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PROCESS OF BLEACHING WASHED GOODS AND APPARATUS THEREFOR

Filed May 1, 1925

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To all whom it may concern:

Be it known that MARION G. DONK, a citizen of the United States, and a resident of the city of Washington, in the District of Columbia, and WILLIAM D. MARSHALL, a citizen of the United States, and resident of Germantown, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Processes of Bleaching Washed Goods and Apparatus Therefor, of which the following is a specification.

This invention relates to processes of bleaching washed goods and apparatus therefore and it comprises generating alkali hypochlorite directly in the presence of the goods to be bleached by introducing to the laundering machine containing the goods, regulated and measured amounts of gaseous chlorine, and in the introduction to the laundering machine containing the goods to be bleached of a sufficient amount of an alkaline material (for example, soda ash) to produce hypochlorite and prevent the production of substantial amounts of hypochlorous acid; and also comprises as a new organization of apparatus elements, a laundry wheel, (serving as an absorbent chamber) and means for introducing gaseous chlorine therein, such means comprising a regular volume metering device; all as more fully hereinafter set forth and as claimed.

In modern power laundries the washing and bleaching of the laundry is done in what is known as laundry wheels. A laundry wheel consists of a stationary perforate cylinder containing an inner perforate cylinder of smaller diameter with mechanism adapted to give the inner cylinder oscillatory rotary motion. The inner cylinder is provided with a number of partitions forming compartments or pockets for different lots of goods and usually the machines are built of such a size as to operate upon 150 pounds (dry weight) of goods, the operation being conducted under such conditions that approximately one-half of each of the compartments only is filled with goods when the water is added. In using the machine the goods are introduced into each of the compartments of the inner cylinder through appropriate doors and the cylinder placed in oscillation and between the two cylinders, in the lower part thereof is a body of water or other liquid which is changed from time to time as the washing operation proceeds. This liquid is splashed and worked into and through the goods by the oscillation of the inner cylinder. In an ordinary routine operation the clothes are first washed in water containing alkali and then rinsed, next are washed with water and soap and again rinsed, next bleached, then rinsed and soaped with a final rinsing. All this is done in the same wheel, the liquid being changed from time to time but the goods remaining undisturbed. In the washing steps the dirt is removed in colloidal suspension by the soapy alkaline wash water surging back and forth through the perforated cylinder and the goods.

The bleaching operation usually consists in adding to the laundry wheel a certain proportion of a stock sodium hypochlorite solution. This solution is made in the laundry from bleaching powder ('chlorid of lime'); the usual process being to dissolve the bleaching powder in water as far as possible, and then treat the resultant mixture with an excess of sodium carbonate to eliminate the lime compounds and to secure a sodium hypochlorite bleach liquor as free as possible of lime, since the presence of lime compounds in the laundry wheels is disadvantageous partly because of their effect upon the soap to form insoluble calcium compounds with spotting and discoloration of the goods, particularly when later ironed.

This usual bleaching process is therefore cumbersome, relatively expensive and not entirely satisfactory. In an endeavor to overcome the disadvantages flowing from the use of bleaching powder in the making of the sodium hypochlorite solution, it has been proposed to use liquid chlorine. This liquid chlorine is allowed to vaporize and diffuse into a solution of caustic soda, or carbonate of soda or a combination of the two with the resultant formation of sodium hypochlorite. But by this method there must be used an excess of alkali over that required to combine with the chlorine for the purpose of preventing decomposition of the sodium hypochlorite formed, sodium hypochlorite being a very unstable compound. In addition to the fact that such a stock solution of sodium hypochlorite readily deteriorates the process of making it is so inconvenient that lately laundries have been buying hypochloride in carboys at a greater expense than the
cost of making it in the plant. By adding the hypochlorite directly there is an initial high concentration, and later diminution, so the bleaching operation is not uniform.

The provision of a simple, easy and inexpensive method of bleaching clothes is therefore a desideratum in the art to which this invention relates. We have discovered that we can effectively and economically bleach goods in the laundry wheel without injuring the goods or creating a nuisance from the escape of chlorine and without at any time having a substantial concentration of hypochlorite within the wheel or any localized concentration of hypochlorite therein, by the introduction of gaseous chlorine direct to the goods in the presence of sufficient alkali to prevent the formation of hypochlorous acid. In other words, instead of making hypochlorite somewhere else and transferring it to the wheel we make it where it is wanted—in the wheel itself. Under the conditions its existence is temporary, there is at no time a high concentration of hypochlorite, nor is there any localized concentration thereof.

In accordance with our process we make the alkaline hypochlorite directly in the presence of the goods to be bleached while said goods are immersed in water containing soap and alkali. It is used up and disappears substantially as fast as produced. When it is desired to bleach the clothes in the wheel we add an amount of alkali, for example, soda ash, based upon the amount of chlorine to be used, and then meter into the wheel a definite amount of chlorine and continue the operation of the inner cylinder. If desired the chlorine may be introduced in solution in water but we advantageously introduce gaseous chlorine.

In the accompanying drawings showing one form of a specific embodiment of our invention and illustrating apparatus in which our invention may be carried out.

Fig. 1 is a more or less diagrammatic showing of a complete apparatus, certain parts being shown in section.

Fig. 2 is a front plan view of the valve chamber; and

Fig. 3 is a vertical section along line 2—2 of Fig. 2 looking in the direction of the arrows.

In the drawings numeral 1 indicates the inner perforated cylinder of the usual laundry wheel, it being understood that this is divided into compartments each having a door, as is well known. The inner cylinder is mounted to rotate in the outer imperforate cylinder 2 and is driven by means of the pulley 3 from a source of power not shown. Usually the inner cylinder is rotated in one direction several times and then reversed an equal number of times. The outer cylinder is provided with sliding door 4 and with the connection 5 for supplying steam, hot and cold water and for withdrawing washing liquids etc. In the drawings three separate laundry wheels are shown for illustration. To each of the laundry wheels is connected a pipe 6 through which the chlorine (or chlorine water) is delivered to the wheel from the metering device to be described. These pipes 6 lead to several connections 24 mounted in manifold 7. For instance, line 6 from the machine at the extreme left leads to valve 8 and line 6 from the machine shown partly in vertical section leads to valve 9. As shown the manifold is provided with four valves 8, 9, 10 and 11 each controlling a chlorine pipe and a laundry wheel.

The metering device shown comprises two containers, bottles or carboys 12 and 13, suitably mounted one above the other in a supporting frame 14. By means of line 15 leading from chlorine tank 16 to and through inlet valve 17 in the manifold 7, chlorine is supplied to lower carboy 13 through line 18. The chlorine is fed into carboy 13 under sufficient pressure to displace the liquid contained therein, this liquid rising through line 19 into upper carboy 12. This carboy 12 is suitably graduated as at 20 and the rise of liquid therein indicates the displacement of liquid from the lower carboy; or the volume of chlorine therein. The liquid is usually a strong solution of calcium or sodium chloride. Either has but little solvent power for chlorine. The upper carboy is provided with air vent pipe 21 leading to the atmosphere at a high point. Chlorine tank 16, although shown for convenience of illustration as between two wheels, in practice is usually located outside the room. It is provided with the usual valve 22.

While manifold 7 may be of any other convenient construction, it is desirably made as shown in Figs. 2 and 3. Referring more specifically to these views, the admission valve 17 is provided with a valve chamber 23 through which communication can be established between chlorine supply pipe 15 and lower carboy 13 by means of pipe 18 extending into the top thereof. Communication can also be established between carboy 13 and an individual chlorine pipe 6 through line 18, chamber 23, and thence through one of the conduits 24 connecting the chamber 23 with valves 8, 9, 10 and 11 respectively.

As before stated, these valves control the supply of chlorine through the various lines 6 to the individual laundry machines. To prevent the possibility of chlorine escaping from the tank and line 15 directly to one of the washers, valve 17 is provided with a double seated valve stem 25 so arranged as to close off the conduit 24 when the valve is arranged for permitting entry of chlorine from the source of supply to carboy 13.
through line 18. The valve stem 25 is provided with threads 26 of such a pitch that one turn of the valve handle will be sufficient to either open or close the valve. Some sort of telltale (not shown) should be provided to indicate the on and off positions. The other valves should also be provided with telltales. The opening orifice in the valve seat in each case is so proportioned to the usual tank pressure of the chlorine that the flow of the gas into the carboy can take place without building up undue pressure therein even with the valve wide open and not subject the carboy to impact shocks.

In the case of the discharge valves the escape of chlorine from the carboy should not be faster than it can be absorbed in the washer. It may be noted however that the absorption of the chlorine in the washer is totally efficient.

In operating the metering device, presuming carboy 13, pipe 19 and the lower portion of the carboy 12 to be full of liquid up to the zero graduation mark, valve 17 is opened. Gaseous chlorine will then pass from tank 16 through line 15, valve chamber 23 and pipe 18 into container 13, displacing liquid ahead of it. This liquid passes upwardly through pipe 19 into carboy 12. The chlorine continues to flow into the carboy 13 in the manner described until the liquid level in carboy 12 has risen to a height corresponding to the amount of chlorine desired. With a 5 gallon carboy, at the time the liquid is all displaced from it this carboy will contain 5 gallons of gaseous chlorine (at the pressure prevailing). The graduations on carboy 12 will also indicate 5 gallons. Valve 17 is now closed and when it is desired to use the measured quantity of chlorine the carboy 8, 9, 10 or 11 is opened. Chlorine flows through carboy 10 through pipe 13, valve chamber 23, conduit 24 and through the appropriate valve and line 6 to the designated washer. The liquid in carboy 13 flows downwardly into carboy 12 to displace the gaseous chlorine as this is drawn off. For 150 pounds (dry weight) of goods, about 14 ounces of soda ash are placed in the wheel before the chlorine is introduced. Where the wash is alkaline, due allowance is made in adding soda ash. The delivery of the chlorine should be rather gradual. With the equivalent of about 14 ounces of soda ash present, there should be added about 4 ounces of chlorine; this amount of gas occupying a volume of about 10 gallons.

Under some conditions it may be desirable to supply the chlorine to the wheel in the form of chlorine water or hypochlorous acid solution and this may be done by providing means whereby the chlorine from the metering device may be absorbed in water. In Fig. 1 we have shown such a device. The tank 30 is provided with a valved water inlet 31 at the top and near the bottom with valved chlorine inlet 32 and with a valved outlet 33. When it is desired to absorb the chlorine from the metering device in water and supply it as chlorine water or hypochlorous acid solution to the wheel, valve 32 is opened and valve 34 on line 6 is closed. Chlorine is absorbed by water in tank 30 and then the valve on line 33 is opened.

While we have more particularly described a metering arrangement wherein chlorine is metered by displacement of a liquid and is delivered at substantially atmospheric pressure, yet other forms of apparatus adapted to deliver predetermined volumes of chlorine may be employed; as for example a cylinder which can be placed in communication with the chlorine cylinder to receive chlorine gas under pressure; the pressure coming from the cylinder. With a gas tank or compression chamber of this sort known volumes of chlorine can be readily delivered. The chamber can be provided with gages giving at any particular pressure the corresponding amount of chlorine gas at atmospheric pressure. No moving parts are necessary in such a device. Of course measuring pumps and like devices may be employed but the device just described is simple and desirable.

What we claim is:—

1. The process of bleaching washed goods which comprises conditioning the water in the laundry wheel to an alkaline state and introducing gaseous chlorine while operating the wheel.

2. In laundering goods in the laundry wheel, the process which comprises introducing gaseous chlorine into such wheel in the presence of an alkaline solution and of the goods to be bleached, said solution containing alkali equivalent to about 3.5 ounces of soda ash for each ounce of gaseous chlorine so introduced.

3. The process of bleaching washed goods which comprises agitating the same in the presence of an alkaline solution and introducing free chlorine thereto, the alkalinity of the solution being of such nature that the amount of chlorine introduced will not form a substantial amount of hypochlorous acid.

4. The process of bleaching washed goods which comprises agitating the same in an alkaline solution and while under agitation introducing free chlorine.

5. The process of bleaching washed goods which comprises agitating the same in a laundry wheel in the presence of an alkaline solution and forming hypochlorite bleaching solution in the wheel by introduction thereto of gaseous chlorine.

6. The process of bleaching washed goods in a laundry wheel, which comprises adding alkali to the water in the wheel and while agitating the goods in the solution thus
formed admitting chlorine to the wheel to form hypochlorite bleach therein as the chlorine is admitted, the amount of alkali added to the wheel being sufficient to prevent substantial formation of hypochlorous acid by the amount of chlorine introduced.

7. Bleaching apparatus comprising a laundry wheel, a receptacle for chlorine supply, a metering device for the chlorine, connections from the chlorine and supply to the metering device and from the metering device to the wheel.

In testimony whereof, we have hereunto affixed our signatures.

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