

The effects of Lightning at Sea



HMF Fisgard struck by lightning

From: “Remarkable instances of the protection of certain ships of Her Majesty’s Navy, from the destructive effects of lightning” by W Snow Harris FRS et al. 1847

The Official Journals of the British Navy present, from the earliest period of its history, melancholy and often fatal instances of the destructive action of Lightning. In about 120 cases only, the amount of money sunk on account of masts and other material ruined or destroyed, cannot be set down, on a moderate computation, at less than £100,000. Three hundred seamen either lost their lives or were seriously injured, and the country was frequently deprived of the efficient services of its ships and fleets at critical periods. Between the years of 1810 and 1815, we find records of no less than thirty-five sail of the line, thirteen frigates, and ten sloops, either disabled or greatly damaged. Taking into account every instance in which ships of the Royal Navy have suffered from lightning since the war of 1793, and every expense contingent on the repairs and refit of the ships, the country did not certainly, on a moderate estimate, expend less than from £7,000 to £10,000 annually, during a period of about twenty-three years’ war, and from £2,000 to £5,000 for about the same period of peace, in consequence of damage done to its navy by lightning.

A want of due attention to the means of parrying the force of the electrical discharge, may be considered as the more immediate cause of so much devastation. Our ships have either been unprovided with lightning-conductors altogether, or if furnished with them, they have been of such small capacity, so partially and ill-applied, and so dependent on the

prejudices of sailors, for due care and attention to them, that little benefit seems to have been derived from this source of protection.

That the common temporary forms of lightning-conductor, applied as rigging, do not satisfy all the conditions of the problem, or meet the many difficult circumstances in which the general fabric of a ship, in all its casualties, may become placed, is now pretty generally admitted. In certain cases of electrical discharge, this kind of conductor may be partially destroyed; or otherwise, from its misapplication, or from its constituting an imperfect line of discharge, or from lightning striking low down, or obliquely, upon the mast, it may fail to afford the required protection. The results of the trials resorted to by the Board of Admiralty, [1839 to 1842,] are quite conclusive on this point, even if all former experience had not already determined the fact. The following are two extracts from the log of HMS Hazard, lately returned from China, and which, in 1841, was ordered to be furnished with lightning-conductors consisting of small ropes of wire led from the trunk to the sea, along the rigging and over the ship's side; their lordships having been informed, that ropes of this kind would prove economical, and be more safe, than a more capacious and permanent kind of conductor fixed in the masts and hull:-

“Diamond Point, north end of Sumatra, May 1, 1846, A.M. 3.35.- In royals and flying jib – up, mainsail. 5, set top-gallant sails. 7, ship struck by lightning, splitting masthead vane-staff, and carrying away the conductor. Maintop-sail sheet-bits damaged. Lightning passed down by the starboard maintop-sail chain-sheet and by the wire conductor, tearing copper off the ship's side, and materially injuring the wire by breaking the strands.”

“Cape Po, Sarawak, Borneo, June 12, 1846; at anchor, A.M. 5.30. - Lightning struck the ship, splitting and carrying away maintop-gallant and royal-mast, the whole of maintop-mast, from the hounds to the lower cap, sprung after cross-tree, split and carried away starboard trusseltree. The electric fluid partly escaped down the conductor by main rigging overboard. A part of the damaged topmast on falling went through the quarter-deck into the gun-room. 8, cleared the wreck, and pointed new maintop-mast, ...”.

In referring to the log of HMS Bittern, another of the vessels in which these conductors were ordered to be tried, we find a similar result, as shown in the following extract from the log :-

“Angorha River, Jan. 23, 1844, P.M. 1020. - Struck by lightning, which shivered the main-trunk, and splintered the royal-mast.”

It further appears, by the medical officer's report, that the discharge fell on the deck, and disabled several of the sailors: eight men were sent to the hospital. A great portion of the discharge, however, is said to have passed off by the conductor, so far contributing to protection. These are not solitary instances; Arago, in his “Notices sur Le Tonnerre,” *Annuaire* for 1838, p. 515, gives a similar case, as occurring in *La Junon*, a French frigate, which had a rope of twisted wires applied as a lightning-conductor in the rigging. In the “*Comptes Rendus*,” for June 1839, we find an account of damage by lightning to l'Hôtel des Invalides at Paris, in which case the lightning-conductor of twisted wire ropes was knocked in pieces. In HMS *Impregnable* and HMS *Belleisle*, two line-of-battle ships, these ropes were chafed through by the working of the gear aloft, and were returned as defective to the Devonport dockyard; and these are not the only instances of this, beside others in which they have been found either misapplied or out of place.

The Commission for inquiring into the best form of lightning-conductors for ships, appointed in 1839 by the Board of Admiralty, under the countenance of the House of Commons, gave in their Report numerous examples of the inapplicability of these temporary expedients to meet the exigencies of a ship in storms of lightning, and to resist the violent mechanical forces to which a ship's rigging is exposed, and concur fully in the opinion advanced by almost every practical seamen, that if lightning-conductors are applied at all on shipboard, they should be applied under a capacious and permanent form, so as to render them secure, and independent of the crew of the ship for their perfect application and preservation.

This has lately become an affair of no inconsiderable moment, since it is now found requisite to apply a conductor to each mast; hence it follows that the officers and seamen have to look after three conductors instead of one, as in former times, all of which is considered a great source of peril and annoyance, especially in gales of wind and in thunder-storms. But then the question arose, how far metallic conductors, of a fixed and capacious kind, can be applied so as to meet all the varying conditions of a ship's masts, and all the casualties in which the vessel itself may become placed – a problem more difficult of solution than would at first be imagined.

It, in fact, amounts to this:- to construct and apply lightning-conductors in ships, so as to be always in place, always ready to meet the most unexpected danger; to be permanently fixed and of great capacity, admitting, at the same time, not only of every possible motion of the different parts of the masts one on the other, but also of any portion of the mast being removed, either by accident or design, without in any way interfering with the protecting power; to be quite independent of the officers and crew of the ship, so as not to impose on them the responsibility of their correct application, or the necessity of watching and handling them, of placing and replacing them in times of difficulty, to their great peril and annoyance; to be quite clear of the standing and running rigging, capable of resisting external violence, and at the same time yield to any flexure the mast can sustain; finally, to be so applied, that a discharge of lightning falling on the ship cannot enter into any circuit in its passage to the sea, of which the conductors do not constitute a part. Such are the principal conditions we have to satisfy in any attempt to effectually secure shipping against the destructive ravages of lightning.

To meet such complicated conditions the author of these remarks proposed, so long since as the year 1820, to give the ship a perfectly continuous conducting power throughout the masts and hull, by incorporating with the masts a line of double copper plates, of great electrical capacity, applied one over the other, in alternating close joints, so as to yield with the flexure of the spar, being firmly embedded in a shallow groove ploughed in the after part of it. These flexible metallic lines to be finally connected with similar conductors, fixed under the beams and in the body of the ship, and connected with all the great metallic masses employed in the construction of the hull, and with the sea; thus bringing the general fabric into that peculiar electrical position it would assume, supposing the whole were metallic throughout. Thus the conductor, all the minor mechanical details being perfected, became an integral portion of the ship and masts, and the vessel consequently made secure against the violent action of lightning at all times and under all circumstances, without the officers and crew of the ship being parties to it in any way whatever.

So bold an application of the general principles of lightning-conductors was not at first received without much distrust and apprehension; almost everyone having been led to imagine that metallic bodies had a peculiar affinity for the matter of lightning, and by inviting or drawing it down the ship, frequently accelerated the mischief they were meant to obviate; that from the position of the conductors the electrical discharge would necessarily pass through the body of the hull, whilst the variable positions which the sliding masts were liable to assume would derange the line of conduction, and hence damage may ensue.

The author, however, succeeded in proving, by new researches in electricity and by a very extensive induction of facts derived from the analyses of numerous instances in which ships of HM Navy had suffered from lightning, that such apprehensions were not tenable; that what we term lightning being nothing more than an explosive form of action of some occult power in nature when forcing its way through resisting matter, we should, in giving it a free passage through little resisting matter, transform this explosive action, termed lightning, into a comparatively quiescent current, and so avoid those violent results arising from disruptive force altogether;

In the case of the 74 gun HMS Minden, “she was completely fitted with the permanent conductors at Devonport, being destined for service in India and China, where storms of lightning are known to be extremely severe... The ship, since the time of her sailing from England, in 1842, has been frequently exposed to such storms, but without receiving the least injury...”

Mr. Cook, the purser of the ship, in a letter, written from Hong Kong in August 1842 describes the experience of a thunder and lightning storm whilst the Minden was at anchor at that port:

“The lightning last night was heavier than I ever saw it before: two flashes struck the Minden, and played about the conductors for a few seconds, conveying a stream of fire throughout the ship awful to behold. A frizzling noise was distinctly heard, and I have no doubt but that we should have received serious injury had we not been protected by our conductors. I have been informed that the lightning struck several vessels, killed four men, and wounded some others. We are now lying with the fore-yards and top-masts struck.”

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