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## "AMADINE."

The Merchant Shipping Acts, 1854 to 1876.

IN the matter of the formal investigation held at the Admiralty Registry, Somerset House, on the 6th, 8th, and 11th days of June 1877, before H. C. ROTHERY, Esquire, Wreck Commissioner, assisted by Commander FORSTER, R.N., and Captain CASTLE, as Assessors, into the circumstances attending the burning and abandonment of the sailing ship "AMADINE," of London, on or about the 10th December last, while on a voyage from London to Penang.

### Judgment.

*The Commissioner.* The "Amadine," which is the subject of the present inquiry, was a three-masted composite vessel of 547 tons net register, built at Sunderland in the year 1866, and at the time of her leaving London on the voyage in question she belonged to a Mr. Matthew Hall Atkinson, who has since died, but his executors have appeared in these proceedings.

In the month of August last she took in a cargo in the West India Export Dock, was cleared on the 28th, and left for Penang on the 30th of that month. Her crew consisted of 15 hands all told, including a master, a mate, and a boatswain, but about three weeks after she sailed the steward died. Her cargo consisted of 325 tons of Hartley coals, 50 runlets of coal tar, 180 cases of matches, 1,900 cases of gin, 510 cases of brandy, 440 cases of wine, 352 cases of bottled beer, 485 casks of bottled beer, 72 packages, and 102 crates of crockery, about as inflammable a cargo, if it once took fire, as a vessel need have.

It seems that she had but one hold, running fore and aft with three hatchways, but there was a small space forward divided from the hold by a bulkhead, and which contained the ship's spare coal, provisions, &c., access to which was obtained by the fore scuttle, which was just abaft the windlass. On the deck she had a deck-house for the use of the crew, the officers being lodged in the poop aft.

Now Mr. Eastman, the master stevedore, has described the way in which the cargo was stowed, and he has furnished us with a plan which will materially assist us in understanding it. It seems that the coals, which were brought alongside in barges, were shot down through the main hatchway, then trimmed across the ship amidships as high as the hold beams and sloped off forward as far as the bulkhead and aft beyond the mizen mast. In the fore part the coals were levelled and the barrels of coal tar were laid upon them up to the bulkhead forward. Above these were placed crates or cases of crockery, the barrels of bottled beer, and other things. The matches appear to have been stowed above the hold beams, and according to this drawing which I have before me immediately under the deck-house. All the gin, brandy, and wine was stowed aft, the after hatch being quite full of spirits, and, according to the master, some cases of spirits were in the main hatch. Such seems to have been the way in which the cargo was stowed.

For the purpose of giving ventilation to the hold, there was a sliding panel in the fore and after hatches, but there were covers for these hatches which could be put on in case of bad weather. The main hatch, however, was battened down and the longboat put above it, so that no access could be obtained to the hold through the main hatch except by removing the longboat. We are told that the owner during the time that the loading was going on, some 26 or 27 days, was continually on board, morning, noon, and night, I think the stevedore said, but at any rate it is quite clear that he gave his sanction to the mode in which the cargo was stowed and to all the arrangements which were made for the ventilation of the hold.

Nothing material occurred till the night of the 6th of December, at which time the vessel was in about latitude 38° south and longitude 73° east. It was the first mate's watch between 8 and 12 p.m., and there being a heavy sea on, the companion door was closed. When the first mate went to call the boatswain at midnight to relieve the watch he found him stupefied, so that it was with great difficulty that he could be got round at all; and there was a strong sulphurous smell in the cabin, but which passed off when the companion door was put open.

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On the next day and the day following, Thursday and Friday, the 7th and 8th of December, the smoke or steam or whatever it was increased, the only difference being that the wind having got a little more ahead it came up forward instead of aft through the cabin. Nothing, however, was done to ascertain whence it arose.

On the Saturday morning the vapour had increased considerably, and accordingly the master determined to put a ventilator down the hold. A ventilator was accordingly made by the carpenter, and at about 4 or 5 o'clock in the afternoon was put down through a hole cut in the floor of the cabin aft immediately over the spirits.

At 10 p.m. the same evening the smoke had increased considerably, and there were unmistakeable evidences that the ship was on fire. Accordingly, with the force pump which they had on board, water was pumped down through the fore hatch upon the cargo. By 11 o'clock the man who was holding the hose could do so no longer, and was obliged to withdraw. Thereupon a number of holes, I think the carpenter said as many as 60 or 70, were cut in the deck, commencing from the deck-house and going aft, and through them the fire could be distinctly seen in the hold. And an attempt was made to set the two main pumps to work so as to flood the deck, but upon trying them it was found that they had been burnt through and were useless. It was now between 11 and 12 p.m.; the captain thereupon gave orders to get the boats out, of which they had two, a gig and a longboat. Provisions were put into them, and every preparation was made for abandoning the vessel in case of need. It was now between 2 and 3 a.m. The crew were then called on board again, and an attempt was made for about another hour to pump water upon the cargo, but it was found to be of no use, and the crew then withdrew to the boats, leaving the master, the mate, and the boatswain alone on board. At 5 a.m. the mainmast settled down between two and three feet, and the captain then felt that it was time that they should all leave. Accordingly, the mate and three of the men got into the gig, and the master with the rest of the crew got into the longboat. Before they finally lost sight of the ship she was alight from stem to stern. There seems to have been no explosion, but was on fire from one end to the other. After being in the boats for nine days they were picked up by a vessel called the "Ardgowan," of Glasgow, and were ultimately landed at Calcutta on the 18th January following.

Now the duty of the Court is to ascertain, if possible, what was the cause of the fire, and whether anyone and who was to blame for the casualty.

And first, as to the cause of the fire. Although, as I have stated, this cargo was of a very inflammable nature when once on fire, it will, I think, be readily admitted that there were but two of the articles on board which would be likely to catch fire without the application of a match or light of some kind, namely, the coal and the matches. As regards the matches, no doubt the fire might have originated with them, but there is a fact which seems to make it improbable that this fire could have originated with the matches. If we can trust the plan which has been prepared under the instructions of the stevedore, they were stowed immediately under the deck-house. And if these 180 boxes of matches, 3 feet 6 inches long by 2 feet 9 to 10 inches high, and the same breadth, had caught fire, I should have thought that before the expiration of three days, the crew, who were berthed immediately above them, would have become very sensible of the fact.

We are then driven to the coal, and before I proceed to state the circumstances which lead us to think that the fire may have originated with the coal, it would be well that I should say a few words as to the peculiar properties of coal when stowed on board ship.

It is true that we have had very little evidence in this case as to the conditions under which coal becomes a source of danger on board ship. Some evidence was given by Mr. Holland, the shipper of the coal, and by a Mr. Gammon, a coal factor, but neither of these gentlemen pretended to know the properties of coal, and it was obvious from the answers which they gave to the questions I put to them on the subject, that they were profoundly ignorant on the subject. Mr. Wright also, from the Admiralty, could speak as to their having been instances of explosion and of spontaneous combustion in coal on board Her Majesty's ships and in Government stores, but he knew nothing practically as to the causes which had led to them. On the other hand, our attention was called to the report

of the Royal Commission on the spontaneous combustion of coal in ships, which was presented to Parliament in July last, and which contains an immense mass of information on the subject, and is amply sufficient for all the purposes of the present inquiry.

It appears from this report that there are two sources of danger in coal cargoes, namely, one from the explosion of the volatile gases which coal gives out, the other from spontaneous combustion in the coal itself. They are, it would appear, quite distinct and separate, and the causes which tend to produce the one would not produce the other.

As regards the first source of danger, namely, the explosion of the volatile gases, there is a passage at page 24 of the report of the Commission, which explains so clearly the origin and nature of this danger that I cannot do better than quote the words. The Commissioners say: "It should also be borne in mind that the gas which by its mixture with oxygen is productive of an explosive atmosphere, is a light gas which will readily find its way to the surface of the coal. All it requires, therefore, is to have free and constant egress from the surface of the coal into the open air, and the majority of the casualties seem to occur from making the gas dependant for this egress upon the hatchways, which, in the event of rain or heavy weather, are liable to be covered and battened down. The gas then accumulates between the surface of the coal and the deck, and mixing with the air with which it is confined, forms an atmosphere which only needs the application of a flame to explode. Every coal laden ship should, therefore, be fitted with shafts or ventilators piercing the upper deck, but not carried down to or through the coal, with cowls always trimmed so as to form a down-cast and up-cast for the current of air, which would then pass continuously and in all weather over the surface of the coal, carrying with it any explosive gas as fast as it is evolved." And accordingly the Commission recommend: "That with a view to guard against explosion, free and continuous egress to the open air, and independently of the hatchways, should be provided for the explosive gas by means of a system of surface ventilation, which would be effective in all cases whatever."

The other source of danger in coal cargoes, namely, spontaneous combustion, is very clearly explained in a paper annexed to the report, and which is signed by two very eminent chemists, Professor Abel and Dr. Percy, who were also members of the Commission. They say that the "so-called spontaneous development of heat which occasionally takes place in coal is due to chemical changes which certain substances occurring in the coal undergo through the agency of atmospheric oxygen," and they instance iron pyrites as being one of the principal substances, "the oxidation of which is attended by the development of heat." If the heat is confined it may rise to ignition point, and in that case spontaneous combustion would follow.

Now a great deal of evidence was taken before the Royal Commission as to whether ventilation in the hold of ships would be of any use to prevent spontaneous combustion, and the conclusion to which the Commissioners came was that so far as spontaneous combustion is concerned ventilation would be an element of danger rather than otherwise. If the air could permeate every part of the coal it might no doubt carry off the heat, and prevent its arriving at the ignition point, but this is practically impossible, and if the coal is in a condition suitable for generating heat, the introduction of atmospheric air into the hold would tend by oxidation to develop heat, and thus induce spontaneous combustion.

Other circumstances are mentioned by Professor Abel and Dr. Percy, as tending to produce spontaneous combustion, as for instance, the presence of water in the coal where there is iron pyrites, inasmuch as the moisture "promotes oxidation of pyrites." They say also that "the breaking up of the coal which occurs to a more or less considerable extent before and during its shipment obviously favours the absorption of oxygen, and consequently increases tendency to heating."

Accordingly, the Commissioners state as one of the conclusions at which they have arrived "that the breakage of coal in its transport from the pit to the ship's hold, the shipment of pyritic coal in a wet condition, and especially ventilation through the body of coal cargoes" (the italics are in the report itself), "conduce to spontaneous combustion even though the coal may not be unfit for conveyance on long voyages."

Having thus briefly explained the dangers which appear to attend the carriage of cargoes of coal, let us now proceed to inquire under what conditions the coal was shipped on board this vessel.

Mr. Holland, the shipper, has told us that the cargo was conveyed to the ship in six barges. The two first contained Davison's Hartley coal, and was a portion of a cargo of 1,000 to 1,200 tons which had been taken out of a ship that had sustained some damage, that the cargo had been discharged from the ship then carried to and landed upon the wharf in Millwall Dock, where it had remained ever since the 5th June covered only with a tarpaulin, until it was shipped on board this vessel between the 6th and the 11th of August. The other four barges contained West Hartley Main coal. Now it is obvious that as regards the two first barge loads of coal, they had been subjected to more than the usual amount of breakage, before they reached the vessel's hold they had been first shipped on board a vessel, then discharged from the vessel into barges, landed on the wharf in Millwall Dock, then discharged again into barges, carried to the ship, and placed in the vessel's hold. This, as the Commissioners observe, is one of the elements which conduce to spontaneous combustion.

Again, it was not disputed that these coals had been shipped in a very wet condition, and if there was any quantity of iron pyrites mixed with the coal this would be another element conducing to spontaneous combustion.

It unfortunately happens that we have had no evidence before us as to the peculiar character of the West Hartley coal as distinguished from other coal, further than that of Mr. Holland and Mr. Gammon, and if we are to rely on the evidence of these two gentlemen the West Hartley coals are peculiarly free from pyrites, more so in fact than almost any other coals. At the same time they were not prepared to say that the West Hartley coal was wholly free from iron pyrites; all that they could say was that it ought to have been taken out before the coal was shipped, but whether it was or not from this coal no one could say. On the other hand, it was stated by the learned counsel for the Board of Trade that there were many instances in the reports of the Royal Commissioners of spontaneous combustion in West Hartley coal.

Looking then to the fact that there must have been a considerable amount of breakage in at all events two of the barge loads of coals before it reached the vessel's hold, that the cargo was undoubtedly shipped in a wet condition, and that there is no evidence whatever that there was not iron pyrites with it, we have not indeed a certainty but a fair probability that spontaneous combustion did take place in the coal, and that it is to this that the loss of the vessel and cargo is due. It is perhaps reasonable to believe that it would begin by developing increased heat in the hold, the first effect of which would be to burst the bottles of beer which were stowed above the coal, and the vapour which would come from the beer would doubtless produce that effect upon the paint which some of the witnesses have described.

At first there would be, as the master and mate have stated, merely a blue vapour, this would gradually increase until at length it would burst out in smoke and fire.

This being the conclusion to which we have come, the question which we have now to consider is, how far the charge which has been brought by the Board of Trade against the master has been established? The Board of Trade have charged John Watson, the master of the "Amadine," "with negligence in his duty as master of the said ship on her voyage from London to Penang on the 30th of August 1876 and following days until December the 9th, 1876, in not attending to the ventilation of the hold of the said ship." That is the charge, that he did not attend "to the ventilation of the hold of the ship."

Now from what has been said above it is clear that the want of ventilation in the hold, if indeed there was any want of ventilation, was not an element of danger, and certainly did not conduce to the loss of the vessel in this instance. It has been conclusively shown that there was no explosion on board this vessel, the fire was due not to any volatile gases emitted from the coal, which ventilation might have carried off, but if it originated with the coal at all it arose from spontaneous combustion, and ventilation would in that case have done rather harm than good. Indeed, we find as a fact that whilst the hatches were kept closed the fire made little progress, smouldering for some three days, and it was only after the ventilator had been put down between 4 and 5 o'clock on the Saturday afternoon that it burst out into a blaze.

But even assuming that the master had not provided ventilation for the hold of his vessel, are we to blame him for it? The ventilation which the hold got was either through the forward bulkhead and up the fore scuttle, which was always kept open, or through the sliding panels in the fore and aft hatches when they were open. Those were the means which the owner provided for the ventilation of the hold previous to her leaving this country, and it was

hardly for the master to provide other means of ventilation than those which the owner had thought sufficient. If they were not sufficient it would be for the owner to provide other and better means previous to the departure of the vessel. No doubt the ventilation of this vessel was very defective, but this was not the fault of the master.

It appears to us therefore that it is impossible to find this master guilty of the charge which has been preferred against him. Even if he did, as the carpenter has told us, batten down and effectually close both the fore and after hatches, that circumstance did not conduce to the loss of this vessel. It is abundantly clear that the owner must have known that the tarpaulins would in the case of bad weather be put over the hatches, and if anybody therefore is to blame for that it would be the owner.

But are we then to hold that the master is altogether free from blame? We think not; it seems, according to his own admission, that so early as the night of the 6th a vapour was observed issuing from the hold, so powerful indeed, as to stupefy the boatswain, and yet from that time until the morning of the 9th the master took no steps whatever to ascertain the cause of the mischief. The excuses that he has offered for not taking any steps are, first, that there was no appearance of smoke but only steam till the Saturday.

A second excuse is that there was no appearance of heat or fire until about 10 o'clock on the Saturday evening. Thirdly, he says that he was confirmed in his belief that there was no fire in the hold by the fact that the water from the two tanks, one of which was forward of the fore hatch, the other abaft of the pump well, was always cool till late on Saturday evening.

On the question whether there was smoke or not before the Saturday evening the master and mate are at issue with the crew, but whether it was smoke or whether it was steam it makes, in our opinion, very little difference. Whether it was smoke or steam it must have come from heat in some form or other, and with a cargo so inflammable as that which he had on board it was the master's imperative duty to ascertain what was the cause of that heat. The fact that the water in the tanks remained cool down to late on Saturday evening shows not that there was no heat and no tendency to heat in the hold, but only that the heat which existed was local, and at a distance from the tanks. Had measures been taken at an early period before the heat had become so great as to arrive at the point of ignition, and when the fire was still smouldering, there can be little doubt that it might have been put out. The excuse of the master, that if he had opened the hatches he had no place on deck in which to put the cargo, can hardly be admitted. Surely it would have been better to have thrown overboard some portion of the cargo rather than to have risked the whole of it and the lives of all on board. It appears to us that the master has committed a grave error in judgment in having taken no steps whatever from the Wednesday night till the Saturday to ascertain whence the heat or the vapour, or whatever it was arose. We cannot therefore say that he is wholly free from blame for the loss of this vessel. It is quite possible that the master as well as the mate were as much alive to the fact that there was heat in the hold as any of the crew, and that they hoped by keeping the hatches on either to stifle it or keep it under until they fell in with some other vessel. Perhaps, too, they feared that if they took off the hatches the men might get to the spirits and greater risk

would be run. At all events, whatever may have been their motives for taking no steps to get at the source of the mischief, what they did do was eminently injudicious. They kept the hatches closed until the fire had got well hold of the cargo, and then put down a ventilator to fan the flame into a blaze.

But whatever may be our opinion of the master's want of judgment in not trying to get at the source of the mischief at an earlier period, that is not the charge which the Board of Trade have brought against him. The charge against him is for not "attending to the ventilation of the hold," and that charge I have already said has not, in our opinion, been established. If, therefore, we were disposed to punish the master we could not do so, for the Board of Trade have not thought proper to charge him with the only offence of which we think him guilty, and he has consequently had no opportunity of defending himself against it. But as a fact we are not disposed, even if we had the power, to punish him at all. At the utmost he has committed a mere error of judgment. There was no want of seamanship, no want of courage, no desire to abandon the ship too soon, the fault would rather be that he stuck to her too long and thus risked the lives of all on board.

On the whole, we think that justice will be sufficiently done by merely warning the captain to be more cautious in future. The case, however, was a very proper one for an inquiry, and of course there will not be any costs of the investigation.

(Signed) H. C. ROTHERY,  
Wreck Commissioner.

*Finding.*

The Court, having carefully inquired into the circumstances of the above-mentioned shipping casualty, finds, for the reasons stated in the annexed judgment:

(1.) That the mode of ventilating the cargo by means of sliding panels in the fore and after hatches was, in the opinion of the Court, not a good or proper one, but that in no way contributed to the loss of the ship.

(2.) That the loss of the ship was, in the opinion of the Court, due to the spontaneous combustion of the coal on board.

(3.) That the master is to blame for not having taken any steps to ascertain the cause which ultimately led to the burning of the vessel from the night of Wednesday the 6th of December, when the heating of the cargo first developed itself, until Saturday the 9th, when the fire broke out.

And (4.) That as the only charge preferred against the master is for not attending to the ventilation of the hold of the ship, and for which, even if it had contributed to the loss of the ship, he was in no way responsible; the Court accordingly returns to him his certificate, but is of opinion that there ought to be no costs of the investigation.

Dated this 11th day of June 1877.

(Signed) H. C. ROTHERY,  
Wreck Commissioner.

We concur in the above report.

(Signed) GEORGE H. FORSTER, } Assessors.  
" JOHN S. CASTLE, }