

Aug. 19, 1924.

1,505,934

A. OLIER
 DEVICE FOR THE CONTINUOUS TREATMENT OF LIGNEOUS MATERIALS FOR THEIR
 TRANSFORMATION IN CELLULOSE
 Filed Dec. 15, 1921

4 Sheets-Sheet 1

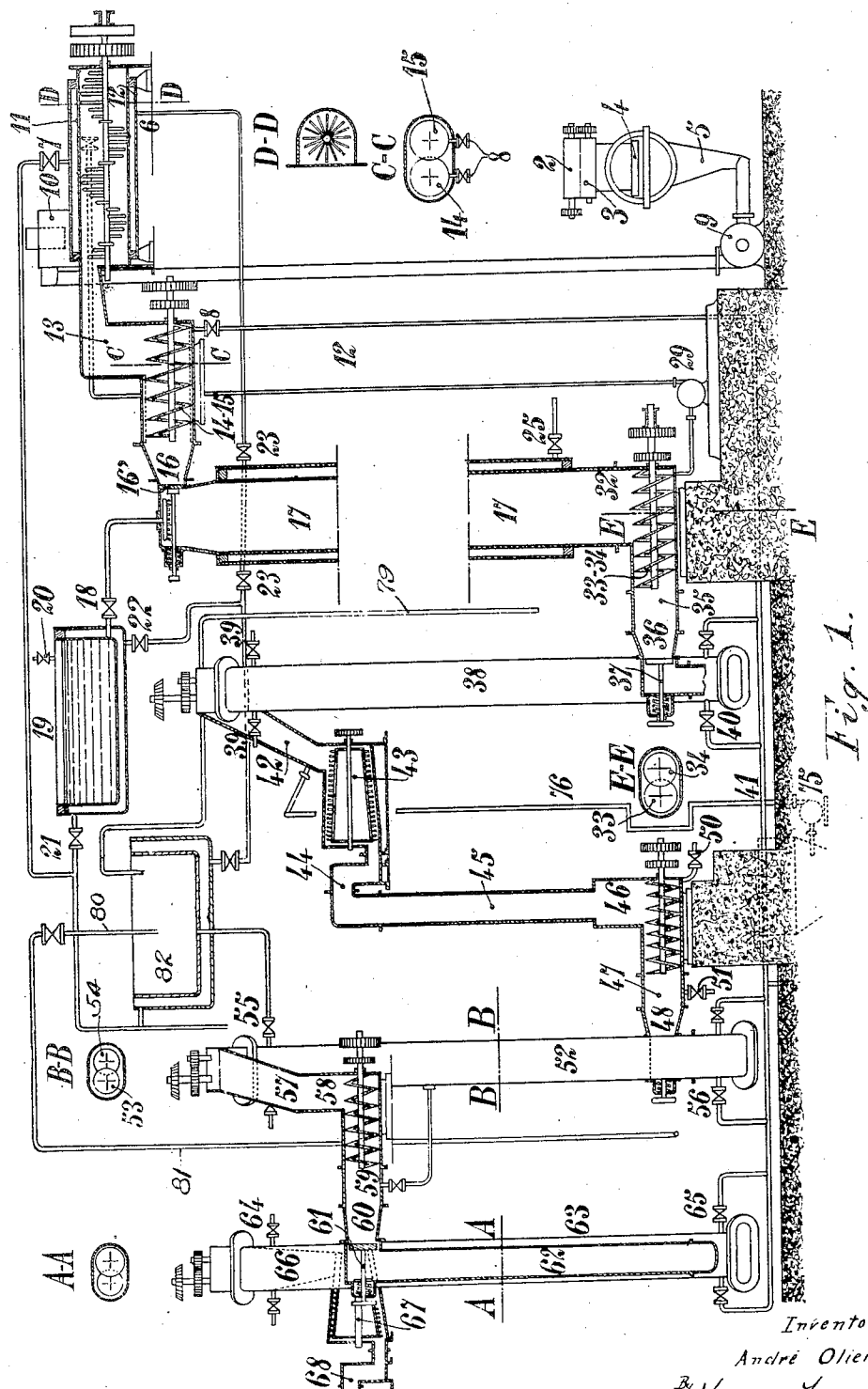


Fig. 1.

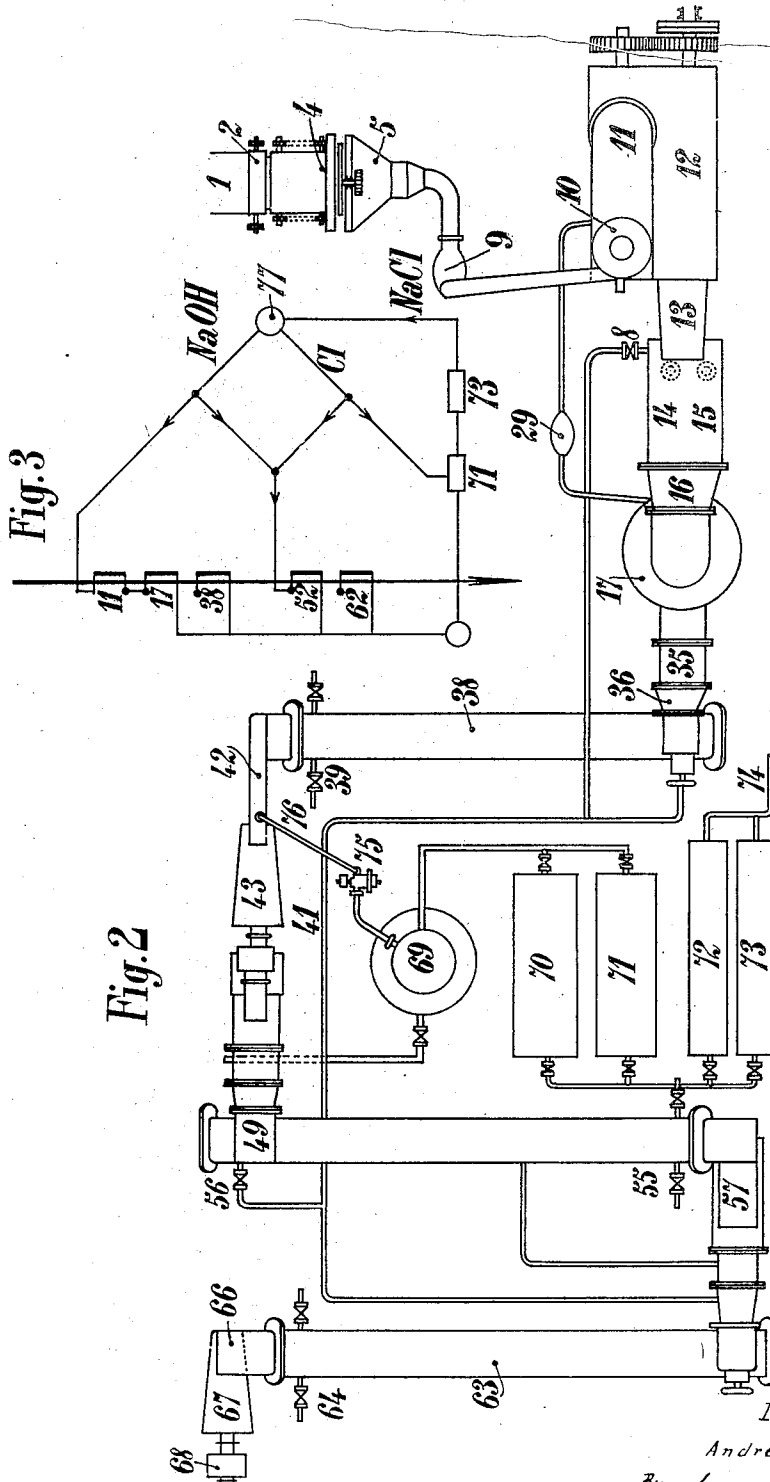
Inventor:
 André Olier
 By Laurence Langue
 Attorney

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4 Sheets-Sheet 2



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André Olier

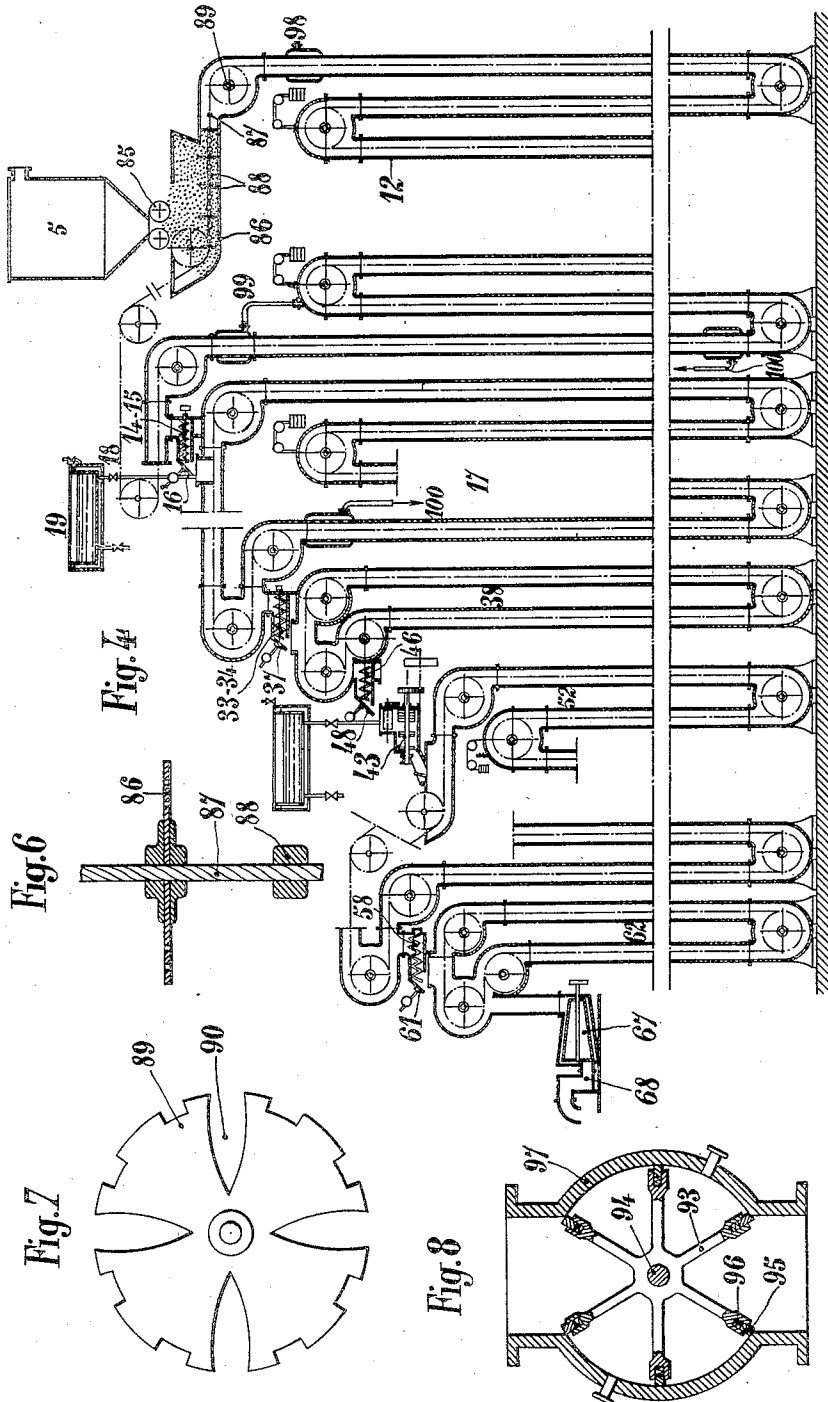
By *Lawrence Langner*
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4 Sheets-Sheet 3



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Andre' Olier

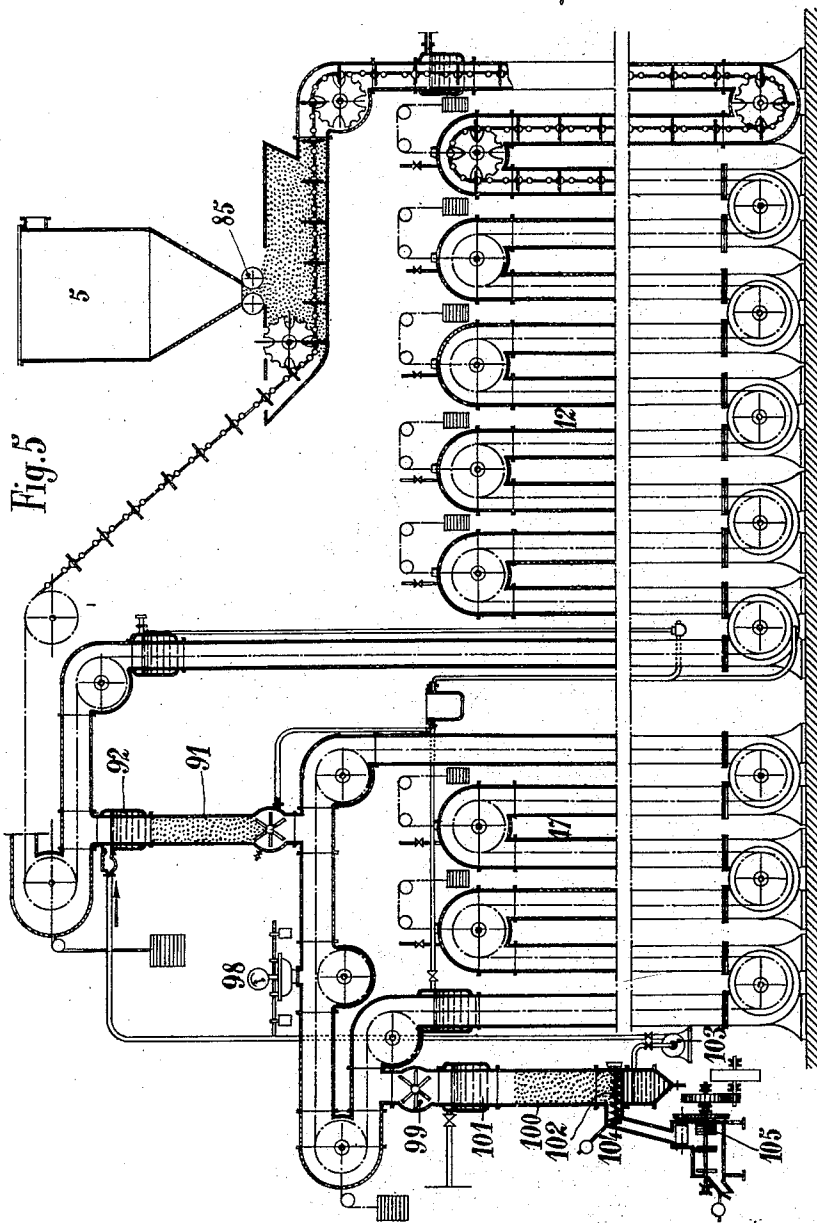
By *Lawrence H. Hargrave*
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4 Sheets-Sheet 4



Inventor.

André Olier

By

Lawrence Langner
Attorney

UNITED STATES PATENT OFFICE.

ANDRÉ OLIER, OF CLERMONT-FERRAND, FRANCE, ASSIGNOR TO SOCIÉTÉ ANONYME DES ÉTABLISSEMENTS A. OLIER, OF CLERMONT-FERRAND (PUY-DE-DOME), FRANCE.

DEVICE FOR THE CONTINUOUS TREATMENT OF LIGNEOUS MATERIALS FOR THEIR TRANSFORMATION IN CELLULOSE.

Application filed December 15, 1921. Serial No. 522,616.

To all whom it may concern:

Be it known that I, ANDRÉ OLIER, citizen of the French Republic, residing at Rue Amadée, Clermont-Ferrand, Puy-de-Dome, France, have invented certain new and useful Improvements in Devices for the Continuous Treatment of Ligneous Materials for Their Transformation in Cellulose (for which I have filed applications in France April 9, 1921; Germany, April 22, 1921; France, patent of addition, Oct. 3, 1921), of which the following is a specification.

For transforming ligneous materials into cellulose, successive operations are actually effected as follows:

The material is freed by washing or ventilation from dust and foreign matters, then it is introduced in a vessel called lye-vat for subjecting it to the action of an alkali or lye, of a suitable density under pressure of steam, during a time varying with the nature of the material.

When the boiling of the material is considered as being carried out to a sufficient degree, the apparatus is emptied on a filter for separating the lye therefrom.

The boiled material is washed several times, it is then crushed in a tritulating apparatus or beating apparatus, stirred in a large quantity of water, thickened and bleached in bleaching vats and finally, after washing, made up in sheet form on a pulp-presser or on a paper machine.

This invention has for its object the continuous manufacture of cellulose, that is to say the successive and intermittent operations by a treatment uninterrupted in its various phases and the combination of suitable mechanical means for obtaining the continuity of the operations so as to do away with all the intermediate manipulations between the admission of the material and the delivery of the finished pulp.

For that purpose:

1. The ligneous materials entering at one of the ends of the plant automatically and continually circulate therein in order to be subjected to the successive transformations allowing to collect paper pulp at the outlet end of the said plant. These materials can also be displaced, as distinct masses of de-

termined volume in series of sinuous conduit-pipes where they are subjected to the various actions constituting the phases of their transformation in paper pulp; these sinuous conduit pipes are formed by vertical parallel conduits communicating together so that the masses of fibrous materials are subjected, in the course of their translation, to successive turning over movements which improve their contact with the physical or chemical agents also circulating in the said conduit-pipes.

2. On the other hand, the cycle of the reacting products through the plant, automatically closes itself; the primary product (after the chemical decomposition which releases, in the working cycle, its constituents forming the reacting agents) is, with the exception of the losses taking place, reconstituted and subjected again to another decomposition similar to the initial decomposition. The duration of the passage of the ligneous materials in each part of the plant corresponding to a stage of the transformation is determined by arranging between each of the apparatuses constituting the same, variable and adjustable resistances controlling the rate of flow and of circulation of the material treated.

The accompanying drawings illustrate by way of example a form of carrying out the invention.

Fig. 1 is an elevation.

Fig. 2 is a plan view.

Fig. 3 is a diagrammatic illustration of the closed chemical cycle.

Fig. 4 illustrates a modification of the plant forming the subject-matter of this invention.

Fig. 5 shows the arrangement adopted when an unbleached pulp for the manufacture of card-board or of wrapping paper is simply to be obtained.

Figs. 6, 7, 8, are views of constructional details.

In the process the ligneous materials similar to wood are torn as usual, but the plants or knotty stalks are subjected to a rolling operation for crushing the knots. For that purpose, they are placed on a horizontal mechanical conveyor 1 which lead them between two or more cylinders 2 and 3 super-

posed two by two and of suitable dimensions for ensuring the flattening of the said knots. Subsequently to this rolling operation, the material is brought on a chopper 4 which cuts it in small lengths. The torn ligneous materials or the chopped plants arrive in a hopper 5 where they are taken and driven back by a fan 7 into a pneumatic agitator 10 from which they fall into a macerating apparatus 11, whilst the dust is evacuated.

The macerating apparatus is constituted by a long vat 11 and 12, the shape of which is suited to the available space and having a semi-cylindrical bottom; throughout the length of this vat extend shafts carrying a series of beaters helically arranged so as to stir together the material falling from the pneumatic agitator and the soda lye sent into the apparatus by the centrifugal pump 29 and cause them to travel towards the outlet orifice 13. The macerating apparatus can be heated either by a double bottom or by a coil surrounding the bottom, in order to maintain a temperature favourable for the maceration.

The material and lye fall, through the orifice 13, in a continuous press constituted by two screws 14 and 15 of reverse pitch and rotating in reverse direction in a perforated cast-iron trunk for permitting, through the branches 8, the flowing away of the lye carried along and of that arising from the squeezing of the material after the feeding of the latter, by the screws, into a conical chamber 16 closed by an automatic flap-valve 16'. The material caught by the screws is driven back against the valve 16', opens the latter and falls in the lye-vat. The agglomerate which is formed in the conical part acts as an obturator during the periods of opening of the valve 16' and prevents the free communication between the macerating apparatus and the lye-vat.

The lye-vat is preferably a vertical apparatus 17, of cylindrical, rectangular or oval section, surrounded by a double wall or by a coil for heating at a constant temperature and of suitable height so that the material sprinkled with alkaline lye, during its passage from the top to the bottom of the apparatus, is so boiled as to allow the fibres to be removed. The alkaline lye driven back by a pump in the vat 19 through a branch 20, enters into the lye-vat through the piping 18; the lye is heated by the double bottom receiving the steam at 21 and carrying it away through 22.

The heating of the lye-vat is effected through the branch 23 and the condensed water is carried away through 25.

The material saturated with lye, arrives in a continuous press composed of two parallel screws 33 and 34 of reverse pitch, straddling each other and rotating in reverse di-

rection in a suitable and perforated cast-iron trunk for permitting the flowing away of the lye in proportion to its admission or to its production by squeezing of the material.

The alkaline lye flows through the lye-vat in a continuous stream, as the density of the lye being greater than the density of the mass under treatment, the lye would occupy all the volume of the base of the lye-vat 17 and of the continuous press 32 and would prevent the advance and compression of the mass under treatment. Moreover, as the said lye has already been subjected to the action of the residual lye in the macerating apparatus, the continuous flow of the lye in the lye-vat simply suffices for producing the necessary and sufficient chemical action. The screws feed this material and push it in a compression chamber 35 permitting the lye to be squeezed out owing to the compression to which the material has been subjected upon its admission in the conical part 36 connecting the press to the column. The agglomerate which is formed acts at the same time as an obturator, thus preventing free communication between the lye-vat and the washing column. At the end of the conical part is arranged an automatically closing flap-valve 37 which obturates it upon starting of the apparatus, in order to facilitate the formation of the agglomerate and to prevent the lye to flow from the lye-vat 17 to the washing apparatus 38.

In proportion as the lye has passed through the material filling the lye-vat, the material issuing through the continuous press enters the vertical or inclined washing column 38 composed of two screws having perforated coils, of reverse pitch, rotating in reverse direction, straddling each other and enclosed in the cast-iron trunk. The material is raised by the screws, that is to say towards the upper part, whilst a stream of water produced by a jet introduced at the upper part of this column through the branches 39 will travel in reverse direction to the material and will flow away, through the perforations in the coils of the screws, to the lower part of the column through the cocks 40. There will thus be obtained a continuous and methodical washing, employing the minimum of water whilst producing the best effect.

The material will therefore be completely washed when issuing at the top of the column whilst the washing water will contain the maximum of impurities at the lower end. This water will pass through the piping 41 to the pulp-collector 69 and will join the residual water of the macerating apparatus in order to allow the cellulose carried along to settle therein.

The entirely washed material passes down, through a conduit pipe 42, into a conical fibre-removing apparatus 43 from which,

after it has been divided and freed from fibres, it issues through the siphon 44 and falls through the conduit pipe 45 in the continuous press 46 for the elimination of the greater portion of the washing water.

The continuous press 46 is in every respect similar to the press 32.

The dried material falls through the conduit-pipe 49 into a bleaching column 52 composed, as the washing column, of a vertical or inclined trunk enclosing two screws 53 and 54 having perforated coils and adapted to raise the material to the upper part, whilst a stream of hypochlorite of soda will be admitted through the branches 55, will travel in reverse direction to the said material and flow away through the cocks 56. This operation constitutes the continuous and methodical bleaching.

From the end of the bleaching column, the pulp containing hypochlorite of soda passes through the conduit-pipe 57 into a continuous press 58 similar to the presses 32 and 46, in which is squeezed out from the bleached material the greater portion of the hypochlorite of soda. This hypochlorite of soda issuing from the filtering cage 59 can be re-used in the bleaching column.

When issuing from the continuous press 58, the pulp still impregnated with hypochlorite falls through the conduit-pipe 62 into a washing column 63, similar to the column 38, in which the pulp and water travel in opposite directions; the water admitted through the branches 64 becomes loaded with hypochlorite and flows away at the upper part through the cocks 65, whilst the pulp is raised by the screws to the upper part of the column.

Being thus completely washed at the end of the washing column, the pulp descends through the pipe 66 on the continuous refining apparatus from which it issues through the siphon 68 and passes to the pulp-presser or to the paper machine.

The residual waters from the macerating apparatus 11 and from the press 13, washing column 38, bleaching column 52 and washing column 63 are collected by suitable conduit pipes in a pulp-collector 69 where the cellulose carried along separates from the liquid by means of a usual known device. The cellulose which had been carried along in the residual waters is sucked by a pump 75 which re-introduces it in the circuit of manufacture, whilst the liquid passes to the decanting apparatus 70 or 71. The liquid is treated therein with hydrochloric acid or with chlorine gas in order to precipitate the greater part of the organic substances combined with soda and to separate them from the liquid by continuous decantation or filtration in the apparatus 72 and 73. If decantation is adopted, the vats 70 and 71 of the decanting apparatus operate alternately, a

vat remaining inoperative whilst the other is in action.

When issuing from these vats, the liquid comprising nearly the whole of the chloride of sodium which has primitively served for the preparation of soda and chlorine is electrolyzed again in an electrolyzer 77, for the purpose of obtaining the soda chlorine and hypochlorite of soda necessary for the treatment of the ligneous material.

The process under consideration supposes therefore that an electrolytic plant is available, allowing to produce soda and chlorine by decomposition of chloride of sodium.

This recovery of the chloride of sodium in the residual waters and this generation by electrolysis of the chemical treating agents thus allows a manufacture in a closed chemical cycle, without any consumption of chemical agents other than those necessary for compensating the losses.

The said closed chemical cycle is diagrammatically illustrated in Fig. 3.

The electrolyzer 77 fed with chloride of sodium by the conduit pipe 74 produces soda and chlorine.

A portion of the soda and a portion of the chlorine are sent through the respective conduit-pipes 80 and 79 of the stirrer 82 which transforms them in hypochlorite of soda which latter bleaches the pulp in the column 52 and issues therefrom under the form of chlorinated products carrying along some fibres of cellulose, etc., which are sent to the pulp collector 69.

The other portion of the soda is sent by the conduit-pipe 81 through the lye-vat 17, macerating apparatus 11 and 12, press 13 and issues therefrom under the form of instable salts of soda (lignates, pectates) which are sent to the pulp collector 69.

The other portion of the chlorine is sent through the conduit-pipe 78 to the chlorination vats 70 and 71.

In the chlorination vats 70 and 71, the chlorine decomposes the instable organic salts of soda, there is formation of chloride of sodium and precipitation of organic matters; the mass thus treated passes from the vats 70 or 71 on the filters 72 and 73 and the chloride of sodium released is sent through the conduit-pipe 74 to the electrolyzer 77.

The chemical cycle is thus closed and the chemical agents must afterwards travel through a new cycle of the continuous treatment.

In the present process, the foreign matters or impurities are extracted from the mass under treatment and are evacuated after each operation of bleaching, washing, chlorination, etc., and do not uselessly travel through the continuous circuit in which passes the said mass.

The treatment is continuous without de-

pendence between the various operations owing to the obturating pulp plugs constituted in a continuous manner after each operation, as, after each passage in a press, the material forms an agglomerate the relative tightness of which prevents any communication between two successive columns.

The pulp collector 69 serves only to collect the cellulose fibres carried away by the lye and washing waters; these fibres settle to the bottom and form a kind of liquid pulp which, at intervals, is taken by a centrifugal pump and delivered in the circuit.

The vats 70 and 71 act both as receiving decanting and chlorination vats. Whilst one of the two vats receives the residual lyes, chlorine gas is at the same time admitted into the said vat; the chlorine gas in proportion as it comes in contact with the lyes decomposes the latter for forming chloride of sodium and precipitates the organic matters. The decantation or separation can be effected only when at rest; when the first vat is full; the lye and chlorine are therefore sent in the second vat and while the latter is filling up, the first vat, at rest, permits the precipitation of the organic matters to the bottom of the vat whilst the brine floats on the surface, clears up and can be decanted.

Strictly speaking, it is not essential to decant, the lyes being simply filtered after treatment with chlorine.

In the modification illustrated in Fig. 4, the ligneous materials similar to wood are torn as usual, but the plants and knotty stalks are subjected to a rolling operation for crushing the knots. For that purpose, when the materials have been cut with a chopper, they are delivered by a fan into a pneumatic agitator 5 adapted to eliminate the dust and to direct the materials on a rolling mill constituted by two parallel horizontal cylinders 85 mechanically actuated and adapted to flatten the hollow stalks and to crush the knots. The rolling mill can be arranged in the train of the chopper so as to transmit to the fan or blower the previously crushed materials, which would present the advantage of evacuating the silicious dust arising from the crushing of the knots. After this operation, the material falls into a continuous macerating apparatus. The continuous macerating apparatus is constituted by a conveyor and a series of suitable trunks for ensuring a continuous circulation. The endless conveyor comprises perforated paddles, buckets or discs 86 (Fig. 6) secured on a chain or, preferably, on a metallic cable 87 provided with knobs 88 forming a regular pitch for ensuring through suitable recessed pulleys 89 actuated by the ordinary and known means:

gears, worms, etc., the displacement of the conveyor through a series of fluid tight trunks containing the macerating liquid. The trunks can be made of sheet-iron, cast iron or any other material; they are of rectangular, square or round shape, arranged vertically and parallel, to each other and connected at the lower part and at the upper part by T-pipes bored in the shape of half-circles for allowing the rotation of the plates 86 about the axes of the pulleys 89. The lower and upper T-pipes are arranged for receiving the pulleys 89 provided with recesses and serving as a guide or driving means for the conveyor. The pulleys 89 are cut away at 90 for allowing the rotation of the perforated discs 86.

At the lower end of each trunk is arranged a blow through cock and a branch (not shown) for the introduction of the heating steam. At the upper part is provided an air pet-cock and a counterweight stretching device for ensuring the automatic tension of the cable in case the latter lengthens. The stretching devices are also adapted to disengage the whole in case the chains or cables should break and in case some wedging takes place. The first and last trunks are at a higher level than the intermediate trunks for permitting a continuous circulation and ensuring the circulation of the liquid notwithstanding the resistances due to the friction and to the movement of the material in the reverse direction.

The pulleys 89 being mechanically actuated, the cable 87 is put in motion through the medium of the knobs 88 and the discs 86 coming in contact with the material move the latter in the series of trunks illustrated, cause it to travel from the first to the last one and this whilst the macerating liquid circulates on the counter-current principle; this liquid can be introduced at the upper part of the last trunk and the material when it has arrived at the top of the last column takes the horizontal direction and falls in a press 16', the delivery of which communicates with the continuous lye-vat 17. The macerating liquid carried along with the material will drip in the tubular chamber 99 shown at the upper part of the last vertical column from which it is delivered to the top of the preceding element.

The macerating liquid circulating on the counter-current principle under the action of the load, will finally flow through the branch 98 and will be directed towards the recovering apparatuses.

The continuous lye-vat 17 is an apparatus of similar construction to the macerating apparatus, but according to the nature of the materials to be transformed, it is designed for working under pressure or at the atmospheric pressure. In the first case, the

strength of the members and the lightness are calculated for the pressures to be reached.

The operation of the lye-vat is as follows:

The materials coming from the macerating apparatus 12 are collected by the discs 86 of the continuous conveyor within cylindrical trunks wherein they travel without interruption up to their point of delivery, these materials, during their passage, being in contact with a suitable lye introduced by a pump or simply by gravity into the apparatus, according as the latter works under pressure or not.

In the case illustrated in Fig. 4, the lye-vat 17 receives the solution of soda at atmospheric pressure, thus allowing its feeding simply by gravity, from the vat 19 through the pipe 18.

The materials issue from the lye-vat 17 and fall in a continuous press 33, 34, which distributes them through a counter-weight flap-valve 37. The lye carried along will drip in the chamber 100 and will be delivered by a pump or any other device at 100' in the lower part of the last element of the macerating apparatus. The pulp obtained must be washed in order to be transformed in a bleached pulp. For that purpose the material is led to a continuous washing apparatus 38 comprising, as the lye-vat and the macerating apparatus, an endless conveyor constituted by a cable provided with knobs carrying perforated sheet-iron discs circulating in a series of vertical and preferably tubular trunks. While the material circulates from the bottom to the top, a stream of water is admitted at the upper part of the column through a branch for producing, by counter-current, a methodical and economical washing. The washing liquid, after passing throughout the height of the column, is saturated with lye and, after evacuation, can be mixed with the residual lyes of maceration. The washed materials enters in a continuous press 46, similar to the previous ones, which extracts a portion of the washing waters and sends, after compression, this material in the continuous bleaching apparatus. The bleaching apparatus 52 is similar in construction to the macerating apparatus. It comprises an endless conveyor constituted by a cable provided with knobs and discs which force the material to travel in the trunks in which is caused to circulate on the counter-current principle a bleaching liquid: either chloride of lime, or hypochlorite of soda.

The material issues from these trunks and falls in a continuous press 58 which squeezes out the greater portion of the bleaching liquid remaining in the said material. The liquid extracted can be recovered if the bleaching has been effected by means of hypochlorite of soda.

After this squeezing operation, the material is admitted in a last continuous wash-

ing apparatus 52, similar to the preceding one, in which it enters by travelling in the trunks in contact with the stream of water which circulates in reverse direction. The washed pulp falls in a vertical column which brings it in a conical refining apparatus 67 which effects the final division of the cellulose.

Upon leaving the refining apparatus, the pulp descends in a sand box, then passes in a purifier and falls therefrom in a vat (not shown) and finally it is brought to the pulp presser or paper machine.

In case it is simply desired to obtain an unbleached pulp for the manufacture of cardboard or of wrapping paper, the described plant no longer comprises the bleaching and washing apparatus 52 and 62 above mentioned. It is also possible, in this case, considering the duration of the contact which can be realized between the ligneous materials and the reaction agents, to simply use water, at a suitable temperature, for producing the maceration and lixiviation of the materials to be treated.

In this case, the plant can receive the following modifications (Fig. 5):

When issuing from the macerating apparatus 12, which is constructed and operates in the same conditions in both cases, the materials fall in a conduit the wall of which is perforated at the upper part and in communication with a chamber 92 receiving the squeezed liquids at the end of the manufacture. This chamber which feeds the liquid to the conduit 91 and to the lye-vat determines therefore the formation of an hydraulic joint above the columns of materials which must enter in the continuous lye-vat under pressure.

For effecting the passage of the materials from the conduit 91 (which is in communication with the atmosphere) into the continuous lye-vat under pressure 17, use is made of a rotary distributor (Fig. 8). This distributor is constituted by a number of paddles 93 (six for instance) radiating about a central hub carried by the driving shaft 94. These paddles 93 are provided on their edges with sliding bars 95 subjected to the action of springs 96 which tend to maintain them in contact with the cylindrical wall of the casing 97 about the axis of which the whole of this rotary system moves angularly. The buckets formed between the paddles 93 are successively presented in front of the conduit 91, receive a load of materials which they carry along and finally discharge in the continuous lye-vat without sudden drops of pressure being capable of taking place. Leakage is prevented in the column of material contained in the feeding conduit 91. Branches can be provided on the casing 97 of the rotary distributor for evacuating the pressure of the rotating buckets and using

it for the reheating of the macerating apparatus.

It is obvious that any feeding device other than that described might be employed; for instance, use may be made of a pump sucking the macerated material for delivering it in the lye-vat 17.

The lye-vat 17, constructed as described in the foregoing, is provided with a safety valve 98. The injection of water, (not shown) is effected at the lower part of each trunk, the devices being tangentially arranged at the bottom of the connecting T-pipes. In this manner, the obliquely directed steam jets drive before them the materials which tend to collect at the lowest part of the T-pipes.

The materials, when issuing from the lye-vat 17, are extracted by means similar to those which have caused their admission on the trunks. For that purpose, use may also be made of a rotary distributor 99 surmounting a conduit 100, the upper part of which is surrounded by a cooling device 101.

The materials are led to a continuous press 102, the bottom of which is perforated for allowing to collect the squeezed out lye which is raised by the pump 103 to the inlet of the lye-vat 17, or delivered in the macerating apparatus 12. Through a counter weight flap-valve 104 which obturates the outlet of the press 102 and simultaneously produces a compression which dries the material and determines a previous fibre-removing action, the pulp falls in a continuous fibre-removing apparatus 105. The removal of the fibres is completed by the passage in a conical refining apparatus which finally gives a pulp which may be directly conducted to the pulp-presser, the paper machine or the cardboard machine for obtaining wrapping paper or cardboard.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a plant for the transformation of cellulose materials into paper pulp, a macerating apparatus in which the cellulose materials, previously torn, are subjected to a continuous translation in contact with the current of macerating liquid, a continuous press constituted by a worm rotating in a casing and communicating with the said macerating apparatus, a movable valve subjected to the antagonistic action of an antagonistic force, and opening under the thrust of the material for periodically putting the macerating apparatus in relation with the lye-washer.

2. In a plant for the transformation of cellulose materials into paper pulp, a macerating apparatus in which the cellulose materials, previously torn, are subjected to a continuous translation in contact with the current of macerating liquid, a continuous press constituted by a worm rotating in a

casing and communicating with the said macerating apparatus, a movable valve subjected to the antagonistic action of an antagonistic force, and opening under the thrust of the material for periodically putting the macerating apparatus in relation with the lye-washer, a lye-washer in which the materials are displaced in contact with the soda lye, a continuous press communicating with the said lye-washer, an automatic valve subjected to the action of an antagonistic force and opening under the thrust of the materials for periodically putting the lye-washer in relation with the washing apparatus.

3. In a plant for the transformation of cellulose materials into paper pulp, a macerating apparatus in which the cellulose materials, previously torn are subjected to a continuous translation in contact with the current of macerating liquid, a continuous press constituted by a worm rotating in a casing and communicating with the said macerating apparatus, a movable valve subjected to the antagonistic action of an antagonistic force, and opening under the thrust of the material for periodically putting the macerating apparatus in relation with the lye-washer, a lye-washer in which the materials are displaced in contact with the soda lye, a continuous press communicating with the said lye-washer, an automatic valve subjected to the action of an antagonistic force and opening under the thrust of the materials for periodically putting the lye-washer in relation with the washing apparatus, a washing apparatus in which the materials are displaced in contact with the washing water, a continuous press communicating with the washing apparatus for squeezing out the cellulose materials, an automatic valve subjected to the action of an antagonistic force and opening under the thrust of the materials for periodically putting the lye-washer in relation with a fibre-removing machine for allowing to obtain an unbleached paper pulp.

4. In a plant for the transformation of cellulose materials into paper pulp, a macerating apparatus in which the cellulose materials, previously torn, are subjected to a continuous translation in contact with the current of macerating liquid, a continuous press constituted by a worm rotating in a casing and communicating with the said macerating apparatus, a movable valve subjected to the antagonistic action of an antagonistic force, and opening under the thrust of the material for periodically putting the macerating apparatus in relation with the lye-washer, a lye-washer in which the materials are displaced in contact with the soda lye, a continuous press communicating with the said lye-washer, an automatic valve subjected to the action

of an antagonistic force and opening under the thrust of the materials for periodically putting the lye-washer in relation with the washing apparatus, a washing apparatus in which the materials are displaced in contact with the washing water, a continuous press communicating with the washing apparatus for squeezing out the cellulose materials, an automatic valve subjected to the action of an antagonistic force and opening under the thrust of the materials for periodically putting the lye-washer in relation with a fibre-removing machine for allowing to obtain an unbleached paper pulp, a bleaching apparatus in which the materials are displaced in a continuous manner in contact with hypochlorite of soda, a continuous press communicating with the bleaching apparatus for extracting the hypochlorite of soda contained in the cellulose materials, an automatic valve connecting the said press with a washing apparatus.

5. In a plant for the transformation of cellulose materials into paper pulp, a macerating apparatus in which the cellulose materials, previously torn, are subjected to a continuous translation in contact with the current of macerating liquid, a continuous press constituted by a worm rotating in a casing and communicating with the said macerating apparatus, a movable valve subjected to the antagonistic action of an antagonistic force, and opening under the thrust of the material for periodically putting the macerating apparatus in relation with the lye-washer, a lye-washer in which the materials are displaced in contact with the soda lye, a continuous press communicating with the said lye-washer, an automatic valve subjected to the action of an antagonistic force and opening under the thrust of the materials for periodically putting the lye-washer in relation with the washing apparatus, a washing apparatus in which the

materials are displaced in contact with the washing water, a continuous press communicating with the washing apparatus for squeezing out the cellulose materials, an automatic valve subjected to the action of an antagonistic force and opening under the thrust of the materials for periodically putting the lye-washer in relation with a fibre-removing machine for allowing to obtain an unbleached paper pulp, a bleaching apparatus in which the materials are displaced in a continuous manner in contact with hypochlorite of soda, a continuous press communicating with the bleaching apparatus for extracting the hypochlorite of soda contained in the cellulose materials, an automatic valve connecting the said press with a washing apparatus, a washing apparatus in which the bleached materials are displaced in a continuous manner in contact with the washing water, a continuous refining apparatus communicating with the washing apparatus for allowing to obtain a white paper pulp.

6. In a plant according to claim 4, including in combination, an electrolyzer for decomposing sodium chloride and releasing the sodium and the chlorine, means for forming a lye current and for determining a current of lye in the lye washer, and a current of chlorine in the bleaching apparatus.

7. In a plant according to claim 5, means for collecting exhausted waters and solutions from the various parts of the plant and into chlorination vats, means for conducting the chlorine coming from the electrolyzer into chlorination vats for reconstituting sodium chloride and means for leading back the regenerated sodium chloride into the electrolyzer.

In testimony whereof I have affixed my signature.

ANDRÉ OLIER.