Mowry Vs. Whitney

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Appellant : Mowry

Respondent : Whitney

Judgement :

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Mowry v. Whitney

81 U.S. (14 Wall.) 620

APPEAL FROM THE CIRCUIT COURT FOR

THE SOUTHERN DISTRICT OF OHIO

SYLLABUS

1. Asa Whitney's patent of April 25, 1848, for an "improvement in the process of manufacturing cast iron railroad wheels," was for a process, not for a combination.

2. Where only vague and uncertain directions could be given as to the degree of foreign heat to be applied in any particular case, there, when a patentee in his specification, establishes a *maximum* and a *minimum,* the ascertainment of the proper intermediate degree may be left to the skill and judgment of the operator practicing the process.

3. It is as true of a process, invented as an improvement in a manufacture, as it is of an improvement in a machine that an infringer is not liable to the extent of his entire profits in the manufacture.

4. In such a case, the question to be determined is what advantage did the infringer derive from using the invention over what he had in using other processes then open to the public and adequate to enable him to obtain an equally beneficial result? The fruits of that advantage are his profits, and that advantage is the measure of profits to be accounted for.

5. When a patent is for an entire process made up of several constituent steps or stages, the patentee not pretending to be the inventor of those constituents, his claim to the process as an entirety does not secure to him the exclusive use of the constituents singly. What is secured is their use when arranged in the process.

6. The profits recoverable from an infringer are the measure of the patentee's

Page 81 U. S. 621

damages, and though called *profits,* are really damages, and unliquidated until a final decree is made.

7. Interest upon unliquidated damages is not generally allowable, and should not be alloyed before a final decree for profits.

Appeal from the Circuit Court for the Southern District of Ohio; the suit being a bill by Whitney for an alleged infringement by Mowry, of a patent which Whitney had for an improvement in the process of making wheels for railcars. The case was thus:

Wheels for rail cars require to be made in a special way. The "tread" of the wheel, as it is commonly called -- that is to say, the periphery -- the surface which runs over the rail -- must be very hard, or else it will wear out. On the other hand, the interior portions of the wheel, especially the hub, against which there is no friction, but on which there is great strain, need not be so hard, but must be very tough. Now here are requisites which by a law of the metal do not coexist in the same casting. Iron can be very hard only when it exists in a state of *laminated* crystallization, and then it is brittle. It can be very tough only when it exists in a state of *granulated* crystallization, and then it is soft. Now how is the "tread" to be made very hard and the interior very tough? This was the first problem in regard to iron car wheels. And it was thus solved. It had been long observed that where molten iron was cooled *suddenly,* it came out solid in the laminated or hard and brittle form, but when cooled slowly it came out solid in the tough and softer form.

The problem, of course, then was to cool rapidly the part of the melted mass of iron which was to make the "tread" of the wheel, and to cool more slowly the rest which was to make the interior of the wheel -- that is to say, the spokes and hub. To do this, the moulds into which the molten iron was to be cast were made of sand, *surrounded by a circle of iron;* this circle, called in the manufacturer's language a "chill." Iron being a rapid conductor of heat and sand a slow one, the part of the molten mass which came against

the iron or chill -- the part, in other words, of the molten mass which was to form the tread -- was cooled rapidly and came out in the laminated and *hard* (though brittle) form, while the parts of the wheel nearer to the hub, and especially the hub itself (which is a very thick part of the wheel, and where a very great strain is put when the rail car is in motion), cooling slowly, the requisite toughness was obtained, through *this* part (and particularly the hub, owing to the greater mass of it) coming out in the granulated and tough (though soft) form. The cut below, which represents a piece fractured from off that part of the wheel including the flange, which runs over the rail, indicates the two forms. The lower part or chilled "tread" (which in the ordinary car wheel itself is about half an inch deep) being

distinguished by its laminated crystallizations and light gray color, and the upper part which runs in the direction of the hub by its granular crystallization, and a deeper gray line.

image:a

This problem, therefore -- the problem of obtaining a hard tread, and a tough interior and hub -- was solved. The thing desired was attained through the process of a sand mould with an iron "chill."

But of this good result in one way, a very bad one in another was the consequence. The wheels had no strength. And here was the cause. A mass of iron in its molten state

Page 81 U. S. 623

is larger than the same mass of iron when cold. Now here the molten iron was poured into the mould at the hub. Thence it flowed out through the sand mould of the spokes to the tread. There it came in contact with the chill, and as soon as it touched the chill, it was cooled, crystallized, and reduced in volume almost instantly. The metal immediately behind it, on the contrary, being in contact with the sand, parted with its heat more slowly and remained in a fluid or semi-fluid state much longer. Thus it happened that the periphery of the tread cooling and shrinking first, reduced its diameter, while the hub and spokes remaining in a fluid or soft state, presented little or no resistance to the contraction of the tread or rim. But as these spokes and

image:b

hub subsequently parted with their heat and passed into the solid state, an inherent strain began to be exerted between the rim and hub. The spokes were too short. Restoration of so much of their length as had been diminished by the

Page 81 U. S. 624

prior cooling and shrinking of the rim was demanded. All parts of the wheel having passed into the solid state and become comparatively unelastic, the spokes were severed by mere tensile strain before the temperature of the whole mass was reduced to that of the atmosphere. And the same result followed when, instead of spokes, disks or plates were used on the sides of the wheel, as shown in Figure 3.

To obviate this effect, a rude practice was, on the one hand, to uncover and expose to the air the thick parts of the wheel, sometimes, in addition, pouring cold water on them, while on the other the thin portions would be covered with burning fuel or hot sand. Still, however, the wheel would always strain and usually break.

The great matter now was to remove this difficulty. One plan was to divide the *hub* into sections, as shown in Figures 2 and 3, instead of casting it solid. This, of course, relieved the spokes from the tensile strain they were subjected to when connected with the solid hub, the spokes connected with each of the sections being left comparatively free to contract in length (only, however, it may be added) by carrying the section of hub to which they were attached with them.

To restore the requisite *strength* to the hub, the spaces between these sections would be subsequently filled with pieces of metal of the exact size of the spaces, and wrought iron bands would be shrunk on to each end of the hub so as to hold firmly together all the sections and the metal fillings or plates between them. Figure 4 illustrates the metal fillings or plates and bands that would be put into and on the hubs.

image:c

Wheels of this description were used till 1840. At that date, our roads began to be made more substantial, and higher velocities upon them being demanded, the cast *spoke* -wheel, thus filled out at the hub, began to show great defects. The expense of filling the spaces between the sections was considerable. There was difficulty in putting the

wrought iron bands on the ends of the hub and of boring out the divided hub so as to make it fit well on the axle and to secure it from becoming loose. Yet if these things were not effectually done, the wheel broke or changed its position on the axle, and the cars were thrown from the track.

image:d

To avoid these difficulties other means were employed to compensate for the unequal cooling and shrinking of the parts. These were nearly all confined to making the hub solid and connecting the hub and rim by a disk or plate, which was generally made double, two plates extending from hub to rim, in form convex, as in Fig. 5, or otherwise curved, so as to be susceptible, as was supposed, of contracting or expanding in diameter as much as would be required by the unequal cooling and contraction before noticed. In one of these forms, the hub was also divided, as shown in Fig. 5, it being expected that with the shrinking of the outer disks it would about close up. These wheels, when skillfully made, were an improvement on the spoke-wheel, with the hub divided into sections, so far as safety was concerned, but they were still faulty.

What, in this obviously not yet perfect art of making cast iron car wheels, was wanted was some way to make such wheels, having a solid hub, and either *spokes,* or any desired form of *plates,* single or double, straight or curved, as represented in Figs. 6 and 7 below, and possessing all the requisites of durability and strength in the respective parts, and yet free from the defects which had attended, up to this time, all wheels yet made, and not requiring the expenditure of special labor upon the mould or pattern before casting, nor upon the finishing of the wheel for use, after it had been cast and cooled -- some new and effective device which should eradicate and annihilate the difficulties which have been already imperfectly described, and which were still baffling manufacturers and inventors in this art. A new process of

prolonging the time of cooling, in connection with annealing wheels would, if rightly conceived, secure the desired end.

image:e

It was in this state of the art and of its necessity that Whitney made a claim for what he called "a new and useful improvement in the process of manufacturing cast iron railroad wheels," and on the 25th of April, 1848, obtained a patent for it for fourteen years.

The specification in his patent was thus:

"My improvement consists in taking railroad wheels from the moulds in which they are ordinarily cast as soon after being cast as they are sufficiently cool to be strong enough to move with safety, or before they have become so much cooled as to produce any considerable inherent strain between the thin and thick parts, and putting them in this state into a furnace or chamber that has been previously heated to a temperature as high as that of the wheels when taken from the moulds. As soon as they are deposited in this furnace or chamber, the opening through which they have been passed is closed and the temperature of the furnace or chamber, and its contents, gradually raised to a point *a little below that at which fusion commences,*

Page 81 U. S. 627

when all the avenues to and from the interior are closed and the whole mass left to cool no faster than the heat it contains permeates through, and radiates from the exterior surface of the materials of which it is composed. By this process, all parts of each wheel are raised to the same temperature, and the heat they contain can only pass off through the medium of the confined atmosphere that intervenes between them and the walls of the furnace or chamber; consequently the thinnest and thickest parts cool and shrink simultaneously together, which relieves them from all inherent strain whatever when cold."

"The figure below represents a vertical cross-section of the FURNACE OF CHAMBER, wherein is shown a pile of wheels as they"

image:f

"are placed to be annealed. The cover of the furnace, being movable, is raised when the wheels are put in, and then closed and covered with earth to prevent the too rapid escape of the heat. The damper in the flue leading to the chimney is also closed after the wheels are put into the furnace and the opening in the lower wall stopped by an iron plate banked with earth, which prevents the escape of the heat in that direction. [Footnote 1] "

Page 81 U. S. 628

"To heat this furnace, I have used anthracite coal, it requiring less than one-fourth of a ton to anneal two tons of wheels. The heat required to perform the process may, however, be obtained by the use of any other fuel that may be less expensive at the place where the process is to be performed, or the requisite heat may be taken in a suitable conduit from the furnace in which the metal is melted from which the wheels are made, after it has performed that office, to the chamber in which the annealing process is to be performed. In either case, however, the furnace or chamber must be made of such form, and have such appendages connected with it, as to enable the operator to control the quantity and intensity of the heat used by admitting more or less of it into the chamber, and of excluding it entirely."

"The advantages resulting from the process of prolonging the cooling and annealing as above described are that the wheels may be made much stronger, when made of the same weight, than they can be when cast and cooled in the ordinary manner, and railroad wheels having any form of spokes or disks connecting the rim and hub, if subjected to this process, will not require their hubs to be cast in sections and the spaces between the sections subsequently filled with some suitable metal and wrought bands put on to the hub."

"Wheels subjected to this process of cooling and annealing will be stronger without bands on their hubs than those of the same weight cast and cooled in the ordinary way having the wrought iron bands on. In this way, the original cost is diminished and the wheels rendered more durable than they would be when made in any of the ways heretofore employed."

"I do not claim to be the inventor of annealing castings made of iron or other metal, when done in the ordinary way; nor do I claim to be the inventor of any particular form or kind of furnace, in which to perform the process. But what I *do* claim as my invention and desire to secure by letters patent is the process of prolonging the time of cooling, in connection with annealing railroad wheels in the manner above described -- that is to say the taking them from the moulds in which they are cast, before they have become so much cooled as to produce such inherent strain on any part as to impair its ultimate strength, and immediately after being thus taken from the moulds, depositing them in a previously heated furnace or

chamber, so constructed, of such materials, and subject to such control that the temperature of all parts of the wheels deposited therein, may be raised to the same point *(say a little below that at which fusion commences),* when they are allowed to cool so fast, and no faster, than is necessary for every part of each wheel to cool and shrink simultaneously together, and no one part before another. [Footnote 2]"

Whitney being in possession of his patent as already described, one Mowry, of Ohio, conceived that he too had made a valuable improvement in the same branch as Whitney professed to have made one, and on the 7th of May, 1864, also obtained a patent. His specification, illustrated by a vertical cross-section of his furnace, says:

"My invention consists in the use of charcoal or other equivalent substance, interlaid with the wheels in the annealing pits, in connection with the regulated admission of air, for the purpose of heating the wheels up to a proper temperature,

prolonging the heat, and permitting them to cool in the course of a given time, gradually, as will be more particularly explained below."

"The operation of my invention is as follows:"

"A layer of charcoal having been laid on the perforated bottom of the annealing pit, the wheels, as they are turned out of the moulds red hot, are placed in the pits, with a layer of charcoal between each wheel, a layer of charcoal being laid on the uppermost wheel, and on this a perforated metal plate is laid."

"The charcoal becoming now ignited by the hot wheels, the cover of pit is then laid on and the damper opened so as to admit just sufficient air to effect the combustion of the contained charcoal in the space of seventy-two hours, less or more, as may

Page 81 U. S. 630

be found necessary for the annealing operation. The draft of air in the apparatus shown on drawings is from above downward, but it may, without affecting my invention, be from below upwards by conveying the air from the horizontal flue up through the pits and through the aperture in cover, and from thence through flues into the main shaft or chimney *C* ; the result will be the same in both cases, and the adoption of one or the other plan will be dictated by convenience."

image:g

Under his patent, Mowry employed a process of annealing such as it described, and Whitney thereupon filed a bill to enjoin him as an infringer. Mowry answered, denying infringement, alleging the invalidity of Whitney's patent for want of novelty and for want of utility,

" *Inasmuch as the said process would ruin and destroy the hardness on the rim of the car wheels, known as the 'chill,' and thus greatly detract from the usefulness and durability of the wheels.* "

Page 81 U. S. 631

A large amount of testimony being taken on both sides, the cause was brought to a final hearing on the pleadings and proofs, and all the issues being found for Whitney, the cause was referred to a master to taken and state an account of the gains and profits which the defendant had derived from the infringement of Whitney's patent.

The master reported, on the 1st of August, 1868, that Mowry had made use of Whitney's patent in the manufacture of 19,819 wheels, and for the use of the process in making these wheels charged him:

Profits on these wheels $91,501.86

Interest on the said profits to

1st August, 1868. . . . . 19,984.21

He further reported that Mowry, prior to the 1st of April, 1861, and without the use of the process complained of in this cause, had built up his business to its then condition. That the use of the process did not diminish, but did increase the cost of making the wheels manufactured by Mowry. That while Mowry used the said process, he did not make any difference in the quality of iron used for the manufacture of car wheels, nor in the weight or form of car wheels, nor by reason of the use of such process, in their price. That Mowry's business was apparently not increased by the use of the process, and that he had sold the wheels he had since manufactured without the process complained of as readily as those manufactured by use of the process, and at the same *prices.*

[The patentee himself, it should be here added, in 1862, when applying for an extension of his patent, had stated under oath that he believed there was no essential difference in the cost per pound of making cast iron chilled car wheels of the various patterns, and by the different modes in use, provided the same skill and system controlled the manufacture; that by his process he was enabled to make them lighter than those made in any other way for a similar service, and therefore could afford to sell them at the same price per wheel as other makers, and save the cost of the

difference in weight; that this saving of metal he deemed to measure the essential advantage he had over his competitors, and also the profits arising from his patent, and he estimated that *ten pounds per wheel would be a fair average of the metal saved by his process.* [Footnote 3]]

Mowry excepted to the charge made, as above stated by the master, of profit derived by the entire manufacture of the wheel, and the case was recommitted to the master with instructions to inquire:

1st. Whether the wheels made and sold by Mowry had or could have any market value without being subjected to the process patented by Whitney.

2d. If they had or could have been made to have such value by any annealing or slow cooling process outside of the Whitney patent, how much additional value, if any, they derived from being subjected to that patented process?

To this the master returned that he was unable to report any division of profits, and, being uninformed as to what was covered by the patent, he reported that if the entire process of reheating and prolonged cooling used by Mowry in the manufacture of the wheels was an infringement of the complainant's patent, the total profit realized by the defendant from the manufacture and sale of the wheels was due to the use by him of the complainant's invention.

He reported secondly that if there was no infringement of the complainant's patent, unless the wheels were subjected to the process of reheating -- that is to say if the process of slow cooling used in connection with reheating was old, and not a part of the complainant's invention, nor included in his patent -- no part of the profits realized by the defendant from the manufacture and sale of the wheels was due to the use by him of the complainant's invention.

[This second finding of the master the court set aside, sustaining an exception to it that not only the entire process described in the patent, but each part of such entire process, was the invention of Whitney, and the use of any material,

substantial and essential part of such entire process -- the slow cooling being a substantial and material part, whereby only an improved chilled cast iron railroad wheel could be made, and beneficial effects the same in kind, if not in degree attained, that were attained by Whitney's entire process -- was an infringement of Whitney's patent, and that the profits derived from the use of such material, substantial and essential part should be accounted for in this case.]

But the master, in addition to the second finding thus, as just mentioned, set aside, further found that had the wheels manufactured by the defendant been left to cool in the open air, they would have had no value as car wheels, and have been worth only the value of the iron of which they were made; that reheating in connection with slow cooling, or slow cooling without reheating, was indispensable to make marketable cast iron wheels of the configuration of those made by the defendant; that there was no reheating process for the manufacture of cast iron car wheels outside of the complainant's patent.

The master also found that the wheels could have been removed from the moulds and finished without being subjected to the reheating process or without any extraneous heat, and he specified two modes in which it might be done. Wheels so manufactured, he reported, have and did have, during all the time in which the defendant used the complainant's process, a market value equal to that of wheels manufactured by that process.

There were some other findings which may be briefly noticed:

1. That the 19,819 wheels were annealed wheels, and sold as such.

2. That if the complainant's patent included prolonging the time of cooling the wheels, as used by the defendant, the process conferred upon them their entire market value, above their weight in iron, but not so if the complainant's patent covered only the application of extraneous heat to the wheels after they are taken from the moulds.

3. That taking annealing to mean reheating in connection

Page 81 U. S. 634

with slow cooling, no other process of annealing in connection with slow cooling than that patented to the complainant and that described in the patent of the defendant appeared to have been known.

4. That the wheels made by the defendant required no treatment other than that described in the complainant's patent to complete them as annealed wheels.

5. That still taking annealing to mean reheating in connection with slow cooling, the annealed wheels could not have been made by any process outside the complainant's patent.

Upon these findings, the court below decreed against Mowry the entire profits made by him in the manufacture and sale of the wheels from beginning to end; the profits resulting from the reheating, and regulated slow cooling in connection, and those also which might have resulted from mixing and melting the iron, casting in moulds, making the chill, and from the possible advance on the iron above its cost, with $10,980.22 additional interest on the whole, from the 1st of August, 1868, when the original reports were made, to August 1, 1870; at which time the subject was finally heard.

The final decree thus stood:

Profits on 19,819 wheels . . . . . $ 91,501.86

Interest to date of original report

(August 1, 1868) 19,984.21

Interest on $91,501.86 (from August 1,

1868, to August 1, 1870) 10,980.22

$122,465.29

From this decree Mowry, the defendant, appealed.

Page 81 U. S. 639

MR. JUSTICE STRONG delivered the opinion of the Court.

The defenses set up to the complainant's bill for an infringement are that the patent is void for want of novelty in the invention, and for want of utility, and also that it has not been infringed by the defendant.

To determine how far these defenses are sustained, it is important to have a clear apprehension of the state of the art when the patent was granted and of the invention which it was intended to secure to the patentee. Prior to the 2d of August, 1847, cast iron railroad wheels had been cast, and cast in chills -- that is, they had been cast in sand moulds with an outer circumference of iron. The effect of this outer circumference was to produce a more rapid chill on the periphery of the wheel, thereby crystallizing and hardening it so that the wheel was made stronger and more capable of resisting the friction of the rails. But the parts of the wheel were of different thicknesses. The hub and the rim were much thicker than the plate which connected them, and of course they cooled after casting more slowly than the plate. The consequence of this unequal cooling was to produce a strain between the thick and thin parts that greatly impaired the strength of the wheel. Various devices had

Page 81 U. S. 640

been made to guard against, or to remedy the mischief resulting from, this inherent and inevitable strain caused by unequal contraction in cooling. The most common of these perhaps was casting the wheel with the hub in sections in order that the sections might accommodate themselves to the contraction of the plate. But this was expensive. It required the open space between the sections to be filled up with other metal, and generally it required the hub to be hooped. It is unnecessary, however, to describe these devices. It does not appear that in any of them the idea

existed of making a car wheel with chilled tread, straight plates, and solid hub, *annealed* and cooled so as to leave it uninjured by the strain attendant upon the unequal cooling of the thick and thin parts. Annealing some kinds of castings was known and practiced before 1847. This is abundantly proved by the witnesses, and various modes of annealing plain castings had been described by scientific writers both in this country and abroad, before that time. But there is no evidence that we have been able to discover that cast iron car wheels had ever been subjected to an annealing process, in connection with slow cooling, before the process was discovered or invented by Whitney. In all the experiments made for annealing other castings, the object sought was different, and in them all, as well as in the process described in the publications given in evidence, the effect upon the annealed metal or glass was not to leave them in the condition in which it was sought to bring car wheels, with the crystallization or chill of the periphery unimpaired, and the plate or thin part unaffected by strain. Cast iron railroad wheels are castings of a peculiar kind. The methods of slow cooling, or of annealing and slow cooling, which were applied to other castings before 1847, were not adapted to their peculiarities or to what they needed. They are not homogeneous throughout. They are of different thickness in their several parts, and hardened at the tread, while the plate and hub are not crystallized, but are soft and tough. These different qualities of the different parts it is necessary to preserve, and what was needed when Whitney's invention

Page 81 U. S. 641

was made was to preserve them and at the same time relieve against any strain caused by unequal cooling which might impair the strength of the wheel.

If now we proceed to inquire what Whitney's alleged invention was, as described in his specification and claim, it will be seen that it was a process not to make a car wheel or to destroy any of the advantages which had already been secured, but to add another. Its avowed object was to obtain a new value, or rather exemption from imperfection. It was to remedy the evil of strain resulting from the more rapid cooling of one part of the wheel than the cooling of the other parts. And this was sought to be accomplished by a process that insured the cooling of all parts, both

the thick and the thin, with equal slowness. The process consists of several parts. The first is taking the wheels from the moulds after the melted iron has been run into the moulds, before they become so much cooled as to produce strain on any part sufficient to impair their ultimate strength. The second is placing the wheels immediately after their removal in a furnace or chamber previously heated to about the temperature of the wheels when taken from the moulds, the heat in the furnace being subject to control. The third is applying heat until the temperature of all parts of the wheels shall again be raised to the same point (indefinitely said to be a little below that at which fusion commences). The fourth and last stage in the process is allowing the wheels, after they have been thus reheated, to cool so fast as and no faster than is necessary for every part of each wheel to cool and shrink simultaneously together, and no one part before another. It is therefore a patent for a process, not for a combination. Neither as a whole nor in parts can it be considered without reference to the ultimate object in view, which was to retard cooling by a second application of heat supplied until all parts of the wheel are raised to the same temperature, and then permit the heat to subside so gradually that the cooling of the parts shall not only commence at the same point of temperature, higher than that where hurtful strain begins, but shall continue

Page 81 U. S. 642

equable till all artificial heat ceases. The removal from the moulds to the furnace or chamber, the removal at the time described, before the incipient strain has become permanently hurtful, and to a place where more heat may be applied, and where the heat can be under control, are parts of the process to secure equable cooling during the time when cooling without such appliances is likely to produce strain and consequent weakness. It is apparent that this is more than a process for *annealing.* That is included, it is true, but it is only a small part. It is applying foreign heat to a hot chilled wheel at the point of time when it has reached a particular stage of cooling by means of such foreign heat bringing the whole casting up to a higher and uniform temperature, and maintaining an equable abatement of heat in a furnace or chamber under the control of the operator. We have sought in vain through the proofs submitted in this case, for any satisfactory

evidence that this process was known before 1847, when Whitney commenced it, or that anything equivalent to the process was known. Certainly nothing of the kind had ever been applied to cast iron railroad wheels, and, as we have seen, they are castings of a peculiar character, not admitting of the treatment that may be applied to other castings. What they needed was (what was substantially described by one of the witnesses) the discovery of the fact that the chilled cast iron, constituting one part of the wheel, could be subjected to heat less than that which would cause fusion without producing any material effect upon its hardness, while the cooling of other parts of the wheel could be so prolonged by applying that heat externally as to enable all parts to cool without being subjected to the strain attendant on unequal contraction and, in addition to the discovery, they needed the invention of a process by which it could be practically carried out. Such a discovery and such a process were needed for no other castings. The novelty of the patentee's invention is not therefore disproved by evidence that glass, or speculum metal, or even other iron castings had been annealed and slow-cooled, prior to the time when it was made. Of this

Page 81 U. S. 643

there is very considerable evidence both in the testimony of witnesses and printed publications. The specification disclaims invention of annealing iron castings done in the ordinary mode. It claims annealing when applied to cast iron railroad wheels, in the mode or by the process described. It is not, therefore, merely an old contrivance or process applied to a new object, as case of double use. A new and previously unknown result is obtained -- namely the relief of the plate of the wheels from inherent strain without impairing the chilled tread, a result which, though anxiously sought, had not been obtained before Whitney's invention. We are therefore of opinion that the defense set up that the patent was void for want of novelty of invention is unsustained.

The validity of the invention is next assailed for the reason that the process described in it, and claimed, is denied to be useful, because it would destroy the hardness of the rim, or tread of the car wheel known as the chill, and thus greatly detract from the durability and usefulness of the wheels.

It is undoubtedly true that a chilled periphery or tread is essential to the usefulness of a car wheel. Indeed, the evidence is that whenever car wheels are spoken of, wheels with chilled tread are meant, and any process which destroys the chill must render them valueless for the purposes for which they are needed.

It is also true that the fusing point of cast iron is in the neighborhood of 2,786 degrees of Fahrenheit, twelve or fifteen hundred degrees above the point at which, according to the evidence, the chill of the tread of a car wheel would be destroyed. If, therefore, the process patented to Whitney requires, after the removal of the wheel to the heated furnace or chamber, the application of a degree of heat closely approximating the point of fusion, it must be conceded that instead of being beneficial, it is positively hurtful. And this is what is contended by the appellant. The objection seems to be aimed at the sufficiency of the description of the

Page 81 U. S. 644

patentee's invention, which it is abundantly proved he practiced successfully through many years, rather than at its utility. Whitney conceived a process and practiced it. That process may have been a highly useful invention, and therefore patentable, and yet he may have failed so to describe it as to teach the public how to practice it. The law requires every inventor, before he can receive a patent, to furnish a specification or a written description of his invention or discovery and of the manner and process of making, constructing, using, and compounding the same, in such full, clear, and exact terms, avoiding unnecessary prolixity, as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound, and use the same. The specification, then, is to be addressed to those skilled in the art and is to be comprehensible by them. It may be sufficient though the unskilled may not be able to gather from it how to use the invention. And it is evident that the definiteness of a specification must vary with the nature of its subject. Addressed as it is to those skilled in the art, it may leave something to their skill in applying the invention, but it should not mislead them. The objection here is that, in describing the degree of heat to be applied after the wheels have been deposited in the heated chamber, the patentee states it to be such that the temperature of all parts of the wheels

"may be raised to the same point (say a little below that at which fusion commences)," and the defendant insists that this amounts to a direction to raise the heat to a degree that must destroy the chill of the tread, and thus render the casting valueless as a railroad car wheel. But it is obvious that only vague and uncertain directions could have been given respecting the extent to which the heat is necessary to be raised. It must differ with the difference in the progress of cooling which has taken place before the wheels are removed from the moulds. The process requires this removal before they have become so much cooled as to produce such inherent strain on any part as to impair its ultimate strength. Precisely when such a strain begins cannot

Page 81 U. S. 645

be known. Cooling commences the instant the casting is made, and with cooling commences contraction, and strain must soon follow. Plainly it is impossible to describe the point of time when the strain has proceeded so far as to impair the ultimate strength of any part of the wheel. That, in the nature of things, must be left to the judgment of the operator. But before that time, the strain may be checked, and this is what is contemplated by raising the temperature of all parts of the wheel to the same point or degree. The moment that is done, the strain ceases and the primary object of the patentee's process is accomplished. The state of things is reproduced which existed before the contraction and attendant strain began, when the slow cooling is allowed to follow in an atmosphere so heated and regulated that each part of the wheel loses its heat at an equal pace with all others.

Now anyone skilled in making cast iron railroad car wheels in view of this specification must see that the object of the process is to relieve from and guard against hurtful strain without destroying the chill, and that heat is applied only for that purpose. It requires no particular science or skill to enable an operator to perceive that the moment all parts of the wheel are raised from a point above where serious strain begins, and where yet the thick and thin parts are in different stages of cooling, to a stage where the degree of temperature of all parts is the same, and above the degree where serious strain commenced, the thing sought

has been attained. Then the avowed purpose of the inventor has been accomplished. It would be most unreasonable to read the directions of the specification without reference to the object which they profess to have in view. The evidence is that the chill is formed while the casting is in the mould, and that the hurtful strains commence after the formation of the chill. Indeed it is manifest there can be no strain until the chill is complete. It must be, therefore, that all the heat which is needed to relieve from the strain is that which suffices to raise the temperature of the thin part, or plate, to the degree at which the strain commenced -- a lower

Page 81 U. S. 646

temperature than that which existed when the chill was formed. Hence an operator, in following the directions of the specification, would be taught by his practical knowledge that the instant all parts of the wheel had been heated to that temperature no more heat was needed.

And we do not think it a fair construction of the patentee's language to hold that it requires the heat to be raised in all cases to a degree only a little below the point of fusion. He does not attempt to give any more definite direction than that all parts of the wheel must be raised to the same temperature, suggesting in a parenthesis ("say, a little below that at which fusion commences"). He fixes a *maximum.* The heat must not reach the point of fusion, and the prescribed *minimum* is that degree where the heat of the different parts of the wheel is equal. Within those limits, the degree is left to the judgment of the operator, and within those limits it is clear from the evidence that the process may be applied without injury to the chill. The proof is that it has been successfully applied in the manufacture of a vast number of wheels, and that failure has been very rare.

There are some witnesses who have testified that the Whitney process, as they understand it, would destroy the chill of the wheel. But they explain their understanding to he that the wheels are to be reheated to a degree far beyond what is required to relieve from strain, and thus heated for no purpose. They keep in sight the *maximum* limit, and approach near to that, overlooking entirely the

minimum, and disregarding the single object of the process, namely, relief of the plate, or thin part of the wheel, from the strain caused by unequal contraction.

We are therefore of opinion that the patent is not void for want of utility, and that the specification sufficiently describes the process invented and claimed.

The remaining defense is a denial that the process conducted by the defendant is an infringement of Whitney's patent.

What the process of the defendant was is clearly set out

Page 81 U. S. 647

in a patent which he obtained on the 7th of May, 1861. It consists in placing in a pit the wheels as they are turned out of the moulds red hot, with a layer of charcoal beneath the lowest wheel, and a layer between each wheel as well as above the uppermost, and covering the pit with a perforated metal plate. The charcoal is ignited by the hot wheels, and just sufficient air is admitted to effect combustion of the coal. Thus the wheels are reheated and permitted gradually to cool. There are some minor details which it is unnecessary to mention. So far as relates to reheating the wheels and retarding the cooling by the application of additional heat, it is obvious that the process is substantially the same as that covered by the complainant's patent. The object is the same, and the mode of attaining it is in substance the same. The purpose of the charcoal interlaid with the wheels is avowed to be to heat them in the pit to a proper temperature, prolonging the heat and permitting them to cool gradually in a given time, said to be severity-two hours, more or less, as may be found necessary for the annealing operation. The rapidity of combustion of the charcoal is regulated by a damper in the flue. And this process is followed, as the specification explains, that the different parts of the wheels may adjust themselves to each other, and accommodate the unequal contraction which results from the process of chilling. It is under this patent and in accordance with its directions that the defendant has prepared his car wheels for market. As the object of the patentees is the same, relief from the strain incident to unequal contraction, the only inquiry is whether the object is attained by

substantially the same means. The idea of Whitney was undoubtedly arresting contraction before any remediless strain had commenced, and regulating the progress of cooling so that all parts of the wheel may maintain an equal temperature at all stages of cooling. Manifestly the process of the defendant embodied the same idea and carried it out by means identical in principle. It reheats the wheels when removed from the moulds to the chamber or pit. It prolongs the cooling in connection with the reheating,

Page 81 U. S. 648

and it subjects the rapidity of cooling to control of the operator. The form or structure of the furnace, chamber, or pit, is not claimed by either patentee.

It hardly seems necessary to resort to the opinions of experts in order to reach the conclusion that the process of the defendant is only formally different from that of Whitney, while the essential element of the two processes is the same. But the testimony of the experts examined, taken as a whole, clearly supports such a conclusion. It is true some of the witnesses testify that in their opinion the processes are different, but when they attempt to describe the difference they point out only matters which are merely formal, only variances in the mode of using the same process. On the other hand, several witnesses, entirely competent to apprehend the principle of the invention, and the devices for practically using it, have testified that the processes of the defendant and of the complainant are substantially the same in principle, mode of operation, and in the effect produced. We must therefore conclude that the charge of infringement made in the bill has been sustained and that the complainant was entitled to a decree for an injunction and an account.

We come next to the consideration of the account stated by the master and confirmed by the circuit court.

The master reported that Mowry, the defendant, used Whitney's process in the manufacture of 19,819 wheels, and the account has been stated on that basis. For the use of the process in making these wheels the defendant has been charged

with $91,501.86 as profits made by him (more than four dollars and sixty cents on each wheel), besides $19,984.21 interest upon such profits to the first day of August, 1868, and the further sum of $10,980.22, being interest from August 1, 1868, to August 1, 1870.

It is very obvious, in view of what the patentee himself stated, under oath, in 1862, when applying for an extension of his patent, [Footnote 4] that the account has been erroneously stated. If

Page 81 U. S. 649

he was correct in this statement, the profits arising from the use of his patent in manufacturing 19,819 wheels (valuing iron at the price proved to have been paid for it by the defendant) must have been less than $5,500, instead of over $91,000, decreed in the circuit court -- about thirty cents per wheel, instead of four dollars and sixty cents. It is not an unfair presumption that if the profit to the patentee was no greater than he claimed it was, it could not have been more when the invention was used by an infringer. Now it is clear that Whitney is not entitled to receive more than the profits actually made in consequence of the use of his process in the manufacture of the 19,819 wheels. It is the additional advantage the defendant derived from the process -- advantage beyond what he had without it -- for which he must account. But he has been held liable far above this. The master reported, in the first instance, the difference between the cost of the wheels and the price for which they were sold as the profits realized by Mowry, thus charging him the profit obtained from the entire wheel, instead of that resulting from the use of Whitney's invention in a part of the manufacture; and this, though he found at the same time and reported that Mowry had built up his business before he commenced the use of Whitney's process; that the use of the process did not diminish the cost of making wheels, but increased it; that while he used the process, he used the same quality of iron that he had used before, and made no difference in the weight or form of the wheels, or in their price, and that the wheels made by him before he commenced the use of Whitney's invention, and since he has abandoned it, have sold as readily and at the same prices as those manufactured by that process.

Exception was taken to the charge of the profit made by the entire manufacture of the wheel, including not only the selection and mixing of the iron, but its melting, pouring into moulds, forming the chill, removing from the moulds, and cleaning, as well as annealing and slow cooling; and the case was again sent to the master with instructions to inquire:

Page 81 U. S. 650

First. Whether the wheels made and sold by the defendant had, or could have been made to have any market value without being subjected to the process patented to Whitney; and,

Second. If they had, or could have been made to have such value by any annealing or slow-cooling process, outside of the Whitney patent, how much additional value, if any, they derived from being subjected to that patented process.

Upon the findings (stated *supra* 81 U. S. 632 -- REP.) made by the master on this order, the court decreed against the defendant the entire profits made by him in the manufacture and sale of the wheels from beginning to end, not only the profits resulting from the reheating and regulated slow cooling in connection, but also those which may have resulted from mixing and melting the iron, casting in moulds, making the chill, and from the possible advance on the iron above its cost, with interest on the whole.

This we think was an error. The findings of the master justified no such decree. It must be conceded that the findings are incomplete, obscure, and in some particulars incongruous, but it is not a legitimate construction of them taken together, that the benefit which the defendant derived from the use of the complainant's invention was equal to the aggregate of profits he obtained from the manufacture and sale of the wheels as entireties, after they had been completed. It is as true of a process invented as an improvement in a manufacture, as it is of an improvement in a machine, that an infringer is not liable to the extent of his entire profits in the manufacture. [Footnote 5] If the wheels made by the

defendant would have had no market value above that of cast iron if they had not been annealed and slow cooled, the same may be said if they had been cast without a chill. The same principle, therefore, which gives to the complainants the aggregate profits of the entire manufacture would give the same profits to a patentee of the process of chilling,

Page 81 U. S. 651

if there were one, and as there are many processes in the manufacture, for each of which it is conceivable there might be a patent, and as everyone of the processes is necessary to make a marketable wheel, an infringer might be mulcted in several times the profits he had made from the whole manufacture. We cannot assent to such a rule. The question to be determined in this case is what advantage did the defendant derive from using the complainant's invention over what he had in using other processes then open to the public and adequate to enable him to obtain an equally beneficial result. The fruits of that advantage are his profits. They are all the benefits he derived from the existence of the Whitney invention. It is found that there were other processes by which the inherent strain caused by unequal cooling could be, and was prevented, counteracting which strain was the sole object of the complainant's invention, and a car wheel could be prepared for similar service, valuable in the market and salable at a price not less than was obtained for those which the defendant manufactured. The inquiry then is what was the advantage in cost, in skill required, in convenience of operation, or marketability, in bringing car wheels by Whitney's process from the condition in which they are when taken hot from the moulds, to a perfected state, over bringing them to the same state by those other processes, and thus rendering them equally fit for the same service. That advantage is the measure of profits. It is quite unimportant what name was given to the products of the processes, whether one could be called annealed wheels and the other could not, except so far as affected their marketability.

The record shows that the court overruled the alternative finding of the master that if there is no infringement of the complainant's patent unless the wheels are subjected to the process of reheating -- that is to say if the process of slow cooling

used in connection with reheating is old, and not a part of the complainant's invention, no part of the profit derived by the defendant from the manufacture and sale of the wheels was due to the use by him of that invention.

Page 81 U. S. 652

One exception taken to this finding was that not only the entire process described in the patent, but each part of such entire process, was the invention of the complainant, and the use of any material, substantial, and essential part of such entire process, the slow cooling being a substantial and material part, whereby only an improved chilled cast iron railroad wheel could be made, and beneficial effects the same in kind if not in degree attained, that were attained by the complainant's entire process, is an infringement of complainant's patent, and the profits derived from the use of such material, substantial, and essential part, should be accounted for in this case. This exception the court sustained, and thereby held that the defendant is chargeable with the profits he derived from slow cooling alone. We cannot assent to this. The patent is for an entire process, made up of several constitutions. The patentee does not claim to have been the inventor of the constituents. The exclusive use of them singly is not secured to him. What is secured is their use when arranged in the process. Unless one of them is employed in making up the process and as an element of it, the patentee cannot prevent others from using it. As well might the patentee of a machine, every part of which is an old and known device, appropriate the exclusive use of each device, though employed singly and not combined with the others as a machine. The defendant was not, therefore, responsible for slow cooling alone, or for the profits he derived from it. He was liable to account for such profits only when he used slow cooling in connection with reheating in the manner described in Whitney's claim substantially, or when extraneous heat was employed to retard the progress of cooling. We have said that slow cooling, is not claimed in the specification as the invention of the patentee. And it is found by the master that there are other modes of slow cooling, and even other modes of relieving against the inherent strain caused by unretarded cooling, than that practiced by the complainant and claimed by him. Though, therefore, slow cooling is an essential part of the

complainant's process, it is an equally essential part of other processes which

Page 81 U. S. 653

the defendant was at liberty to use in preparing his car wheels for market.

We add only that in our opinion the defendant should not have been charged with interest before the final decree. The profits which are recoverable against an infringer of a patent are in fact a compensation for the injury the patentee has sustained from the invasion of his right. They are the measure of his damages. Though called profits, they are really damages, and unliquidated until the decree is made. Interest is not generally allowable upon unliquidated damages. We will not say that in no possible case can interest be allowed. It is enough that the case in hand does not justify such an allowance. The defendant manufactured the wheels of which the complaint is made under a patent granted to him in 1861. His infringement of the complainant's patent was not wanton. He had before him the judgment of the Patent Office that his process was not an invasion of the patent granted to the complainant, and though this does not protect him against responsibility for damages, it ought to relieve him from liability to interest on profits.

Decree reversed and the cause remanded with instructions to proceed in accordance with the rules laid down in this opinion.

[Footnote 1]

There were other drawings and descriptions not given by the reporter.

[Footnote 2]

It may here be stated that, on the 7th of August, 1849, there was granted to one Murphy a patent (extended subsequently for seven years from the 7th of August, 1863) for a mode of cooling car wheels which consisted in encasing and protecting from the air all parts of the wheels except the hubs, and causing a current of cold air, by means of connection with the main chimney, to pass through the hubs, thus retarding the cooling of the plates and speeding the cooling of the hubs. This process, it will be observed, was the antithesis of Whitney's, the essence of which

consisted in heating the wheels until all parts of them had attained the same degree of heat.

[Footnote 3]

See supra, 81 U. S. 435 , *Mowry v. Whitney.*

[Footnote 4]

See this statement, *supra,* in brackets, beginning at foot of p. 81 U. S. 631 .

[Footnote 5]

Jones v. Morehead, 1 Wall. 155; *Seymour v. McCormick,* 16 How. 480.