Our invention relates to a process for treating the bagasse of sugar cane, bamboo, banana stalks, corn stalks and other similar fibres in order to produce therefrom pulp available for use in paper manufacture, and further provides for the treatment of such pulp to extract therefrom substantially pure cellulose adapted for use in the manufacture of rayon and in other industries. It is further an important purpose of our invention to provide a process in the practice of which it is possible to dispense largely with the use of fresh water in the treatment of the fibres to produce the desired material, this being desirable for the reason that in many of the regions where supplies of bagasse are available fresh water supplies are limited but sea water is readily available. By our process we are enabled to dispense largely with the use of fresh water and to use sea water instead. In its broader aspects, however, our invention is not limited to the use of sea water.

In bagasse, corn stalks and similar products pithy material is closely associated with the fibres. The first step in our process consists in the separation, mechanically, of the pith from the fibres. This may be accomplished by various mechanical means, but we prefer to subject the bagasse or other fibre to the action of a swing hammer mill because the crushing action of such a mill tends to open up the fibres and to prepare them better for the action of salt water than is accomplished by other means. After this mechanical treatment, the pith, dust and "fines" or very short fibres by an air blast is an air separator.

We now take the longer fibres, free from the pithy material, dust and fines, and place them in a digester of any suitable type, which is preferably provided with a suitable means for circulating the cooking liquor during digestion. We then introduce a cooking liquor consisting of a solution of sodium hydroxide with or without soda ash in sea water. We prefer to use for every 100 pounds of dry fibre about 100 gallons of water, sodium hydroxide equal to 15-18% by weight of the dry fibre, and soda ash equal to 5-8% by weight of the dry fibre. We also introduce into the cooking liquor 2-4% of a soap material, preferably an alkali cellulose in saponified fatty acids. Sodium bisulphite may, if desired, he added to the extent of 4-8% based on the weight of the fibre.

We find that by cooking the fibres in this solution at pressures ranging from 25-30 pounds per square inch gauge for 2-5 hours, we obtain a pulp of suitable quality for paper manufacture. These pressures are notably low as compared with those employed in other digestion processes with which we are acquainted.

After cooking, the cooked fibres are washed, preferably with hot sea water, and then subjected to a beating process. This may be accomplished in an ordinary beater engine, but we prefer to employ, instead, the form of apparatus disclosed in the co-pending application of Raymond Charles McQuiston, Serial No. 448,461, consisting essentially of a form of gear pump through which the pulp mixture is circulated, which accomplishes more simply and cheaply the results usually accomplished by a beater and jordan treatment.

The beaten fibres are now in condition to be utilized for the manufacture of Kraft stock, cardboard and pressed and molded insulating materials, artificial lumber, etc.

If a higher grade pulp is desired for use in the manufacture of better grades of paper or for the extraction of pure cellulose, we now subject the pulp to a bleaching which is preferably accomplished by a solution of calcium hypochlorite in sea water. Other bleaching solutions may be used, if desired. It is our opinion, however, that a salt water solution of calcium hypochlorite considerably hastens the bleaching operation. We prefer to use 25-30 gallons of 3.0 to 5.0° Baumé calcium hypochlorite solution for every 100 pounds of wet pulp. The bleached solution is preferably maintained at a temperature of from 90 to 100° F. and the bleaching continued for from one-half to one hour. During the last ten minutes of bleaching we prefer to add to the bleaching solution about one pint 50% acetic acid or smaller amounts of 90.
sulphuric or hydrochloric or similar acids for every 100 pounds of wet pulp.  
The bleached fibres are now thoroughly rinsed, preferably first with sea water, and finally with fresh water, and are then ready for felting into dried pulp or for manufacturing directly into all grades of paper. The pulp obtained at this stage is snow white.

For the production of alpha-cellulose we now take the bleached pulp produced as aforesaid and treat it with a 12-18% solution of caustic soda in sea water maintained at 70-80° F., for 40-60 minutes, depending upon the degree of purity desired. We have found that a 5% solution of sodium hydroxide will yield a product containing about 84% of alpha-cellulose, while a 15% solution of sodium hydroxide will yield a product containing about 95% of alpha-cellulose.

The product is now washed in cold sea water and then suspended in a 1-2% cold fresh water solution of oxalic or acetic acid for 30-40 minutes, after which it is again washed with cold fresh water, and finally with hot fresh water.

The product obtained in this manner is substantially pure cellulose, free from lignin and pentosans, containing a low ash and high alpha content, and, after drying, is suitable for use in the production of rayon and other converted cellulosic materials.

While the primary purpose of our invention is to make available for the purposes indicated bagasse from sugar cane, our process is equally applicable to other fibrous materials of similar characteristics such as corn stalks, bamboo, banana stalks, etc. and it will be understood that such materials are included within the general scope of the word “bagasse” as used in the subjoined claims. It will also be understood that where in the subjoined claims we refer to the extraction of cellulose, we mean to include not only the extraction of pure cellulose, but of semi-cellulosic or cellulosic materials such as pulp suitable for use in the manufacture of paper and paper products.

We claim as our invention:
1. The method of extracting cellulose from bagasse which consists in treating the same with a solution of sodium hydroxide in sea water.
2. The method of extracting cellulose from bagasse which consists in treating the same with a solution of sodium hydroxide in sea water at relatively low pressures of the order of 25-30 pounds per square inch.
3. The method of extracting cellulose from bagasse which consists in treating the same with a solution of sodium hydroxide in the presence of an alkali cellulose in saponified fatty acids.
4. The method of extracting cellulose from bagasse which consists in first subjecting the bagasse to treatment in a hammer mill, sep-