Cellulose made from straw has hitherto been used exclusively as an ingredient added to other cellulose in the manufacture of fine grades of note-paper and writing-paper. In the production of such cellulose the main object has been to obtain an easily washed and easily bleached cellulose, and for this purpose the straw has been boiled at an excess pressure of 4 to 6 kg. per sq. cm. The cellulose fibre obtained in this manner, however, becomes short and weak. During recent times another method has also been proposed which consists in first treating the straw at a low temperature of about 100° C. with caustic soda lye, so that a half stuff is obtained which is afterwards transformed into cellulose by treatment with chlorine, such cellulose being further treated, if desired, by bleaching in the ordinary manner.

This latter method, however, gives a still more short-fibred cellulose, for which reason it has a very limited use.

Now, the present invention relates to a method of producing from straw, esparto, reed, and similar raw materials, a cellulose having properties quite different from those of the above-mentioned hitherto known straw cellulose, and also to a method of producing from the cellulose thus obtained, a paper having properties particularly desirable for certain purposes. The method of producing the cellulose consists principally in that the raw material is subjected to boiling with caustic soda lye, with or without sodium sulphide added thereto, at a temperature above 100° C. but not exceeding 140° C., in such manner that glutinous substances present in the raw material are not destroyed, and that the separation of the waste liquor from the cellulose after the boiling is completed, is carried out at a temperature of 50° C. at the highest, so that the glutinous substances are not dissolved from the cellulose, but may be utilized in the production of paper from the cellulose obtained. The raw material may consist of ordinary straw, for instance straw or rye, wheat, barley or oats, or of reed, Indian corn straw, rice straw, esparto, sugar cane, sunflower stalks, cotton plants, papyrus, or similar vegetable matter. The separation of the waste liquor from the cellulose fibres is carried out most suitably in such manner that the entire pulp together with the waste liquor is cooled to about 30° C. before the separation, and that the washing itself is carried out by means of cold washing liquids and cold water. It is also possible, however, to obtain a good result by carrying out the separation of the waste liquor from the cellulose in such manner that the principal quantity of wasteliquor is separated at a temperature of about 50° C., after which the washing proper is effected with washing liquids and washing water of a temperature of 30° C. at the most. The separation of the waste liquor from the cellulose may suitably be effected by the aid of a retort filter, since ordinary washing in diffusers can not be used in this case owing to the presence of the glutinous substances in the cellulose.

From the cellulose produced in this manner—termed straw cellulose here below—which contains the glutinous substances present in the raw material used, a great many special grades of papers having desirable properties for particular purposes may be produced by means of ordinary paper machines. Thus, after grinding the straw cellulose in beaters with lightly adjusted knives so that the cellulose fibres are neither cut off nor torn asunder, a pulp is obtained having a degree of grinding of 65 to 80 degrees Schopper-Riegler from which pulp parchment paper or greaseproof paper may be produced on suitable paper machines. A pulp having a degree of grinding of 65 to 75 degrees S.-R. gives an excellent greaseproof paper, whereas for producing parchment paper the grinding should be carried to 75 to 80 degrees S.-R. If it is desired to produce thicker paper, for instance such having a weight of over 50 gr. per sq. m., it is suitable to heat the cellulose pulp before it is spread out upon the wire apron of the paper machine. Such heating should never be carried above 40° C. but may without inconvenience run up to 30° C. If higher temperatures are used the glutinous substance is easily dissolved, so that the paper produced loses in closeness. The paper produced in this manner becomes perfectly air-tight and, provided that digestor liquor free from sodium sulphide was used for the production of the straw cellulose, it has also the advantage of being absolutely inodorous and free from injurious acids and inorganic substances.

If the straw cellulose is ground in the manner above described in beaters with lightly adjusted knives but only to a grinding degree of 55 to 60 degrees S.-R., a pulp is
obtained which directly gives an excellent kraft paper having at least an equally great breaking length and tensibility as the best kraft papers which it has hitherto been possible to produce from sulphite pulp made from wood. If it is desired to increase the power of the paper to resist tearing, one may add to the straw cellulose obtained in the manner above described a suitable quantity of long-fibred pulp, for instance kraft pulp, strong sulphite pulp, jute fibres, hemp fibres, or cotton fibres. An addition of 10 percent of any of the three last mentioned kinds of fiber is quite sufficient for obtaining an unusually strong kraft paper. Such kraft paper loses very little in strength by being stored, owing to its freedom from lignin, particularly in case no glue has been added.

The straw cellulose obtained in the manner above described may also be used to replace the strong sulphite cellulose in the production of ordinary newsprint paper. The yellow colour of the straw cellulose is scarcely noticeable in the paper owing to the great addition of mechanical pulp (about 75 percent) and may, besides, always be covered by adding suitable dyes. The straw cellulose obtained according to the invention shows on the whole a great resemblance to ordinary sulphite cellulose.

The straw cellulose produced according to the invention may be bleached without the glutinous substance being destroyed, if a higher temperature than about 30° C. is not used during the bleaching. With the use of the customary bleaching liquors, for instance ordinary solution of chloride of lime, a good bleaching is attained during a normal time if the bleaching is carried out at a temperature of 25° C. Bleached in this manner the fibres of the pulp lose only very little in strength. From the straw cellulose bleached in this manner one may obtain, by suitable grinding, parchment paper as well as grease-proof paper. Furthermore, such pulp can wholly or partly take the place of bleached sulphite pulp in the production of fine papers of all grades.

In order to illustrate the method an example of the manner in which it may be carried out is described here below.

Rye straw is used as raw material. The straw is first chopped to shaff of a length of about 3 cm. The shaff is afterwards sifted through a rotary sieve which must be so fine that it does not let through the ears but all shaffs. The chopped straw free from ears obtained in this manner is afterwards passed through a cyclone apparatus for the purpose of removing the dust. The chopped straw is afterwards boiled in an upright digester with circulating digester liquor which is drained just below the middle of the digester and, after having been passed through a heater, is again admitted into the upper and lower ends of the digester. For the boiling a mixture of white liquor and black liquor is suitably used, so that when the boiling is finished, the waste liquor has a specific gravity of 1.24 at 20° C. For the boiling 150 to 170 kg. NaOH are used per 1000 kg. chopped straw. The time of boiling amounts to about 3 hours when an excess pressure of 1.8 kg. is used. When the boiling is finished the pulp is blown to a blowing diffusor from which it is tapped into a receptacle in which it is diluted with strong cold black liquor, so that a mixture is obtained which contains about 4 percent cellulose and has a temperature of 50° C. at the most. Afterwards the straw cellulose is separated from the waste liquor by means of a rotary filter on which the washing is effected, at first with cold washing liquids and finally with cold water. Formation of scum in the rotary filter apparatus receptacle for liquor and washing liquid is suitably prevented by an addition of petroleum, or oils having a high boiling temperature and obtained by dry distillation of waste liquor from the cellulose manufacture. For the purpose of washing the straw cellulose diffusors can not be used, since after cooling the black liquor the pulp can not be filtered in thick layers owing to the presence of the glutinous substances. The pulp obtained is afterwards diluted with water, during further defibration if desired, after which the knots are strained off. The pure pulp thus obtained is afterwards ground in beaters in the manner above described, after which it is ready to be transferred on to the wire apron of the paper machine. If the pulp is to be bleached, this may suitably be effected simultaneously with the defibration, after which the pulp is strained and further treated.

For grinding the pulp beaters having very broad knives may suitably be used. The pulp can then be ground to a grinding degree of 75 degrees S.-K. in two or three hours' time without the fibres being torn off.

I claim:

1. The method of producing cellulose from straw, esparto, reed, and similar raw materials, which consists in subjecting the raw material to boiling with caustic soda lye at a 115 temperature not exceeding 140° C. whereby the glutinous substances present in the raw material are not destroyed but are capable of being utilized in the production of paper, from the cellulose obtained, and separating the waste liquor from the cellulose after the boiling is completed at a temperature not exceeding 50° C. whereby the glutinous substances are not dissolved from the cellulose.

2. In the production of paper from straw, esparto, reed, and similar raw materials, producing cellulose from the raw material by subjecting the same to boiling with caustic soda lye at a temperature not exceeding 140° C. whereby the glutinous substances present
in the raw material are not destroyed, separating the wasteliquors from the cellulose after the boiling is completed at a temperature not exceeding 50° C. whereby the glutinous substances are not dissolved from the cellulose, and grinding such cellulose in beaters with so loosely adjusted knives that the fibres of the cellulose are only defibrated and hydrated but are not cut up or torn off.

3. In the production of thick parchment paper and greaseproof paper from straw, esparto, reed, and similar raw materials, producing cellulose from the raw material by subjecting the same to boiling with caustic soda lye at a temperature not exceeding 140° C. whereby the glutinous substances present in the raw material are not destroyed separating the waste liquors from the cellulose after the boiling is completed at a temperature not exceeding 50° C. whereby the glutinous substances are not dissolved from the cellulose, grinding such cellulose in beaters with so loosely adjusted knives that the fibres of the cellulose are only defibrated and hydrated but are not cut up or torn off, and heating the cellulose obtained to about 30° C. but not above 40° C. before transferring the same to the wire apron of the paper machine.

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