long before the alleged invention under consideration, were folded by laying upon the unfinished side of the same a piece of tin having at one edge the required curve, which enabled the manipulator to accomplish the same object by pressing upward over such curve a part of the collar so as to mark the line of the curve and crease the paper preparatory to turning the collar over, which enabled the laundress to accomplish the same object as the means described in the specification of the patent.

Support to the answer is also derived from the proofs that linen collars had for years been turned over in a curved line and for the very purpose described, which is to prevent wrinkling and to afford space for the cravat.

Taken as a whole, the proofs in this regard are conclusive, that the patentee is not the original and first inventor of the patented improvement described in either of the claims of his patent.

DECREE AFFIRMED.

THE WOOD-PAPER PATENT.*

THE AMERICAN WOOD-PAPER CO. *v.* THE FIBRE DISINTEGRATING CO.
THE FIBRE DISINTEGRATING CO. *v.* THE AMERICAN WOOD-PAPER CO.

1. A manufacture or a product of a process may be no novelty, and, therefore, unpatentable; while the process or agency by which it is produced may be both new and useful.
2. In cases of chemical inventions, when the manufacture claimed as novel is not a new composition of matter, but an extract obtained by the decomposition or disintegration of material substances, it is of no importance, in considering its patentability, to inquire from what it has been extracted.
3. When the substance of two articles produced by different processes is the same, and their uses are the same, they cannot be considered different manufactures.
4. Paper pulp extracted from wood by chemical agencies alone, is not a different manufacture from paper pulp obtained from vegetable substances by chemical and mechanical processes.

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* This case was adjudged October Term, 1873.

Statement of the case.—History applicable to it.

5. The reissued patent No. 1448 granted to Ladd & Keen, April 7th 1863, for a pulp suitable for the manufacture of paper made from wood or other vegetable substances, is void for want of novelty.
6. The patent granted to Watt & Burgess, July 18th, 1854, was for a process consisting of three stages for obtaining paper pulp from wood. The reissue No. 1449 to Ladd & Keen, dated April 7th, 1863, is for a single-stage process. It is not, therefore, for the same invention. Hence, the reissue is void.
7. Construction of the two boiler patents granted to Morris L. Keen, the one dated September 13th, 1859, and the other June 16th, 1863. Both held to be for combinations.
8. A construction of the patent granted May 26th, 1857, to Marie Amedée Charles Mellier.
   a. The patent covers the process claimed, when applied to wood as well as when applied to straw.
   b. The "*internal pressure*," as described in the specification, is to be ascertained by deducting from the pressure marked by the steam-gauge, the weight of one atmosphere.

CROSS APPEALS from the Circuit Court for the Eastern District of New York.

The preceding case has treated somewhat of the manufacture of paper; though that case had reference chiefly to a manufacture from rags, and by mechanical means. The present case concerns the manufacture of paper; though this case relates more to manufacture from wood, &c., and by chemical agencies.

As most persons know, the materials out of which paper is made, have to be reduced in the paper-mill, before the paper is formed, into what is known as pulp. This pulp, whether obtained from wood or other vegetable substances, is a fibrous material, consisting of what is called in chemistry "cellulose." As such, in its natural state, it is combined with other substances called "intercellular matter," which must be removed to render the cellulose fit for being made into paper. It was well known before the year 1853 that the fibres of cotton or of flax were pure cellulose, and that cellulose existed also in straw and wood, but it had not, so far as is known, been extracted from wood by *chemical* agencies alone, nor brought into a condition to be wrought into paper without mechanical treatment. Even the fibres

of cotton and of flax, though pure cellulose, required disintegration in order to reduce them to a pulp suited to felt in paper. This was usually effected by mechanical means—by a rag-beating machine—but when thus effected a product had been obtained adapted to the manufacture of paper, a fibrous pulp, the same in kind and capable of the same use as that obtained from straw or wood.

So a pulp had been produced from straw and some varieties of wood by various processes, many of them cumbrous, and all of them perhaps much inferior to the process of Watt & Burgess; two persons, a patent to whom, and certain reissues of it were under consideration in this case. This is shown by numerous well-known patents, and was admitted in this case.

So before the year 1853 the cellulose produced from straw, wood, and other vegetable substances was not produced in the first instance in a condition of purity, other than one approximate. But it was cellulose abundantly suitable for making paper, and could be purified.

So again, prior to the year mentioned, and the patent of Watt & Burgess, the cellulose produced was not in the first instance of the proper consistency and dimensions, and with fibre of the proper length for immediate felting. However, by chemical and mechanical treatment, subsequently applied, it could be made so, and made so completely.

Finally. In no case and by no process prior to 1853 was pulp produced ready for washing and bleaching by a single operation. Successive operations, largely mechanical, were used; the vegetable substances being however sometimes boiled in alkalies, with or without pressure, and disintegration by mechanical means following.

This having been the previous state of the art, the American Wood-Paper Company being engaged, A.D. 1866, in the manufacture of paper pulp and paper from wood, straw, and other vegetable substances under different patents owned by them, including two reissued patents of Watt & Burgess, all of which different patents they alleged could be used conjointly in their business, filed a bill in the court below to

Statement of the case.—The defences.

restrain a company called the Fibre Disintegrating Company from what was alleged to be an infringement.

The defendant company made their paper principally from bamboo; though it was alleged, and there was some evidence to show, that they made it also from straw.

The following were the patents owned by the complainants:

I. Two reissued patents, numbered respectively 1448 and 1449, upon a patent originally granted on the 18th day of July, 1854, and antedated the 19th day of August, 1853 (the date of a patent which had been granted by the British government), to Charles Watt and Hugh Burgess, already named, for an improvement in the manufacture of paper from wood, reissued (to Ladd & Keen) in the two reissued patents numbered as above, on the 7th day of April, 1863; one for an improved manufacture of paper and paper pulp from wood, and the other for the paper and paper pulp, the product of said process of manufacture.

II. A patent granted to Morris L. Keen on the 13th day of September, 1859, for a new and useful improvement in boilers for making paper pulp from wood.

A patent granted on the 16th day of June, 1863, to the said Keen, for an improvement in boilers for making paper pulp.

III. A patent granted on the 26th day of May, 1857, antedated the 7th day of August, 1854, to Marie Amedée Charles Mellier (a Frenchman), for an improvement in the manufacture of paper.

The defendant set up among other things,

1. Invalidity of the Watt & Burgess reissues on the ground, as to No. 1448, that the invention claimed was old; and as to No. 1449 on the same ground of want of novelty, and on the additional ground, one more specially insisted on, that the reissue was for a different invention from that patented; and, therefore, by the terms of the Patent Act,* which required that the reissue should be for the "*same* invention"

* Revised Statutes of the United States, § 4916.

as the original patent, void. The alleged want of identity consisted in the fact, as alleged, that the original patent described the production of paper pulp in a state ready for washing and bleaching, by three successive stages of work, while the reissue described the production of it by a single operation.

2. That the Keen patents were for combinations, and that all parts had not been used. Accordingly that there was no infringement.

3. Invalidity of the Mellier patent, on the ground of want of novelty in the alleged invention.

Evidence was taken upon all the issues thus raised, and a decree was made,

That the Watt & Burgess patents were void.

That the Keen patents were for combinations, and that defendants were not infringers.

That the Mellier patent was valid, and that the defendants were infringers of it.

Thereupon the complainants appealed from that part of the decree which related to the Watt & Burgess and the Keen patents, and the defendants from that part which sustained the bill as to the Mellier patent.

To enable the reader to understand perfectly the case, the patents under consideration are all set out. This, with a few remarks and some testimony, &c. interposed, it is hoped will enable the reader, who has any general knowledge of the art of papermaking, sufficiently to understand the case.

I.—THE WATT & BURGESS PATENTS.

1. ORIGINAL PATENT JULY 16TH, 1854. ANTEDATED AUGUST 19TH, 1853.

Specification.

The wood or vegetable substances upon which it is intended to operate by this process should first be reduced to very fine shavings or cuttings, the finer the better. This may be done in any suitable machine.

The shavings are then to be boiled in a solution of caustic alkali, the strength of which, being dependent on the nature of vegetable substances operated on, can only be learned by ex-

perience. For deal or fir wood we find that a solution of alkali of the strength indicated by twelve degrees of the English hydrometer answers very well. The length of time necessary for this part of the process is somewhat dependent on the nature of the vegetable substance to be treated.

We find boiling in a solution of caustic alkali under pressure of considerable service.

We do not claim this operation as a part of our invention.

The shavings are then to be well washed and pressed; and the washings may be saved and evaporated down, and burned in a suitable furnace, when they are again available for the same purpose.

The damp shavings are now to be exposed to the action of chlorine, or the compounds of chlorine with oxygen, till on a portion being placed in a dilute solution of caustic alkali the vegetable substance falls into a dark pulpy mass. This part of the process is conveniently effected by placing the damp shavings on racks or drawers about nine inches apart, one above another, arranged in a chamber, and allowing the chlorine, or the compounds of chlorine with oxygen, to enter the chamber and fill it. Of the compounds of chlorine with oxygen, we prefer that known as protoxide of chlorine, or hypochlorous, or chlorous acid, or euchlorine. If found more convenient, the chlorine, or the compounds of chlorine with oxygen, may be used in aqueous solution instead of the gaseous form.

As soon as the shavings have been sufficiently acted upon by the gas, as may be ascertained by the method above described, they may be removed and the hydrochloric acid, which is the result of the above process, removed by washing, and the shavings well pressed. This should be done with as little water as possible, as this acid may be saved and made use of for the reproduction of chlorine. The shavings are now to be placed in a weak solution of caustic alkali, when they will fall into a pulpy mass of dark brown color. This part of the process may be expedited by exposing this mass to the action of a beater or "engine," placed in a tank containing the solution of alkali.

The pulp thus obtained, as above described, having been freed from the alkali by washing (which may be saved as before directed), may now be bleached by the usual process, or, as we prefer, by chlorite or hypochlorite of soda or potash, liberating the chlorous or hypochlorous acid by hydrochloric acid.

Having thus fully described the nature of our invention, and shown how the same may be reduced to practice, we wish it to be distinctly understood that we do not confine our claim to the apparatus or utensils, or the manipulations herein named, as they may be varied to suit the circumstances of the case.

Claim.

But what we do claim as of our invention, and desire to secure by letters-patent, is the pulping and disintegrating of shavings of wood and other similar vegetable matter for making paper, by treating them with caustic alkali, chlorine simple, or its compounds with oxygen and alkali, in the order substantially as described.

As has been already stated (*supra*, p. 569), one ground set up by the defendants as a defence to the bill was, that the original patent and the reissue No. 1449 were not for the same invention; the allegation of the defendants being that the original patent was for the production of the pulp ready for bleaching and washing by a single operation, whereas in the reissue No. 1449 three distinct operations, following each other in order of time, were adopted.

In support of this their view the defendants showed that in March, 1854, before the original patent was granted, but while an application for it was pending, the Commissioner of Patents wrote to Watt & Burgess stating that there were "at least forty other applications for patents, or patents on record, for processes of treating vegetable fibre," and that "in a large part of these alkali and chlorine or its compounds were used;" and requesting Watt & Burgess to make "a clear and definite expression of what the novelty in their devices was confined to, both in the specifying of the nature of the invention and in setting forth the claim."

The defendants showed further that in reply Watt & Burgess, through their counsel, said:

"The invention relates to a series or combination of processes, *in the order in which they are stated*, for treating shavings, &c., for the purpose of reducing them from their crude state to a pulp, ready to be made into paper. The *several* processes through

which the shavings pass, may be enumerated in the following *order*, viz.:

"First. The shavings are boiled in a solution of caustic alkali, until by the test of washing they have lost their woody taste (for white pine shavings about three hours), when they are washed and pressed to rid them of the alkali.

"Second. They are then subjected to the action of chlorine, or its compounds and oxygen, until by testing a portion in a dilute solution of caustic alkali, it falls into a dark pulpy mass, when it is again washed and pressed to remove the hydrochloric acid, which is the result of this process.

"Third. The material is then subjected to a weak solution of caustic alkali, when it falls into a pulpy mass of a dark-brown color. It is then again washed to free it of the alkali, and may be bleached by any of the known processes.

"The shavings must pass through these several processes, *and in the order stated*, and this constitutes the invention. The processes taken separately will not produce the article, but their sum will, and they are only claimed in their series, and not in their individual capacities. It is admitted that alkali and chlorine have been used in pulping vegetable matter. But it is not known that alkali, chlorine, oxygen, and alkali, have been used in the manner, and in the order, in which Messrs. Watt & Burgess use them. *This order and series of processes* is what, therefore, constitutes their invention, and what they suppose they have embodied in their claim."

After some further discussion the patent, from which the above specification is quoted, was granted.

The testimony of Burgess, one of the original patentees, was taken by the complainants. He said:

"I began to make experiments on the preparation of pulp for making paper from wood in 1851, with Mr. Watt. On account of his great age, making most of the experiments devolved on me. . . . I produced a good pulp by boiling wood in caustic alkali at a high pressure. I found that some woods required much more alkali than others. I found that when intercellular matter was not wholly removed by caustic alkali it could be decomposed by chlorine, or the hypochlorides, one answering the purpose as well as the other. I used, therefore, chlorine or bleach-powder, preferably chlorine, since one of the products

attending the elimination of chlorine, namely, sulphate of soda, had a marketable value in England. I found that to a certain extent, and when desirable, I could substitute the employment of caustic alkali for chlorine, the one for the other, but the nature of the wood under treatment materially affected this substitution. I found the greater quantity of intercellular tissue was removed by the caustic alkali, the less chlorine or its compounds with oxygen was required, and consequently the higher the temperature and pressure, and the greater the strength of the alkali employed the less of the intercellular tissue was left, and consequently less chlorine or its compounds with oxygen required; but if sufficient caustic alkali was employed at a requisite temperature, chlorine was only necessary for bleaching purposes. As regards the cost, the chlorine process appeared to cost less than the free use of alkali, since one of the products of its elimination is a marketable article in England, and we calculated on the sale of the sulphate of soda as one of the sources of profit in working the patent. In drawing up the specification for a patent I therefore laid most stress on the process that seemed to offer the greatest pecuniary advantage, since the recovery of the soda-ash had not been practically tried by us at this time, and we were in uncertainty as to the success of such recovery. With a knowledge of the above facts, I was desirous of embracing in my specification the modes of producing wood-pulps with caustic alkali, either with or without steam pressure; supplementing when necessary the alkaline boiling, with the subsequent treatment of chlorine or the hypochlorides.

"I prepared a description of my invention—a provisional specification—prior to my application for an English patent. I here annex a copy of the specifications, both provisional and final, of the English patent.

"The wood upon which it is intended to operate by this process should first be reduced to very fine shavings, the finer the better; this may be done by any suitable machine.

"The shavings should then be boiled in caustic alkali of the strength indicated by about 12° of the English hydrometer. This process is much better performed under pressure, after the wood has been boiled for about twenty-four hours, but we do not confine ourselves to this time, as it varies with the nature of the wood and amount of pressure, and it should be well washed and squeezed to remove all the alkali.

Statement of the case.—Watt & Burgess's reissue 1448.

"It is then placed in a chamber furnished with racks about nine inches apart, upon which the wood is placed and exposed to the action of chlorine, or any of the compounds of chlorine with oxygen, however obtained. The wood should be exposed to the action of chlorine or its compounds with oxygen until it assumes an orange color and falls into a pulpy mass on the addition of caustic alkali."

[Here followed a plan, stated to be a convenient and economical means of obtaining chlorine.]

"When the wood has been sufficiently acted upon by chlorine, or its compounds with oxygen, it is to be removed from the gasing-chamber, and the HCl with which it is saturated, which is formed by the action of the chlorine, is to be removed with water and the wood pressed so as to remove as much of the water and acid as possible. After all the acid has been removed from the wood, it is to be placed in a suitable vessel, and a weak solution of caustic alkali poured upon it so as to cover it, when the wood falls into a pulpy mass of a dark-brown or almost black color. . . . The pulp, after being well washed, has now to be bleached. This may be done in the usual way, or we prefer to add a certain quantity of chlorite of soda, called also hypochlorite, and liberating the hypochlorous acid by dry HCl. The quantity of chlorite of soda can only be learned by experience."

We now pass to—

2. REISSUE (1448) PRODUCT PATENT, APRIL 7TH, 1863.

The most important feature of this patent to be noted is its *claim;* the matter of identity between the original and reissue, not being a matter which need, in this No. 1448, specially engage the reader's attention, that matter occurring as one to be attended to chiefly in considering the original and the reissue No. 1449.

Be it known that Charles Watt and Hugh Burgess did invent a new and useful improvement in the manufacture of paper-pulp, from wood and other vegetable substance.

Specification.

The wood or vegetable substance, from which it is intended

to make the pulp, should be first reduced to fine shavings or cuttings. This may be done in any suitable machine.

The shavings or cuttings of wood, or the vegetable substances, are then to be boiled in a solution of caustic alkali, in a suitable boiler, under pressure. The strength of the alkali is dependent on the nature of the vegetable substance used and operated upon. For non-resinous woods, a solution of alkali of the strength indicated by 17° of the English hydrometer, or thereabouts, answers very well, and for deal, pine, or fir wood, or other woods containing resinous matter, a strength of about 12° is sufficient, but varying with the nature of the vegetable substance being acted upon to a strength of about 10°. The varied nature of the vegetable substance to be operated upon is such that only general directions can be given for the strength of the alkali or the degree of heat to be used, or the duration of the operation. Boiling in a solution of caustic alkali, under pressure, is of essential importance.

By the words "under pressure" is meant a pressure at, near, or above 300° of Fahrenheit's scale, which is the ordinary pressure used; but a heat and corresponding pressure of from 300° to 500° may be used, according to the nature of the vegetable substance to be treated, whether resinous or non-resinous, or otherwise, and the time may be from four to twelve hours, according to the nature of the substance.

After the vegetable substance has been thus operated upon by caustic alkali, under heat and pressure, for the requisite time, as above described, it should be discharged from the boiler, while under pressure, into a tank or other reservoir with proper safety-valves and pipes for the discharge of the steam, and should be drawn as soon as the steam shall have escaped, into open vats, where it can be operated upon in the next stage of the process, or it may be drawn directly into the vats from the boiler.

The vats which receive the wood shavings or cuttings, or other vegetable substances, being formed into pulp, should be constructed with suitable means of drainage. The alkaline solutions must then be removed from the pulp, either by percolation and subsequent washing in the vats, or by pressure in any convenient apparatus and subsequent washing. The mode of percolation has generally been found sufficient. . . . The alkaline solutions having been removed by percolation and wash-

ing, or by pressure and washing, the wet mass of woody or vegetable pulp is now to be exposed to the action of chlorine, or the compounds of chlorine with oxygen, for the purpose of bleaching it and preparing it for the manufacture of white paper. Brown, colored, or unbleached paper, of a good quality, can be produced from the pulp as soon as the alkaline solutions are removed; but for the production of good white paper, it is necessary to subject the pulp to the bleaching process. If the material used be wood, or vegetable substance of a non-resinous nature, the pulp may be bleached by subjecting it to the action of chlorine in a gaseous form, or, which is preferable in this case, in an aqueous solution, in any of the common and well-known modes.

If the wood or vegetable substance be of a resinous nature, the alkaline solutions should be removed by the mode above described, and the pulpy mass should be exposed to the action of chlorine, or its compounds with oxygen. This may be done by placing the pulpy mass of woody or vegetable substance on racks or drawers arranged in a chamber, and applying chlorine, or its compounds with oxygen, in the gaseous form, which with resinous substances is preferable to the aqueous solution, until the mass is sufficiently acted upon. The mass must then be again well washed and treated with a weak solution of caustic alkali, warm preferred, which changes the red color to a dark-brown. The alkaline solution should then be removed by washing, and the resulting gray pulp may be bleached by any ordinary method of bleaching.

Claim.

What we claim, &c., as the invention of Charles Watt and Hugh Burgess, as a new article of manufacture, is a pulp suitable for the manufacture of paper, made from wood or other vegetable substances, by boiling the wood or other vegetable substance in an alkali under pressure, substantially as described.

We come, finally, in the Watt & Burgess patents, to

3. REISSUE (1449) PROCESS PATENT, APRIL 7TH, 1863.

In reading *this* reissue the reader will direct his attention to the matter of how far it is for the same invention as the original patent; that is to say, having in his mind how far that

was for producing by a succession of operations—three operations perhaps—pulp in a state fit for washing and bleaching; he must now direct his attention to the matter whether this reissue is for producing it by such a series or by a single operation; whether, in short, the reissue is for the "same invention" as the original patent.

Be it known that Charles Watt and Hugh Burgess, &c., did invent, make, and apply to use, certain improvements in pulping and disintegrating wood and other vegetable substances, &c.

Specification.

The wood or vegetable substances upon which it is intended to operate by this process should first be reduced to shavings or cuttings. This may be done in any suitable machine.

The shavings or cuttings of wood, or the vegetable substances, are then to be boiled in a solution of caustic alkali, in a suitable boiler, under pressure. The strength of the alkali is dependent upon the nature of the vegetable substance used and operated upon. For non-resinous woods, a solution of alkali of the strength indicated by 17° of the English hydrometer, or thereabouts, answers very well, and for deal, pine, or fir wood, or other woods containing resinous matter, a strength of about 12° is sufficient, but varying with the nature of the vegetable substance being acted upon to a strength of about 10°. The varied nature of the vegetable substance to be acted upon is such that only general directions can be given for the strength of the alkali, or the degree of heat to be used, or the duration of the operation. Boiling in a solution of caustic alkali under pressure is of essential importance. By the words "under pressure," is meant a pressure at, near, or above 300° of Fahrenheit's scale, which is the ordinary pressure used; but a heat and corresponding pressure of from 300° to 500° may be used, according to the nature of the vegetable substance to be treated—whether resinous or non-resinous, or otherwise—and the time may be from four to twelve hours, according to the nature of the substance.

After the vegetable substance has been thus operated upon by caustic alkali, under heat and pressure for the requisite time, as above described, it should be discharged from the boiler, while under pressure, into a tank or other reservoir, with proper safety

Statement of the case.—Keen's patent, A.D. 1859.

valves and pipes for the discharge of the steam, and should be drawn as soon as the steam shall have escaped, into open vats where it can be operated upon in the next stage of the process, or it may be drawn directly into the vats from the boiler. The vats which receive the wood shavings or cuttings, or other vegetable substances being formed into pulp, should be constructed with suitable means of drainage.

The alkaline solutions must then be removed from the pulp, either by percolation and subsequent washing in the vats, or by pressure in any convenient apparatus, and subsequent washing. The mode of percolation has generally been found sufficient. The alkaline solutions thus obtained may be saved and evaporated down, and the residuum burned in a furnace suitably constructed, so as to prepare the alkaline substances for use in a repetition of the same process.

The alkaline solution having been removed by percolation and washing, or by pressure and washing, the wet mass of vegetable or woody pulp is now to be exposed to the action of chlorine, or the compounds of chlorine with oxygen, for the purpose of bleaching it and preparing it for the manufacture of white paper. Brown, colored, or unbleached paper, of a good quality, can be produced from the pulp as soon as the alkaline solutions are removed; but for the production of good white paper it is necessary to subject the pulp to the bleaching process.

If the material used be wood or vegetable substance of a non-resinous nature, the pulp may be bleached by subjecting it to the action of chlorine in a gaseous form, or, which is preferable in this case, in an aqueous solution, in any of the common and well-known modes.

If the wood or vegetable substance be of a resinous nature, the alkaline solution should be removed by the mode above described, and the pulpy mass should be exposed to the action of chlorine or its compounds with oxygen. This may be done by placing the pulpy mass of woody or vegetable substance on racks or drawers arranged in a chamber, and applying chlorine, or its compounds with oxygen in the gaseous form, which with resinous substances is preferable to the aqueous solution, until the mass is sufficiently acted upon. The mass must then be again well washed and treated with a weak solution of caustic alkali, warm preferred, which changes the red color to a dark brown. The alkaline solution should then be removed by washing, and

the resulting gray pulp may be bleached by any ordinary method of bleaching.

Claim.

What we claim as the invention of Charles Watt and Hugh Burgess is, first:

The process of treating wood or other vegetable substance, by boiling it in alkali under pressure, as a process, or preparatory process, for making pulp for the manufacture of paper from such woods or other vegetable substances substantially as described.

We also claim the process of treating resinous woods by boiling in an alkali under pressure, and treating the product with chlorine and its compounds with oxygen, for making white pulp for the manufacture of paper from such woods, substantially as described.

So far as to the Watt and Burgess patents and their reissues. We now proceed to—

II.—KEEN'S BOILER PATENTS

The FIRST of these purported to be an invention of certain "improvements in boilers for boiling wood or ligneous materials for making paper pulp, under pressure." The following was the

Specification.

Fig. 1, on page 581, represents a perspective view of said boiler.

Fig. 2, on page 582, represents a vertical central section through the same.

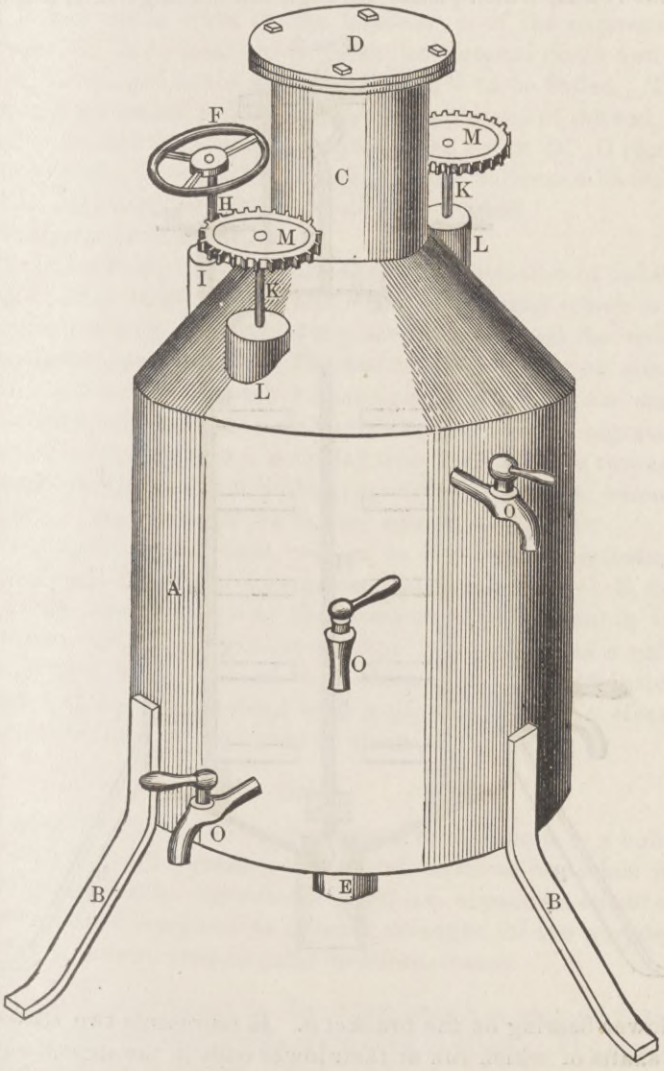
My invention relates to the construction of a boiler for boiling wood and ligneous materials for making paper-pulp, in which proper provision is made for keeping the stock covered by the alkali or liquid used, and giving it motion, to insure the mass being properly boiled throughout, and a discharge valve or cock, by means of which the stock when sufficiently boiled is blown out in a pulpy state.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

Statement of the case.—Keen's patent, A.D 1863.

A represents a vertical cylindrical boiler, which is mounted on supports, B, or on any other suitable frame. The upper part of the boiler is made conical, and is provided with an expansion-

FIG. 1.

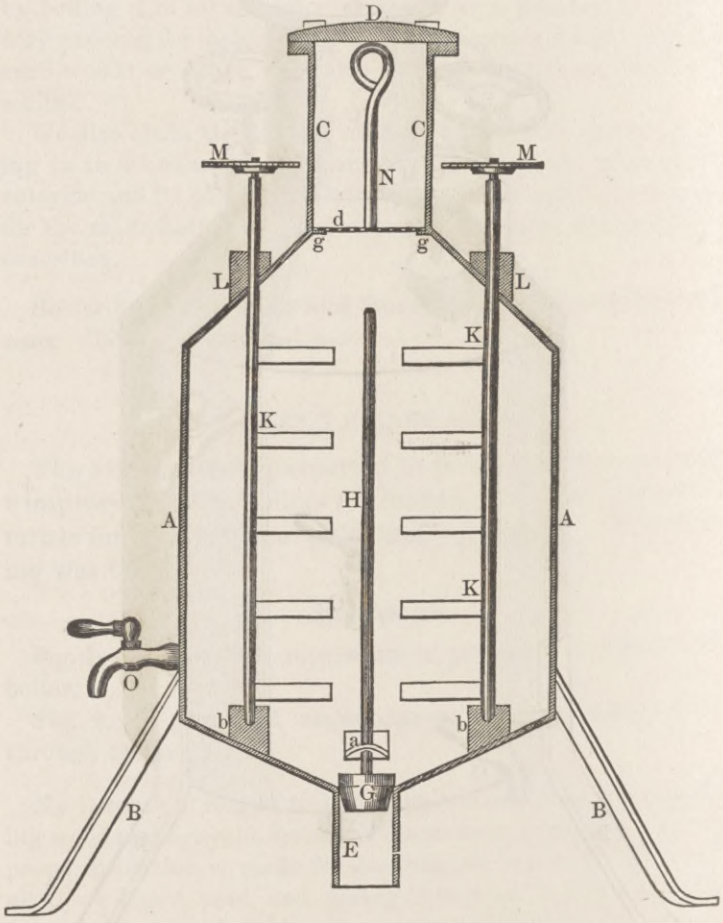


chamber, C, through the aperture of which the boiler is charged, and which is closed by a cover, D, which is bolted steam-tight

Statement of the case.—Keen's patent, A.D. 1863.

to the same. The bottom of the boiler A, is made funnel-shaped, and ends in the centre in the discharge-pipe, E, which is closed by a piston or stop-cock, G. The latter is secured to the rod H, and can be opened or closed by means of the hand-wheel F, of the rod H, which passes through the stuffing-box I, and has

FIG. 2.



its lower bearing on the bracket *a*. K represents two stirrers, the shafts of which run at their lower ends in the steps *b*, while their upper ends pass through the stuffing-boxes L, and are provided with pinions M, which are driven by suitable gearing.

Statement of the case.—Keen's patent, A.D. 1863.

The shafts of the stirrers, K, are provided on one side only with the horizontal stirring arms, which, when the boiler is to be charged are turned towards the periphery of the boiler, and are therefore not in the way of the material as it is thrown into the boiler. *d* represents a perforated plate, which is secured to the rod, N, and which rests on the brackets, *g*, of the expansion-chamber, C. It is intended to press the material down and to keep it submerged in the fluid in which it is to be boiled. The plate, *d*, is prevented from rising by the upper end of the rod, N, being in contact with the lower face of the cover, D. O represents try-cocks, by which the material in the boiler can be tried, to what degree of perfection the stock is worked.

The operation is as follows:

The boiler being charged with the proper solution of caustic alkali or other suitable fluid, and with the material which is to be reduced to pulp, the plate *d* is placed upon it, and the cover G is screwed down tightly. The boiler A is then heated, either by a direct fire or by any other heating apparatus, and the mass in the boiler is boiled and stirred until thoroughly disintegrated. During this process the steam arising from the fluid rises through the perforated plate, *d*, and fills the expansion-chamber, C, whence it exerts a pressure upon the boiling mass in the boiler.

When the stock has been reduced to the desired perfection, the stop-cock, G, is opened by means of the hand-wheel, E, and the entire mass is blown by the pressure of the steam in the expansion-chamber and boiler through the pipe, E, as a pulp, into an open tank adjacent to the boiler, A. The expansion-chamber, C, may be provided with a pipe leading to a steam-gauge, to indicate the pressure of steam in the boiler.

Claim.

Having thus described my invention, what I claim is a boiler for boiling, under pressure, wood and ligneous materials for making paper-pulp, constructed with an expansion-chamber, stirrers, and discharge valve or cock, arranged for the purposes and in the manner substantially as herein stated.

In regard to this patent, the main question seemed really to be whether or not it was for a combination. The proofs showed that the defendants had never employed two stirrers, nor even one having arms upon one side alone, capable of

being turned outwardly when the boiler was filled, so as not to impede the filling or emptying of it. They used for some time a single shaft provided with four blades, shaped like those of a propeller; used, in other words, an ordinary stirrer; but this they abandoned, they having found that from its being under the expansion-chamber and under the aperture for supply, it impeded the filling and emptying of the boiler. This abandonment was about the time when the bill in this case was filed. Messrs. Renwick and other experts of the defendants testified that in their opinion the contrivance of the defendants did not infringe this patent of Keen. Dr. Rand, an expert in chemistry but not in mechanics, who was called for another part of the case, but was examined in this, gave it as his opinion that it did.

2. The SECOND of Keen's patents purported to be for "improvements in boilers for making paper-pulp," and contained the following

*Specification.**

In boilers, where a perforated diaphragm is placed in the interior, and through which diaphragm the material out of which the pulp is to be made is to be charged into the cylinder, it is found that the material falling upon the diaphragm chokes up its openings; and, moreover, gets above or on top of the liquid, which it is the special object of the diaphragm to prevent. My object and purpose is to prevent this difficulty; and I have achieved it in a very simple manner. My invention consists in connecting the man- or feed-hole in the shell of the boiler with the man- or feed-hole through the diaphragm, by a perforated well or cylinder, so that the material can be charged through said well into the boiler without falling upon or clogging the perforated diaphragm.

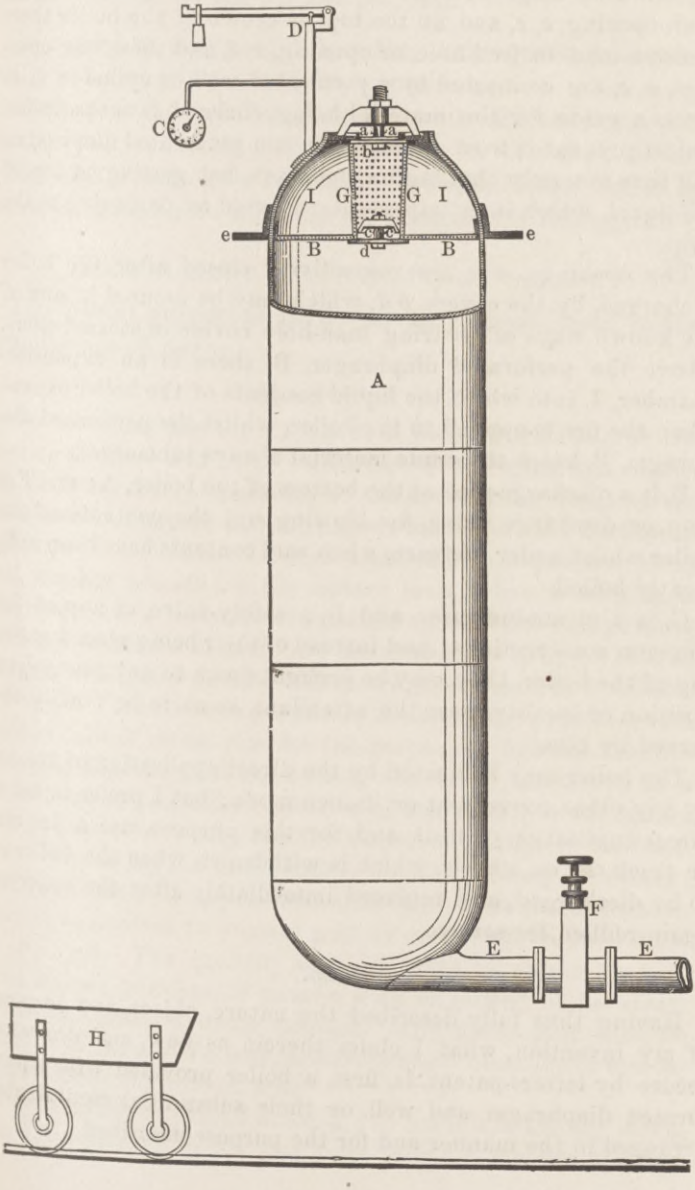
To enable others skilled in the art to make and use my invention, I will proceed to describe the same, by reference to the drawings.

A, represents a boiler, which stands vertically in the furnace or brickwork, and which, for strength and convenience, has

* The drawing on p. 585 represents the boiler in elevation, with a portion of its upper part represented in section, to show the interior arrangement thereof.

hemispherical ends, its body being cylindrical. This boiler is suspended to the brickwork or foundation, by flanges, *e*, so that

FIG. 3.



it may expand or contract without loosening itself from the foundation or its support.

In the interior of the boiler, near its upper end, there is placed a perforated diaphragm, B, through the centre of which there is an opening, *c*, *c*, and at the top or crown of the boiler there is also a man- or feed-hole, or opening, *a*, *a*, and these two openings, *a*, *c*, are connected by a perforated well or cylinder, G, to act as a guide for the material being charged into the boiler, and to prevent it from falling upon the perforated diaphragm, and thus not only choking its openings, but getting on top of the liquid, which it is important to avoid as damaging to the pulp.

The openings, *a c*, are respectively closed after the boiler is charged, by the covers, *b d*, which may be secured in any of the known ways of securing man-hole covers in steam-boilers. Above the perforated diaphragm, B, there is an expansion-chamber, I, into which the liquid contents of the boiler expand when the fire is applied to the boiler, whilst the perforated diaphragm, B, keeps the crude material always submerged.

E, is a discharge-pipe at the bottom of the boiler, A; and F, a stop or discharge valve, for blowing out the contents of the boiler whilst under pressure, when said contents have been sufficiently boiled.

C, is a steam-indicator, and D, a safety-valve, of any of the common constructions; and instead of their being placed at the top of the boiler, they may be brought down to any convenient position or locality, near the attendant, so as to be readily observed by him.

The boiler may be heated by the direct application of fire, or by any other convenient or known mode; but I prefer to use a direct application of heat, and, for this purpose, use a fire car or truck, H, on wheels, which is withdrawn when the boiler is to be discharged, and replaced immediately after the boiler is again refilled for service.

Claim.

Having thus fully described the nature, object, and purpose of my invention, what I claim therein as new, and desire to secure by letters-patent, is, first, a boiler provided with a perforated diaphragm and well, or their substantial equivalents, arranged in the manner and for the purpose described.

I also claim, in combination with the boiler, the arrangement of the discharge pipe and valve, for the purpose of blowing out or discharging the contents of the boiler under pressure, substantially as and for the purpose set forth.

In regard to this patent, too, the main question seemed really to be whether it was for a combination.

The proofs showed that the defendants did not use a perforated well connecting the feed-hole in the shell of the boiler with a man-hole in its shell, but fed their boiler by means of a feed-hole *below* the diaphragm, not through it.

III.—MELLIER'S PATENT, AUGUST 7TH, 1854.

This patent purported to be for an improvement in the manufacture of paper.

Specification.

The invention has for its object a peculiar process for the treating of straw and other vegetable fibrous materials requiring like treatment preparatory to the use of such fibres in the manufacture of paper; and the improvement consists in subjecting straw or such other fibrous materials to a pressure of at least seventy pounds on the square inch, when boiling such fibrous matters in a solution of caustic alkali. For this purpose the straw or fibrous matters are cut into short lengths, soaked in warm water, and washed. They are then placed in a suitable boiler; and I use for such purpose a rotary boiler, provided with a coil or coils of steam-pipe for the purpose of heating the contents, and I prefer that the boiling should be carried on at a temperature to produce at or above eighty pounds on the square inch in the boiler where are the fibrous materials to be acted upon. But so high a temperature is not absolutely necessary; for I have found by experiment that it is essential that a temperature equivalent to seventy pounds on the square inch must be employed. The quantity of alkali used is at the rate of about sixteen per cent. of caustic soda or potash of the straw or fibrous substance under process. The fibres may then be bleached by the use of a comparatively small quantity of bleaching powder or chloride of lime.

To enable others skilled in the art to make and use my invention, I will proceed to describe more fully the manner of using

the same. The straw or other fibrous material requiring a like process to prepare the same for the paper manufacture, is first, as heretofore, to be cut in a chaff-cutting or other machine into short lengths, and to be freed from knots, dirt, and dust, and then steeped for a few hours in hot water. The straw or fibrous materials and a weak solution of caustic alkali are then to be placed in a suitable close boiler, heated by steam, as hereafter explained, and the heat is to be raised to such a degree as to attain and maintain for a time, a pressure internally of the boiler equal to or exceeding seventy pounds on the square inch, that is, about 310° of Fahrenheit, by which means a considerable saving of alkali, as well as time and fuel, results, as compared with the means of using a hot solution of caustic alkali, as now practiced in preparing straw and other fibres for papermakers. The boiler employed for the purpose, and the manner of heating it by steam, may be varied. But first, it must have a rotary motion, either on its long or on its small axis, by means which are very well known; and secondly, I prefer not to send the steam directly into the liquid in which the materials are immersed, but to pass it either in a jacket around the boiler or through a coil, or a system of steam pipes inside of it, so that the steam does not mix with the caustic alkaline solution in the middle portion of the boiler, but is kept separate, and does not therefore in condensing dilute the caustic alkaline solution used.

The plan of construction of the boiler I would recommend would be, if the boiler is to rotate vertically or on its small axis, as very well known, to cover it with a jacket so that the steam could circulate from one end to the other between the two plates, or rather, if it is to revolve horizontally or upon its long axis, as is equally very well known, to fix near each end of the boiler, and inside of it, a diaphragm or partition, which partitions are connected together by numerous tubes, which are arranged in a circle near the outer circumference of each partition. By this arrangement the steam is introduced through the hollow axis at one end of the boiler, and it passes through the steam-pipes and thence into the compartment at the other end of the boiler, where it and the condensed steam are conveyed away, as is understood, through the other hollow axis. In adopting the plan of not sending directly the steam into the boiler I found the three following advantages: 1st, not to dilute, as I have already said, the alkaline solution; 2d, to avoid the

Statement of the case.—Mellier's patent, A.D. 1857.

trouble of having sometimes the end of the steam-pipe in the boiler choked with straw, and to prevent, in case that, by one cause or another, the pressure in the steam-boiler would fall under the degree of the pressure in the straw-boiler, the priming of the first by the second, viz., the absorption of straw and alkaline solution from the straw-boiler into the steam-boiler; 3d, the greater facility of cooling the straw-boiler when the pressure has been maintained for a sufficient length of time, by means of turning off the steam at one end, letting it at the other end out of the jacket, or of the coils or steam-pipes just described, and passing through the same a stream of cold water, which at the same time that it cools the mass furnishes a quantity of cold water, which can be received in convenient vessels, and will be found very useful for washing the straw or other fibrous materials after boiling.

By means of submitting the straw or similar fibrous materials to a pressure of between seventy to eighty-four pounds on the square inch inside of the boiler, I can reduce considerably the proportion of alkali; and the solution which I prefer to use is to be from two to three degrees of Baumé, or of a specific gravity of from 1.013 to 1.020, and at the rate of about seventy gallons of such solution to each cwt. of straw or other fibrous vegetable matters requiring like treatment.

The boiler is to be filled with straw and alkaline solution and then closed fluid and steam-tight. The boiler is made to revolve slowly, say about one or two revolutions per minute, and the steam is to be admitted. I find it desirable to keep up the heat and pressure during about three hours after the pressure above mentioned has been obtained, when the process of boiling is complete. A steam-gauge properly fixed upon the boiler will enable one to ascertain when the pressure has attained the required degree. When the apparatus and the fibres under process have been cooled by means hereinbefore mentioned, or rather when the pressure has been reduced to nothing, I open the man-hole of the boiler, empty the materials in suitable vessels, and wash them first with hot water, then with cold water, until the liquor runs perfectly clear. I then steep the fibre for about an hour in hot water, acidulated with a quantity of sulphuric acid, equal to about two per cent. of the weight of the fibres under process, and finally the washing is completed with cold water. The straw or fibre may then be bleached in the

ordinary manner, and it will be found to be accomplished by a comparatively small quantity of chloride of lime.

Claims.

I do not claim the general use of caustic alkaline solutions, nor the employment generally of a close boiler for boiling straw or other vegetable fibrous substances.

But what I claim as my invention, and desire to secure by letters-patent, is the use of a solution of caustic soda (Na O) in a compartment of a rotary vessel, separate from that which contains the steam-heat, substantially as described.

I also claim the within-described process for bleaching straw, consisting in boiling it in a solution of pure caustic soda (Na O) from 2° to 3° Baumé, at a temperature not less than 310° Fahrenheit, after it has been soaked and cleaned, and before submitting it to the action of a solution of chloride of lime from 1° to 1½°, substantially as described.

It was the second of these claims that the defendants were charged with infringing.

On the whole case, therefore, to recapitulate and explain, the alleged infringement of the Mellier patent and of the reissue No. 1449, consisted in the use by the defendants of bamboo, disintegrated by a peculiar process, in the manufacture of paper-pulp, by boiling it in a caustic alkaline solution under a pressure not exceeding sixty pounds, and at a temperature corresponding thereto; and as to the reissue No. 1448, in the use of the pulp so produced.

The apparatus whose use by the defendants was alleged to infringe the Keen boiler patents of 1859 and 1863, was a boiler for the same purposes as those claimed in those patents, and exhibiting the same combination of parts as the patent of 1859, except the peculiar stirrers, and the same combination as the patent of 1863, except the diaphragm; nor were any equivalent devices used in the place of these elements.

One great difficulty in regard to the patent to Mellier was, saying what invention it was that was patented; and different courts had given to the patent different constructions

Statement of the case.—Mellier's patent, A.D. 1867.

In the court below the invention covered by this patent was construed to be a process for the production of pulp from wood, &c., by a simple chemical operation, and upon this singleness of the operation and the consequent economy of time and material the novelty and utility of the invention were sustained. The description of his process by the patentee was so construed by the court, upon reference to the French system of reckoning pressure, as to fix the minimum temperature specified at a point below that which the defendants had reached in their use of the process. The claim was declared to include vegetable substances besides those similar to straw, and of such a class as to comprise bamboo, and the preparatory process used by defendants for the disintegration of the material, it was held, did not affect their liability for the use of a final process which was substantially the same as that claimed in the Mellier patent.

In the Circuit Court of Pennsylvania Mr. Justice Cadwalader expressed his idea of Mellier's invention thus:

"Mellier would appear to have been the first person who discovered that the temperature and strength of the solution and the duration of the boiling could in practice be so graduated and adjusted as to produce the pulp *at one operation.*"

But in *Buchanan* v. *Howland*,* when the same patent was presented for construction, the Circuit Court for the Northern District of New York (Hall, J.) thus stated the principle of the discovery:

"The real discovery of Mellier, the main idea, the spirit or principle of his invention, was that the known effects of a solution of pure caustic soda, which had been previously advantageously used for boiling straw and other fibrous materials of similar character and texture, in open vesssels, in which the heat could be raised only to 212° Fahrenheit, might by the use of a much higher degree of heat, not less than 310° Fahrenheit, be advantageously and greatly increased; while the lessening of

* 2 Fisher, 359; concurred in by Woodruff, J.; American Wood-paper Company v. The Glen's Falls Paper Company, 8 Blatchford, 516.

the time the fibre was subjected to the action of the caustic alkaline solution, and the use of the weaker solution, which could thus be advantageously used, would be less injurious to the fibre as well as more economical in its use and application. This was the discovery or principle to be developed and practically applied, and he embodied that principle and arranged and described the means of its practical application, for the purposes specified, in the mode and manner particularly described in this specification. This mode, he says, he prefers, and he recommends a particular construction of the boiler as proper to be used in the practical application of the leading idea and principle of his invention. But, aware that inferior forms may be devised by any mechanic, and that superior forms and modes of construction and application may be devised after the use of his process has become familiar, he very wisely makes his second claim broad enough to cover his actual discovery and invention, irrespective of the particular form or construction of the vessel in which the boiling process might be carried on."

Assuming this construction, which accorded in essential parts with the construction of the court below, to be correct, and assuming also the patent to be valid, there remained the question of infringement of this Mellier patent.

On this point it appeared that the defendants chiefly used *bamboo* (which they disintegrated by blowing through a steam gun), as their chief material for making pulp, straw being perhaps used also sometimes; and it appeared that while using a caustic alkaline solution of the general strength of from two and a half to three degrees Baumé, they occasionally—though only occasionally—used an external pressure, as measured by the gauge, of from forty to sixty pounds; the latter being equal to an internal pressure of nearly seventy-five pounds, or a temperature of above 310°.

On the whole case, the court below held, as already stated, p. 570—

1. That the reissues, Nos. 1448 and 1449, of the Watt & Burgess patents, were void: the first as claiming what was not new; the second as being for a different invention from the original.

2. That there was no infringement of the Keen boiler

patents, both the patents being for combinations, and all parts of the combinations not being used in the alleged infringement of either patent.

3. That the Mellier patent was to be construed in the way already stated as the one in which the court below construed it, and that so construed it had been infringed.

An injunction was accordingly awarded.

Mr. T. A. Jenkes, for the American Wood-Paper Company; Mr. R. W. Russell, contra.

Mr. Justice STRONG delivered the opinion of the court.

Though the two reissued patents (Nos. 1448 and 1449*) were granted on the same day and to the same patentees, and though they are both substitutes for the one original patent granted July 18th, 1854, antedated August 19th, 1853, they are to be carefully distinguished one from the other. The first (No. 1448) is a patent for a product or a manufacture, and not for any process by which the product may be obtained. The second (No. 1449) is for a process and not for its product. It is quite obvious that a manufacture, or a product of a process, may be no novelty, while, at the same time, the process or agency by which it is produced may be both new and useful—a great improvement on any previously known process, and, therefore, patentable as such. And it is equally clear, in cases of chemical inventions, that when, as in the present case, the manufacture claimed as novel is not a new composition of matter, but an extract obtained by the decomposition or disintegration of material substances, it cannot be of importance from what it has been extracted.

There are many things well known and valuable in medicine or in the arts which may be extracted from divers substances. But the extract is the same, no matter from what it has been taken. A process to obtain it from a subject from which it has never been taken may be the creature of inven-

* *Supra*, pp. 575 and 580.—REP.

tion, but the thing itself when obtained cannot be called a new manufacture. It may have been in existence and in common use before the new means of obtaining it was invented, and possibly before it was known that it could be extracted from the subject to which the new process is applied. Thus, if one should discover a mode or contrive a process by which prussic acid could be obtained from a subject in which it is not now known to exist, he might have a patent for his process, but not for prussic acid. If, then, the Watt & Burgess patent for a product is sustainable it must be because the product claimed, namely, "a pulp suitable for the manufacture of paper, made from wood or other vegetable substances," was unknown prior to their alleged invention. But we think it is shown satisfactorily that it had been produced and used in the manufacture of paper long before 1853, the year in which the original patent of Watt & Burgess was dated.

It is insisted, however, that the paper-pulp which had been produced before the invention of Watt & Burgess was not pure cellulose, that it was only approximately pure, and from this it is argued that the pure article obtained from wood by their process is a different and new product, or manufacture. Whether a slight difference in the degree of purity of an article produced by several processes justifies denominating the products different manufactures, so that different patents may be obtained for each, may well be doubted, and it is not necessary to decide. The product of the complainants' patent is a pulp suitable for the manufacture of paper, and, confessedly, to make white paper it requires bleaching. The pulp which had been obtained by others from rags in large quantities, and from straw, wood, and other vegetable substances to a lesser extent, was undeniably also cellulose, suitable for manufacturing paper, and, so far as appears, equally suitable. The substance of the products, therefore, was the same, and so were their uses. The design and the end of their production was the same, no matter how or from what they were produced.

It is freely admitted that the patent of an originator of a

complete and successful invention cannot be avoided by proof of any number of incomplete and imperfect experiments made by others at an earlier date. This is true, though the experimenters may have had the idea of the invention, and may have made partially successful efforts to embody it in a practical form. And though this doctrine has been more frequently asserted when patents for machines have been under consideration, we see no reason why it should not be applied in cases arising upon patents for chemical products. But the doctrine has no applicability to the present case. What had been done before the Watt & Burgess invention was more than partially successful experimenting. A product or a manufacture had been obtained and had been used in the arts, a manufacture which was the same in kind and in substance, and fitted for the same uses as the article of which the complainants now claim a monopoly. That this manufacture may have been the product of one or more different processes is, as we have said, quite immaterial in considering the question whether it is the same as that produced by the complainants.

It has been, however, argued that the product of the complainants' process and the product claimed as a new manufacture is cellulose, of the proper consistency and dimensions, and with a fibre of a proper length for immediate felting into paper, while the cellulose obtained from rags or wood, or other vegetable substances, by other processes than that of the Watt & Burgess patent, had a longer fibre, and required, in addition to chemical agency, mechanical treatment to prepare it for use in paper making. Hence, it is inferred the product is a different one, that it is properly denominated a new manufacture, and that it was patentable as such.

This argument rests upon a comparison of the finished product of the complainants with an article in an intermediate stage, and while undergoing treatment preparatory to its completion. It may be quite true that at some stage of its preparation the paper-pulp made and used before 1853 was not of the proper consistency for paper making, or that

its fibre was too long, and that it required additional manipulation to fit it for use. But when it had received that treatment, its fibres were reduced to the proper length, and it became capable of all the uses to which it is claimed the product of the complainants is adapted. It is with the finished article that the comparison must be made, and, being thus made, we are of opinion that no substantial difference is discoverable.

It may be that if the cellulose which had been produced prior to 1853, of such form and with such properties that it could be at once felted into paper, had been only a chemical preparation in the laboratory or museum of scientific men, and had not been introduced to the public, the Watt & Burgess product might have been patented as a new manufacture. Such appears to be the doctrine asserted in some English cases, and particularly in *Young* v. *Fernie.** In that case, Vice-Chancellor Stuart remarked upon a distinction between the discoveries of a merely scientific chemist, and of a practical manufacturer who invents the means of producing in abundance, suitable for economical and commercial purposes, that which previously existed as a beautiful item in the cabinets of men of science. "What the law looks to," said he, "is the inventor and discoverer who finds out and introduces a manufacture which supplies the market for useful and economical purposes with an article which was previously little more than the ornament of a museum." But this is no such case. Paper-pulp obtained from various vegetable substances was in common use before the original patent was granted to Watt & Burgess, and whatever may be said of their process for obtaining it, the product was in no sense new. The reissued patent, No. 1448, is, therefore, void for want of novelty in the manufacture patented.

The reissue, 1449, is for a process to obtain pulp from wood or other vegetable substances for the manufacture of paper. It consists in boiling the wood under pressure in a

* 10 Law Times Reports, 861.

solution of caustic alkali, with such an adjustment of the strength of the solution, of the pressure, and of the time of boiling as to produce the pulp ready for washing and bleaching at a single operation. It is in the main, if not entirely, a chemical process, and it differs from all processes for obtaining paper-pulp known before 1853, when the original patent to Watt & Burgess was dated, in this particular,—that it produces the pulp ready for bleaching or for use in a single operation. In all processes prior to that date, successive operations were necessary in order to obtain a pulp fitted for use in making paper. These were in part mechanical, sometimes wholly so. In some cases the vegetable substances had been boiled in alkalies in open or closed boilers, under pressure, or without pressure. To this treatment, disintegration by mechanical means was added, and in no case had a suitable pulp been produced by chemical agency and in a single stage of treatment. It must then be admitted that the process described in this reissue was unknown before 1853, and if then invented by Watt & Burgess, it was patentable to them. Whether it was in fact patented to them is another question. It is, we think, fairly established by the testimony of Hugh Burgess, one of the original patentees, that in 1851 or 1852, he produced a good pulp by boiling wood in a caustic alkali at a high pressure. The witness does not, however, state that this production was the result of a single process. His description of his experiments, as given in his testimony, is very significant.* What he there swears to does not look at all like the production of pulp by a single operation, nor does it intimate any discovery of a process by which it could be effected. Such an idea seems not then to have been in the mind of the inventor. And when the schedule to the English patent, dated August, 1853, was prepared, it described a process, consisting of several stages. In that wood shavings were first boiled in caustic alkali of the strength indicated by about twelve of the English hydrometer. This process, the specification stated, was much

* See *supra*, pp. 573–575.—REP.

better performed under pressure, and after the wood had been boiled about twenty-four hours it was to be well washed and squeezed to remove the alkali. The wood was then placed upon racks in a chamber and exposed to the action of chlorine, or any of the compounds of chlorine with oxygen. When sufficiently acted upon by the chlorine it was to be removed and washed, and then subjected to the action of a weak solution of caustic alkali. Only then, after these successive stages, was a pulp produced ready for bleaching. The specification of this patent is the same as that of the first American patent, dated July 18th, 1854, but antedated August 19th, 1853, to correspond with the English one. If it contains the germ of the process described and claimed in the reissue 1449, it is too evident to admit of doubt there was then in the mind of the patentees no finished conception of such a process. What they contemplated was a series of manipulations. Boiling under pressure, though preferred, was not stated to be essential. No graduation of the strength of the alkali was described. No degree of pressure was named, and no variation of the time of treatment. These are all-important to the production of pulp in one operation.

Undeniably three successive stages of operation were described in the specification, three distinct processes, not employed contemporaneously, but following each other in order of time. And this succession in the order mentioned was considered by the patentees as essential, in fact it was claimed as their invention. In support of their application for the original American patent it was argued on their behalf that "their invention relates to a series or combination of processes, in the order in which they are stated, for treating shavings, &c."* The several processes and their order was then stated. An "order and series of processes" is what, according to the statement made in support of their application, "constituted their invention, and what they supposed they had embodied in their claim." And the claim of the

* See the argument quoted, *supra*, pp. 572, 573.—REP.

patent was for the treatment of wood shavings by chemical agencies "*in the order* substantially as described." How, then, is it possible to maintain that a process to obtain pulp by chemical action in a single operation had been invented by the patentees when their first patent was granted? And what is of more importance, how is it possible to hold that such an invention was patented to them? We find no satisfactory evidence that the idea of a single-stage process was ever conceived by Watt & Burgess until after a patent disclosing it was granted to Marie Amedée Charles Mellier on the 26th day of May, 1857. This was before the surrender of their original patent, and before the reissue. And if Watt & Burgess had not invented the single-stage process, when their original patent was granted, the reissue 1449 is for a different invention from that described or referred to in the original patent; and such is the testimony of the experts who have been examined in this case. But the testimony of the experts is not needed. It appears on the face of the reissue that it is for a different invention, for the reissue is attempted to be sustained only on the ground that it is for a single-stage process. Both the reissues, therefore, we think, are void.

We proceed next to consider the two boiler patents granted to Morris L. Keen. The first of these, dated September 13th, 1859,* is for a boiler for boiling under pressure wood and ligneous materials for making paper-pulp, constructed with an expansion-chamber, stirrers, and discharge valve or cock, arranged for the purpose and in the manner substantially as stated in the specification. Such was the claim of the patentee. The invention claimed is, therefore, a combination, in a specified manner, of an expansion-chamber, stirrers of a peculiar construction, and a discharge valve in a boiler, and the purposes avowed are to keep the stock boiled covered with the liquid used, to give it motion in order to insure its being properly boiled throughout, and to blow it

* *Supra*, pp. 580–583.—REP.

out in a pulpy state when it has been sufficiently boiled. In the arrangement of the constituents of the combination for the accomplishment of these purposes, the expansion, chamber is provided with an aperture through which the boiler is charged. The stirrers are two in number, the shafts of which are placed vertically toward the sides of the boilers, and provided with arms on one side only, in order that they may be turned toward the periphery of the boiler when it is to be charged, so as not to be in the way of the material thrown in. That the stirrers constructed and arranged substantially as described were a material part of the combination is certain, and we think it has not been proved that they were used by the defendants. It is true that the extent of the use, if there was any, is immaterial. A single instance of using the combination would have amounted to infringement, and would have entitled the complainants to a decree. But the defendants never employed two stirrers, nor even one constructed with arms only on one side, capable of being turned outward when the boiler was charged, so as not to be in the way of the charge or an impediment to the discharge. The novelty in the arrangement, so far as it relates to the stirrers, is in their construction and location, with a view to remedy this difficulty. There is evidence that the defendants did for a time use an ordinary stirrer, a single shaft in the centre of the boiler, provided with four blades, in form like the blades of a propeller. Arranged as it was, directly under the expansion-chamber, and under the supply aperture, it was, of course, an obstruction to the material with which the boiler was charged, and to the discharge of the pulp, and hence its use was abandoned either before or soon after this bill was filed. Regarding, as we must, the Keen patent as being for a combination of the devices mentioned, constructed and arranged as described in the specification, and for the purposes avowed, we think it must be held that the device employed by the defendants cannot be considered substantially the same as the peculiarly constructed and located stirrers of the patent. We think it evident that the novelty and usefulness of the Keen com-

bination, so far as it relates to the stirrers, is in their construction and location, so as to avoid the obstruction to filling and discharging the boiler, which was caused by the use of such an agitator as the defendants employed. We cannot, therefore, hold that this patent has been infringed by the defendants. They have not used all the constituents of the combination, nor employed any equivalent device which produces, or is calculated to produce, the same effects. It is true a witness for the complainants, not a mechanical expert, has testified that the boilers used in the factory of the defendants are substantially the same as those described and patented by Keen, and are operated and treated substantially in the same way. This was, no doubt, the opinion of the witness, but he has stated no facts that justify such an opinion. He has not undertaken to say that the central propeller of the defendants is substantially the same in operation or effect as the stirrers of the Keen patent. And all the mechanical experts who have been examined are of opinion that the defendants' boiler does not infringe either of the Keen boiler patents.

We are also of opinion that there has been no encroachment upon the second boiler patent, dated June 16th, 1863.* In that there are two claims. The first is "a boiler provided with a perforated diaphragm and well, or their substantial equivalents, arranged in the manner and for the purpose described" (in the specification). The second is, "in combination with the boiler, the arrangement of the discharge-pipe and valve, for the purpose of blowing out or discharging the contents of the boiler under pressure, substantially as and for the purpose set forth" (in the specification). The invention relates to boilers in the interior of which a perforated diaphragm is placed, and through which diaphragm the material for paper-pulp manufacture is to be charged into the cylinder. Its design is to prevent the falling of the material upon the diaphragm and choking its openings, and the means devised for achieving this are connecting the feed-

* *Supra*, pp. 584–587.—REP.

hole in the shell of the boiler with a man- or feed-hole through the diaphragm by a perforated well, or cylinder, so that the material can be charged through the well into the boiler without falling upon or clogging the diaphragm. As the defendants have not used a perforated well connecting a feed-hole in the shell with a man-hole in the diaphragm of the boiler, they are certainly guilty of no infringement of the first claim in this patent. They feed their boiler by means of a feed-hole below the diaphragm, not through it. Surely this is not a substantial equivalent for a cylindrical well from the top of the boiler through the diaphragm. Surely the patent was not intended to be for every possible means of supplying the boiler without clogging the interstices or perforations of the diaphragm. Had it been it would be void. But it is not for a result however obtained, it is for a mode of attaining a useful result. In such a case as this it cannot be maintained that because the result is the same the devices for obtaining it are not substantially different.

It is argued, however, that the defendants have infringed upon the second claim of the patent, and they undoubtedly have if the mode of charging the boiler, and the devices by which the charging is accomplished, have no relation to the asserted invention. If it be true that the second claim means nothing more than the assertion of an exclusive right to discharge *any* boiler in the mode described in the specification, very clearly the defendants are trespassers. But is that the true construction of the claim? We think not. It is not the arrangement of the discharge-pipe and valve that the patentee claims, but it is those devices in combination with the boiler particularly described in the specification, namely, a boiler containing near its upper end a perforated diaphragm, with an opening in its centre, and having a well connecting that opening with the feed-hole in the shell of the boiler. It may be quite true that the well and the mode of charging the boiler have no effect upon the mode of discharge, yet the claim is for a combination, of which the well is a part. Its language admits of no other construction.

Hence the defendants, not having used the well, they have not used the combination.

These considerations lead to the conclusion that the appeal of The American Wood-Paper Company cannot be sustained.

It remains to inquire whether the Mellier patent* is a valid one, and whether the defendants have been guilty of infringing it. Both these inquiries the Circuit Court answered in the affirmative, and consequently awarded an injunction against the defendants. It is from this part of the decree they have appealed.

The difficulty of this part of the case lies in determining what was the invention of Mellier—the invention patented. The second claim of the patent (which is the only one asserted to have been infringed) is, to say the least of it, obscure. It is avowedly for a process, and a process described in the preceding specification. But what that process is which the patent describes, wherein consists its novelty and usefulness, it is not easy to define. And it is not surprising that though no less than three Circuit Courts have been called upon to construe the patent, a construction somewhat different has been given in each case.

In the court below the principle of the Mellier discovery was held to be this, namely, that the effect of a solution of pure caustic soda upon straw and such other fibrous materials could be increased by the use of it under pressure, at a temperature of not less than about 310° Fahrenheit, so as to result in the production of the nearly pure fibre without resort to any other chemical process, thereby saving both alkali and time. In the Circuit Court of Pennsylvania the discovery was, by one of the judges, understood to be that the temperature and strength of the caustic alkali solution, and the duration of the boiling could in practice be so graduated and adjusted as to produce the pulp at one operation. This construction of the specification was, in

* *Supra*, pp. 587–590.

effect, holding the invention to be substantially the same as that in the Watt & Burgess reissue No. 1449, already considered.

But in *Buchanan* v. *Howland*,* when the patent was presented for construction in the Northern District of New York, the principle of the discovery was held to be that the known effects of a solution of pure caustic soda, which had been previously used for boiling straw and other fibrous materials of a similar character and texture, in open vessels, in which the heat could be raised only to 212° Fahrenheit, might, by the use of a much higher degree of heat, not less than 310°, be advantageously and greatly increased, while at the same time the reduction of the materials to paper-pulp would be more economical, inasmuch as it dispensed with the large quantities of alkali which had been previously employed. This resembles the construction adopted in the court below, though not exactly the same. And such, we think, is the true construction of the specification, and the process described is, we think, an attempted embodiment of this principle. Undoubtedly the patentee in framing his process made use of known agents. The use of caustic alkali in reducing vegetable substances to paper-pulp was no novelty. Neither was boiling under pressure. But a process combining those things with a certain specified arrangement of the strength and quality of the alkaline solution, and a defined regulation of the heat and pressure, may well have been patentable if it had no other novel result than the production of paper-pulp more economically. In the specification the improvement claimed is declared to consist "in subjecting straw or other fibrous materials to a pressure of at least seventy pounds on the square inch when boiling such fibrous matters in a solution of caustic alkali." Then follows a description of the mode in which the improvement is effected, in which not only is the minimum of pressure or heat described, but the strength of caustic alkali used is approximately defined. The heat is specified by

* 2 Fisher, 341.

stating it as equivalent to at least seventy pounds on the square inch, internal pressure, on the boiler, and the strength of the alkali used is described as from two to three degrees of Baumé, or of a specific gravity of from 1.013 to 1.020. These are to be used together in a boiler where a steam gauge will render it possible to ascertain when the pressure has attained the required degree. A certain strength of alkaline solution, and a degree of heat, indicated by a minimum pressure, are essential elements in the process. The precise proportion of alkali used is not specified, but it is described as about sixteen per cent., that is, sixteen pounds to one hundred of the fibrous substance under process. The heat is described as that which is equivalent to at least seventy pounds internal pressure on the boiler, or, as the patentee says, equivalent to 310° Fahrenheit. Quite evidently by using the phrase "internal pressure," the patentee intended artificial pressure alone, that produced by the application of heat, and the measure of the heat. If so, the pressure, as measured by the steam-gauge, instead of being seventy pounds, is the weight of one atmosphere ($14\frac{7}{10}$) less, or $55\frac{3}{10}$ pounds. This was the opinion of the court below, and in that opinion we concur. That the patentee so understood it is manifest from the fact that he defined seventy pounds internal pressure on the boiler as being equal to about 310° of Fahrenheit. It is much more than equal to that temperature if the pressure is marked by the steam-gauge, unless the weight of the atmosphere be deducted. But if from it be deducted the weight of one atmosphere, the remainder ($55\frac{3}{10}$) approximately corresponds with the temperature named. Sixty pounds pressure exceeds 310° Fahrenheit, even with distilled water, and still more with an alkaline solution. It is, then, altogether probable the French tables of steam-pressures, recognized throughout the scientific world, were in the patentee's mind. They start from a vacuum at zero, and make ordinary atmospheric pressure $14\frac{7}{10}$ pounds, whereas safety valves and manometer gauges in this country are always graduated so as to express the pressure in pounds, exclusive of that of the atmosphere.

Mellier was a Frenchman and probably familiar with the French tables.

Understanding the terms used in the specification thus, the elements of the process claimed are, 1st, the use of a solution of pure caustic soda (natrium and oxygen), from two to three degrees Baumé strong; and, 2d, boiling the materials to which the process is applied in the solution raised to a temperature of not less than 310° Fahrenheit, which, of course, implies the use of a close boiler. The preparation of the materials for the process is no part of it, nor is the subsequent washing and bleaching.

The claim, it is true, in referring to the material to be treated, mentions only straw, but the object of the claim was to secure a monopoly of the process, not to enumerate the materials to which it might be applied. They had already been described in the specification, and there was no necessity for mentioning any of them in the claim. It is true the patent cannot be extended beyond the claim. That bounds the patentee's right. But the claim in this case covers the whole process invented, and the complainants seek no enlargement of the process. Certainly the claim of the process ought not to be regarded as excluding all other substances than the one mentioned. As already noticed, the specification avows the object of the invention to be a process for treating straw *and other vegetable fibrous materials requiring like treatment preparatory to the use of such fibres in the manufacture of paper.* The subject to be treated is fibrous materials of a vegetable nature. And it may well be doubted, in view of this general declaration of the object, whether there is anything that limits the scope of the invention to a process of treating straw and other like materials. The language of the patent is not "straw and other like vegetable materials." The specification speaks of "straw or such other fibrous matters," of "straw or fibrous matters," of "straw or fibrous substance," "straw or other fibrous material," and it uses other similar forms of expression, but all of them clearly referring to fibrous materials requiring treatment like that required by straw for the pro-

duction of paper-pulp. It would, therefore, in our opinion, be too narrow a construction of the patent to hold that it is for a process applicable only to straw or other similar vegetable substances, and not applicable to vegetable substances generally requiring like treatment for the uses mentioned.

It remains only to inquire whether the defendants have infringed upon the complainants' rights as thus defined, for no sufficient reason has been given to justify our holding the patent void. This part of the case presents real difficulty. If there has been any infringement it was very slight. Admitting that bamboo, which is the subject principally used by the defendants (though there is some evidence that straw was also used), is one of the vegetable fibrous materials to which the complainants have an exclusive right to apply their process, does the evidence show that the process has been applied? Certainly it has not, unless in boiling bamboo or straw the minimum degree of heat and pressure specified in the patent has been employed by the defendants in their treatment of vegetable substances. The evidence upon this subject is that while using an alkaline solution of less than $3\frac{1}{2}$ degrees Baumé the defendants have sometimes used an external pressure, as measured by the gauge, of from forty to sixty pounds, the latter being equivalent to an internal pressure of nearly seventy-five pounds, or a temperature above 310°. This may have been, and it probably was, only occasionally, but it was, nevertheless, an invasion of the monopoly. In regard to the strength of the solution of caustic alkali employed, there is evidence that the general strength was from two and a half to three degrees Baumé.

Upon the whole, therefore, we have come to the same conclusions as those reached by the court below.

DECREE AFFIRMED: each party to pay his own costs in this court.