Sept. 4, 1928. 1,683,262

G. A. RICHTER ET AL

PROCESS OF CHEMICALLY TREATING AND WASHING PULP

Filed April 19, 1927 2 Sheets-Sheet 1

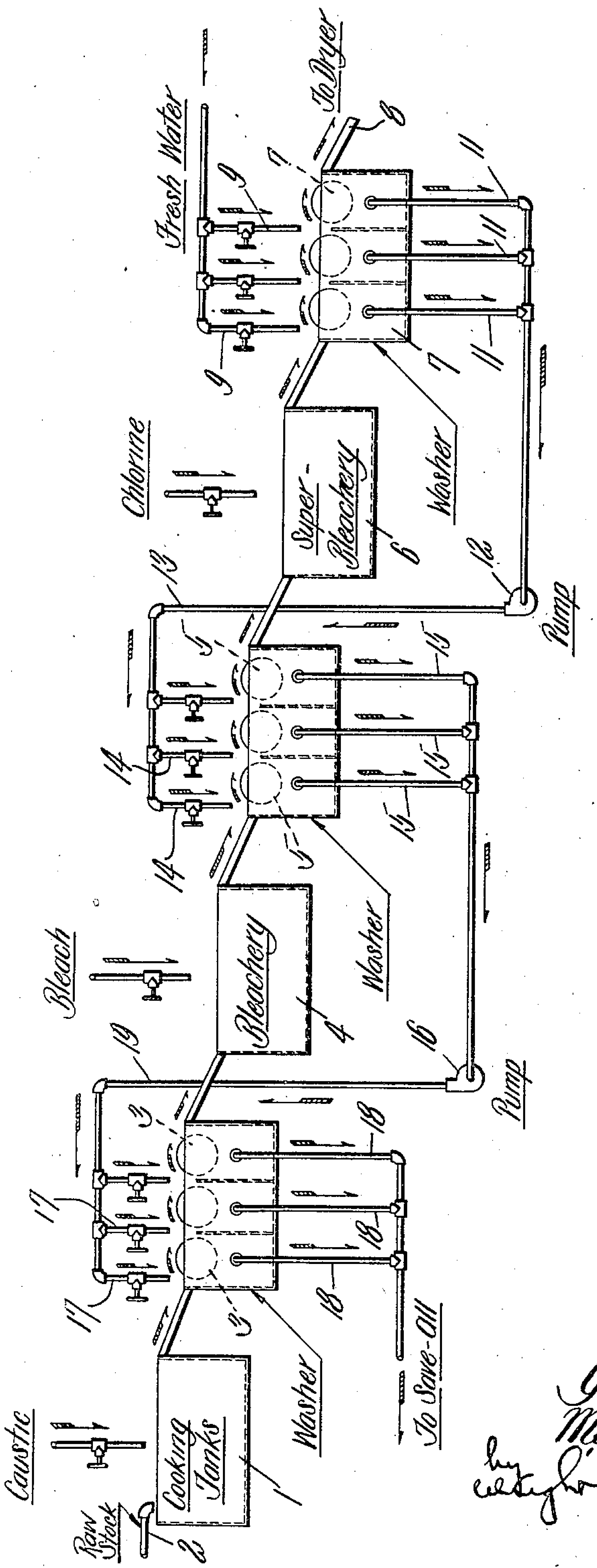

Fig. 1.

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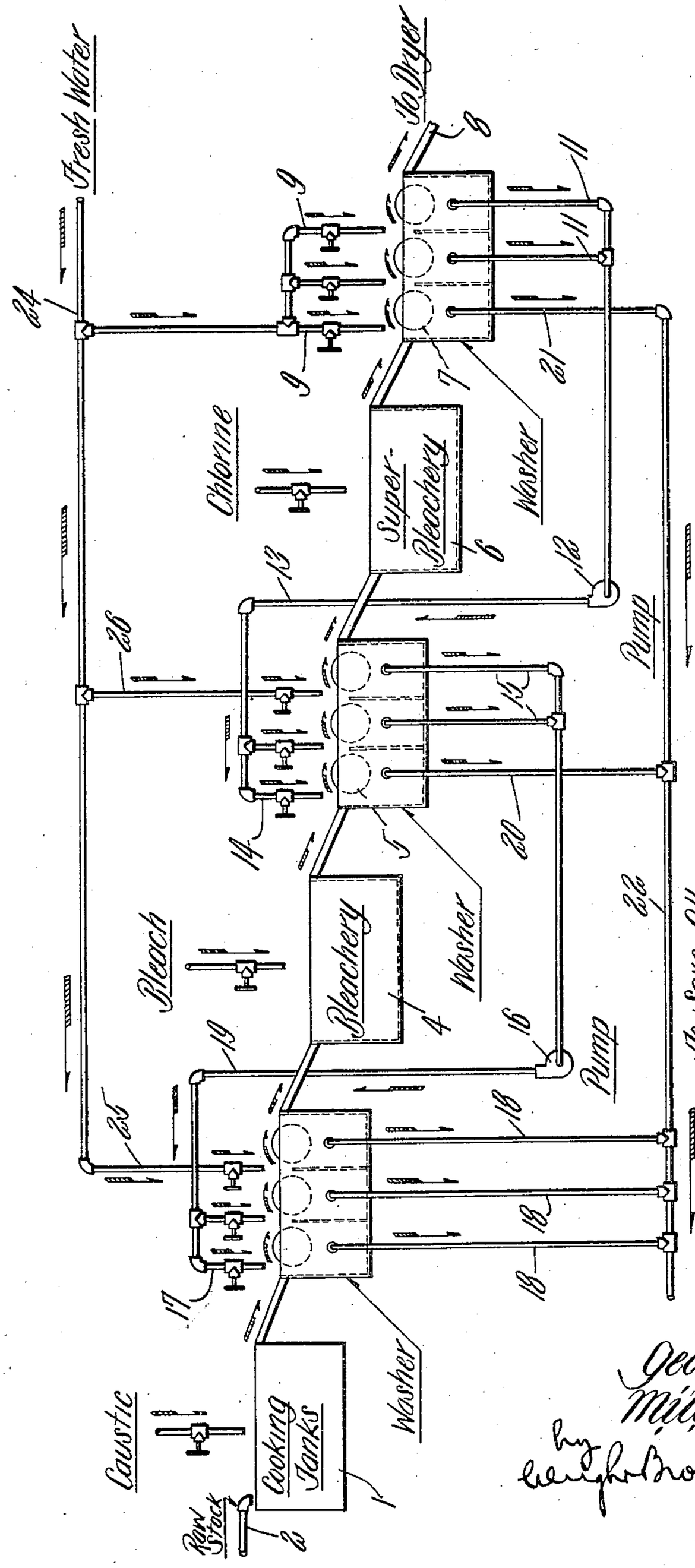

Fig. 2.

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UNITED STATES PATENT OFFICE.

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PROCESS OF CHEMICALLY TREATING AND WASHING PULP.

Application filed April 19, 1927. Serial No. 185,020.

This invention relates to a process of chemically treating and washing cellulose pulp, and has for its object to effect an economy of wash water in a process wherein pulp is subjected to a series of alternating chemical treatments and washings.

After the liberation of cellulose pulp from raw cellulosic material such as wood, it is sometimes subjected to a series of chemical treatments, after each of which the pulp is washed free of treating chemical and reaction products. For example, after the liberation of chemical wood pulp, as by the so-called "sulphite" process, it is sometimes subjected to a series of alternating chemical treatments and washings, to effect a removal of non-alpha cellulose components therefrom, and accordingly to produce a fiber high in alpha cellulose, which for convenience of designation shall hereinafter be termed "alpha wood fiber." A process of this character is described in our application, Serial No. 72,522, filed December 1, 1925. In accordance with that process, raw or unbleached wood pulp, e. g., sulphite pulp, is digested in an alkaline liquor, such as caustic soda solution, then bleached in hypochlorite bleach liquor, and finally superbleached in chlorine water. After each of such chemical treatments, the pulp is washed, as otherwise the active chemical of one treatment would interfere with the succeeding chemical treatment.

Where such a series of chemical treatments is performed on pulp, a large amount of wash water is required to wash the pulp. Such wash water must be free from impurities, such as specks, which if introduced into the fiber would impair its value. Hence, in certain localities where the supply of fresh water is limited, the problem of supplying a large amount of wash water becomes a very serious one.

In accordance with our process, wash water effluent resulting from one washing of the pulp is employed in another washing of the pulp when the contaminations do not deleteriously affect the pulp or materially interfere with its succeeding chemical treatment. Thus, wash water effluent resulting from washing pulp free of chemical and chemical reaction products of one class may be used successfully in washing pulp free of chemical and chemical reaction products of another class. For instance, the wash water effluent resulting from washing superbleached pulp and containing chemical and chemical reaction products of one class is suitable for washing bleached pulp, as the chemical and chemical reaction products present in bleached pulp are quite dissimilar to those present in superbleached pulp. Similarly, the wash water effluent resulting from bleached pulp is suitable for washing alkaline-digested pulp, as the chemical and chemical reaction products present in alkaline-digested pulp are quite dissimilar to those present in bleached or superbleached pulp.

A better understand of the present invention as applied to one particular process, for purpose of illustration, may be obtained from the following more complete description thereof, when considered in conjunction with the accompanying drawings, wherein

Figure 1 represents diagrammatically apparatus for carrying out a continuous series of alternating chemical treatments and washings for the production of an alpha wood pulp.

Figure 2 represents a similar arrangement of apparatus, wherein a somewhat modified washing procedure is practised.

Referring to the drawings, 1 indicates a tank into which raw or unbleached chemical wood pulp, e. g., sulphite pulp, is fed from a supply pipe 2, and in which such pulp is digested in an alkaline solution of proper alkalinity to effect a solution of non-alpha cellulose components therefrom. Digestion may be performed under the desired conditions, as in a caustic soda solution, until the alpha cellulose content of the pulp has been raised to the desired point. After digestion, the charge is highly colored, owing to the production of colored reaction products by reaction of the caustic soda solution and the non-alpha cellulose components in the pulp. The digested charge is passed from the cooking tank 1 through a series of washers 3, wherein the colored reaction products are largely removed from the pulp. The washed pulp is then passed into a bleaching tank 4, wherein it is bleached in a calcium hypochlorite liquor to the desired whiteness. The bleached pulp is then passed through a series of washers 5, wherein the bleaching reaction products are removed, then into a superbleaching tank 6, wherein it is superbleached in cholorine water to substantially ultimate whiteness. The superbleached pulp is then passed through a series of washers 7, where-

in the superbleaching reaction products are removed, then through the sluice 8 into a reservoir (not shown), from which it may be withdrawn for use as desired. Such alpha wood fiber is, for example, suitable for manufacture into high grade writing papers and for use as a cotton fiber substitute in the maufacture of cellulose derivatives.

In accordance with our process, fresh water is employed for washing the superbleached pulp, and the wash water effluent from the superbleached pulp is employed for washing the bleached pulp, and the wash water effluent from the bleached pulp is employed for washing the alkaline-digested pulp, thus utilizing a minimum quantity of clean wash water in the process. The wash water effluent from the superbleached pulp contains in solution a certain amount of free chlorine, hydrocloric acid, and chlorinated organic material representing chemical and chemical reaction products of one class, but these impurities do not appreciably affect the bleached pulp or its subsequent superbleaching, as the chemicals and chemical reaction products in such bleached pulp are of a different class. Thus, the bleached pulp contains lime salts, particularly calcium chloride, together with oxidized organic material which the wash water effluent from the superbleached pulp is quit capable of removing, as it is subtantially free of such impurities. Any impurities which are acquired by the bleached pulp from the wash water do not interfere with the superbleaching, as they represent chemical or chemical reaction products of superbleaching. So, too, the wash water effluent from the bleached pulp is very effective in washing the alkaline-digested pulp substantially free from colored reaction products, which, if allowed to remain in such pulp, would consume large quantities of bleach and seriously interfere with the attainment of high whiteness.

As shown in the drawings, fresh wash water is delivered through a series of pipes 9 into the washers 7, through which the superbleached pulp is passed. The wash water effluent from these washers flows out through outlet pipes 11, and is forced by a pump 12 through a pipe 13, and thence through pipes 14 into the washers 5, through which the bleached pulp is passed. The wash water effluent from the washers 5 flows out through outlet pipes 15, and is forced by a pump 16 through a pipe 19 and thence through pipes 17 into the pulp washers 3, through which the alkaline-digested pulp is passed. The wash-water from the washers 3 flows out through pipes 18 into a save-all (not shown), which catches and retains fibers carried along with the wash water. The various impurities in the pulp are in this way accumulated in the same wash water before it is finally discharged via the save-alls. A minimum amount of wash water consequently passes through the save-alls, thus necessitating a minimum save-all capacity.

In certain instances, it may be desirable to discard the most contaminated wash water effluent in each washing, to lower the concentration of impurities in the wash water effluent which is to be reused. Such a procedure is illustrated in Figure 2, wherein the effluent wash water from the first of the washers 5 through which the bleached pulp is passed, flows into a discharge pipe 20 leading to the save-all. Similarly, the effluent wash water from the first of the washers 7, through which the superbleached pulp is passed, flows into a discharge pipe 21 leading to the save-all. Thus, the wash water effluent containing most of the impurities of previous chemical treatment is discarded. This discarded effluent is replaced by supplying fresh water from a supply pipe 24 through a pipe 26, preferably to the last of the washers 5 and through a pipe 25, preferably to the last of the washers 3.

While we have described our process as applied to a process for the production of an alpha wood fiber, it is to be understood that it may find application in other processes where cellulose pulp is subjected to a series of alternating chemical treatments and washings, in each of which treatments chemicals and chemical reaction products of a different class are produced.

Hence, we do not wish to limit ourselves strictly to the procedure herein disclosed, but what we claim is:

1. A process which comprises subjecting pulp to a series of alternating chemical treatments and washings, and employing the wash water effluent from one washing of the pulp in another washing of the pulp wherein the contaminations in such effluent do not deleteriously affect the pulp or materially interfere with its succeeding chemical treatment.

2. A process which comprises subjecting pulp to a series of alternating chemical treatments and washings, discarding the most contaminated portion of the wash water effluent from one washing of the pulp and employing the remaining portion in another washing of the pulp wherein the contaminations in such effluent do not deleteriously affect the pulp or materially interfere with its succeeding chemical treatment.

3. A process which comprises subjecting pulp to a continuous series of alternating chemical treatments and washings, employing fresh water for washing the pulp after the last chemical treatment, and employing such wash water effluent in another washing of the pulp wherein the contaminations in such effluent do not deleteriously affect the pulp or materially interfere with its succeeding chemical treatment.

4. A process which comprises subjecting pulp to a series of different chemical treatments each producing reaction products of a different class; washing the pulp substantially free of chemical and reaction products after each treatment; and employing the wash water effluent from one washing of the pulp in another washing of the pulp.

5. A process which comprises subjecting pulp to a series of different chemical treatments each producing reaction products of a different class, washing the pulp substantially free of chemical and reaction products after each treatment, discarding the most contaminated portion of the wash water effluent from one washing of the pulp and employing the remaining portion in another washing of the pulp.

6. A process which comprises subjecting pulp to a continuous series of different chemical treatments each producing reaction products of a different class, washing the pulp substantially free of chemical and reaction products after each treatment, employing fresh wash water for washing the pulp after the last chemical treatment, and employing such wash water effluent in another washing of the pulp wherein the contaminations in such effluent do not deleteriously affect the pulp or materially interfere with its succeeding chemical treatment.

7. A process which comprises subjecting cellulose pulp to a series of chemical treatments including alkaline digestion and bleaching, washing the pulp after each treatment, and employing the wash water effluent from the bleached pulp in washing the alkaline-digested pulp.

8. A process which comprises subjecting cellulose pulp to a continuous series of chemical treatments including digestion in an alkaline liquor, bleaching in hypochlorite liquor, and superbleaching in chlorine water; washing the pulp after each treatment; employing the wash water effluent from the superbleached pulp in washing the bleached pulp; and employing the effluent wash water from the bleached pulp in washing the alkaline-digested pulp.

In testimony whereof we have affixed our signatures.

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