

plete apparatus," and, furthermore, a described object of the annular casing with the openings in its peripheral wall is to keep the vessels in an atmosphere of steam. The specification says that the contents of the vessel are maintained during the rotation "at a high temperature by the same steam which effects the rotation, and which enters the casing, F, and keeps the vessels in an atmosphere of exhaust steam. Openings, f³, shown in the wall, f¹, may be provided to insure the entrance of steam within the casing." It is difficult to understand the importance of this casing unless it was intended that the machine with its improvement was complete and efficient without the addition of a heavy exterior cover. The defendants' machine is made in accordance with letters patent No. 484,685, issued to Ralph Stoddard on October 18, 1892, for slight improvements in milk-testing apparatus. It has the old exterior cover, which covers a whirling apparatus provided with testing bottles. To the outer ends of radial arms is secured a rim, the outer periphery of which is provided with buckets against which the jet of steam strikes. The theory of the complainants is that this rim is the annular casing of claim 3 of No. 458,194. It is not that casing with its two walls inclosing the pockets, and designed to keep the steam in contact with the bottles, but is simply the rim of a rotating frame which receives the propelling force of the steam, which is kept in close contact with the bottles by the exterior cover. It is too great an expansion of the narrow improvement of claim 3 to construe it so as to include a mere rim, which does not retain the steam in the vicinity of the bottles. The decree of the circuit court is directed to be modified, with costs of this court, so as to decree that claim 3 of letters patent No. 458,194 was not infringed, and modifying accordingly the decree in regard to an injunction and an accounting with respect to that claim.

CAMPBELL v. MAYOR, ETC., OF CITY OF NEW YORK.

(Circuit Court, S. D. New York. May 14, 1897.)

1. PATENTS—STATUTES OF LIMITATION.

A patent was granted May 24, 1864, and infringement was begun in 1865, and continued until the expiration of the patent. Suit was begun November 24, 1877. At the time the patent was granted, therefore, there was no federal statute of limitations applicable to infringements, and the state statute would govern. The state statute was displaced by section 55 of the patent act of 1870, which required suits to be brought during the term of the patent or within six years after its expiration. This provision was repealed by Rev. St. § 5599, but existing causes of action were saved. *Held*, that no part of the claim for infringement was barred.

2. SAME—MARKING ARTICLES PATENTED.

Rev. St. § 4900, in relation to marking articles "patented," does not apply so as to prevent recovery of damages for infringement, when neither the plaintiff, nor any one for or under him, has made or sold the patented device.

3. SAME—NOTICE OF INFRINGEMENT—ESTOPPEL AS TO PRIOR INFRINGEMENT.

Where notice of infringement is given on a certain date, there is no estoppel, as against complainant, as to prior infringements, when it appears that defendant did not act upon the notice with respect to prior, or even subsequent, infringements, so as to make the claim for the prior infringements iniquitable.

4. SAME—COMPETENCY OF WITNESSES.

In determining the profits or savings made by a city by the use of an infringing improvement upon its fire engines, the chiefs of its fire departments, its foremen, and others in those departments engaged at the time and before the infringement commenced, are competent witnesses on the question of the savings accruing from the infringing device.

5. COMPUTATION OF DAMAGES BY THE COURT.

The very long pendency of a suit in equity is good reason for a computation of damages or profits by the court, if it can be done, instead of again referring the cause to a master.

6. PATENTS—INFRINGEMENT—PROFITS OR SAVINGS.

Where, by the use of an infringing device in connection with a city's fire engines, the number of men required with each engine was reduced, the amount of their wages should be included in the computation of savings or profits, although the city did not in fact reduce the number of men employed, but either utilized them for other purposes or allowed them to remain idle.

7. SAME—BURDEN OF PROOF.

Where the complainant has shown that a certain amount of saving to the defendant resulted from the use of an infringing device, the defendant, if he claims that a part of the saving was due to a different device, has the burden of proof in respect thereto and as to the amount attributable to such other device.

Harvey D. Hadlock, Walter K. Griffin, William T. Washburn, and John McDonald, for plaintiff.

Edmund Wetmore and John R. Bennett, for defendant.

WHEELER, District Judge. This suit was begun November 24, 1877, upon letters patent No. 42,920, dated May 24, 1864, and granted to James Knibbs, assignor, for a relief valve in steam fire-engine pumps. The patent was sustained, and the cause sent to an account of profits. *Campbell v. Mayor, etc.*, 20 Blatchf. 67, 9 Fed. 500, and 47 Fed. 515. The master has reported profits from savings in making repairs, \$28,336, with a comprehensive statement of evidence and findings as to this claim and others not allowed. The cause has now been heard upon exceptions by each party to this report, some of which raise questions as to any recovery, and some as to any further recovery.

One general question arises upon the statutes of limitation of the state and of the United States. The infringement was begun in 1865, and continued till the expiration of the patent. When the patent was granted there was no federal statute of limitations applicable to infringements, and the state statute would govern. *Campbell v. City of Haverhill*, 155 U. S. 610, 15 Sup. Ct. 217. The state statute was displaced by section 55 of the patent act of 1870, which provided that "all actions shall be brought during the term for which the letters patent shall be granted, or extended, or within six years after the expiration thereof." This provision was repealed by the Revised Statutes, but existing causes of action were saved by section 5599, with the same right of suit as if the repeal had not been made. The state statute had not run upon any part of this infringement at the time of the act of 1870; the federal statutes took place and saved all of that was prior to December 1, 1873, until six years after the expiration of the patent; and the state statute, which again took

place, had not run upon what was after December 1, 1873, when this suit was commenced. So no part of the recovery sought here was barred, even at law, by any statute. Walk. Pat. § 472.

Another general question arises upon section 4900, Rev. St., which requires all patentees, their assigns and legal representatives, and all persons making or vending any patented article for or under them, to mark or label the articles "Patented," and prohibits the recovery of damages for infringement "by the party failing so to mark," except on proof of notice to the defendant. Mr. Justice Gray, in *Dunlap v. Schofield*, 152 U. S. 244, 14 Sup. Ct. 576, said:

"The clear meaning of this section is that the patentee or his assignee, if he makes or sells the article patented, cannot recover damages against infringers unless he has given notice of his right."

Neither the plaintiff, nor any one for or under him, has made or sold this patented device; and he does not come, according to this construction, within this prohibition. The defendant had notice, July 11, 1877, which was alleged in the bill, and has been suggested to have worked an estoppel as to prior infringements. But the defendant did not act upon the notice with respect to prior, or even subsequent, infringements, so as to make the claim for the prior infringements inequitable because of that precaution as to further infringement, and the insertion of it in the bill would not be any express or implied waiver of other grounds of recovery.

The master reports:

"The Amoskeag Manufacturing Company, one of the largest manufacturers of steam fire engines, immediately appropriated the invention, and an engine equipped with it was delivered by that company to this city. All engines subsequently purchased contained the invention. Engineers in the department witnessed its operation, and one of them applied the device to an old engine then in use. The other engines were thereafter sent to the repair shop to be fitted out with the relieving mechanism. It was extremely valuable in and of itself, and it opened the way for other improvements, which enabled steam fire engines to be operated so as to extinguish fires with a minimum loss in the destruction of property, and to avoid needless waste of water. The superiority of an engine containing in its main water pump this relieving device over those known to the art at the date of the invention is conceded. * * * The first steam fire engine came permanently into service in this city in 1858. There was but one such engine in service in 1860, when Chief Decker took charge of the department. He left the service in 1865, at which time there were twenty-nine in active service and four under construction. The patent in suit was granted May 24, 1864, and the first engine fitted with the relieving mechanism came into the service of the city during the year 1865. At the end of 1866 all the old engines in active service had been fitted with the patented relief."

That the plaintiffs—

"Claims are based upon benefits due wholly or in part to the patented device, which are as follows: (1) Economy in the use of water; (2) reduction in property destruction; (3) economy in engine and pump repairs; (4) prolongation in the life of engines; (5) stability, reliability, and increased efficiency in the use of engines; (6) economy in manual labor; (7) prolongation of the life and savings in the use of hose. As compared with the old style or solid pump engines, the evidence is conclusive that the defendant enjoyed each of the advantages above enumerated by the use in its fire service of steam fire engines subsequent to the grant of the patent in suit. Some of them were due solely to the relieving mechanism, and others were obtained by the use of that device in connection with subsequently patented controlling nozzles. There

was a great saving in water, and the damage to property by water was materially reduced."

The first two of these claims were abandoned for reasons given by the master.

The plaintiff improved as witnesses before the master chiefs of fire departments of the defendant, and foreman and others in those departments, some of whom had been engaged there from long before this infringement was commenced, and all were men of long experience about things connected with it, and of great skill and judgment concerning them. From their testimony as to the utility of the patented device, the uses made of it, and results produced, with their estimates as to the saving in number of men employed in making repairs, the master has found the defendant enabled "to discontinue the services of two machinists in making repairs to engines and pumps, whereby it made a saving of three dollars per day for each of said men, amounting to the sum of \$1,848 per year, for the period of fifteen years and four months, making an aggregate saving due to the invention of \$28,336," as before mentioned. Nevertheless, apparently because such evidence as to other claims was thought to be less competent, no other savings or profits are found. The exceptions raise questions as to this competency. The testimony is not that of mere experts giving opinions upon supposed cases, but of observers as well, stating facts from their own knowledge, with estimates and opinions thereupon. The cases most relied upon to show the incompetency of such evidence seem to be quite different from this one in this respect. Thus, in *Mayor, etc., v. Ransom*, 23 How. 487, the plaintiffs furnished no evidence as to damages or profits except that the invention was valuable, and could be applied at an expense of \$25, thereby greatly increasing the power of the machine. In *Ingersoll v. Musgrove*, 14 Blatchf. 541, Fed. Cas. No. 7,040, which was on a patent for an improvement in cuspidors, the plaintiff showed merely that the defendant infringed, and his prices were reduced 30 per cent. In *Sargent v. Manufacturing Co.*, 17 Blatchf. 249, Fed. Cas. No. 12,367, which was on a patent for an improvement on a lock, two witnesses appear to have estimated the value of the device to the defendant without stating facts as a foundation for the estimate. In *Munson v. City of New York*, 21 Blatchf. 342, 16 Fed. 560, which was a patent on a method for preserving bonds, one witness testified, without stating facts for foundation, as to what, in his judgment, would be the advantage or benefit from the use of that plan. In *Garretson v. Clark*, 111 U. S. 120, 4 Sup. Ct. 291, which was on a patent for an improvement on a mop head, the plaintiff merely proved the cost of his mop heads and the price at which they were sold. In *Coupe v. Royer*, 155 U. S. 565, 15 Sup. Ct. 199, which was on a patent for an improvement on a machine for treating hides, one of the plaintiffs testified that, in his opinion, there would be a saving of four or five dollars a hide by using his machine over what it would cost to treat hides by any other method, and that the difference between the treating hides on his machine and by hand would be more than one dollar a hide. Such evidence alone was held in these cases, respectively, to be in-

competent. On the other hand, that the estimates and opinions of experts, and of observers stating facts for foundation, are in many such cases admissible in evidence and competent from which to find ultimate facts relating to such subjects, is well shown in many books and cases.

In 1 Greenl. Ev. (Redfield's Ed.) § 440a, it is said:

"Facts which are latent in themselves, and only discoverable by way of appearances more or less symptomatic of the existence of the main fact, may, from their very nature, be shown by the opinion of witnesses as to the existence of such appearances or symptoms; such as the state of health or of the affections, as already stated. Sanity is a question of the same character. So, too, upon inquiries as to the state or amount of one's property, when the facts are too numerous and evanescent to be given in detail, those acquainted with the facts are allowed to express an opinion, which is the mere grouping of the facts. So, too, as to the marketable condition and value of property, and many other questions, where it is not practicable to give more definite knowledge, opinions are received."

In 2 Best, Ev. (Wood's Ed.) § 517, subd. 2, in speaking of exceptions to the general rule that witnesses are to be confined to knowledge, it is said:

"Another class of exceptions is to be found where the judgment or opinion of a witness on some question material to be considered by the tribunal is formed on complex facts, which, from their nature, it would be impossible to bring before it."

In Wood's note to the same section it is stated that opinions are to be confined to that class of evidence that lies within the peculiar knowledge of a certain class of men—

"Or that class of evidence that from necessity can be given in an intelligible manner in no other way than by the opinions and impressions of the witness, derived through some one of the senses." "As an illustration of the applicability of this class of evidence, it may be stated, generally, that knowledge of any kind gained for and in the prosecution of a business or occupation, as pertaining thereto, which is not generally known, but which only comes from a particular training or experience, is, when material in a cause, sufficient to make its possessor an expert, and to entitle his opinion to be considered and weighed by the jury for what it is worth."

Many cases illustrating the competency of this kind of evidence are mentioned in this note.

In *Webber v. Eastern R. Co.*, 2 Metc. (Mass.) 147, a witness, who did not profess to be an expert, but who had been a county commissioner several years, and had estimated damages for roads and railroads, and as secretary of an insurance company had examined and estimated the value of estates, testified that, in his opinion, the passage of locomotive engines within 100 feet of a building would increase the rate of insurance from $1\frac{1}{2}$ to 2 per cent., and the rent of the buildings would be reduced from one-fourth to one-third; and, on exceptions to this, Shaw, C. J., in delivering the opinion of the court, said:

"He was, we think, quite competent to give his opinion as evidence to the jury upon that subject."

In *Porter v. Manufacturing Co.*, 17 Conn. 249, one question was whether a dam on a stream was reasonably sufficient and safe. Witnesses were admitted to testify that they had been acquainted with the stream many years; that it rose very rapidly in time of freshets;

that the dam was high, and kept back a large pond; and that, in their opinion, under such circumstances, such a dam as the defendant's was could not stand. As to this Storrs, J., for the court, said:

"The judgment or opinion of these witnesses, as practical and observing men, was sought on this point on the facts within their knowledge and to which they testified. They had acquired by their personal observation a knowledge of the character of the stream, and also of the dam, and were therefore peculiarly qualified to determine whether the latter was sufficiently strong to withstand the former. The opinions of such persons on a question of this description, although possessing no peculiar skill on the subject, would ordinarily be more satisfactory to the minds of the triors than those of scientific men who were personally unacquainted with the facts in the case; and to preclude them from giving their opinion on the subject in connection with the facts testified to by them would be to close an ordinary and important avenue of truth."

And after alluding to the admissibility of the testimony of experts, he said further:

"On such a question the judgment of ordinary persons, having an opportunity of personal observation, and testifying to the facts derived from that observation, was equally admissible, whatever comparative weight their opinions might be entitled to, of which it would be for the jury to judge. It was a question of common sense as well as of science."

In *Transportation Line v. Hope*, 95 U. S. 297, on a question of negligence in towing a canal boat, a witness had testified that for many years he had been the captain of a tug boat, and was familiar with the making up of tows; that he was a pilot, and had towed vessels on Long Island Sound, although he was not familiar with the Sound, but that he was familiar with the waters of the Chesapeake Bay. As to the admissibility and competency of his testimony, Mr. Justice Hunt, for the court, said:

"The witness was an expert, and was called and testified as such. His knowledge and experience fairly entitled him to that position. It is permitted to ask questions of a witness of this class which cannot be put to ordinary witnesses. It is not an objection, as is assumed, that he was asked a question involving the point to be decided by the jury. As an expert, he could properly aid the jury by such evidence, although it would not be competent to be given by an ordinary witness. It is upon subjects on which the jury are not as well able to judge for themselves as is the witness that an expert, as such, is expected to testify. Evidence of this character is often given upon subjects requiring medical knowledge and science, but it is by no means limited to that class of cases."

In *Walsh v. Insurance Co.*, 32 N. Y. 427, it was decided that the testimony of experienced navigators on questions involving nautical skill was admissible. The witness in that case was asked to what cause the loss of the vessel was attributable, which was the point to be decided by the jury. The court sustained the admission of the evidence, using this language:

"We entertain no doubt that those who are accustomed to the responsibility of commanding, and whose lives are spent on the ocean, are qualified, as experts, to prove the practical effect of cross seas and heavy swells, shifting winds and sudden squalls. The books give a great variety of cases in which evidence of this character is admissible, and we have no doubt of the competency of the evidence to which this objection is made."

In *Suffolk Co. v. Hayden*, 3 Wall. 315, Mr. Justice Nelson, delivering the opinion of the court on the question of damages in patent cases, said:

"The question of damages, under the rule given in the statute, is always attended with difficulty and embarrassment, both to the court and jury. There being no established patent or license fee in the case, in order to get at a fair measure of damages, or even an approximation to it, general evidence must generally be resorted to; and what evidence could be more approximate than that of the utility and advantage of the invention over the old modes and devices that had been used for working out similar results? With a knowledge of these benefits to the persons who have used the invention, and the extent of the use by the infringers, a jury will be in possession of material and controlling facts therein, in the exercise of a sound judgment, to ascertain the damages, or, in other words, the loss to the patentee or owner by the piracy instead of the purchase of the use of the invention."

In *Herring v. Gage*, 15 Blatchf. 124, Fed. Cas. No. 6,422, the master's record shows that much testimony of opinions by experts, and by observers stating facts for reasons, was received by the master. As to this Wallace, J., said:

"By further exceptions, the defendants insist that the master's findings, as to the actual savings realized by the defendants by the use of the device, is not sustained by the evidence. This finding is based, in part, upon the testimony of various experts, who were familiar with the practical working of the device in other mills, and who were permitted to state the quantity of flour lost when the device was not used; thus estimating the saving realized under their observations, and basing upon that their opinion of the saving ordinarily gained by the use of the device. The conditions under which the device was used differed in the different instances observed by the witnesses. It is contended that this testimony is not entitled to consideration. To this I cannot agree. Of course, the ultimate inquiry was only as to the saving made by the defendants. It was impracticable to ascertain this by direct evidence, because the defendants did not keep any account relative thereto. They and their witnesses gave their opinions, with the data upon which they were based. The complainants gave the best evidence which was attainable, from the nature of the case."

To the same effect are *Railway Co. v. Edwards*, 24 C. C. A. 300, 78 Fed. 745, and *Equipment Co. v. Blair* (2d Circuit, April 8, 1897) 25 C. C. A. 216, 79 Fed. 896.

Upon these authorities and cases, the testimony of the fire chiefs, engineers, and foremen seems to have been amply competent for consideration in ascertaining what was proved upon the issues before the master in this case. He seems to have warrantably found from it the saving in men for repairs, but to have hesitated because of the supposed incompetency of it as to the other claims. But, with its competency so established as to make it proper to be considered, he would apparently have proceeded to ascertain further the validity and amount of other claims made by the plaintiff. As to the saving of men from engine companies, the master in his opinion states:

"The proposition that a number of men could have been dismissed from each company operating with an old-style engine without impairing effective fire service, the improved apparatus compensating for the difference in men, is not seriously contested by the defendant. At any rate, the proofs sustain the proposition. * * * The majority of the witnesses agree that a company of nine men using the approved apparatus was about equal to twelve men using the old-style engine, and they also agree as to the men who could be displaced, viz. one to carry messages from pipe to engine and two men in holding the pipe."

And from this evidence, if he had supposed it to be admissible and competent, he seems to have been persuaded and ready to find

that there would be a saving of three men to each such engine company maintained by the defendant, the city of New York, during all of the time of the infringement of this patent. And as to the saving in hose, he states the testimony of several of these witnesses, and as to that claim says:

"But one factor is wanting,—the percentage of saving. During the period of the accounting the defendant expended for hose the sum of \$366,788.64. The lowest estimate of saving was one-third, or 33 $\frac{1}{3}$ %. This was by Mr. Bates. If that were the measuring factor, then, without the relieving mechanism, the city would have been compelled to purchase hose to the amount of \$550,182.96, and the difference between the two amounts, \$183,394.32, would be the saving. The city would have employed the same number of engines. It would have maintained practically the same equipment. It would have had the same service at fires, and it would have provided hose equal to the necessities of the department. Basing one of the factors upon opinion evidence in such a computation does not call for an irrational presumption necessary to support the contention as to the increased number of engines."

Both parties agree in requesting that this case be not returned to a master, and its long pendency seems to be a good reason for the computation of savings and profits by the court, if it can be done. *Tuttle v. Clafin*, 22 C. C. A. 138, 76 Fed. 227. The testimony of the witnesses before mentioned is so full upon these two points, and so undisputed upon either of them, that such course in this case seems proper, under the circumstances. For example, the testimony of Martin Cook, foreman of engine company No. 4, No. 39 Liberty street, who had been connected with the department going on 23 years in the capacity of fireman, assistant engineer, engineer, assistant foreman, and foreman, covering all the period of this infringement, as to the saving in men and the saving in hose, who testified:

"373. Re-D. Q. Have you ever known hose, known as the 'Maltese Cross Hose,' to be attached to an engine operated with the relieving mechanism being in use,—or, in other words, with the automatic relief lock,—while the hose was lying in the street? If so, please state the effect of so operating the engine upon that hose. 374. Re-D. Q. Did you prior to 1881? A. Lots of times. It would have an effect on some engines different from others. With a single-pump engine, it would make that jump like a snake through the street,—stretch out from the motion of the pump. A double-pump engine, worked under a high pressure, would do the same, only not to as large an extent. 375. Re-D. Q. What effect would that have on the hose? A. Bad effect; sometimes burst three or four lengths, one after the other. 376. Re-D. Q. In what way as to chafing? A. Wear it out working on the street." "55. Q. What number of men did you require to handle the pipe when the relieving mechanism was in use? A. One; never more than two. 56. Q. Why did it require more men to control the pipe without the device than with it? A. There would be more pressure on the line; it would require more men to hold it and move it around. 57. Q. Did it require more men to hold the hose without the relief operating, in moving it from one story to another in a building, than when it was in operation? A. It did require more men; yes, sir. 58. Q. How many? A. I said it would require four or five men. 59. Q. Have you had occasion during the time prior to 1881 to operate at a fire on the inside of a building when you found it necessary to move from one floor to the other with the relieving mechanism on the engine? A. With the relieving mechanism on the engine at small fires it is under a small pressure, such as we can use with the relief mechanism on an engine. * * * 62. Q. Locked or closed hard upon the seat,—either? A. Yes, sir. 63. Q. With the relieving mechanism locked, how many men did it require, under a pressure of 160 pounds, to remove a line of hose from one floor of a building to another? A. I had the experience of

doing that. Four or five men. * * * 67. Q. Now, operating under like circumstances, with the exception of instead of a locked relief having a relief in operation, how many men would it take to remove the hose from one floor to another, under the circumstances stated in the last question? A. With 160 pounds pressure, about two men."

Many other witnesses, with similar qualifications and experience, covering all this time, have testified how, under varying circumstances, there would be a saving in wear and tear of hose, and the extent of it, and the saving in the number of men necessary to be had with each engine company, and the saving of them. The great majority of all the witnesses in this case on this subject would put the saving of men necessary for each engine company on account of this improvement at three. No one puts it at less than two; and from the kind of savings to which the improvement applies, and the testimony, taken altogether, it is quite conclusive and satisfactory that, at the least, two men could well be dispensed with from each engine company in service during the time and on account of this infringement by the respective engines. The statement of Mr. Purroy, entitled "Supplementary Account No. 2" (Master's Record, vol. 4, p. 5476), shows that from 1865 there were of active engines, besides spares, three; from 1866, three; from 1867, five; from 1868, four; from 1871, five; from 1873, six; from 1874, one; from 1877, three; and from 1880, three,—engines containing the improvement from those times, respectively, to the expiration of the patent, May 24, 1881. Computing the time from when the improvement began to be used in each engine to the expiration of the patent, omitting the two years prior to 1867, the whole number of years for a single engine amounts to 328, which would be, at two men for each engine, equal to 656 years for one man, which, at \$3 per day for 308 working days to the year, would amount to \$924 per year for one man, and for the two men to each engine to \$606,344. While the numbers of men in each company theoretically remained the same, many men were detailed from the companies to do work as plumbers, tinsmiths, caulkers, gas fitters, stone cutters, painters, and many other necessary purposes, which altogether would amount to near as many as have been reckoned at two each to a company in making this computation, and probably to a good many more. This fact that the number was nominally always the same is mentioned by the master, among other things, as a reason for not allowing for the savings as to these men. By the improvement, there was this amount and more or less work of men to be done. That the defendant actually kept so many men in service, when so many less would be sufficient, would make the saving of labor of men none the less. The men were there and used for other purposes, if not idle; and the defendant had so many more men to use for other purposes, in useful labor or in idleness, as should be seen fit. The saving in services of men attributable to the improvement was no less, whether the defendant did or did not actually bring these savings to its own treasury by reduction of the money for this purpose paid out. But, on the whole, it seems clear enough that the defendant did in this way, on account of this improvement, save at least this amount.

An appliance, called a "shut-off nozzle," is referred to as contributing substantially to this saving; but this nozzle, according to the finding and the proof, was a thing long before known, and one of no use whatever, in this connection for this purpose, without this relief valve. It was like any of the other parts of a steam fire engine into which this improvement was put. The saving so made when the engines had these shut-off nozzles, which they could have as well as any other part of an engine, was due wholly to this improvement. It stood in the same relation to that as it did to any other of the parts of the engines, and was entitled to credit for whatever it saved as a part at any time of the then working whole. All the witnesses agree that with that nozzle, but without this improvement, none of this saving could have been made. Besides this, after such showing, if any deduction was to be made on account of the contribution of the shut-off nozzle to the savings, the burden was upon the defendant to show how much it would be. *Elizabeth v. Pavement Co.*, 97 U. S. 126; *Crosby Steam-Gage & Valve Co. v. Consolidated Safety-Valve Co.*, 141 U. S. 441, 12 Sup. Ct. 49; *Tuttle v. Clafin*, 22 C. C. A. 138, 76 Fed. 227.

The plaintiff claims, and evidence such as has been mentioned tends to show, that engines with this improvement were to those without it, in efficiency, by some witnesses one equal to two, by some two equal to three, and by some three equal to five. The plaintiff claims to recover what it would have cost more to maintain the same efficiency of the fire department with engines of the former style than it has with those having this improvement, as savings due to the improvement. If the defendant had been required by law to provide a fire department up to any certain degree of efficiency, and had made use of this improvement in reducing the number of engines necessary to bring the department up to that degree, there would be reason in saying that the defendant had made as much profit in savings by using the improvement as the engines saved would have cost; but, while the city was required by law to have a fire department, it was not required to have one of any particular efficiency. The extent of it was left largely to the discretion of the officials of that department. They made use of this improvement, but not in any other way than by having it in the defendant's engines. What they saved by it to the defendant was what the cost in the use made of these engines was reduced by it. The other gain was in the improvement of the fire department in efficiency for putting out fires, and not to the city in its expenditures for the fire department. As to this, the conclusion of the master seems to be sound.

The exceptions of the defendant, and those of the plaintiff, as to savings in number of engines, are overruled; those of the plaintiff as to savings in hose and in number of men are sustained; and the savings in hose are found to be \$183,394.32, and in number of men to be \$606,344, and, including those reported by the master, to be, in all, \$818,074.32.

WESTERN ELECTRIC CO. v. STANDARD ELECTRIC CO.

(Circuit Court, N. D. Illinois, N. D. March 8, 1897.)

PATENTS—LIMITATION BY PRIOR ART—INFRINGEMENT—DYNAMO-ELECTRIC MACHINES.

The Scribner & Warner patent, No. 496,449, construed in connection with the prior art, and held not infringed as to claim 2, which is for a dynamo-electric machine having pole pieces perforated on a line coincident with a plane passing through the axis of the armature shaft, whereby a uniform magnetic field is produced, regardless of the direction of rotation of the armature.

Barton & Brown, for complainant.

Francis W. Parker, for defendant.

SHOWALTER, Circuit Judge. This is a bill in equity for the alleged infringement of letters patent of the United States No. 496,449, issued May 2, 1893, on the application of Charles E. Scribner and Ernest P. Warner, to the complainant corporation as assignee. The applicants say in the specification that they "have invented a certain new and useful improvement in perforated pole pieces for dynamo-electric machines." The proposed monopoly is set forth in two claims. The action here is grounded on the second of these claims, which is in words following:

"A dynamo-electric machine having consequent pole pieces cut away or perforated on a line coincident with a plane passing through the axis of the armature shaft, such perforations being symmetrical with regard to said plane, whereby a uniform magnetic field is produced, regardless of the direction of the rotation of the armature, substantially as described."

The first claim of this patent is for the method set forth more at large in the specification, whereby the exact size of the cuttings or perforations (that is to say, the ultimate shape of the pole pieces) is attained. As I understand from the patent and from the testimony, a dynamo-electric machine is first constructed with consequent and uncut pole pieces. The predetermined resistance or full load is let into the external circuit. The armature is then rotated at the predetermined speed, and the predetermined current is generated or induced in the external circuit. The brushes, under these conditions, are put in position for maximum and sparkless commutation by experimental readjustment of the field coils. As I understand from the evidence, the point of maximum commutation is at this stage forward not only of the point of maximum electro-motive force, but forward of what will be the point of practical and maximum commutation when the cuttings or perforations in the pole pieces shall have been completed on the method of the patent. The brushes are thereupon shifted forward from point to point through the quadrant of commutation as the machine is operated, the load or resistance in the circuit being at the same time proportionately cut down. At each successive position of the brushes it will ordinarily be found that, when the current is preserved constant, sparking will appear, and that the movement of the brushes in that locality to bring them to the point of sparkless commutation reduces or changes the current

in volume. These variations in current and in the position of the brushes are noted as the exploration proceeds throughout the quadrant of commutation, and from them as a guide the cuttings or perforations of the pole pieces are finally, and after successive trials, completed. The specification contains the following statement:

"Our invention consists in producing in the field lines of force uniformly distributed as to generating or current producing effect throughout the arc or segment traversed by the coils of the armature opposite the faces of the different pole pieces, whereby the machine is made capable of running in either direction, and of being regulated under varying load to maintain constant current strength by shifting the brushes upon the commutator."

At the moment the short circuit is completed in the quadrant of commutation, the current from the working circuit with which the coil then parts is still running in such coil. This current is at once dissipated, and another in the contrary direction is induced. If this latter current be brought up to the point where it has the same volume and momentum as the working circuit which it is about to join, and if this condition be attained at the instant the coil becomes part of said working circuit, there will be neither flash nor spark. But the electrical state of the short-circuited coil is the resultant of shifting conditions. With respect to magnetic saturation, the state of the armature core varies from the region of the pole tips to the center of the pole pieces, and the poles of the armature, considered as a magnet, change in position as the brushes are moved. The uniformity of field sought by the method of the patent in suit is a uniformity in resultant effect on the short-circuited coil, to the end that, at whatever position in the quadrant of commutation the short-circuiting may occur, the current shall at the instant the short circuit is broken be the same in volume and momentum as that of the working circuit which it then joins. The cutting or perforation of the claim in suit is functional, on the theory of the patent, to secure (1) a current greater in volume than would be practical without cutting or perforation; (2) a current which is constant and uniform in volume under all variations of load; (3) sparkless commutation; and, (4) as I infer from the evidence and specification of the patent, wider range of the brushes; that is, greater variation in electro-motive force, or greater variation in load or working capacity. Prior to this patent the difficulty of sparks or flashes at the commutator was met—or the effect of sparks or flashes avoided—by brushes adjusted for variable overlap, by a construction whereby the segmental subdivisions of the commutator were greatly increased in number, or by a provision for blowing out the sparks. As I gather from the testimony, there are from 10 or 12 to 16 or 18 commutator segments in the machine made by complainant, and the brushes used in connection with such machine have a fixed overlap. The dynamo-electric machine constructed by defendant at the time this suit was brought was a consequent pole machine, with 96 segments on the commutator. Each pole piece contained a cut or perforation in the center, on a line coincident with a plane through the axis of the armature, and symmetrical with reference to said plane. The pole pieces were not, however, shaped or cut pursuant to the method of the patent;

nór, apparently, were said pole pieces, especially if the base or bed plate is to be considered, quite uniform in shape or volume of magnetic material, or symmetrical with respect to each other. The effect of the cutting in the case of the machine as made by defendant was intended to be, and in fact was, to increase the volume or quantity of the current. A machine which, for instance, without the perforation, would yield a current of seven amperes, became, with the perforation, an eight-ampere machine. With the pole pieces uncut, the current would decrease from no load to full load. When perforated, the tendency of the current was to increase in volume from no load to full load. But in defendant's machine the cuts or perforations in the pole pieces did not enlarge the working range or variation in electro-motive force, nor were they the means of securing sparkless commutation. So much I gather more particularly from the testimony of Clinton E. Woods, a practical electrician, called by both the parties as a witness. The iron ring or core of the revolving armature is itself, as before suggested, a magnet. I gather from the testimony and the arguments that, when the machine is in operation, there results out of the condition of the armature a magnetic flow or current from the neighborhood of the forward tip of the pole piece along the adjacent armature core to the rear pole tip; thence across the gap space; thence along the pole piece back to the forward tip; thence across the gap space to the armature core. The lines of force due to the field magnets, and which enter the armature core, crossing the gap space from the center of the pole piece to the forward tip, and so proceeding by the armature core to the opposite pole of the field magnets, are, within the space along the armature core from the forward tip to the center of the pole piece, antagonized by the magnetic flow in the armature core already spoken of. There results from this antagonism what is called the "distortion of the field due to armature reaction." The field of force is thus narrowed and weakened, especially near the pole tip, or the place of maximum commutation. The cutting or perforation in the pole piece interposes an additional resistance to that current, which is due to the magnetic condition of the armature; thus strengthening the field, and shifting it in the direction of maximum, and from the point of minimum, commutation. In this way the quantity or volume of the current in the external circuit, but not necessarily the working range of the machine, is increased. Counsel for complainant say in their argument, in reply:

"It will be seen that the perforation or slot in the pole piece obstructs or throttles the magnetic flux, or increases the magnetic reluctance; and therefore it destroys, to a certain extent, the effect of the magnetism of the armature core. Now, the effect of the magnetism of the armature core is to neutralize the effect of the field magnet, and this neutralizing effect takes place at the tip of the pole piece [meaning the forward tip]. The result of this neutralizing or demagnetizing effect of the armature core magnet is to cause the magnetic flux in the vicinity of the tip of the pole piece [meaning the forward tip] to be much weaker than it should be. So the cutting of the slot in the pole pieces, which destroys the effect of the magnetism of the armature core to a certain extent, by increasing the resistance of the magnetic circuit from one pole to the other of the armature core, has the double effect of weakening the field magnet at the point where the field magnet tends to concentrate the lines of

force, and also to remove the antagonistic effect of the magnetism of the armature core at the pole tip [meaning the forward tip]."

They say, further, in explaining the operation of the complainant's machine (and this is also in their reply argument):

"In the operation of a dynamo, the armature lines of force flowing through the pole pieces, being of the same polarity as and opposite in direction to the lines of force flowing from the pole pieces through the armature, will repel the field of force lines, and force them in the direction of rotation of the armature. This is called the 'distortion of the field of force due to armature reaction.' The effect of the distortion of the field of force is to concentrate the lines of force at the middle or central portion of the pole pieces, and to materially diminish and weaken the lines of force at the forward tips of the pole piece, and by this we mean at the tip where the short-circuited coil enters when the brushes are adjusted for full load."

The specification of the Hochhausen patent, No. 404,848, dated June 4, 1889, contains the following statements:

"The object of my invention is to * * * heighten the efficiency of dynamo-electric machines. My invention also relates to the construction of the field-of-force magnet for dynamo-electric machines and motors, and, in some of its features, relates more especially to machines of the kind in which the field magnet is composed of two or more electro-magnets having their like poles conjoined to form a magnetic field-of-force pole [that is, to consequent pole machines]."

I quote further from the Hochhausen specification:

"In machines of this construction, it is common to use as the pole a mass of iron joining the ends of the magnets, and curved to form a proper pole face for the armature rotating in proximity to it. Owing to a reaction between this mass of iron and the armature of the machine, the line of strongest magnetization and the line of commutation are in ordinary machines shifted to a greater or less extent forward in the direction of rotation when the machine is in operation. With field-of-force magnets, as ordinarily constructed, I have found that there is not, strictly speaking, a symmetrical magnetic field, and the brushes of the machine cannot be set exactly on a diametrical line. My invention consists of a field magnet having a perfectly symmetrical field produced in obvious manner; that is to say, by a symmetrical disposition of the masses of iron making up the field magnet or the framework with relation to the field-of-force poles. Pieces or blocks of diamagnetic material—such as brass, and indicated at F—serve to mechanically unite the juxtaposed pole ends without furnishing any mass of magnetic material, which, as before explained, might give rise to a distortion of the magnetic field during rotation of the armature. The form of magnet shown and described gives great compactness, and at the same time a highly-intense magnetic field for the armature is obtained. It will be seen that, from the construction just described, there is practically no mass of iron forming a pole piece for the machine that is not under the strong and direct influence of field-of-force coils; and it results, therefore, that, owing to the absence of the usual mass of magnetic material removed from the coils, but employed to join the pole ends of the electro-magnets, the armature is less able to shift the line of strongest magnetism in the direction of rotation."

The slot or space in the center of the pole pieces is also emphasized by Hochhausen in his second, third, and fifth claims, which are as follows:

"(2) In a dynamo-electric machine or motor, a field-of-force magnet consisting of two electro-magnets, whose cores are curved in the arc of a circle which, prolonged, would pass through the center of the armature, and which magnets have their core ends of the same name magnetically distinct, so far as concerns union by a mass of nonmagnetic material, but held in proper proximity and properly formed to constitute together a field-of-force pole piece. (3) In a dynamo-electric machine or motor, a field-of-force pole piece consisting of two magnet-

core ends of the same polarity, arranged in proximity, with the axes of the magnet cores at the end presented to the armature, forming substantially a perpendicular to the circle of the armature periphery, in combination with uniting pieces of nonmagnetic material, as and for the purpose described." "(5) In a dynamo-electric machine or motor, a field-of-force magnet composed of two electro-magnets whose like poles are placed in proximity, but are magnetically disunited, in combination with the uniting diamagnetic block, and whose magnetic axis continued from their pole ends would cut the circular periphery of the armature at a right angle."

It is said that the Hochhausen machine has no pole pieces, and is thereby distinguished from the invention of the patent in suit. Pole pieces are merely extensions of the magnet cores beyond the coils in order to form the concave or cylindrical space between the opposite poles in which the armature may revolve. The windings in the Hochhausen machine are brought far towards the ends of the cores, and over the pole pieces. In that machine the pole pieces may be said to be rudimentary or initial, but they are there, and they are consequent pole pieces. If the ends were brought in contact; if the cut, which in that machine is on a line coincident with a plane through the armature axis, and symmetrical with reference to said plane, were not made; if the interposed strip were not nonmagnetic,—the distortion of the field due to armature reaction would be present in that machine. The slot filled with the nonmagnetic material has distinctly the function of abating the armature reaction, as against the lines of force between the field magnets, by interposing a resistance to the magnetic current in the armature core, and so of strengthening the field near the forward pole tips. So far as I can find, there is not in the Hochhausen patent, or in any prior patent wherein slotted or perforated consequent pole pieces are shown, any suggestion that the slot or perforation is so made as to secure sparkless commutation, constant current, or wider variation in the range of the brushes. But, as said, strengthening the field by abating armature reaction, and so increasing the volume of the current, is the distinct purpose of the slot in the Hochhausen machine; and this, as also noted above, is the function of the slot in the machine made by defendant when the suit was brought. In the machine as subsequently made by defendant, the pole pieces are not perforated, nor are they cut out eccentrically, as described in complainant's patent. Moreover, the number of commutator segments is increased in the new machine from 96 to 132. It is not stated in the claim that the opposite poles are uniform in volume, or symmetrical in construction, with respect to each other. But the diagrams seem to show that they are so made, and, from the requirement that the armature is to be rotated in either direction, it might be plausibly concluded that the opposite poles must present to each other faces of the same dimensions, and must be symmetrical in volume of magnetic material. On this ground, perhaps, the machine of defendant is also distinguished from that of complainant. However, for reasons before given, and on what seems to me the best conclusion from the evidence, I think the claim is so far limited by the prior art that the defendant does not infringe. The bill is therefore dismissed for want of equity.

NATIONAL FOLDING-BOX & PAPER CO. v. ELSAS et al.

(Circuit Court, S. D. New York. May 26, 1897.)

1. PATENTS—POWER OF COURT TO INCREASE DAMAGES.
Under Rev. St. § 4921, the power of the court to increase the damages may be exercised in equity as well as at law.
2. SAME.
Statutory authority to give treble damages includes authority to multiply or increase them to any amount less than treble damages.
3. SAME—CONCEALMENT OF BOOKS.
In a case of deliberate infringement, the spiriting away by defendant of his books after decree against him, to embarrass the accounting, constitutes good ground for imposing increased damages, under Rev. St. § 4921.
4. SAME—INTEREST.
Interest cannot be added to the damages, from the filing of the bill, before a doubling of the damages by the court.

This was a suit in equity by the National Folding-Box & Paper Company against Herman Elsas and others for infringement of a patent. The cause was heard on a motion by plaintiff to be allowed treble damages.

Walter D. Edmonds, for plaintiff.

Arthur v. Briesen & Harry M. Turk, for defendants.

WHEELER, District Judge. This case shows deliberate infringement in attempted defiance of the plaintiff's patent, and spiriting away of the books of the defendants after decree, to the great embarrassment of the accounting. On settlement of the final decree the plaintiff moved for treble damages, and this motion has now been heard. The defendants insist that damages can only be trebled or increased at law, which at some time may have been true; but the present statute seems to fully provide for this. Rev. St. § 4921. The master has reported damages, not profits, and seems to have been driven to that aspect of the case, and hampered there in finding full damages, by the acts of the defendants in concealing their books. In view of this situation, this seems to be a very proper case for the application of this statute, and for an increase of damages under it. Authority to treble, of course, includes authority to multiply, or increase, to any amount within what trebling would reach. From the nature of this allowance the award does not rest upon, but must go beyond, actual damages capable of legal proof, and rest largely in discretion, like exemplary damages in actions at law. Upon consideration of the conduct of the defendants here the damages reported, \$382.90, are doubled, making \$765.80. The plaintiff has submitted a computation including interest on the damages found from the bringing of the bill, which amounts to \$122.34, and would make the damages found \$505.24. To double this would double interest, which would not be lawful, even if the interest was allowable. But while lapse of time and what money would bring at interest may be considered in assessing damages for an injury done considerably before, interest upon unliquidated damages does not seem to be allowable before verdict, judgment, or decree. *Silsby v. Foote*, 20 How.