditions of pressure below that of the surrounding atmosphere, for the purposes specified.

9. The process of dehydrating moist chlorin which consists in refrigerating the gas in a plurality of chambers, thereby produc-

ing chlorin hydrate in such chambers, disconnecting a part of such chambers from the system, and treating the contents of such disconnected chambers for the separation of chlorin and water and further separating chlorin from the water thus obtained and returning the chlorin to the system.

10. The process of dehydrating moist chlorin which consists in first chilling the gas and then refrigerating same in a plurality of chambers, thereby producing chlorin hydrate in such chambers, disconnecting a part of such chambers from the system and treating the contents of such disconnected chambers for the separation of chlorin and water.

11. The process of dehydrating moist chlorin which consists in first chilling the gas by the wet contact process and then refrigerating same in a plurality of chambers, thereby producing chlorin hydrate in such chambers, disconnecting a part of such chambers from the system and treating the contents of such disconnected chambers for the separation of chlorin and water.

12. The process of dehydrating moist chlorin which consists in refrigerating the gas in a plurality of chambers, coupled in a series, thereby producing chlorin hydrate in such chambers, disconnecting a part of such chambers from the series and treating the contents of such disconnected chambers for the separation of chlorin and water and re-establishing the chambers so removed as members of the series.

13. The process of dehydrating moist chlorin which consists in refrigerating the gas in a plurality of chambers, producing chlorin hydrate in such chambers, the refrigeration in one or more of such chambers being produced by the melting chlorin hydrate in another or others of the group.

14. The process of dehydrating moist chlorin gas contained in a mixture of chlorin and other gas or gases or vapor, which consists in refrigerating the gas while in transit through a suitable chamber, thereby forming chlorin hydrate from the chlorin content of such gas and removing the other gas or gases from the chamber under pressure below that of the surrounding atmosphere.

15. The process of dehydrating moist chlorin which consists in converting chlorin into chlorin hydrate by refrigeration, decomposing the hydrate into chlorin gas and water and rechilling the gas so produced for the purpose specified.

16. The process of dehydrating moist chlorin which consists in converting chlorin into chlorin hydrate by refrigeration, decomposing the hydrate into chlorin gas and water, and refrigerating the gas so produced down to a point below that at which chlorin hydrate is produced.

17. The process of dehydrating moist, gaseous chlorin, which consists in adding moisture to the gas, refrigerating the gas in a suitable chamber to a point at or below that at which chlorin hydrate is formed, and treating the contents of the chamber to effect decomposition of the product.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ELMER A. SPERRY.

Witnesses:
CARL G. PREIS,
WALTER B. KNIGHT.