

Case No. 1,465. BLACK ET AL. V. THORNE ET AL.
[10 Blatchf. 66; 2 O. G. 388; 5 Fish. Pat. Cas. 550.]¹

Circuit Court, S. D. New York.

June 19, 1872.

PATENTS—IMPROVEMENTS IN FURNACES FOR BURNING WET FUEL—APPARATUS—PROCESS—PRIOR DISCOVERY—JURISDICTION—WAIVER.

1. The reissued letters patent granted to Moses Thompson, March 31st, 1857, for an “improvement in furnaces for burning wet fuel,” the original patent having been granted to him, as inventor, April 10th, 1855, and reissued to him October 7th, 1856, and the patent having been extended for seven years from April 10th, 1869, and the letters patent granted to said Thompson, December 15th, 1857, for an “improvement in bagasse furnaces,” and extended for seven years from December 15th, 1871, are valid.
2. The first claim of the reissue of 1857, namely, “Using green bagasse, wet tan, wet sawdust, and other wet carbonaceous or vegetable substances, as fuel, for the production of intense heat, by mingling the gases issuing from a highly heated mass thereof, with those arising from carbonaceous combustion, by the intervention of a flue or chamber, with which the chamber or chambers containing the fire and charge of wet substances communicate, and in which said gases meet, mingle and consume each other, on their way to the apparatus to be heated and to the stack,” is a claim to the use of a flue or chamber, intervening between, on the one hand, the chamber or chambers containing the fire of carbonaceous combustion and a highly heated mass of the wet substances named, and, on the other hand, the apparatus to be heated and the stack, for the purpose of mingling, in such chamber, the gases issuing from such highly heated mass with the gases arising from the fire of carbonaceous combustion, so that such gases may consume each other in such flue or chamber, and thus intense heat be produced, by the use, for fuel, of such wet substances.
3. As the model and drawings of the reissue are the same as those of the original patent, and show such a mingling or mixing chamber as is claimed in such first claim, and such an arrangement of parts, as, when used according to the directions of the patentee, with the fuel named, will produce the result described in said claim, and as the specification of the original patent gives substantially the same directions for producing such result as are given in the reissue, such claim is valid.
4. Although, in the reissue, the patentee disclaims the arrangement of a series of fire-chambers to communicate with one common flue, irrespective of the purpose for which, and the manner in which, the arrangement is employed, he can lawfully claim the arrangement which he uses, when used for the purpose for which he employs it, and can lawfully claim it when used in the manner in which he employs it.
5. The said first claim is for a process carried into effect by an apparatus. The prior apparatus would not have enabled the patentee to work his new process, nor was such process ever worked before in any apparatus.
6. The second claim of said reissue, namely, “The combustion, for the purposes of a high degree of heat, of bagasse, refuse tan, sawdust, and other wet refuse substance, or very wet and green wood, by the employment of a series of fire-chambers arranged in any manner substantially as described, to communicate with one common flue or mixing chamber, when any number of said chambers are nearly closed to the admission of air, when first charged, as described, whilst the remaining chamber or chambers is in full communication with the mixing chamber, and has a

proper supply of air admitted, and the ash-pit of each chamber, in its turn, is nearly closed, and then opened, and has air admitted, whereby the heat required is rendered continuous and comparatively uniform, while the fuel in some of the chambers is being heated and decomposed, and its gases sent forward to the mixing chamber, to any desirable degree, as herein set forth," is a claim for an apparatus when employed to work a process, the apparatus and the process being both, of them new with the patentee.

7. The claims of the letters patent granted to said Thompson, December 15th, 1857, for an "improvement in bagasse furnaces," are for special constructions to work out more effectually the process of burning wet fuel discovered by Thompson and made known in his original patent of 1855, and are valid claims.
8. The form of apparatus shown by Thompson in his drawings, and described, admits of many formal variations, within the principle of his inventions, and the scope of his claims.
9. Consideration of constructions which would infringe various claims of Thompson's patents.
[Cited in Black v. Munson, Case No. 1,463.]
10. Thompson was the first to discover and put in practice the true method of economically burning wet fuels, and obtaining from them better results than from equal quantities of dry fuels.
11. The point that a cause of action arose in the northern district of New York, so as not to be cognizable by the circuit court for the southern district of New York, may be voluntarily waived by a defendant, and is waived where, in a suit in equity, it is not raised in the answer.

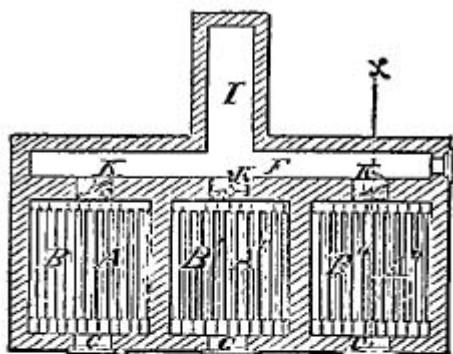
[Cited historically in Black v. Thorne, Case No. 1,466.]

²[In equity. Final hearing on pleadings and proofs.

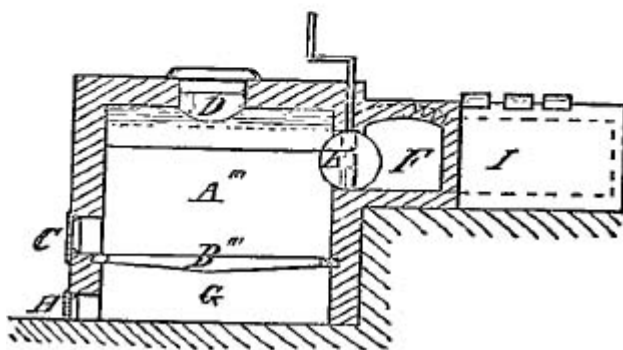
{Suit brought (by Charles N. Black, as administrator of Moses Thompson, and Eliza W. Fitzgerald, as administratrix of William P. N. Fitzgerald, against Samuel Thorne, James McFarlane, and Jonathan Thorne, Jr.) upon two letters patent granted to Moses Thompson: One (No. 12,678) for an "improvement in furnaces for burning wet fuel," granted April 10, 1855; reissued October 7, 1856, and again March 31, 1857 (No. 446), and extended for seven years from April 10, 1869; the other, for an "improvement in bagasse furnaces," granted December 15,

1857 (No. 18,874), and extended for seven years from December 15, 1871. (Decree for complainants.)

[Patent of 1855.]



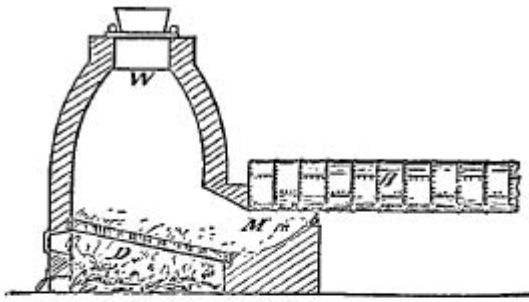
[Horizontal Section.]



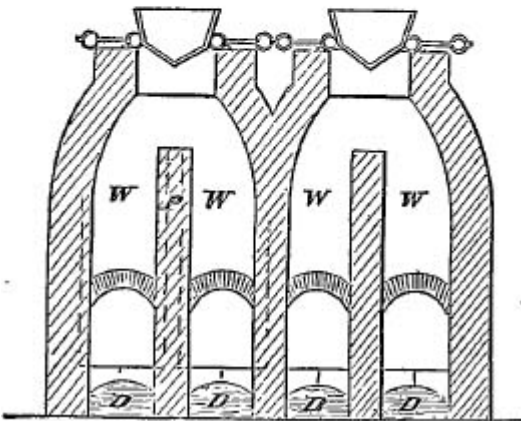
[Vertical Section.]

[The invention which formed the subject of the reissue of March 31, 1857, will be readily understood from the detailed description given in the opinion, in connection with the foregoing engravings.]

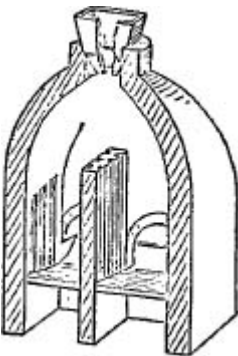
[Patent of 1857.



[Side Section.



[Front Section.



[There were five drawings attached to the patent of December 15, 1857. The last three engravings are copies of three of them, to wit: the sectional side view, the front sectional view, and the sectional prospective view of the interior of one-half of the furnace. These will be fully understood by reference to the description of the invention in the opinion of the court.]³

Charles N. Black, for plaintiffs.

Clarence A. Seward and Andrew J. Todd, for defendants.

BLATCHFORD, District Judge. This suit is brought on two patents. The first is a reissued patent, granted to Moses Thompson, March 31st, 1857, for an "improvement in furnaces for burning wet fuel," the original patent having been granted to him, as inventor, April 10th, 1855, and reissued to him October 7th, 1856. The application for the original patent was filed November 14th, 1853, the specification having been sworn to November

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9th, 1853; and a caveat, describing substantially the invention patented, was filed August 12th, 1853. This patent was extended April 8th, 1869, for seven years from April 10th, 1869, by the commissioner of patents.

The second patent is one granted to the same Moses Thompson, December 15th, 1857, for an "improvement in bagasse furnaces." The application for this patent was filed May 13th, 1857, a previous application filed on the same model, in February, 1857, having been rejected. On an interference declared between the application of Thompson and a patent granted to A. Hager and S. Allyn, for an "improved bagasse furnace," May 6th, 1856, priority of invention was decided in favor of Thompson, November 30th, 1857. This interference related to what is the second claim in the patent granted to Thompson, December 10th, 1857. This patent was, on the 14th of December, 1871, extended for seven years from the 10th of December, 1871, by the commissioner of patents.

The contest between the parties to this suit has been very severe. The suit was brought after the extension of the 1855 patent,

and before the extension of the 1857 patent The extension of the 1857 patent was strenuously opposed “by the same parties who have conducted the defence of this suit and on substantially the same evidence, on the question of the novelty of the inventions covered by that patent, which is adduced on the same question in this suit It appears, from a paper in evidence, that seventeen different persons and firms, including the defendants, representing thirty-eight tanneries, including the three tanneries involved in this suit, have joined together to resist the claim of the plaintiffs under the said patents, agreeing to share, pro rata, all legal expenses incurred in defending against said patents. The defence of this suit has been conducted under that arrangement.

The answer sets up, that the 1857 reissue of the 1855 patent was obtained by Thompson for the purpose of further including therein, and did include therein, more than Thompson originally contemplated, specified or showed to be his alleged invention, on the application for his original patent and matter which he had no right to include and claim therein, and that such reissue is not for the same invention as the original patent of 1855, but is for inventions and things substantially and materially different. It also sets up, that the first claim of such reissue is invalid, because it is indefinite and equivocal, and does not refer to the process specified and described in the language preceding said claim. It avers, that the extension of the 1855 patent was obtained by misrepresentation and fraud, and denies any infringement of either patent. It sets up want of novelty in regard to both patents, and specifies, in respect to each, prior knowledge by nineteen persons, and prior description in eight printed publications, fourteen English patents, and two United States patents. Twenty-six witnesses have been examined on the part of the defendants, and twenty-one on the part of the plaintiffs. Of these, two on each side are chemical experts, Benjamin Silliman and William H. Plumb for the plaintiffs, and Charles F. Chandler and Adolph Faber du Faur for the defendants. The printed case on the part of the plaintiffs covers over six hundred printed pages. That on the part of the defendants covers nearly one thousand printed pages. The direct examination of the plaintiffs’ experts occupied six days, and covers sixty-five printed pages, embracing seventy-six interrogatories. The cross-examination of those experts occupied twenty-five days, and covers two hundred and seventy-two printed pages, embracing six hundred and five interrogatories. The direct examination of the defendants’ expert Du Faur occupied six days, and covers fifty-six printed pages, embracing one hundred and fifteen interrogatories. The cross-examination of the same ‘expert occupied seven days, and covers sixty-seven printed pages, embracing three hundred and thirty-one interrogatories. The direct examination of the defendants’ expert Chandler covers fifteen printed images, embracing thirty-two interrogatories. He was not cross-examined. These observations are made for the purpose of showing how thorough has been the investigation of the questions at issue. The title of the reissued patent of 1857 is, “an improvement in furnaces for burning wet fuel.” The specification

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states the invention to be one of “improvements in burning tan-bark, bagasse, sawdust, and other kinds of fuel, in a wet state, for the purpose of creating heat to generate steam, or to be employed in heating or drying operations.” Bagasse is crushed sugar-cane. There are two figures of drawings accompanying the specification. One is a horizontal section of a furnace constructed according to the invention. The other is a vertical section of the same. The specification states, that the main object of the invention is, “to effect the more economical use, for fuel, of tan-bark, bagasse, or other trashy matter, in a wet state, or very green or wet wood.” The furnace shown in the drawings has three fire-chambers. The patentee states that he considers three, “in many cases, to be best adapted to practical operation.” He proceeds: “In some cases, two may be sufficient, and, in others, more or less. In making these variations as to the number of chambers, the builder is to be guided by the quantity of heat required, size of chambers and character of fuel to be used. The fire-chambers are of a square, but may be of other form, with grate bottoms, B, B', B'', and arched tops, or said tops may be used or built of any other form adapted to the kind of fuel to be used. They are separated by a wall of fire-proof material, and lined throughout with firebrick, and, in case of burning wet tan or bagasse, fire-brick grates should be used. Each burning chamber is provided with a door, C, in front, for the purpose of lighting and tending the fire, and with an opening, D, at the top, for the purpose of supplying the fuel, and with an opening, E, at the back end of the chamber, which leads to the flue, F, or the mixing chamber. The opening may be provided with a damper, K. Each fire-chamber has a separate ash-pit, G, below it, which is furnished with a door, H, to regulate the admission of air. The flue or mixing chamber, F, extends across the back of all the three fire-chambers, and the chimney may be at one end, or may be placed in the rear, with a flue, I, leading to it from the flue, F. If the furnace is used for generating steam, the best place for the boilers will be in flue I, which will be made of a proper size to receive and nearly surround it. If used for other purposes, any arrangement may be made best adapted to the application of said heat. The thing to be heated ought to be placed a little above the inside top of the

mixing chambers. The current from the mixing chamber, in passing to the place of use, should descend or pass under a bridge to the place of use, equal to about one-half of the depth of the mixing chamber, then rise to the place of use. In case of nearly dry fuel, such as green wood and sawdust, the current should rise, immediately after leaving the burning chamber, through the mixing chamber, to the place of use, and the flue, E, leading out of the fuel chamber, A, into the flue or mixing chamber, E, should be increased to about three-fold capacity of that used for very wet fuels, to be varied in proportion to the wetness or dryness of said fuel. In case of burning of sawdust or green or wet wood, the chambers should be about double the grate surface of what is commonly used for burning of wood to accomplish the same object, but for wet tan it should be increased to about four-fold, and, in case of burning bagasse, it should be increased about six-fold, and the height of the chamber increased so that the grate may be covered by feeding at the top. The mode of conducting the operation of the furnace is as follows: Fires being lighted in all of the fire-chambers, with dry fuel, and the masonry heated to a high degree, two of the three chambers, A, A', are fed with wet fuel, and have their ash-pits closed, and the dampers, K, K, partially closed, though this latter is not absolutely necessary. The other fire-chamber, having its charge partially dry in the meantime, has the damper, K, opened, and the door of the ash-pit, H, opened far enough to admit any quantity of air which may be required to promote such a degree of combustion as may be necessary to generate the amount of heat required. There should be no artificial blast, and, if a high stack be used, there should be a damper in it, to moderate the draft. When the fuel in the open chamber is reduced to a desirable degree, its ash-pit is closed, and the chamber recharged, and another opened and supplied with air, until the fuel within is reduced, when it is closed, recharged and another opened, each, in its turn, being opened and supplied with air, to generate and supply the requisite amount of heat and carbonaceous gases, while the others are closed and successively supplied with fresh fuel, to heat and decompose the same to such a degree as is desirable before allowing rapid combustion to take place. Each fire-chamber should be supplied successively with fuel at proper intervals, by any convenient means, either through the hole, D, or door, C, in front. The principal advantage of a furnace and process of this description consists in heating the wet charge without unnecessary waste of heat, decomposing it into such gases as will, when mingled, in the mixing chamber, with the products of combustion from the active chamber, cause the most perfect combustion of the gases and smoke to be effected. This perfect combustion could not be effected in a single fire-chamber, but, when two or more fire-chambers are employed, no interruption takes places, and the object is readily attained. Another advantage consists in always holding a certain quantity of heat and highly heated fuel in reserve in the closed chambers, which may be immediately brought into action by opening one or more of the chambers. A similar but inferior result might be produced by having several grates and

ash-pits to the same fire-chamber, each grate charged successively, and its ash-pit for the time closed, immediately after fresh charging, to exclude the air. I have described this in my caveat on which my application is based, but do not use it because of its inferiority in practice, although it involves my principle. After ample experiments, I have discovered that any results which can be produced by the use of dry fuel are inferior to wet, in proportion to quantity used, and that results like mine can only be attained by the use of wet fuel, similar to what I have herein mentioned, fed into an intensely heated chamber. Under such circumstances, the water in the fuel, in the presence of the carbonaceous substances in the furnace, will be decomposed, giving its oxygen to the carbonaceous matter, dispensing with a draft, and its cooling and wasteful influence, and rendering the combustion so perfect that no smoke is visible. In burning tan and sawdust, where a large quantity of heat is to be made, in order to save the increase of their number, I put the chambers in twice as long as wide, and use two openings, D, to feed through, and thereby accomplish double to each chamber." Then follows this disclaimer: "I do not claim the within described arrangement of a series of fire-chambers to communicate with one common flue, irrespective of the purpose for which, and the manner in which, I employ the said arrangement." The claims are these: (1.) "Using green bagasse, wet tan, wet sawdust, and other wet carbonaceous or vegetable substances, as fuel, for the production of intense heat, by mingling the gases issuing from a highly heated mass thereof, with those arising from carbonaceous combustion, by the intervention of a flue or chamber, with which the chamber or chambers containing the fire and charge of wet substances communicate, and in which said gases meet, mingle and consume each other, on then way to the apparatus to be heated and to the stack." (2.) "The combustion, for the purposes of a high degree of heat, of bagasse, refuse tan, sawdust, and other wet refuse substances, or very wet and green wood, by the employment of a series of fire-chambers arranged, in any manner substantially as described, to communicate with one common flue or mixing chamber, when any number of said chambers are nearly closed to the admission of air when first charged, as described, whilst the remaining

chamber or chambers is in full communication with the mixing chamber, and has a proper supply of air admitted, and the ash-pit of each chamber, in its turn, is nearly closed, and then opened, and has air admitted, whereby the heat required is rendered continuous and comparatively uniform, while the fuel in some of the chambers is being heated and decomposed, and its gases sent forward to the mixing chamber, to any desirable degree, as herein set forth.”

It will be proper, in the first place, to consider the objections that are made to the reissued patent of 1857. It is contended, that the first claim of the reissue is void, because the invention claimed in it is not found in the original patent of 1855. That claim is a claim to the use of a flue or chamber, intervening between, on the one hand, the chamber or chambers containing the fire of carbonaceous combustion and a highly heated mass of the wet substances named, and, on the other hand, the apparatus to be heated and the stack, for the purpose of mingling in such chamber the gases issuing from such highly heated mass with the gases arising from the fire of carbonaceous combustion, so that such gases may consume each other in such flue or chamber, and thus intense heat be produced, by the use, for fuel, of such wet substances. The model and drawings of the reissue are the same as of the original patent. Such model and drawings show such a mingling or mixing chamber as is claimed, and show such an arrangement of parts, as, when used according to the directions of the patentee, with the fuel named, will produce the result described in the claim, of mingling and consuming, in such chamber, the gases mentioned, and producing intense heat. The specification of the original patent of 1853 gives substantially the same directions for producing such result as are given in the reissue of 1857. Those directions are, that, taking the use of three fire-chambers, for illustration, in burning wet fuel, two of the fire-chambers have their ash-pits closed and their dampers partly closed, while the third fire-chamber has its damper open and its ash-pit open, so far as necessary to produce the requisite combustion in that chamber, to produce the degree of heat desired; that when, by such combustion in the open chamber, its fuel is reduced, it is recharged with wet fuel and closed, and one of the above chambers is opened for combustion; that so, in turn, each chamber is opened and supplied with air, to make it a burning chamber and generate carbonaceous gases, and is then supplied with wet fuel and closed, so as to heat and decompose such fuel before admitting air freely to it; that the chambers are thus supplied with wet fuel in succession; that this carrying out of the process by using two or more fire-chambers, with such a construction of apparatus and flues as is shown in the drawings, will effect the most perfect combustion of the gases generated in the chambers, and enable a proper supply of heat to be yielded uninterruptedly; that the use of a single fire-chamber will not produce such a perfect result, nor an uninterrupted supply of heat, although an inferior result, within the principle, may be produced, by using a single fire-chamber, with several grates and ashpits, and charging the several grates in

succession, excluding the air from the charged grate, until the charge is in a condition for rapid combustion; that, by such use of wet fuel, fed into an intensely heated chamber, better results can be obtained than can be from an equal quantity of dry fuel; and that the principle of the operation is, that the products of the carbonaceous combustion in the rapid combustion chamber, being present with the gases arising from the decomposition of the wet fuel in the heating chamber will decompose the vapor of the water and cause it to yield up its oxygen, so that a perfect combustion will be produced, without such a draft being used, as had ordinarily been employed for like fuel. All this is disclosed in the specification and drawings of the original patent, and is repeated in the specification of the reissue. The claims of the reissue are both of them fully warranted by what appears in the specification and drawings of the original patent. The inventor failed to claim, in his original patent, all that his original specification and drawings would have warranted him in then claiming.

It is also objected to the reissued patent of 1857, that as the patentee disclaims the arrangement of a series of fire-chambers to communicate with a common flue, irrespective of the purpose for which and the manner in which he employs such arrangement, he cannot lawfully claim the arrangement which he uses, when used for the purpose for which he employs it, and cannot lawfully claim it used in the manner in which he employs it. Fire-chambers in a series, communicating with a common flue, existed before. But, the patentee's process was not carried out in any of such prior structures, nor was such common flue used as a mixing chamber in any of them. The first claim of the reissue is for a process carried into effect by an apparatus. The prior apparatus would not have enabled the patentee to work his new process, nor was such new process ever worked before in any apparatus. The second claim of the reissue is for an apparatus when employed to work a process, the apparatus and the process being both of them new with the patentee. It is not perceived how any tenable objection can be taken to the validity of either claim. The disclaimer does not admit that the patentee's arrangement existed before, although he disclaims it irrespective of the purpose and manner of his use of it.

Passing now to the patent of December.

1857, the invention therein is stated, in the specification, to be, “improvements in furnaces for using, as fuel, bagasse, wet tan, and other carbonaceous substances too wet to be conveniently burned in the usual way.” Five figures of drawings are given—a front view of the patentee’s furnace; a sectional side view, showing the interior thereof, and the charge of wet fuel, &c.; a front sectional view; a horizontal view of the grate; and a sectional perspective view of the interior. The specification says: “The leading object of my invention is, to use, as far as possible, the hot vapors driven out of the wet mass, while drying, instead of cold common air, to support and complete the combustion of the carbonaceous portions of the wet fuel. Bagasse and other wet fuels might be advantageously burned in one furnace, but results are much more uniform and reliable when two are used, discharging their gases into a common mixing chamber, and I, therefore, prefer to use two or more. The grate surface and the height of the furnace should be regulated according to the kind and wetness of the fuel. The wetter the fuel, the larger the furnace, and the smaller the mixing chamber should be.” Then follow directions for the sizes of furnaces for burning bagasse. “For burning refuse tan and sawdust, I think it better to make the furnace longer and narrower, with two fuel openings on the top, and, for a furnace five feet wide and ten feet long, I would make the height, from the bottom of the fire-chamber to the top of the wet fuel chamber, about five feet. The bottom of the grate I would place about two feet above the hearth. But, wet fuels differ so much in character and wetness, that it is impossible to give precise dimensions. The furnace I propose to describe is particularly calculated to consume bagasse. I build two furnaces side by side, each nearly square, in its horizontal section. Towards the top I draw in the wall, in such manner as to form a kind of dome, with a sufficient opening at top to feed the bagasse. The outer walls of these furnaces should be from twenty-four to thirty inches thick, and built with a special view to rendering them nonconducting. The wall near the top, and the partition between the two furnaces, may be thinner. In each furnace chamber there should be a partition of fire-brick, extending across it from front to back, and rising nearly to the top, dividing it into two nearly equal parts. The whole interior of the furnace should be of fire-brick. The main chamber of each furnace should be divided into two parts, upper and lower, by a firebrick grate about one-fifth the height of the furnace above the hearth, the back end of the grate being a little lower than the front. The bottom of the lower chamber may be a grate with an ash-pit, but a hearth is much better. In each furnace, at the front, on each side of the central partition, and immediately under the front end of the grate, should be doors for feeding wood or other dry fuel, and, directly under these doors, at the hearth of the lower chamber, should be draft openings, capable of adjustment, to support combustion in the lower chamber. Extending across the back of both furnaces, and opening into both by flues, is a mixing chamber, into which all the gases from both furnaces enter, in a highly heated state, and mix, and consume each other, on their way to the boiler and

stack. This chamber should be about one-half the capacity of all the fire-chambers, and it should extend down about as low as the back end of the grate. The flue through which the products of combustion pass out of this chamber, and under the boiler, should be, in section, about one square foot to forty cubic feet of mixing chamber. The feed openings at the top of the furnaces should be closed by doors, which open inward by the weight of the feed, but are self-closing, and do not yield to pressure from within." Then follows a description of up and down corrugations in the interior of each upper chamber, on each side, down to the grate, which are stated to be unnecessary in burning tan and sawdust, and to be "for the purpose of allowing the heat to radiate upwards from the fire-chamber, for heating the masonry and the wet charge, while the-gases or vapors driven out of the wet charge, by the heat, are allowed to descend to the fire-chamber or the mixing chamber." "The spaces between the grate bars, for burning-bagasse, should be about six inches wide, for the finest grinding, and twenty inches wide for the coarsest, and should vary between these widths according to the fineness of grinding, but, for sawdust and tan, much less, say from one inch to three-quarters of an inch. The grate should be made of firebrick. The operation of my furnace is as follows: A hot fire of dry fuel is kindled in the lower fire-chambers of the furnaces, and, after it has been continued until the masonry is well heated, the chamber above the grate-is fed with the bagasse, or other wet fuel. This hot fire in the fire-chamber, especially towards the front of it, under the principal mass of the wet fuel, must be preserved throughout the operation. The heat from the masonry and the fire-chamber will be communicated to the wet fuel, which will cause steam and other gases to issue from it, and mix with the intensely hot gases of combustion from the fire-chambers, and, in a short time, the mixing chamber will present intense combustion and heat, the dampers of the fire-chambers being partially closed. The lower part of the wet charge will, by degrees, become dry and charred, and will fall through the grate, prepared as above, into the fire-chamber, and supply, or nearly supply, the place of other dry fuel, in preserving the fire in this chamber, and the wet fuel, being from time to time supplied, will furnish, in a highly heated state, aqueous vapors, which descending through the corrugations,

and otherwise, into the fire-chamber and mixing chamber, will be decomposed, furnishing much oxygen to the fire, and supply the oxygen necessary to complete, in the mixing chamber, the combustion of all the combustible gases issuing from the fire-chamber. If, by accident, the fire in the lower part of the furnace should predominate, the draft should be diminished, and more wet fuel added; and if, by accident, the fire in the fire-chamber should become too much cooled down, the draft should be let on, and any deficiency of dry fuel should be supplied to the fire-chamber. Under proper management, little or no dry fuel need be fed to the fire-chamber, after the operation is fairly commenced. The charred matter falling through the open grate will supply its place, and the calorie thus produced by the combustion of wet fuel will be vastly greater than from the same quantity, by measure, of the same fuel, when dry. In the fire-chamber, and in the mixing chamber, under intense heat, the carbonaceous gases will decompose the steam from the wet fuel, and effect complete combustion. "When the operation is fairly commenced, if the water in the wet charge amounts to, say, fifty per cent, by weight, of the fuel, the dampers of the fire-chambers should be nearly or quite closed, to exclude the air. Vapor from the wet charge will then descend through the corrugations, and otherwise, into the fire-chambers, and support the combustion therein, while other portions of the vapor will enter the mixing chamber, and complete the combustion there. If the fuel, however, contains much smaller quantities of water, more air in proportion should be admitted at the damper, the object being to admit no more air than will supply the deficiency of the vapor." Then follow written references to the drawings. "Little, if any, of the boiler, should extend over the mixing chamber. If any considerable portion of the mixing chamber is covered by the boiler, its cooling influence will prevent the decomposition of the vapor, and defeat the object of my invention. Great care should be observed in giving proper dimensions to the mixing chamber, for, the perfection of the combustion, and the efficiency of the furnace, depend greatly upon it. The principal object of this chamber is to give the combustible carbonaceous gases from the fire, and the aqueous gases from the mass of wet fuel, an opportunity of mingling together in such a manner, and under such circumstances, that the aqueous vapor will be decomposed by the carbonaceous gases, and its oxygen given out to complete the combustion of the carbon, without the introduction of air into the mixing chamber, thus saving the caloric previously communicated to the wet charge, while drying it and charring its lower portions, and avoiding the cooling influences of cold air. This can take place effectually only in the presence of a high degree of heat, and in the absence of a supply of free oxygen. If that chamber be too small to receive these gases as fast as the furnace is able to produce them, the operation will, of course, be choked and impeded. If the chamber is larger than can be kept densely filled with these gases, of course, atmospheric air will be found there at the commencement and will continue to find its way into the chamber, and, while atmospheric air is present, the

carbonaceous gases will take its oxygen from that principally, instead of decomposing the steam, and the heat in the chamber will be much diminished, and the large quantity of nitrogen, four-fifths, contained in the air, which is neither a combustible, nor a supporter of combustion, will at once greatly increase the volume of gases to be sent forward to the stack, and proportionately decrease its temperature; and, when the chamber becomes very large, the cooling influences become so great that combustion will immediately cease, and smoke, mingled with steam, oxygen, and nitrogen, will go forward, thus wasting the fuel, and imparting a faint degree of heat to the boiler. I have, therefore, fixed the size of the mixing chamber by many careful experiments, and that given above will produce the desired effect with wet bagasse. For drier fuel, furnishing less vapor, the mixing chamber should be proportionably increased in size, to supply the deficiency with air, and to effect complete combustion. Eules more precise would be inconsistent with the nature of the subject. A large and hot fire should always be preserved in the fire-chamber below the grate, and directly under the charge of wet fuel, for the purpose of driving the vapor out of it, and charring its lower portion; and the grate is left much more open than in furnaces for burning dry fuel of the same size, for the purpose of allowing the charred portions of the wet charge to fall through, to supply fuel for this fire, as fast as it becomes fit for that purpose, thus consuming the mass with little or no expenditure of other fuel." The claims are: (1) "The combination of two chambers, the one above the other, and separated by a grate, the lower one for the combustion of any known dry carbonaceous fuel, and the upper one, in immediate proximity therewith, to receive heat therefrom, for heating and drying the charge of wet fuel, with a mixing chamber into which both continuously and simultaneously discharge their gases, before reaching the thing to be heated, for mingling and mutual combustion." (2) "In combination with said fire-chamber and wet fuel chamber, or drying chamber, making the grate upon which the wet charge rests sufficiently open to allow the lower portion of the wet charge, as it becomes dried and charred, to fall through into the fire-chamber, and keep a hot fire therein, supplying the place of other dry fuel, while the uncharred portion of the wet fuel is properly supported by the grate, till dried, as described."

(3) "Placing the mixing chamber of combustion in substantially the same position described relatively to the fire and the wet charge, so that the products of combustion" from the dry fuel may pass along the lower part of the wet charge, drying and charring it, on their way to the mixing chamber, and reach it without being, in any considerable degree, obstructed or cooled by the wet charge, substantially as shown." It is added: "I wish it distinctly understood, that I make no claim to any of the parts or combinations above specified, except in their application to the preparation and combustion of wet fuels." The principle developed in the first claim of the reissue of 1857 is worked out in the furnace and method of procedure described in the patent of 1857, but the claims of the two patents are different. The claims of the patent of 1857 are for special constructions to work out more effectually the process of burning wet fuel discovered by Thompson, and made known in his original patent of 1855. The first furnace constructed by Thompson on his principle was built at Richmond, Virginia, in August, 1853, and was then and there used successfully in burning wet tan. In 1854, he built a furnace on this plan, at Weed's tannery at Binghamton, New York. Others were built after its pattern at various places in New York, and the furnaces used by the defendants are traced, in their origin, to the furnace so built at Binghamton. It is very manifest, from the language of Thompson's specifications, and from the testimony, that the form of apparatus shown by Thompson in his drawings and described, admits of many formal variations, within the principle of his inventions and the scope of his claims. Thus, a single furnace, with an upper chamber and a lower chamber, separated by a grate and sufficiently long to admit of two feed holes in the top, with a proper mixing chamber, and operated so as to produce, in such chamber, the mingling and consumption of the gases from the wet fuel in the upper chamber with the gases from carbonaceous combustion, would infringe the first claim of the reissue of 1857. Such a construction, with the lower chamber used for the combustion of dry carbonaceous fuel, and so operated as to cause the gases from both chambers to be continuously and simultaneously discharged into the mixing chamber, for mingling and mutual combustion, would infringe the first and third claims of the patent of 1857. A single furnace, with the grate between the upper and lower chambers so open as to allow the lower portion of the wet charge, as dried and charred, to fall through into the lower chamber, and keep a hot fire therein, the uncharred portion of the wet charge being supported by the grate, would infringe the second claim of the patent of 1857. So, also, various constructions of mixing chambers may be made, which would be substantial equivalents for the mixing chamber of the form and location shown by Thompson, and would be the mixing chamber of each of his two claims in the reissue of 1857, and of the first and third claims of his patent of 1857.

It is satisfactorily shown, that the wet tan furnaces of the defendants, in their tanneries at Albion, Laporte, and Thorndale, which are the three proceeded against, infringe each

of the patents. All of the claims of each patent are infringed by the furnaces at Albion and Laporte, and all except, perhaps, the second claim of the reissue of 1857, are infringed by the furnace at Thorndale.

The claims of the Thompson patents are none of them successfully attacked on the ground of a want of novelty. There is nothing in the Crockett furnace, or the Morrison furnace, or the Woodstock, Sparrowbush, or Newark furnaces, or any of the other American furnaces adduced in evidence, so far as such furnaces are shown to have existed in construction, or in description or drawings, before the dates of Thompson's inventions, which destroys the novelty of those inventions. So far as such furnaces burned wet fuel successfully, before Thompson's inventions, to what extent they did, they did so on different principles from those developed by him, and in structures arranged and operated in a manner not embraced in his claims. In regard to all the foreign patents and publications put in evidence, it is sufficient to say, that they none of them anticipate Thompson's inventions. It is not an unimportant consideration, that both of his patents have been extended by the patent office, after, as there is every reason to believe, a full consideration of substantially everything, on the question of novelty, that is brought up in defence in this suit.

It is apparent, from the evidence, that Thompson was the first to discover and put in practice the true method of economically burning wet fuels, and obtaining from them better results than from equal quantities of dry fuels. In respect to the tanning business, tanners can, by his inventions, certainly obtain all the heat they need by the use of no other fuel than their spent tan, wet from the leaches. The combined resistance by them to his patents is a tribute to the merits of his inventions.

I have examined, with care, all the evidence taken in this case, and considered the views advanced by the counsel for the defendants, but I am unable to resist the conclusion that the plaintiffs have fully established their case.

As to the point, that the cause of action respecting the furnace at Albion arose in the northern district of New York, where that furnace is situated, the objection is one which may be voluntarily waived. The defendants in this case have waived it by not raising it in their answer.

There must be a decree for the plaintiffs, for a perpetual injunction, and on account, with costs.

{NOTE. Patent No. 12,678 was granted to Moses Thompson, April 10, 1855, reissued March 31, 1857 (No. 446); No. 18,874 was granted to the same December 15, 1857. For other cases involving these patents, see *Black v. Hubbard*, Case No. 1,460; *Black v. Munson*, Case No. 1,463; *Black v. Scott*, Case No. 1,464; *Black v. Thorne*. Case No. 1,466; and *Black v. Thome*, 111 U. S. 122, 4 Sup. Ct. 326.]

¹ [Reported by Hon. Samuel Blatchford, District Judge; reprinted in 5 Fish. Pat. Cas. 550; and here republished by permission. Syllabus is from 10 Blatchf. 66, and statement from 5 Fish. Pat. Cas. 550.]

² [From 5 Fish. Pat. Cas. 550.]

³ [From 5 Fish. Pat. Cas. 550.]