

tip was therefore new. Undeniably it was useful. It was, therefore, the proper subject of a patent, unless the substitution of the muslin and shellac for leather or vulcanized rubber was such an obvious thing to persons skilled in the art that it did not involve invention. This is always a question of fact. In this case it would not be in the least doubtful were it not that there was nothing new in pressing by heated dies muslin or similar textile material coated with shellac into such form and shape as was desired. But it was not obvious that when muslin coated with shellac might be pressed by dies into the form of a shoe tip, the beveled configuration could be dispensed with, and that a serviceable, practical article could be produced. The circumstances that the value of the new article was immediately recognized, and that it supplied a want long felt, but not before met, should have due weight, and in this case go far to resolve all doubts in favor of the sufficiency of invention.

A decree is ordered for complainants.

LANSBURGH *v.* HASBROUCK and others.

(*Circuit Court, S. D. New York. May, 1883.*)

PATENTS FOR INVENTIONS—REISSUE INVALID—IMPROVEMENT IN FILTERS.

The reissued letters patent granted to complainant as assignee of Louis Raecke, September 16, 1879, for an improvement in filters, expand the claims of the original, granted to said Raecke January 17, 1871, and are invalid.

In Equity.

Worth Osgood and Henry A. Seymour, for complainant.

Thos. N. Cator, for defendant.

WALLACE, J. The conclusion is reached that the reissued letters patent granted to the complainant as assignee of Louis Raecke, September 16, 1879, for an improvement in filters, expand the claims of the original and are invalid. The original patent was granted to Raecke January 17, 1871. December 14, 1875, a patent was granted to Thomas R. Sinclair for an improvement in apparatus for filtering liquids, and the rectifying devices constructed in conformity with this patent are now sought to be adjudged to infringe the complainant's reissue.

The original patent to Raecke was granted January 17, 1871. That patent described his invention fully, and without any ambigu-

ity, and upon the first inspection indicated clearly what Raecke had conceived and accomplished. His invention related to that class of filters in which the filtering medium is composed of wool, cotton felt, or similar material, and in which the sieve or exit for the escape of the filtered liquid is located at the bottom of the filtering chamber. In such filters the presence of the liquid during filtration tends to compact the mass or body of the filtering material in the chamber of the filter and create a space between the material and the walls of the chamber, consequently more or less of the liquid finds a channel between the walls and the material, and reaches the sieve without having passed through the filtering material sufficiently for purification. Raecke proposed to obviate the escape of the liquid in an unfiltered condition by forming a receptacle at the bottom of the chamber, between the walls and the exit, in which the filtering material could be so densely packed that the liquid could not create a space or channel along the walls, but would be forced by the density of the packing to pass from the walls and find a passage through the filtering material. To accomplish this he built upon the bottom of the chamber, between the walls and the exit passage, a flange running around the whole chamber, concentrically with the walls, thus forming a contracted space in which the filtering material could be densely packed, and through which the liquid would have to pass after leaving the channel at the wall before it could escape at the exit. It was important that the packing receptacle should be proportioned to the size of the filtering chamber. A large space in a small chamber could not be packed materially better than the body of the chamber. On the other hand, a small space in a large filter would hold so little material that it would not be of much practical benefit. Accordingly Raecke pointed out in his specifications that the height of the flange, and the distance it should be placed from the walls of the filter, should be adjusted to the size of the filter, and the proportions to be observed were approximately stated. Raecke also used a sieve at the top of his filtering chamber through which the liquid to be filtered would pass to the filtering chamber, and which served to keep the filtering material in the body of the chamber in place. There was no novelty in this feature of his filter.

The claims of the original patent were as follows:

- (1) In a filter, a sieve constructed with a flange so placed on its surface as to leave a space between the said flange and the walls of the filtering vessel;
- (2) packing the space between the flange and the walls of the cylinder so closely with the filtering material as to prevent the fluid from passing down the walls

and out the sieve in an impure state; (3) a filter constructed and arranged as hereinbefore described, viz., having two sieves with a filtering material of wool, cotton felt, or other fibrous material between the same, and the lower sieve having on it a flange, all combined as and for the purposes described.

Undoubtedly these claims were defective. In each claim essential elements of the combination which constituted Raecke's invention were omitted. The claims in the reissue purport to restrict and limit the claims of the original by incorporating into each claim elements which were omitted in the claims of the original. If they could be fairly construed as narrowing the claim of the original, the reissue would not be obvious to criticism unless by not claiming what was described there was such an abandonment to the public that the right to a reissue covering intermediate improvements, made by others in the same field of invention, has been forfeited by laches. But it is apprehended that the claims, when read, as they must be, with the descriptive portions of the specification, expand the scope of the patent, and are calculated to confer on the complainants the exclusive right to improvements which Raecke did not invent. What Raecke invented may be appreciated by a reference to the patent which had been granted to Benjamin Best, March 27, 1866. Best's patent was for a filter in which charcoal, sand, or a similar filtering medium was to be employed. His exit passage was located at the bottom of the filtering chamber, and he had erected a flange on the bottom of the chamber, which extended around the whole chamber. The flange thus formed a chamber or packing space between the walls of the filter and the exit passage. The only material variation between his structure and Raecke's was that the packing space formed by the flange was much larger in proportion to the body of the filtering chamber. Undoubtedly Best did not intend to use this space as a packing chamber, and it could not be packed as tightly as Raecke's, because it was larger in proportion to the body of the filtering chamber. But, in view of Best's devices, all that Raecke did was to adopt them by modifications in their proportions for a filter in which a yielding and pliable filtering medium was to be employed, in order that this filtering material could be tightly packed in the space between the walls and the flange. When he had done this and packed the space, his invention was perfected. It is apparent that Raecke's invention was a narrow one. As the packing was to be done with the filtering medium peculiar to his particular class of filters, the original patent could not have been construed to sanction any claim for a combination in which the packing receptacle packed

with the peculiar filtering material of his filters was not an element.

It is sought by the reissue to emasculate this element, and by eliminating from the descriptive portion of the specification all reference to the particular class of filters, and the special characteristics of the filtering medium to prepare the way for claims in which an annular chamber packed with any kind of packing material is an element. The claims of the reissue are as follows:

(1) A filter having filtering material packed in an annular chamber formed by a flange located between the wall or inner surface of the filter and sieve or foraminated exit through which the liquid flows from the filtering vessel, whereby the liquid that flows along down the walls of the filter is caused to flow inwardly and away from the inner surface of the filter, and through the filtering medium, before it reaches the foraminated exit, substantially as and for the purpose set forth. (2) A filter provided with a filtering diaphragm, located in the upper portion of the filter, and an annular chamber in which filtering material is packed, located between the wall or inner surface of the filter and the sieve or foraminated exit through which the liquid flows as it escapes from the receptacle in which the filtering material is packed, substantially as set forth

These claims, by legitimate and necessary construction, when read by the descriptive portion of the specification, are admirably adapted to embrace the improvements of Sinclair when his filter is packed with sand or charcoal. His patent describes ledges, deflectors, or shelves projecting inwardly from the walls and bottom of the filter, the office of which is to present obstructions or barriers across channels which may be formed by the liquid under filtration between the mass or body of the filtering material and the sides or walls of the chamber. The ledges may extend in continuous lines around the walls and upon the bottom, or in broken lines. They serve to deflect the liquid from the walls into the body of the filtering material. His filter was not designed for the use of such fibrous filtering material as Raecke employed, but was for charcoal or similar material. Undoubtedly, these ledges, when located on the bottom of the filter, and made to extend in continuous lines concentrically with the walls, afford spaces in which the material may be packed. It is quite possible that when the filter is filled, the filtering material is packed more tightly in these spaces than in the body of the chamber, and thus, incidentally, the same result may be effected, to some extent, as is effected by packing Raecke's devices. Obviously Sinclair's devices were not designed to create receptacles for dense packing of the filtering material. Whether it was intended by the reissue to appropriate, for the benefit of the complainant, the monopoly of the im-

provements made by Sinclair, it is unnecessary to decide. It suffices that after nearly eight years had expired, and after Sinclair had occupied the same domain of improvement, the reissue which was obtained expanded the claims of the original patent.

The bill is dismissed.

THE SHAND, etc.

District Court, S. D. New York. May 23, 1882.)

1. DAMAGE TO CARGO—APPORTIONMENT.

Where a cargo has been damaged by independent causes, for only a part of which the ship is liable, the loss will not be equally divided nor cast wholly upon the ship except as a last resort, and when all means fail of making an approximate apportionment of the loss to the several causes of damage.

The cases of *Speyer v. The Mary Belle Roberts*, 2 Sawy. 1, and *Snow v. Car-ruth*, 1 Spr. 324, distinguished.

2. SAME—METHOD OF COMPUTATION.

A cargo of sugar in mats having arrived at New York on the ship S., nearly flooded with water from sea perils for which the ship was not responsible, the water was pumped out by persons employed by the ship; but shortly afterwards, through negligence for which the ship was held liable, was suffered to be flooded a second time. *Held*, that an approximate apportionment of the loss of sugar from the two floodings was possible, though attended with great difficulty, and that the ship should be held liable for the latter loss only, as thus determined.

Exceptions to Commissioner's Report assessing damages at \$30,-328.63.

On Wednesday, December 27, 1876, at about 12 m., the ship Shand, on her voyage from Manilla to New York, arrived at her dock at Martin's stores, at this port, in a sinking condition, having 10 feet of water in her hold. Her hold was 15 feet deep, and at Manilla was stowed solid from a little abaft the quarter hatch to a little forward of the fore hatch, with sugar in bags or mats, resting upon a platform built up three feet and four inches from the bottom of the hold. The sugar was owned by and consigned to the the plaintiffs' agents, under the usual bills of lading. The rise of water above the level of the platform had occurred within three days prior to the arrival of the ship, and during the last 24 hours it was only with the utmost difficulty, and by the employment of fresh hands at the pumps from quarantine, that she was kept afloat. After her arrival a steam-pump was procured and got to work at about 9 o'clock Wednesday evening, by which

the water was pumped down to the level of the platform by 3 A. M. of Thursday, the 28th. The water was not pumped lower by the steam-pump through inability to carry its suction-hose deeper in the well. The cargo between-decks was discharged during Wednesday night and Thursday forenoon, and on Thursday afternoon the discharge of the sugar was commenced from the main hatch. The steam-pump during this time had been worked at intervals sufficiently to keep the water down to the above-named level. On Thursday night, however, through some neglect or defect in the pump, it ceased to work, and at 7 o'clock on Friday morning, the 29th, the water was found to be nine feet deep, and remained about the same until between 9 and 10 o'clock, when the steam-pump was again got to work and pumped the water down again to the level of three feet six inches, by or before 2 P. M. The whole loss and damage by both floodings were \$129.-471.71.

The sugar shipped at Manilla amounted to 34,742 mats, weighing 2,240,000 pounds, or about 64 pounds net to the mat. During the voyage 3,079 mats were jettisoned; and, deducting the average weight of this number from the total weight, there should have remained to be delivered 31,663 dry mats, weighing 2,026,432 pounds. There were, in fact, delivered but 1,327 dry mats, weighing 82,270 pounds; all the rest were more or less wet and damaged; and only 913,876 pounds were discharged upon the wharf, including the dry mats above mentioned, showing sugar dissolved and lost to the amount of 1,112,556 pounds. The discharge from the ship was completed on the sixth of January, and on the ninth, all the wet and and damaged sugar was sold at auction, weighing 801,269 pounds.

On the twelfth day of January, 1877, the libelants filed a libel in this case to recover damages for the loss and injury of the sugar by both floodings. On the trial of the cause, before CHOLATE, J., (*The Shand*, 10 Ben. 294,) it was held that the loss and damage caused by the first flooding arose from a peril of the sea, within the exceptions of the bill of lading, for which the vessel and her owners were not answerable; but that the loss and damage caused by the second flooding, through the failure to keep the vessel properly pumped out, arose through negligence, chargeable upon the vessel and her owners; and an order of reference to a commissioner was made to ascertain the amount of that loss and injury.

After a protracted examination, in which the evidence was very voluminous, the commissioner reported three items of loss and dam-

age: (1) That 4,653 mats of sugar, which were dry after the first flooding, were wet by the second flooding; that these mats, if sound, were worth, at the market rate at the time of the arrival of the ship, \$24,721.70, but, in their damaged condition, brought at the auction sale on the ninth of January only \$12,842.28, showing a loss and damage upon this item of \$11,879.42; (2) that there was a further loss and waste caused by the second flooding of sugar which had been previously wet to the amount of 408,893 pounds, which, at the rate of 3.35 cents per pound, the price of the auction sale of the thoroughly wet sugar, amounts to \$10,471.29; (3) that by a further partial flooding on the morning of Thursday, the 28th, through neglect to keep the water pumped down, there was an additional loss of sugar previously wet of 13,423 pounds of pure crystallizable sugar, worth \$1,114.38. These three items together amount to \$23,465.09, which, with interest from December 27, 1876, to November 12th, the date of the report, makes \$30,328.63, which the commissioner awarded to the libelants for their loss and damage by the second flooding.

Both parties excepted to the report.

Benedict, Taft & Benedict, for libelants.

Butler, Stillman & Hubbard, for claimants.

BROWN, J. The principal exception on the part of the libelants is based upon the ground that the claimants have failed to show what was the amount of the loss and damage occasioned by the first flooding as distinguished from the second; that the burden of proof was upon them to show affirmatively and definitely what portion of the loss and damage they are legally exempt from; and that, not having done so, they are legally chargeable either with the whole amount of the loss, as was held in *Speyer v. The Mary Belle Roberts*, 2 Sawy. 1-6, or at least for the one-half part of the entire loss, as in the case of *Snow v. Carruth*, 1 Spr. 324, 327. In the case last cited there had been a loss by leakage upon barrels of oil and tierces of lard shipped from New Orleans to Boston. SPRAGUE, J., says:

"I am satisfied that the great loss in this case (above the necessary leakage) was partly attributable to the negligence of the carrier, and partly to the negligence or misfortune of the shipper or consignee, and that it is not practicable to ascertain for how much of the loss the one party or the other is, in fact, responsible. I am, therefore, obliged to adopt some arbitrary rule in determining the amount to be allowed the respondents. An analogy may be found in the rule adopted by courts of admiralty, in cases of collision, when both parties are in fault. In such cases the aggregate amount of the damages is divided equally between the parties."

In the case of *Speyer v. The Mary Belle Roberts*, which was an action for damages for an injury to goods on a voyage from Hamburg to San Francisco, on the part of the vessel it was claimed that the damage had arisen mainly through the access of water to the cargo arising from the severe weather encountered. The libelant claimed that it arose from bad stowage and insufficient dunnage. HOFFMAN, J., says:

"In the view I take of the case it is not necessary to attempt to determine (if that were possible) how much of the injury to the cargo is to be attributed to this cause," (perils of the sea.) "That some of it was due to it cannot, I think, be denied; but probably no very considerable amount when compared with the total damage. * * * But the most important allegation of the libel with regard to the stowage of the cargo and the insufficiency of the dunnage, appears to be clearly established by the proofs. * * * That the cargo would have sustained, even if properly dunnaged, some injury from the unavoidable effect of sea perils encountered by the vessel, and her consequent leaking, must be admitted. But what would have been the extent of that injury, and how much of the damage is to be attributed to each cause, it is impossible now to ascertain. * * *

"It is evident that in this case the carrier is liable for all injuries which, though immediately caused by a peril of the sea, would not have occurred had not his own negligence contributed to produce the injurious result. * * * The real difficulty in the case arises from the fact, which, however, is not conclusively established, that the cargo would have sustained some damage even if it had been properly stowed; but how much cannot be known. We are thus forced to choose between two alternatives,—either to hold the carrier responsible for damages, a part of which he is not accountable for, or else to deny to the shipper any compensation for losses which, in great part, were caused by the carrier's fault. The former alternative must, in my opinion, be adopted. * * * The cargo being found to be damaged, the burden of proof was on him" (the carrier) "to show that the loss was occasioned by one of the causes which, by law and the terms of his contract, afford an excuse for its non-performance. * * * To excuse himself for that portion of the loss for which he is not liable, he must show how much that portion is; and, unable to exonerate himself *in toto*, he should establish the degree and extent of the exoneration to which he is entitled. If he fails to do this, it seems to me that he must be held responsible for the whole damage."

In both the cases cited the rule adopted was applied as a rule of last resort only, it being conceded that any attempt at an apportionment would, in these cases, be impracticable. In the case of *The Mary Belle Roberts* it was "not conclusively established" that any part of the damage was caused by a peril of the sea, and if any were so caused it was comparatively small; while in the other case the leakage was owing to the negligence of both, and there were no

data whatever for determining what part or proportion was owing to the negligence of either. In each case the rule applied was adopted to prevent a failure of justice, not as an exact measure of what was in fact due to each of the causes of loss, for that was not ascertainable, but because it was the nearest approximation to justice which the circumstances of the case permitted. In the case of *The Mary Belle Roberts*, where the loss from sea peril, if any, was comparatively small, it was just to hold the carrier answerable for the whole unless he could show how much was to be deducted on account of the minor cause as to which he might claim exemption. But if the general circumstances of the case show that the loss has probably arisen as much from the act or cause attributable to the one party as from that attributable to the other, there would be no justice in imposing the whole loss upon one simply because he could not separate and distinguish the exact amount arising from his own fault; and the rule adopted by SPRAGUE, J., is, in such a case, obviously the juster one. But neither of these rules can be rightly applied where the facts and circumstances afford the means of a tolerable approach to accuracy in an apportionment of the loss to the several parties, or where an approximate apportionment of the damages is practicable.

In the case of *Rogers v. Mechanics' Ins. Co.* 1 Story, 603, 609, cited by the commissioner, STORY, J., says, in reference to the value of blubber jettisoned:

“It is said that it is difficult, and indeed impracticable, to ascertain its true and exact value when thrown overboard. There may be difficulty, and perhaps an impossibility, to ascertain its exact and minute value, for we have no means of weighing it in scales, or fixing its positive price. But the same difficulty occurs in many other cases of insurance; as in cases of injuries to sails or rigging or spars by tempest, or by cutting them away in cases of jettison; and yet no one doubts that they must be contributed for according to their value, ascertained by a jury, in the exercise of a sound discretion, upon proper evidence. Suppose that fruit is insured, and the vessel has a long passage, in which, by ordinary waste and decay, it must suffer some deterioration, and then a storm occurs in which it suffers other positive damage and injury, or there is a jettison thereof; how are we to ascertain what diminution is to be attributed to natural waste and decay, and what to the perils of the sea? or what was its true value at the time of the jettison? There can be no positive and absolute certainty. The most that can be done is to ascertain, by the exercise of a sound judgment, what, under all the circumstances, may reasonably be attributed to one case, and what to the other. Absolute certainty in cases of this sort is unattainable. All that we can arrive at is by an approximation thereto; and yet no man ever doubted that such a loss must be paid for, if it is covered by the policy.”

The libellant's counsel contends that this principle is not applicable to actions sounding in tort as for negligence against carriers. But, in cases like the present, where the injury is not malicious or willful, I do not perceive any basis in justice or sound reason for any distinction. The question in each class of cases is, what is the actual damage arising from the cause for which the carrier is responsible? and in both alike the obligations arising from the burden of proof are satisfied by proof of such facts and circumstances as enable an approximately correct division of the loss to be made, and by making whatever margin of uncertainty may still fairly exist upon the testimony, chargeable against the party who has the burden of proof. The burden of proof in this case, as held on the trial, is upon the claimant as carrier of the goods, (*The Shand*, 10 Ben. 294, 311;) and, as such, he must bear whatever loss is not shown with reasonable certainty to have arisen from the first flooding of the sugar, or the prior waste from perils of the sea.

The facts proved are in my judgment sufficient to render inapplicable the rule adopted in either of the cases first cited, because they show that of necessity the principal part of the loss must have arisen from the first flooding, and that an approximately correct division of the whole loss and damage from the two floodings can be made. This is apparent from the report of the commissioner, which is based upon all the proofs and evidence in the case. The evidence, though voluminous, complicated, and to a degree indefinite and contradictory, is, nevertheless, evidence as tangible and certain as that from which juries are often forced to estimate damages, and more so than sometimes happens in trial by jury. *Spaight v. Farnworth*, L. R. 5 Q. B. Div. 115; 29 Moak, Eng. 200.

The claimants' exceptions are to the commissioner's conclusions of fact, being chiefly directed to his findings as to the amount of sugar previously wet which was lost and carried off by the second flooding, and to his finding that there was any sugar left dry by the first flood which was lost or wet by the second.

Upon the last point the conclusion of the commissioner is based on the fact that two experienced examiners of sugar cargoes visited the ship on Thursday noon, (December 28th,) the day preceding the second flood, went down into the lower hold and walked about upon the sugar for the express purpose of seeing what sugar was wet, having heard that the ship had been flooded; that they then could find no signs on the surface of any part of the sugar having been wet, though

they walked around on the sugar from the after hatch to midway between the main and fore hatches; that in the afternoon, on breaking down into the sugar at the main hatch and working out head-room for discharging, from two or three to five or six tiers of dry mats were found above the 10-foot water line of the first flood; that on Friday, the following morning, at 9 o'clock, when the second flooding showed nine feet of water in the hold, on looking down the hatch from between-decks, no whole tiers of dry mats were visible, but only about a half of a tier of mats was seen around the hole made in discharging from the main hatch the day before, while all the sugar at the after hatch was submerged, whereas on the day previous it had been dry; and that out of all the mats contained in the two to five tiers which showed dry on Thursday afternoon, only 1,327 mats, or the equivalent of about one tier only, were dry upon the final discharge of the ship; and that of these 1,327 mats at least one-half must have been discharged on Thursday before the second flooding.

The commissioner finds that there was an average of four tiers of dry mats on Thursday noon, containing 5,980 mats; whereas, on the final discharge, only 1,327 in all came out dry. The difference he charges to the second flooding. The claimant contends that the water did not come up any higher upon the sugar on Friday than it had done on Wednesday noon, upon the following grounds: (1) Because the former water line was 10 feet and the latter only nine feet, and these measurements are substantially undisputed; (2) because the master, mate, and all the stevedores testified that they saw no settling of the cargo between these dates,—three of them say there was no settling, and most of them say the flood of Friday was two tiers below the water line of Wednesday; (3) because about 5,000 mats came out substantially dry, instead of 1,327.

The claim that more than 1,327 mats came out dry, or substantially uninjured, is not sustained by any sufficient evidence. The mats were separated as they were discharged by persons employed by the claimant; they were weighed by the custom-house officers as they were separated. The 1,327 dry mats, and no more, were delivered by the claimant to the libellant as sound; the others were all sold at auction on January 9th, three days after the discharge was completed, as damaged mats. It was the business of the claimants in their own interest to see that this separation and sale of damaged sugars was properly made; it is not to be supposed that they did not do so at the time, and the only support for the claim now made is

based upon the weights of the mats, about 5,000 of which are shown to have run from 57 to 63 pounds,—64 pounds being the average of a dry mat, as shown by the number of mats and total weight given by the bills of lading. But these weights, from 57 to 63 pounds, are not proof that any of those mats were not wet or damaged. Some dry mats ran as high as 70 pounds weight and upwards; so that the weights of those 5,000 mats, as returned, are quite consistent with a considerable loss of sugar from the mats, and there is no evidence whatever that any mat put among the damaged lot was not more or less damaged inside by salt water; all the direct evidence is that they were thus damaged inside. Some of the best were examined and found to be dry in the center, though wet with salt water on one side; and others were wet on all sides, though dry in the center. The first effect of water upon a dry mat is to increase its weight, and this continues until the sugar begins to dissolve and run off. No account of the absorption of water was taken by the commissioner; he gave credit for the full weight returned by the custom-house weighers in estimating the loss of dry sugar, by deducting their returns from the full average weight of dry mats. The weighers allowed a tare of three pounds per mat. Whether or not this was larger than belonged to the dry mats I have been unable to ascertain, as the evidence shows nothing on the point, and the bills of lading give only the "net" weight of the sugar, the tare allowed not being stated.

The evidence, therefore, will not admit of any increase in the number of dry mats delivered; and no theory of the flooding can, therefore, be accepted, which does not fairly account for the wetting of all the rest of the bags. To the testimony of all the witnesses, that there were on Thursday noon from two to five dry tiers visible where the stevedores broke out in the main hatch, the claimant urges that this was true at the main hatch only; and that the cargo sloped downward from this point in all directions, so that the three to five tiers would make no more than the dry mats delivered. There was, doubtless, some settling close along the wings of the ship, to which I shall presently refer. But, aside from this, I find no evidence of any general sloping from the main hatch. On the contrary, all the witnesses say it ran higher midway between the main and fore hatches; all say it was lowest right below the main and after hatches; and between the latter Dougherty says it was hilly, and then tapered off towards the after hatch; while Cameron on the trial testified that it was higher by four to five mats beneath the main hatch and the wings

than beneath the main hatch; nor is there any cause assigned for any considerable sloping fore and aft, save the jettison, of which due account will be hereafter taken.

Increased settling of the cargo took place, no doubt, along the skin of the ship, from the washing out of sugar through the rolling of the vessel in rough weather, before the water reached the sugar platform. But Dougherty, the stevedore, by whose testimony this fact is directly proved, gives only one mat, or about six inches, as the difference in height along the wings. He says he could stand upright there on Thursday P. M., and he was five feet four inches tall. This would make an aggregate difference of about 192 mats only along both wings. Between the main and fore hatches the cargo was from one to two tiers higher, possibly from being filled up higher there between the beams, through increased thickness of some bags, or by less effect of the water there. Beyond this, I find no evidence in the case of any other difference or inequalities in the cargo, save those which may be ascribed to the irregularities in stowing between the beams and the jettison of 3,079 mats, and no other assignable cause for any additional settling of the cargo. Only about 1,700 of these 3,079 mats could have been taken from the lower hold, as, in stowing, the main hatch was filled with bags up to the upper deck, which would hold about 1,380 mats, and these were jettisoned, as the master testifies, before any were taken from the hold; and the latter were naturally taken more from beneath the hatches themselves, so as to leave the cargo sloping upwards each way from the hatches; and such is the evidence of all the witnesses who testify on this point.

There was, probably, some derangement of the extreme end of the sugar cargo abaft of the quarter hatch, where the hemp had got loose; but the evidence does not show this to have been of a sufficient extent to affect materially the general height of the cargo, and, on the whole, I find no other irregularities than those I have specified. The witnesses on both sides say the cargo was lower under the main hatch than all around it. Wrecks and Myers, who were each about six feet three inches tall, could there stand upright, while elsewhere they could not walk on the cargo with freedom and ease, but only with difficulty and much stooping; and they did not go further forward than midway between the main and fore hatches because the height of the cargo there made it difficult to pass. The testimony of the claimants' witnesses that there was no settling of the cargo between Wednesday noon and Friday morning is mostly of a negative

character; to the effect that they did not notice any such settling, although two or three of them say that there was no settling. So, also, almost all of them testify that the water on Friday did not come up to the former water-mark by two tiers of mats, and some say it did not reach by that distance the former stained water-mark on the mats of sugar; and upon this testimony the claimant insists that there was no settling at all between Wednesday noon, when the first flood left its highest mark of 10 feet on the sugar mats, until 9 A. M. of Friday, when the water measured but 9 feet, the difference of one foot being equivalent to two tiers of mats.

This testimony, if construed in reference to the first water-mark left visible upon the sugar itself, and not to that left on the stationary parts of the vessel, cannot be received as correct, because not only improbable, but utterly incredible. After Wednesday noon the water remained nearly stationary till 9 P. M., and was not all pumped off till 3 A. M. of Thursday, 15 hours afterwards. After that hour the whole cargo of wet sugar was draining for 18 hours, and then during 12 hours succeeding the water rose to nine feet again; so that there was a period of 45 hours during which the sugar was exposed to the active destructive agency of water. If the cargo had sunk at least two and a half feet during the 40 hours preceding Wednesday noon, on the line of the keel fore and aft, where it would not be affected until the water rose above the sugar platform, (which was not until after 5 P. M. of Monday, the 25th,) it is not credible that the cargo should not sink at all during the 45 hours next afterwards. If to this be added the fact that the entire loss of sugar was equivalent to a sinking of the whole cargo of six feet three inches below the deck beams, the claim that there was no sinking during that period of 45 hours becomes still more incredible. The direct testimony of Wrecks and Myers that the cargo had sunk between Thursday noon and Friday morning is not needed to confirm a fact which must have arisen from the necessities of the case, nor the evidence afforded by the pumpings of Friday, which contained a considerable percentage of sugar.

The argument that no dry sugar could have been wet on the second flooding, because the latter was one foot lower than the first, loses its force in view of the constant settling of the sugar itself. From the amount of settling—say two and one-half feet—before Wednesday noon, not only would a further considerable settling be looked for during the 45 hours from Wednesday noon to Friday morning, con-

sidering the comparative duration of the exposure to water and the drainage, but confirmation of such settling of about two feet, as an approximate estimate, may be deduced from a single circumstance, which all admit, viz., that Wreaks and Myers, on Thursday noon, could stand erect beneath the main hatch. For the evidence shows clearly that the number of tiers of dry mats around and in the vicinity of the main hatch, as the stevedores broke out the cargo on Thursday afternoon, varied from two to five, according to the depth of the jettison. The five tiers, therefore, mark the height of the cargo, *i. e.*, $2\frac{1}{2}$ feet above the 10-foot water line of Wednesday noon, around the main hatch. This was, therefore, $12\frac{1}{2}$ feet above the bottom of the hold, and as the hold was 15 feet high to the lower surface of the deck beams, the top of those five tiers must have been $2\frac{1}{2}$ feet below the beams. The sinking of the cargo at the highest part about the main hatch was, therefore, $2\frac{1}{2}$ feet on Wednesday noon, while immediately under the main hatch it was three tiers, or 18 inches lower, *i. e.*, 4 feet in all. This is also confirmed by the stevedores, who say that on Wednesday afternoon, when they began to unload between-decks, they rolled hemp two bales deep into the main hatch to fill it up to work upon, and these bales were 2 feet square on the ends, so that two deep made 4 feet to the bottom of the hole under the main hatch. But on Thursday noon, Wreaks and Meyers could stand upright under the main hatch, and they were 6 feet 3 inches tall; so that even if 14 inches, the depth of the deck beams, be allowed for their use in standing upright, there remains 1 foot more to represent the sinking of the cargo between Wednesday noon and Thursday noon; and if in standing upright they did not use the space above the lower surface of the beams, or if they had any spare room in standing between the beams, so much must be added to 1 foot to represent the sinking of the cargo during the 24 hours from Wednesday noon to Thursday noon; and a similar and nearly equal sinking must have continued until and during the flooding of that night, up to 10 A. M. of Friday, nearly 24 hours afterwards.

There was, therefore, not only an adequate cause at work to bring dry sugar down below the level of the second flooding, and thus to explain the final discharge of so much less dry sugar than was observed to be in the cargo on Thursday afternoon, but no other sufficient cause can be found for this difference. The fact that there were but 1,327 dry mats delivered cannot be questioned, and no possible arrangement of the sugar in the cargo can be made in accord with

the evidence, which will admit of there being two to five dry tiers on Thursday noon, under and about the main hatch, and only 1,327 mats afterwards being discharged dry, except upon the theory that a large part of these two to five tiers was wet after Thursday p. m.

Cameron's testimony, which is urged to show that all the sugar in the after hatch was wet on Wednesday, cannot be accepted as it stands; he, as well as Cosgrove, has doubtless mistaken the date, and erroneously stated a condition of things as existing on the Wednesday's flood, which did not arise until Friday, when the facts would be as he describes. No such wetting of the top of the sugar could have existed there prior to Thursday noon, when the sugar experts, Wrecks and Myers, went down into the hold for the express purpose of finding out how much wet sugar there was, without their observing it, and they testify that no wet sugar was in sight. To have had all this sugar overflowed by the 10-foot flooding of Wednesday noon, would, moreover, have required a settling of the cargo of 5 feet at the after hatch, while the settling was but half that amount around the main hatch, only 10 to 12 feet forward of it. There was no reason for any such excessive settling there more than at the main hatch; the cargo was stowed solid to the beams; it extended some 10 or 12 feet aft of the quarter hatch. There is no evidence of any disproportionate jettison there; and Cameron, on his testimony at the trial, much nearer to the time of the occurrence, did not testify to any such fact, which was so important to be known, if true. As it is contradicted by other testimony, and is improbable in itself, it must be rejected as erroneous in date. For the same reason, I cannot credit Mr. Cosgrove's testimony as to his walking on wet sugar on Thursday.

All the grounds, therefore, upon which the claimant contends that there was no dry sugar wet by the second flooding on Thursday night, seem to me to be opposed to the necessary facts, and to the most trustworthy testimony and evidence in the case, and this exception must, therefore, be overruled. The amount wet will be hereafter considered. The careful experiment conducted by Mr. Ockenhausen, as stated by the commissioner, gives some valuable results. It proves that after Manilla sugar has been subjected to the action of water gradually rising during 46 hours, equivalent to entire submergence for 37 hours, and then again immediately submerged for 7 hours, no drainage intervening, the loss by the second wetting will bear but a small proportion to the first, and that the aggregate proportionate loss during the first wetting of the same height of sugar, as compared

with the second, will be as $3\frac{1}{2}$ to 1 during those periods. Unfortunately, however, this experiment was not sufficiently varied to give the necessary *data* to compare with any accuracy the ultimate results with the results in the case of the Shand. The experiment proves that in case of a long submersion the action of the water is such as to carry off most sugar during the earlier part of the submersion. But no observations were made which would show how early or how late in this period the rate of loss began to diminish rapidly; nor was any note made of the drainage, or its rate, after the water was drawn off,—a very important factor in the Shand; nor were the conditions of the experiment similar in respect to the densely compacted mass of sugar, such as the Shand first presented to the water, and which very possibly largely retarded its action at first, and would tend to equalize somewhat the relative waste during the given periods of submergence; nor, finally, was the experiment so continued, or so ordered, as to result in the aggregate proportionate loss which the Shand actually exhibits,—a proportion which would have required the sugar in the experiment to have sunk in all 25 inches instead of 19; and this difference alone is enough to satisfy the whole loss on the second wetting. This experiment, therefore, though valuable for some of its results, is not a sufficient guide to the proper apportionment of the actual loss sustained by the cargo of the Shand.

The inferences drawn by the claimant from the experiments with sugar wet in bottles, and the testimony as to the amount which thus becomes sodden and insoluble, are shown to be fallacious by the simple fact that the sugar was washed out by water to a far greater proportion than those experiments and that testimony would admit of. According to the experiments and that testimony, no mats could have been nearly emptied; yet the weighers' returns show several thousand mats reduced to 15 pounds, and as many more with less than 25 pounds per mat. It is not impossible that the alternate action of water and air, through successive wettings, with periods of drainage intervening, may be the most rapidly destructive. The stevedores testify to finding mats, shortly after beginning to break down into the cargo, that were "empty," and "entirely empty." I judge, however, that they do not use these words in their literal sense. The pumpings exhibited no such constancy in the percentage of sugar which they contained, nor does it appear to me that the amount of water pumped out is capable of any such approximate determination, as warrants any reliance upon that mode of computation. The di-

rect evidence of the situation of the cargo from time to time, is of a much more certain character, and affords means, I think, of arriving at results tolerably correct.

The difficulties of the apportionment do not arise from any inherent impossibility in the case, but from the absence of such appropriate and exact observations taken at the time and upon the spot as would make the determination easy, and from the contradictory testimony of persons who, for the most part, were not at the time called on to observe with any degree of care as to the particulars which are now found desirable to be known. But this is a difficulty not at all different in its nature from that which is very frequently encountered on the trial of questions of fact. Difficulties of this nature are never held to be grounds of abandoning the attempt at determination as impracticable; and as a jury, under similar circumstances, would be required to make the best they could of the whole evidence, such as it is, and where certainty is wanting, to proceed upon such reasonable inferences as the evidence, the probabilities of the case, and the common knowledge and experience of men may warrant, so, in this case, I think a result may be arrived at with quite as near an approach to certainty as often, in cases of a paucity of the most desirable evidence, juries are accustomed to attain.

The method pursued by the commissioner of relying upon the direct evidence of the witnesses as to the situation of the cargo, the amount of settling, the depth of water from time to time, and the weight of sugar shipped and of that delivered, is, as I have above said, in my judgment, the only safe method to follow. A comparison of the details of some of his computations, however, with some points in the evidence which I regard as sufficiently established, leads me to some modifications of his results. His estimate of the increased loss by the second wetting of sugar already damaged by the first flooding is based upon an estimated settling of the cargo from Thursday noon to 8 A. M. of Friday of 2 feet 2 inches, and this settling is arrived at by a comparison of the height of the sugar, viz., nine inches above the nine-foot water line of Friday, (including one tier supposed to have been removed on Thursday,) with the settling of the cargo below the beams by Thursday noon, which, upon the testimony, he finds to be an average of three feet. The finding of three feet as the settling of the cargo at that time, though somewhat too small in my judgment, as subsequent computations herein will show, was largely owing to the testimony of the claimants' witnesses, who, at the trial,

seemed to be aiming to show the loss by the first flooding to be as small as possible.

The commissioner having found that on Friday morning the cargo had settled to 5 feet 2 inches below the beams, by a loss of 2 feet 2 inches since the noon previous, he found that midway between these times, viz., at 10 P. M. of Thursday, when the second flooding began, the sinking since Wednesday noon had been half of that difference, *i. e.*, 1 foot 1 inch, making, with the previous 3 feet settling by Wednesday noon, 4 feet 1 inch below the beams when the second flooding commenced. All the loss of the cargo after that hour, and all the loss of sugar beyond that sinkage, he ascribes to the second flooding. In so doing he does not take into account the continued loss of sugar from the drainage due to the first flooding, which would have continued after 10 P. M. of Thursday night if it had not been interrupted by the second flood; and this loss cannot have been inconsiderable in amount. Moreover, if the settling was 2 feet 2 inches in the 20 hours after Thursday noon, (which was made up of equivalents of 15 hours' average *drainage* of the whole wet sugar, and of five hours' average *flooding* of the whole wet sugar,) then at least an equal settling must have taken place during the 24 hours preceding Thursday noon,—that is, from Wednesday noon, when the first flood marked 10 feet; for this 24 hours was made up of equivalents of 12 hours' average *flooding* of the whole wet sugar, and of 12 hours of average *drainage*; so that the whole settling by this computation must have been 4 feet 4 inches from Wednesday noon to 8 A. M. of Friday; and as the cargo at that time was, as he finds, 9 inches above the water line of 9 feet, *i. e.*, 9 feet 9 inches above the bottom of the hold, it must have been 4 feet 4 inches higher on Wednesday noon, *i. e.*, 14 feet 1 inch, which would admit a sinkage of only 1 foot during the submergence of the two days previous,—a proportion too small to be admitted as correct.

Again, if the settling from Wednesday to Thursday was two feet two inches, then the water mark on the sugar of Wednesday noon, which was ten feet above the bottom of the hold, must have sunk down to seven feet ten inches above the bottom by Thursday noon; and the average of four tiers of dry mats, equal to two feet, above that water mark, would have made the top of the cargo only nine feet ten inches above the bottom of the hold on Thursday noon, or over five feet below the bottom of the deck beams, when Wrecks and Meyers first visited it, instead of *three* feet, which was the commis-

sioner's starting-point; and had the average depth been so much as five feet below the beams at that time, these witnesses could have easily walked all around standing upright between the beams, instead of walking with difficulty and much stooping, as they testify. In other words, in order to admit a settling of 2 feet 2 inches between Thursday and Friday, no settling at all can be allowed for the still longer interval from Wednesday noon to Thursday noon, if the starting point of three feet sinking on Thursday noon is to be preserved. Comparisons like these are necessary to serve as checks and corrections upon any computations made upon even the best of the testimony, where no careful measurements of the loss of sugar were made from time to time, and the testimony is so various and discrepant. Keeping all such attainable means of comparison and correction in view, I have made some computation based upon what I regard as the most trustworthy evidence in the case, which I will proceed to give, premising them with some additional facts not previously mentioned.

The hold in which the sugar was stowed was about 15 feet deep from the lower edge of the beams, which were 14 inches square and 10 feet apart. The sugar extended from about 12 feet abaft the quarter hatch, to about 25 feet forward of the foremast, so that the length of the sugar part of the cargo did not vary greatly from 120 feet; and at each end were stowed hemp and indigo. The sides of the ship were nearly straight down to the height of the sugar platform, and she was 31 feet broad. The sugar was stowed solid to the lower edge of the beams, and then one tier of mats was laid between the beams. The mats were about 2 feet long and 12 to 15 inches wide, and varied greatly in thickness, some being 3 inches only, some as much as 10, but mostly from 4 to 8 inches, an average of about 6 inches thick, and contained an average of 64 pounds of sugar net, or about $1\frac{1}{4}$ cubic feet. The main hatch was 12 feet by 18; sugar was stowed up through that to the upper deck, a height, with the beams, of about 8 feet. This sugar between-decks was jettisoned first and must have amounted to about 1,380 mats; and 1,700 other mats were jettisoned about equally from the three hatches, as I interpret the testimony of Capt. Sangster, though but 300 mats is stated in the protest to have been jettisoned from the fore hold.

Capt. Sangster testified that a sugar cargo always settles some. No direct evidence was given of the amount of this ordinary settling from mere pressure; but Mr. Ockenhausen allowed in his experi-

ment, as he testified, 2 inches for the difference in pressure; and as his experiment was on the basis of one-third the height of the ship, that allowance would agree with 6 inches allowed for sinkage from pressure in the Shand.

Both counsel have also assumed 11 feet 7 inches as the height of the sugar cargo from the platform to the lower beams, which allows a settlement of 6 inches, equivalent to the one tier of bags which were stowed between the beams, and I assume, therefore, 11 feet 7 inches as the height above the platform which the cargo would have shown on arrival had no loss of sugar happened either from jettison or flooding. Deducting from the weight of the sugar, as given by the bills of lading, viz., 16,000 piculs, equal to 2,240,000 pounds, the weight of the 1,380 mats, stowed between-decks, at 64 pounds each, equal to 88,320 pounds, and we have 2,151,720 pounds as the full weight of 11 feet 7 inches of sugar stowed in the hold. Of this amount, as appears by the returns of the custom-house weighers, there was delivered upon the dock but 913,876 pounds; but before the sale of the damaged sugar, three days after the delivery was completed, this weight was subjected to further loss by drainage on the wharf, so that there remained but 801,269 pounds of damaged sugar sold, which, with 82,270 pounds, the weight of the 1,327 mats delivered sound to the libelants, makes 883,539 pounds as the total sugar remaining at the time of the sale; or a loss of sugar from the hold, from all causes, amounting to 1,278,181 pounds. Of this amount 1,700 bags were jettisoned from the hold, being 108,800 pounds, and the rest, 1,169,381 pounds, is the amount of sugar lost by the several wettings, and by the drainage consequent therefrom. That the loss of the sugar would be accurately represented by the proportionate sinking of the sugar in the hold is not only obvious in itself, but appears definitely in the evidence and in the experiment of Mr. Ockenhausen; the sinking in his experiment on the first and second floodings being in proportion to the loss of sugar. Applying this rule to the cargo of the Shand, the loss of 1,169,381 pounds weight in the whole cargo of 11 feet 7 inches, or 139 inches depth in the hold, weighing 2,151,720 pounds, is equivalent to a reduction of 75 inches, or 6 feet 3 inches of its height above the platform, *i. e.*, from 11 feet 7 inches, which it should have had, to 5 feet 4 inches; or, adding the height of the platform, 8 feet 8 inches above the bottom of the hold.

The 1,700 bags jettisoned from the hold, equal to over one tier, would, if evenly distributed, reduce the average height of the sugar

upwards of 6 inches more, to an average of 4 feet 10 inches above the platform, or 8 feet 2 inches above the bottom of the hold. The jettison was not, however, made evenly from the whole surface of the cargo, but more from beneath the hatches. The cargo, when visited just before the discharge, was found to be uneven, and the highest point was between the main and fore hatches, which were some 40 feet apart, while the main and quarter hatches were not more than 10 to 12 feet apart. Midway between the former the surface was probably not only untouched by the jettison, but also probably stowed higher up between the beams, while the observed depressions beneath the main and quarter hatches showed that in jettisoning more sugar had been taken away there, as was natural.

The greatest inequality in the surface in the vicinity of the main hatch, testified to by any of the witnesses, is that given by Cameron, of 4 tiers, or 2 feet, and this was by taking as the lowest place the hole beneath the hatches where the cargo had been jettisoned. The other witnesses do not give a difference of over three tiers between the highest and lowest places in the vicinity of the main-hatch,—*i. e.*, from two to five tiers; and such is the manifest weight of the evidence. The highest part of the cargo in the region of the main hatch on Thursday, *viz.*, the fifth tier above the water-mark of the day before, must be deemed the tier not touched in the jettison, and this fifth tier would, therefore, represent the level of the cargo if unaffected by the jettison. As the waste of sugar was all below the level of the jettison, the 1,700 mats jettisoned from the hold, which made altogether but little over one tier, may be regarded as restored, for the time being, to their original places, thus filling up the irregularities to the level of the fifth tier, and afterwards deducted.

The question, then, is to apportion this sinking or loss of cargo, equivalent to 6 feet 3 inches of solid sugar up to the day of sale, (because the values are taken upon the condition and weight of the sugar on that day,) between the first and second floodings, by taking due account of the dissolving of the sugar by water while submerged, and of its loss by drainage in the intervals of flooding, and the final drainage afterwards. The importance of the element of drainage can be readily seen from two independent considerations which the evidence supplies. The first is by a comparison of the weight of the sugar upon the ninth of January, the day of sale, increased by the weight of the 1,327 sound mats, as above stated, with the weight of the custom-house weighers, who were weighing all along from December 28th to January 9th, a considerable part of the latter being weighed after

the sugar had already been long draining. This comparison shows a loss of 30,287 pounds; and this loss could have arisen only from subsequent drainage after the custom-house weighers had weighed the sugar. Again, as the actual ultimate loss of sugar, as proved by the loss of weight, must have brought the level of the whole cargo down to 8 feet 8 inches above the bottom of the hold, the water-line of the second flooding, viz., 9 feet, must have been 4 inches above the final average level of the cargo when sold, even with the jettisoned bags restored; so that, if not a bag had been jettisoned, nor a bag discharged from the hold, till after this second flooding, every mat must have been submerged at least 4 inches, except for the fact of the subsequent loss by drainage, as there was no other subsequent cause of loss. But as the top or fifth tier had been removed to a considerable extent around the region of the main hatch before Friday the 29th, and at least half a tier was still above the water-line of the flooding of that day, we have some 12 inches for the subsequent drainage after Friday noon. For the water was all pumped off at least within five hours after 9 A. M. of the 29th, making an average submersion of the whole after that time, of $2\frac{1}{2}$ hours only; and as the loss from submersion alone at no time exceeded 1 inch per hour, the loss from this cause during this period was only about 1 or 2 inches; and the rest of the loss, viz., of about 12 inches (and more, if the mats were above 3 inches out of water) must have come from drainage alone.

The soundings in the well show the depth of water from time to time, and these afford the means of ascertaining the length of time the sugar was exposed to the dissolving action of water during each submersion, as well as the duration of the different periods of drainage. If the average height of the water on the sugar is taken for each interval between the soundings, and multiplied by the hours of the corresponding interval, and these are added together in the case of each flooding, we have the numerical equivalents of each, so that the two can be compared; and the same in regard to the periods of drainage. The time when the water first rose above the platform is derived from the extended protest only; the log having been lost in the foundering of the vessel on her subsequent voyage from New York. This extended protest, or partial copy from the log, must, in my judgment, be read as giving 6 feet 4 inches as the height of the water in the well at 5 P. M. of December 27th, nautical time, *i. e.*, December 26th, civil time, or Tuesday afternoon. By a subsequent part of the entry, the water at midnight following is said to be "gaining on the pumps," and the context shows this is an entry respecting

an observation subsequent to the former. I regard this entry as of higher authority than Capt. Sangster's statement in his deposition that this 6 feet 4 inches must have been shortly after midnight on the morning of December 27th. The platform on which the sugar rested was 3 feet 4 inches high, including matting, and so much is to be deducted from the height of the soundings as given. We have on the first submersion, taking the soundings from the protest:

	Soundings.	On Sugar.
(a) Dec. 25th, 5 P. M., to 26th, at 5 P. M.,	3 ft. to 6-4,	avg. 18 in. 21 hours= 378
(b) " 26th, 5 P. M., to 27th, at 5 A. M.,	6 ft. 4 to 9-0,	avg. 52 in. 12 hours= 624
(c) " 27th, 5 A. M., to 27th, at 8½ A. M.,	9 ft. to 9-11,	avg. 73½ in. 3½ hours= 260
(d) " 27th, 8½ A. M., to 27th, at 12 M.,	11 ft. to 10,	avg. 79½ in. 3½ hours= 278
		1540
(e) " 27th, 12 M., to 27th, at 9 P. M.,	10 ft. to 9,	avg. 74 in. 9 hours= 666
(f) " 27th, 9 P. M., to 28th, at 3 A. M.,	9 ft. to 3 ft. 4,	avg. 34 in. 6 hours= 204
	The whole equivalent for the	55 hours=2410

For the second wetting we have:

	Avg. Wet.
(g) Dec. 28, 9 P. M., to 29th, 9½ A. M., 3 ft. 4 in. to 9 ft. ; 34 in. 12½ hours=425	
(h) " 29, 7½ A. M. to 2 P. M., 9 ft. to 3 ft. 4 in. ; 34 in. 6½ hours=221	

The whole equivalent, during 19 hours, - - - - - 646

It was, however, testified to on the hearing, and is in itself sufficiently obvious, that up to 11 P. M. of the twenty-sixth December, when the vessel got inside of Sandy Hook, the motion of water in the hold, from the rolling and pitching of the ship in the heavy sea to which she was exposed, would cause a more rapid dissolving of the sugar while this agitation of the water lasted, than in the subsequent comparative stillness of the water. The exact increase from this cause cannot be determined, but as it must have been considerable, I think the average action of the water should be deemed increased by one-half during the violent motion of the ship, before arriving inside of Sandy Hook, disregarding the gentle motion afterwards. This would require an addition to the first two items above given of 320, making the equivalent of the first wetting 2,730, and of the second 646.

The drainage began as soon as the water began to sink from its highest mark. Thus, on the 27th, at noon, the water-mark was 10 feet, but by hand-pumps it was reduced to 9 feet by 9 P. M. This gives an average of 6 inches of sugar draining 9 hours=54. Continuing the same calculations for the whole drainage until the flooding reached 9 feet again on the morning of the 29th, we find an equiv-

alent of 2,150 as representing the whole drainage from noon of the 27th to the morning of the 29th, as follows :

		Height of Water.	Height Draining.	Hours.	
(i)	Dec. 27, 12 M. to 9 P. M.,	-	10 ft. to 9 ft.	6 in. avg.	× 9 = 54
(k)	" 27, 9 P. M., to 28th, 3 A. M.,	-	9 ft. to 3 ft. 4,	46 "	× 6 = 276
(l)	" 28, 3 A. M. to 9½ P. M.,	-	3-4 to 3-4,	80 "	× 18½ = 1,480
(m)	" 28, 9½ P. M., to 29th, to 7½ A. M.,		3-4 to 9 ft.,	34 "	× 10 = 340
					<hr/> 2,150

This is equal to a drainage on 6 feet, or 72 inches, of sugar for about 30 hours, which is the drainage equivalent on the first wetting; while the drainage upon the last wetting was upon the whole residue of the cargo of nearly six feet in depth from the afternoon of the twenty-ninth December until January 9th, the day of sale, or 11 days.

Having thus obtained the amount of the exposure of the sugar to submersion and to drainage for the various intervals, the amount of the actual sinking of the cargo, in the vicinity of the main hatch, up to noon of Wednesday, the 29th, can be pretty accurately fixed as a starting point, because the number of the dry tiers of mats above the water line of the first flood, which was highest at that hour, is testified to by a great number of witnesses as running from two to five tiers. Five tiers equal 2½ feet, so that there must have been above these five tiers a space of about 2½ feet more to reach the bottom of the deck beams, which were 15 feet above the bottom of the hold; and this 2½ feet is, therefore, the sinking of the cargo in that region through submersion in water up to that time; the other inequalities being the result of jettison, except a little elevation at the point midway between the main and fore hatches, which may have arisen from a little less action of the water there, or higher stowage between the beams, which cannot much affect the result of this inquiry, and for which some allowance will hereafter be made.

The condition of the cargo at the main hatch, concerning which most of the evidence relates, presents by its situation a fair mean or average for computing the sinkage of the whole cargo. About 20 feet forward of the main hatch the cargo would appear, from the testimony, to have been from 6 to 9 inches higher than it was at the fifth dry tier, in the vicinity of the main hatch. And there may have been a little increased depression forward and aft, caused by the pitching of the vessel, though there is no sufficient direct evidence to sustain any definite depression of that kind; the depth of water under the quarter

hatch on the 29th, when Cameron went down, being fully accounted for by the hole made by the jettison. However the fact may have been, the main hatch offers, from its situation, a fair mean for the whole level of the cargo, and the average sinking can be reckoned from this point.

Taking, therefore, $2\frac{1}{2}$ feet as the average sinking of the whole cargo by Wednesday noon, (twenty-seventh December,) we have from the above table (*a, b, c, d, ante*) as the equivalent for the whole submersion to that hour, 1,540, which, with 320 added for the increased action due to the ship's rolling while outside of Sandy Hook, gives 1,860 as the total equivalent to that time, producing a loss of $2\frac{1}{2}$ feet of sugar; while the subsequent period of the submersion by the first flooding up to 3 A. M. of the 28th, *e, f*, is represented by an equivalent of 870. The proportion, 870-1860 of $2\frac{1}{2}$ feet, would give a little over 14 inches as the subsequent sinking or loss during the first submersion, if the rate of loss continued the same. The equivalent of the submersion by the second flooding, 646, *g, h*, would give, by proportion, 646-1860 of $2\frac{1}{2}$ feet, *i. e.*, $10\frac{1}{2}$ inches, as the loss or sinking during that immersion at the same rate. Some deductions from the amount of sinking in the last two items must, however, be made, as Mr. Ockenhausen's experiment shows clearly that the rate of waste after long submersion is greatly diminished. His experiment shows that after the submersion of successive portions of sugar to the height of 2 feet during 46 hours, equal to an average submersion of the whole 2 feet for 37 hours, if the same depth of wet sugar be again submerged at once for 7 hours with no interval of drainage, and without any dry sugar being wet, the loss during the first period will be 18 inches in depth, and during the second period only 1 inch in depth. The proportionate time of the exposure to water in this experiment being as 7 to 37, the loss should have been $3\frac{1}{2}$ inches instead of 1 inch on the second wetting, if the ratio of loss had remained constant. No other observations, however, were taken by Mr. Ockenhausen as to any other changes in the rate of loss, and it is impossible to conjecture how long after the commencement of the wetting the rate of waste began to decrease.

In his experiment, moreover, the sugar was comparatively loose, not having been subjected to any previous pressure, nor become solidly pressed and matted together, as the evidence shows existed in the cargo of the Shand before the water first reached above the sugar platform during Monday night, December 25th. This would necessarily delay the action of the water at first, while the subsequent loosening of the sugar in the great bulk of the cargo as it lay

in the Shand, through loss of part of the contents of the mats, would accelerate the subsequent action of the water, and both of these causes would make the rate of waste at the successive periods less unequal than that shown in the experiment.

Mr. Myers' experiment, which was still more unlike the circumstances of the Shand, produced rates of loss nearly equal during the two periods tried by him. Moreover, the exposure to water prior to Wednesday noon (1,540) was equivalent to 6 feet or 72 inches of sugar submerged for 21 hours only, and the residue of the loss by immersion on the first flooding arose after that period only of prior exposure, instead of after 37 hours, as in Mr. Ockenhausen's experiment; so that, for these several reasons, the decrease in the rate of loss in the proportion of $3\frac{1}{2}$ to 1, as produced by Mr. Ockenhausen's experiment, cannot be applicable here without much modification. I think a deduction of one-third on account of the decreased rate of loss is all that the evidence warrants, and I therefore reduce the above amount, a little over 14 inches, to 10 inches.

In the subsequent loss on the second flooding, dry sugar was wet and carried off during a part of the immersion to the extent of 44,048 pounds, as hereafter ascertained, (see page 599,) equivalent to a little over 3 inches of solid sugar; and this would tend to equalize still further the rate of loss; but as the time during which the dry sugar was wet was much less in proportion than at the first flooding, the conditions are not equal, and I therefore reduce the above 10 inches to 8 inches, for the loss during the second immersion.

There were two other especial causes of loss by immersion, both small; the one arising from the increased loss along the skin of the ship by her rolling and pitching before the water reached the sugar platform, as well as afterwards, and the other by the temporary rise of water to five feet on Thursday morning. The water does not appear to have ever got above the level of the platform until the night of December 25th. The amount of the loss from the the rolling and pitching in the wings of the ship is fixed by the stevedore, Dougherty, who testifies that one tier, or six inches, was the difference in level along the wings on Thursday afternoon; and this difference can only be ascribed to that cause. This could not extend far inward from the skin of the ship until after the water had got above the level of the platform; *i. e.*, until the night of December 25th, less than 36 hours before arriving inside of Sandy Hook. Following Dougherty's testimony upon this point, an allowance for a special loss from this cause should be made of one tier, or six inches, to the extent of one bag

in length, or two feet inwards from the skin of the ship. As the cargo was 120 feet long, and the mats, from the specimens exhibited, would be about 15 inches wide, if 6 inches were adopted as the thickness, it follows that this loss would be equivalent to 192 mats, or 12,288 pounds of sugar, equal to about 1 inch only spread over the whole cargo. The loss of sugar through the temporary rise of water to 5 feet on the morning of December 28th, was estimated by the commissioner at 13,423 pounds, which would be equivalent to an average loss of one inch in depth over the whole cargo. If the two inches loss by immersion from these special causes be added to the three items of $2\frac{1}{2}$ feet, 10 inches, and 8 inches, we have 4 feet 2 inches as the entire loss during immersion. But as the whole loss of sugar in the cargo was equal to 6 feet 3 inches, the residue, 2 feet 1 inch, must have arisen from drainage alone, during the different periods after the water was drawn off.

The drainage on the first flooding, as above shown, (*i, k, l, m,*) was equivalent to a drainage of 6 feet of wet sugar for 30 hours; while the drainage after the second flooding, for nearly the same depth, continued through 11 days. The drainage after the customs weighers had weighed out the cargo (and they were weighing to the day of sale) was 30,287 pounds, equivalent to over two inches of solid sugar, and this was after the cargo had already been draining an average period for the whole cargo of $5\frac{1}{2}$ days. It cannot be doubted that the drainage from the whole cargo during these 11 days was very much more than the drainage during the much shorter interval (18 hours only on an average upon the whole wet sugar) between the first and second flooding. The drainage of this latter interval would be renewed to substantially the same extent during the same period after the water was last pumped off, and be followed by the long period afterwards in addition; and though the drainage would obviously be much more rapid at first, its continuance to some extent long afterwards is shown by the difference in the weighers' returns, as above stated. The sinking or loss by the whole drainage of 25 inches may be divided so as to give 10 inches for the interval between the two floodings, and 15 inches for the final drainage after Friday, the 29th. Of this 10 inches settling by drainage between the first and second submersions, one-half, or five inches, would occur by 12 m. on December 28th, when the cargo was first visited by Wreaks and Myers, (which was very near the middle of this drainage period,) and the other half, or 5 inches, after that hour. These computations give

the amount of the loss of sugar, or, what is the same thing, the settling of the cargo at its highest point about the main hatch, as represented by the fifth dry tier, during the various intervals of submersion and of drainage, taking no account of the irregularities of the surface occasioned by the jettison, since the loss of the sugar was all from beneath these irregularities, as follows:

TABLE OF SETTLING OF CARGO.

Sinking.					Ft.	In
Ft.	In.					
2	6	(n)	Loss up to 12 M. of Dec. 27th, by immersion=6 ft. immersed 26 hours; water rising on dry sugar,	-	2	6
3	4	(o)	Loss from 12 M. of the 27th to 3 A. M. of the 28th=6 ft. immersed 12 hours; water falling; no dry sugar wet,	0	10	
3	9	(p)	Drainage—12 M. of the 27th to 12 M. of the 28th=6 ft. immersed 14½ hours,	-	0	5
3	10	(q)	Loss by temporary rise on Dec. 28th, by immersion	-	0	1
4	3	(r)	Drainage—12 M. of the 28th to 7:30 A. M. of the 29th=6 ft. draining 14½ hours,	-	0	5
4	9	(s)	Loss by immersion—9 P. M. of the 28th to 2 P. M. of the 29th=6 ft. 9 hours; being 6 in. up to 9 A. M., and 2 in. residue; one-fifth dry sugar wet,	-	0	8
4	11				-	
6	2	(t)	Loss by drainage during 11 days,	-	1	3
6	3	(u)	Loss along the wings by rolling and pitching—avg.	-	0	1
Total loss,					6	3

Some minor changes might doubtless be made in this distribution of the entire loss of 6 feet 3 inches; but no very great change in this apportionment can be made without involving violent contradictions of some of the best-established facts in the testimony, or else some great improbabilities; and the sum total of sinkage must at all events be preserved unchanged. For instance, the first item cannot be made 3 feet 6 inches instead of 2 feet 6 inches without contradicting the unanimous testimony that there were at least five dry tiers in the highest part of the cargo on the 28th; *i. e.*, 2 feet 6 inches above the first water-line of 10 feet. For if the sinking by that time had been 3 feet 6 inches, the height above the 10-foot flooding could have been but 18 inches, and only three tiers, therefore, could have remained dry. Nor could the first item (*n*) be reduced to 2 feet only; for, in that case, items *o* and *s* must be reduced in like proportion, and then the subsequent loss of 4 feet 3 inches could not be made out, without making the entire loss by drainage at least 3 feet, while the whole loss by immersion would be but 3 feet 3 inches, and the result of such an apportionment would render a change of level of less than 2 feet possible from noon of the 27th to 9 A. M. of the 29th, and upon this result less than

two tiers of dry mats would have been touched by the second wetting, and at least four tiers, or nearly 4,000 mats, (after deducting 1,700 jettisoned,) must have come out dry, instead of 1,327; and in many other details it could not accord with the evidence.

On the other hand, the above apportionment of the sinking of the cargo, while starting from the best-authenticated observations, and based upon the soundings at different times, and upon proportions obtained from them for the different intervals, after making such allowances in the computations as seem to me just for every disturbing cause affecting the ratio of waste, does still account for all the essential facts of the loss, and accords in result with the other evidence in the case of a wholly independent character.

(1) It accounts for the dry sugar left untouched by the first flooding being wet by the second; for the change of the sugar level from Wednesday noon (27th) to Friday, (29th,) at 9 A. M., (when the sinking amounted to 4 feet 9 inches,) as shown by the items *o*, *p*, *q*, *r*, and *s*, in the last above table, amounts to 27 inches; and deducting therefrom 12 inches, the difference in the absolute height of the water on the 27th and on the 29th, there remain 15 inches of sugar left dry on the 27th, which had sunk down so as to be immersed on the 29th; and this necessarily includes three dry tiers wholly or in part.

(2) It accounts for the sugar which came out dry; for the fifth dry tier in the region of the main hatch having on the 29th sunk to the level of 4 feet 9 inches below the beams, *s*, it was still 1 foot 3 inches above the 9-foot water-line of that morning. This would leave two tiers dry, both of which, according to the testimony, had probably been removed on Wednesday, so that only the half tier was that morning visible above water. Two dry tiers over the whole ship would, as we shall presently see, amount to 2,780 mats; and in the space midway between the fore and main hatches, where the cargo was at least 1 tier higher, there would be, if that extended say 10 feet in length by the whole width of the ship, about 124 additional bags, which, with the above 2,780, makes 2,804 mats; and if from this be deducted 1,700, the number jettisoned from the hold, (as we have all along treated the fifth dry tier as a level tier,) there remain 1,104 which would have come out dry if none had been removed on Wednesday. One thousand three hundred and twenty-seven were in fact taken out dry, and the excess is accounted for by the removal of some on Wednesday from places where they would have been wet if not removed. All the dry mats immediately under the main hatch were

so removed on Wednesday, and those which would have been thus wet if not removed varied from 2 to 3 tiers, and these tiers in the space of the main hatch would have numbered upwards of 200, which makes up the full number of 1,327.

(3) It accords with the testimony that Wreaks and Myers, each 6 feet 3 inches tall, found room on Thursday noon to stand erect in the hole under the main hatch; for the sinking of the level of the fifth tier being by the above table 3 feet 10 inches at that time, (*p, q*), and the hole being 3 tiers, equal to 18 inches, in depth, there was 5 feet 4 inches height up to the lower edge of the beams; and as the latter were 14 inches deep, the whole available space was 6 feet 6 inches, giving them 3 inches spare room to stand erect.

(4) It accounts satisfactorily for Wreaks and Myers being also able to walk around on top of the cargo, "not with ease, but with much stooping." Before the commissioner it was found on trial that they required over 5 feet to walk with stooping; and in going about on the cargo they did not squat down into the space of about 3 feet, as was possible for them, nor go on their hands and knees; but they walked about, stooping, which required over 5 feet. The settling of 3 feet 10 inches up to that time, added to the height of the beams, 14 inches, gives 5 feet height between the beams, which being 10 feet apart would be mainly available for walking about, while the additional depression of 6 inches along the wings, and the irregularities and increased depth from the jettison, would afford all the space called for by this testimony, and enable them to walk about with moderate stooping only, except beneath the beams; and the whole result would accord well with the general impression derived from their testimony in this respect.

(5) It accords very nearly with the testimony of McGrath and Dougherty as to the height of sugar on breaking into the cargo under the main hatch on Thursday afternoon. McGrath says they first took out the hemp which had been rolled in the day before, (Wednesday;) that the cargo had settled over 3 feet; that they stopped working that afternoon when they had worked down to about 2 feet above the sugar platform, and about 6 feet below the top of the sugar. Dougherty also testifies that they went that day about 6 feet below the top of the sugar. This evidence would give a depth of about 8 feet from the sugar platform to the top tier, or 11 feet 4 inches from the bottom of the hold, which, assuming the hold to be 15 feet from the bottom of the beams, would give a settling from the

latter of 3 feet 8 inches, differing only by 2 inches from the settling at that time of 3 feet 10 inches given in the above table, (*p*, *q*.)

(6) It also agrees with the testimony of Dougherty, who says he could stand erect in the wings on Thursday afternoon; for if to 3 feet 10 inches be added 6 inches for the additional depression of one tier in the wings, and 14 inches for the beams, we have 5 feet 6 inches, and Dougherty was but 5 feet 4 inches tall.

As the above tabular computations are based upon evidence wholly independent of the testimony as to these latter points, the fact that they accord so nearly in result seems to me strong confirmation of their substantial accuracy. Upon the basis, therefore, of the apportionment of the loss or sinking of the sugar at the different intervals, as exhibited in the foregoing table, the determination of the loss by the second flooding is comparatively simple.

The effect of the last flooding was to interrupt the drainage which was in progress from the first flooding, and to set a similar and substantially equal drainage at work *de novo*, after the water of the second flooding was pumped off. The drainage after the second flooding would be substantially the same as that which would have followed the first flooding if it had not been interrupted. The last item for drainage, (*t*), therefore, represents all the amount of the drainage loss consequent upon the first flooding, or what would necessarily have resulted from it had the second flooding not arisen; while the prior drainage items (*p* and *r*) represent the increased loss of sugar by drainage occasioned by the second flooding; because the natural drainage of the sugar consequent upon the first wetting, which was already going on, was interrupted at those points by the second wetting, and the same natural drainage commenced anew as the water from the second flooding subsided. The whole loss of sugar by the second flooding consists, therefore, of items *p*, *r*, and *s*, or 18 inches of solid sugar; that is, 18-139 of 2,151,720 pounds, the contents of the hold when full, which gives 278,640 pounds as the loss by the second flooding. So much of this loss of weight as came from the 3,855 mats which were first wet by the last flooding is otherwise allowed for, being embraced in the item next considered; and it must, therefore, be deducted here. The loss of weight from these mats up to the day of sale is found, as hereinafter stated, to be 44,048 pounds. Deducting this amount from the 278,640 above found, there is left 234,592 pounds as the loss or waste of sugar previously wet which resulted from the second wetting, which, at 4 116-1000 cents per pound, amounts to \$9,655.81 as the damage from this item of loss.

DRY SUGAR WET BY SECOND FLOODING.

To determine the amount of dry sugar wet by the second flooding, the commissioner has taken an average of four tiers as the number shown by the evidence to have been dry upon breaking down into the main hatch on the twenty-eighth of December, after the first flooding; and estimating the number of mats in a tier at 1,510, he arrives at 5,980, from which 1,327 delivered dry are deducted, leaving 4,653 dry mats damaged by the second wetting. The least number of dry mats, two tiers, was under the main hatch, where the deepest depression was made in the surface by the jettison; and the greatest number, six, was at the highest point forwards. A simple medium between these extremes might doubtless vary considerably from the average level of the whole cargo; and six dry tiers above the 10-foot flooding is more than I think the weight of testimony warrants, except in a small space midway between the fore and main hatches. Moreover, the evidence, I think, shows that one tier was originally stowed throughout between the beams, which, upon an average thickness of the mats of 6 inches, would give 24 tiers above the sugar platform. Deducting from the whole number of mats shipped, to-wit, 34,742, the number stowed in the hatch up to the upper deck, amounting, upon an average of a cubic foot and a quarter each, to 1,382 mats, there were left in the hold 33,360 mats, which, divided among 24 tiers, gives 1,390 to a tier. The commissioner's average of four dry tiers at this rate would amount to 5,560; deducting therefrom the 1,327 which came out dry, and 192 special loss from the rolling of the vessel attributable to the first wetting, there would remain 4,041 as the number of dry mats wet by the second flooding, according to his mode of computation. But, for the reason above stated, I think an average of four dry tiers throughout the ship after the first flooding is more than the evidence warrants.

Pursuing the same computations which I have previously adopted as best warranted by the evidence, I take five tiers as left dry by the first flooding at the highest point about the main hatch.

Taking 1,390 as the number of mats to the tier, as above determined,	
and this gives, for five level dry tiers, $1,390 \times 5 =$	6,950
To which add extra height of cargo in a small space midway between	
the main and fore hatches, (say 10 ft. x 31.) =	124
Making.	7,074

Amount brought forward,	-	-	-	-	7,074
Deduct number of mats jettisoned from the five dry tiers,					1,700
Also deduct special loss along the wings, as above stated,					192
Also deduct the number which came out dry,					1,327
					<u>3,219</u>
And the number of dry mats wet by the second flooding would amount to	-	-	-	-	3,855

These, at 64 pounds average net weight per mat, would have weighed, if uninjured, 246,720 pounds, which at $8\frac{1}{2}$ cents per pound, less a discount of $2\frac{1}{3}$ per cent. for cash, would have been of the market value of \$20,481.87. If these same mats had been kept separate from the rest, and sold separately, the loss upon them would have been found by deducting the amount realized on the sale from the market value above given. As they were not, however, thus separated, the loss of weight upon these mats is to be obtained, either from an average derived from the best lots of 5,000 each at the auction sale, with the weights at that time, or else from an examination of the custom-house weighers' returns as the cargo was unloaded, which give the weight of every 25 mats of the better portion of the cargo. An examination of the first two lots of 5,000 each, as sold at auction, shows that they were very nearly equal in weight, and that both together embrace more than half the weight of the sugar delivered; and that the loss of net weight on the first lot of 5,000 was about 31 per cent. of the average weight of 5,000 dry mats at 64 pounds net each. The 3,855 dry mats first wet upon the second flooding must have been less exposed to the action of water than any others of the damaged mats, and must, therefore, be held to be the ones that suffered the least loss of weight, as well as the least damage. An examination of the custom-house weighers' returns shows that after setting aside the 1,327 dry mats delivered uninjured, (which show an average gross weight of 65 pounds each,) the next best 3,855 mats, after making all deductions for tare and ratable drainage between the time of the custom-house weighing and the day of sale, show a weight of 202,672 pounds net; while the same number of mats, of the average weight of 64 pounds net, would amount, as above stated, to 246,720 pounds, showing a loss of weight of 44,048 pounds, which is much less than the average loss in the first lot of 5,000 mats sold at the auction sale.

It is obvious, therefore, that this lot did not represent all of the highest weights; and the fact that the second lot of 5,000 weighed

very nearly the same as the first lot, warrants the inference that the bags of greatest weight were divided between the two lots. The first lot brought $6\frac{3}{4}$ cents per pound, the second 6 cents, which also shows that the difference of their condition and value was small. There must have been, therefore, many bags of a much lower weight in each of these two lots to reduce the average weight of the mats to the amounts which they exhibit; so that the weight of the above 3,855 mats would not be ascertained with even approximate correctness by simply taking the proportion of the weight of either lot of 5,000, as they were sold at auction; while the custom-house weighers' returns of each lot of 25 mats do afford the means of sufficiently identifying the 3,855 mats by taking the highest weights, after setting aside the 1,327 dry mats. These returns show, as above stated, the weight of the 3,855 best mats, after deducting tare and the ratable drainage in the interval, to be 202,672 pounds, which, at $6\frac{3}{4}$ cents per pound, amounts to \$12,920.34 as the cash proceeds of these 3,855 mats. Deducting this from the market value of the full mats uninjured, viz., \$20,481.87, we have a difference of \$7,561.53 as the loss and damage to sugar previously dry, occasioned by the second flooding.

This damage embraces the loss of weight upon these mats of 44,048 pounds, as above stated, which is the weight to be deducted from the previous item of loss.

LOSS BY THE TEMPORARY RISE OF FIVE FEET ON DECEMBER 28TH.

The loss from this cause is ascertained by the commissioner from the pumpings to have been 13,423 pounds. The full price of dry sugar, $8\frac{1}{2}$ cents per pound, is charged upon this weight. It all consisted of sugar which had been wet by the previous flood of 10 feet; and had it not been carried off by this temporary flooding of December 28th, would have remained as so much wet and damaged sugar, worth only the average price of 4 116-1000 cents per pound. The commissioner regarded this as pure crystallizable sugar, worth the full price. But the evidence of Mr. Abbott shows, as I understand it, that the dry Manilla sugar in mats contained about 3 1-5 per cent of water, and polarized 83 per cent. and that the crystallizable sugar was 85.74 per cent. in the dry substance; while the damaged sugar contained 14.71 per cent., water, polarized 77.60 per cent., and in the dry substance showed 90.98 per cent. of crystallizable sugar. As the damaged sugar, therefore, polarized 77.60 per cent., if we add 22.4-77.6 of its amount to the weight of crystallizable sugar as

above given, *i. e.*, 13,423 pounds, we have it restored to its previous condition as wet and damaged sugar, worth 4 116-1000 cents per pound. This percentage of increase gives 3,875 pounds, making 17,298 pounds of damaged sugar, worth, at 4 116-1000 cents per pound, \$711.99, which should be allowed for this item of damage.

RECAPITULATION.

The above calculations give for sugar damaged and wasted :

1. For dry sugar damaged and wasted by second flooding,	-	\$7,561 53
2. For wet sugar wasted by do.,	- - - -	9,655 81
3. Loss in temporary rise of 5 ft., December 28th,	- - - -	711 99
		<hr/>
Making an aggregate loss of	- - - -	\$17,929 33
Instead of \$23,465.09, as found by the commissioner.		
Interest from December 27th, 1876, to date, (May 28th,) @ 6 per cent.,	- - - -	5,814 16
		<hr/>
Total,	- - - -	\$23,744 19

—for which sum judgment should be entered for libellant, with costs.

THE TOMMY, etc.

(District Court, S. D. New York. May 1, 1883.)

1. BILL OF LADING CONSTRUED.

Where a bill of lading recites the receipt of goods in good order, and has a clause at the close, "Not accountable for weight, contents, packing, marks, and damage," *held*, the word "damage" has reference to damage of the goods at the time of their receipt, and not to injuries to them arising subsequently on the voyage.

2. DAMAGE TO CARGO—FAULTY CONSTRUCTION OF BIN—LIABILITY.

Where a cargo of old iron was stowed on the bark T., in a trunk or bin made of boards, running along the center of the ship, with bales of rags on each side, and the bin between decks extended several feet higher than the adjoining bales, and during a long and rough passage the bin was broken down and the iron scattered over the bales, tearing them open, and the rust from the iron also sifting down upon the bales below, *held*, upon the evidence, that the bin was not securely constructed, and the vessel was liable for the damage done to the rags by the iron and rust.

3. SAME—CONTACT WITH SEA-WATER.

Where bales in the lower hold were injured by sea-water and rotting, and it appeared that dunnage of fire-wood along the sides had to a considerable extent fallen down, and no evidence appearing of its being fastened to prevent falling, *held*, the vessel was liable for the contact with sea-water from this cause. *Held, also*, that the vessel was not liable for injuries from sea-water taken in through the water-way seams upon a long and tempestuous voyage.