



THE MERCHANT SHIPPING ACT, 1894

REPORT OF COURT

(No. 7984)

“Sao Paulo” (Ex-Battleship)

In the matter of a Formal Investigation held at 10, Carlton House Terrace, London, S.W.1, on the 4th, 5th, 6th, 7th and 8th days of October 1954, before Mr. R. F. Hayward, Q.C., assisted by Captain A. M. Atkinson and Mr. W. J. Nutton into the circumstances attending the loss of the ex-Brazilian Battleship “Sao Paulo” in the North Atlantic Ocean on or after the 4th November, 1951.

The Court having carefully inquired into the circumstances attending the above-mentioned shipping casualty, finds for the reasons stated in the Annex hereto, that the said ship probably foundered, either with or without capsizing, in a very heavy gale from the N.W., whilst in the trough of a very high sea, after the two tugs which had been towing her had parted their towing connections; that the sinking or capsizing was probably within an hour thereafter; and that the loss may have been caused or contributed to by the failure of the temporary closings of some of the gunports and other openings. The Court finds that there is no blame to be attributed to any of those concerned in the preparations for the towage or the handling of the “Sao Paulo” at sea.

Dated this 14th day of October, 1954.

R. F. HAYWARD, *Judge*.

We concur in the above Report,

A. M. ATKINSON }
W. J. NUTTON } *Assessors*

QUESTIONS AND ANSWERS

Q. 1. By whom was the “Sao Paulo” owned at the time of her loss?

A. The British Iron and Steel Corporation (Salvage) Limited.

Q. 2. When, where and by whom was the “Sao Paulo” built?

A. In 1910 at Barrow-in-Furness by Messrs. Vickers Armstrong.

Q. 3. For how long had the “Sao Paulo” been out of commission as a battleship of the Brazilian Navy when she was sold to the owners named in the answer to Question 1?

A. She had been lying in Rio de Janeiro Harbour since 1946 and was last in dry dock in 1948.

Q. 4. Where was the “Sao Paulo” lying at the time the Brazilian Government sold her to the owners named in the answer to Question 1?

A. In Rio de Janeiro Harbour.

Q. 5. When did the sale take place?

A. 24th August, 1951.

Q. 6. What was the general condition of the “Sao Paulo” at the time of the sale compared with her normal seagoing condition when commissioned as a battleship?

A. Her bottom was heavily coated with marine growth; her secondary armament of 4.7 inch guns had been removed and nine or ten of the gunports had lost their steel doors. Most, if not all, of the non-ferrous metals and the interior furniture of the ship had been removed and also the ammunition.

Q. 7. What were the terms of the sale with regard to the “Sao Paulo’s” condition?

A. The “Sao Paulo” was sold in the “as is” condition with her engines, boilers, motors and further equipment still on board.

Q. 8. What arrangements were made by the owners named in the answer to Question 1 for the delivery of the “Sao Paulo” in the United Kingdom?

A. The Ensign Rigging Company, Limited, were engaged to provide a runner crew for bringing the vessel under tow to the United Kingdom and to be responsible for her preparation for the voyage. The owners also contracted with Metal Industries, Limited, for her towage by the tug “Bustler”, and the latter firm sub-contracted with the Overseas Towage and Salvage Company Limited, for an additional tug to assist, and the tug “Dexterous” was detailed for the work. The owners also arranged for a seaworthy certificate to be obtained from a reputable ship Classification Society.

Q. 9. Who went out to Rio de Janeiro in Brazil to prepare the “Sao Paulo” for the towing voyage to the United Kingdom and to make arrangements for that towing voyage?

A. Mr. W. Painter, the Managing Director of the Ensign Rigging Company Limited and his mate, a Mr. Adams.

Q. 10. Who was engaged to undertake the towage?

A. See Answer to Question 8.

Q. 11. What tugs were provided for the towage?

A. See Answer to Question 8.

- Q. 12. What work was done in preparing the "Sao Paulo" for the journey to the United Kingdom?
- A. The main work done in preparing the "Sao Paulo" for the journey to the United Kingdom was (a) the closing of the gunports of the secondary armament, the provision of new rubber rings for, and the screwing down of, double bottom tank lids, the closing of various scuttles in the ship's side and hatchways and skylights on her upper and one or two lower decks; (b) filling water ballast tanks, mainly to bring her to an appropriate trim; (c) placing in position short lengths of the ship's spare anchor cable for the purpose of attaching the towropes thereto; (d) provisions and water were supplied for the runner crew of eight hands; (e) a walkie-talkie radio receiver and transmitter was supplied; (f) lifesaving appliances and equipment and some timber and cement for use if necessary during the voyage.
- Q. 13. Who carried out this work and to whose order?
- A. As to items (a) and (f) in the previous Answer, the repair department of the Brazilian Naval Dockyard at the order of the owners' Brazilian agents, Casa Mayrink Veiga S/A, Rio de Janeiro; as to (b) the tug "Bustler", under the orders of her master; (e) Mr. Painter supplied the walkie-talkie, which was put in working order by the wireless officers of the "Bustler", As to item (d), Casa Mayrink Veiga.
- Q. 14. Who was in charge of the ocean-towing operation after all the preparations for the voyage had been completed?
- A. Captain Jonathan Adam, the master of the "Bustler".
- Q. 15. Was this work of preparation carried out under the supervision of a Surveyor? If so, who was the Surveyor?
- A. Yes. Mr. Arthur Polono Russi, the Bureau Veritas Surveyor in charge of the Rio de Janeiro District.
- Q. 16. Was a seaworthy certificate given in respect of the "Sao Paulo" for the towing voyage about to be undertaken?
- A. Yes.
- Q. 17. If the answer to Question 16 is yes, who gave the seaworthy certificate?
- A. The Surveyor named in Answer 15.
- Q. 18. Was a runner crew supplied for the "Sao Paulo" and if the answer is yes, how many members did the runner crew consist of and who was in charge?
- A. Yes - nine men including Mr. Painter, who was in charge. One man, de Vos, was injured as the ship was about to leave Rio de Janeiro and he was taken ashore to hospital.
- Q. 19. What length of time was taken up in preparing the "Sao Paulo" for the towing voyage?
- A. Messrs. Painter and Adams arrived on the 25th August and thereafter worked with energy, and the dockyard labour starting on the 5th September worked for some 3,691 man hours before the voyage commenced.
- Q. 20. When did the towing voyage commence?
- A. The 20th September 1951.
- Q. 21. What arrangements (if any) were made for signalling or communication between the "Sao Paulo" and the tugs?
- A. It was arranged that the "Sao Paulo" or the "Bustler" on flying a flag by day or flashing a light at night to the other vessel desired to communicate on the wireless.
- Q. 22. What were the conditions of weather, wind and sea off Rio de Janeiro at the time the towing voyage commenced?
- A. Fine weather with little wind and sea.
- Q. 23. What was the estimated time of arrival in the United Kingdom and what was the intended destination?
- A. So far as could be estimated, the time of arrival would be towards the end of November, and the intended destination was to be wirelessed on the approach to the United Kingdom.
- Q. 24. For how long after the towing voyage commenced was progress maintained?
- A. About 45 days.
- Q. 25. When did the weather and sea seriously deteriorate on the voyage?
- A. The flotilla had experienced strong north-easterly winds on the 19th and 20th October, but on the 4th November a north-westerly gale developed raising a heavy sea and causing the flotilla to heave to head to wind.
- Q. 26. What was the "Sao Paulo's" position when conditions of wind and sea seriously deteriorated?
- A. About 30° 49' North, 23° 30' West.
- Q. 27. Did any signals pass between the "Sao Paulo" and the tugs or vice versa up to the time of the casualty and, if so, what was the general purport of such messages?
- A. Yes. Mr. Painter and Captain Adam communicated by walkie-talkie twice daily until noon on the 4th November, up to which time Mr. Painter had reported that all was well. At about noon on the 4th November, during the last communication between the "Bustler" and the ship, Mr. Painter reported, "I have just completed a round and she is tight. The only sign of anything is that I am getting slight trickles through my gunports", and he said, "It is nothing".
- Q. 28. What was the first indication of serious difficulty brought about by the deterioration of wind and sea?
- A. A heavy sheer to starboard by the tow which fell into the trough of the sea, dragging the tugs astern and closer up towards each other.
- Q. 29. Which of the tugs was the first to be disconnected from the tow?
- A. The "Dexterous".
- Q. 30. Did the tug referred to in the answer to the previous question cast off her towline or was the towline parted by stress of weather and sea?
- A. Whilst the chief engineer of the "Dexterous" was striking with a hammer the slipping arrangements on the towing hook the connection parted which he thought was due to the shackle breaking.
- Q. 31. If the tow line was cast off, what was the reason for such casting off?
- A. It had been arranged that if the tugs got into difficulties the "Dexterous" should cast off, leaving the field of manoeuvre to the "Bustler". The order was given by the master of the "Dexterous" to cast off because the tugs were being drawn into risk of collision with each other.
- Q. 32. What happened to the remaining tug's tow line immediately after the other tug became disconnected?
- A. It parted, apparently at the "Sao Paulo's" end, because so heavy a weight came on to the "Bustler's" towing winch that it created unusual difficulty in heaving in, and the five inch wire fouling the tug's propeller was parted and was lost.

- Q. 33. On what day and at what time and in what approximate position did the "Sao Paulo" become disconnected from the tugs?
- A. 4th November 1951, at about 1730 hours, ship's time and about in the position stated in Answer to Question 26.
- Q. 34. What was the state of the weather, wind and sea and conditions of visibility at the time when the "Sao Paulo" became separated from the two tugs?
- A. The weather was exceptionally bad, the wind rising to about force 12 in squalls with a mountainous sea. It was coming dark and the weather was hazy.
- Q. 35. Did the tugs try to establish radio contact with the "Sao Paulo" after they became disconnected? If so, at what time and with what result?
- A. Yes - promptly after the parting, and the "Bustler's" radar was operating within an hour. No response was heard from the "Sao Paulo", nor was she identified on the radar.
- Q. 36. Was any search for the "Sao Paulo" made by tugs and, if so, what was the nature and extent of the search?
- A. Yes. When on the morning of the 5th the "Bustler" in spite of the continuing very bad weather, turned to the south-eastward, she began a search which continued until the 19th November, on which date she had to make for Lisbon for bunkers. In turning to begin a search on the 5th November, the "Dexterous" received such heavy weather damage that she had to return to port. She was relieved by the "Turmoil", belonging to the same company, which searched from the 10th November until the 20th November. They covered a large area to the southward and eastward of the position in which the tow became disconnected.
- Q. 37. Were any air searches organized and carried out? If so, by whom were the air searches made?
- A. Air searches were made by aircraft of the Royal Air Force, the United States Air Force and the Portuguese Air Force, that by the Royal Air Force between the 7th and 10th November and again on the 14th November.
- Q. 38. What areas were searched by aircraft and when was this done?
- A. The Royal Air Force in its first search between the 7th and 10th November covered an estimated area of some 136,000 square miles between latitudes 41° and 30° N. and longitudes 26° 30' and 19° W., and on its second search between the 14th and 15th November, a further area of about 85,000 square miles to the south-eastward of their first search. Details of the searches by the American and Portuguese aircraft are not stated.
- Q. 39. Was the "Sao Paulo" seen again after she became disconnected from the tugs?
- A. At the time of parting the "Sao Paulo" became invisible in the growing darkness, but her red side light was seen for some time after the parting.
- Q. 40. Was the "Sao Paulo" seaworthy at the commencement of the towing voyage?
- A. Yes.
- Q. 41. What lifesaving appliances were carried on board the "Sao Paulo" and were such appliances in proper working order?
- A. Two lifeboats of variously described dimensions, but of ample size for the eight runners, were provided in proper working order, one secured outboard to the ship's port quarter and the other stowed on deck on the starboard side near amidships under a derrick capable of lifting it outboard and lowering it into the water. There were six new lifebuoys and ten new life-jackets. There were also several hundred old life-jackets which could be made serviceable by the runners.
- Q. 42. How many men sailed on board the "Sao Paulo", and had they access to all parts of the ship? Who was in charge?
- A. Eight men, including Mr. Painter, who was in charge, and they had means of access to all parts of the ship.
- Q. 43. Who was responsible for the towing voyage commencing when it did?
- A. Captain Jonathan Adam, the master of the "Bustler".
- Q. 44. Were the tugs "Bustler" and "Dexterous" adequate and in all ways satisfactory for the task of towing the "Sao Paulo" from Rio de Janeiro to the United Kingdom?
- A. Yes.
- Q. 45. Was it right and proper to commence the towing voyage from South America to the United Kingdom on the date it was in fact commenced?
- A. Yes.
- Q. 46. Were proper arrangements made by the tugs to receive weather forecasts during the voyage?
- A. Yes. A continuous wireless watch was kept during which weather forecasts could be, and were, received.
- Q. 47. Were adequate arrangements made for providing food and water for the crew on board the "Sao Paulo"?
- A. Yes. Before sailing it was arranged that additional provisions could be obtained by the "Dexterous" from the Azores when the flotilla was in that vicinity.
- Q. 48. Was the stability of the "Sao Paulo" considered before she left Rio? If so, by whom?
- A. Not in the sense that any calculations were made. There were no plans of the ship available, but those concerned formed the opinion that she had ample stability.
- Q. 49. Was the "Sao Paulo" upright at the commencement of the towing voyage?
- A. Yes.
- Q. 50. Was the "Sao Paulo" upright during the towing voyage up to the time of the very serious deterioration of weather, wind and sea conditions as far as could be observed from either of the tugs?
- A. Yes, save for a slight list to port which was corrected when its cause, namely, the leakage of ballast water into the bilges, was ascertained. This water was returned to the tank and the tank re-closed several days before the 4th November, 1951. On one occasion the guns in a forward barbette were observed to be slightly out of the fore and aft line, but this was corrected and Mr. Painter reported to Captain Adam that the barbette was thereafter firmly secured.
- Q. 51. If the "Sao Paulo" was not upright at all times during the towing voyage, was anything done (as far as is known) to correct the list and was any improvement observed from either tug?
- A. See Answer to Question 50.
- Q. 52. Does the Court find that the "Sao Paulo" sank and that all hands were drowned?
- A. Yes.

Q. 53. What was the cause of this shipping casualty?

A. Due to the lack of signals or messages from the ship at the material time and the failure to find the wreck, the direct cause of the casualty is unknown, but the Court finds that she probably foundered or capsized before foundering, due to a combination of very high beam seas and very heavy wind pressure on her high upper works, quite possibly aided by breakage of the temporary closing of secondary armament gunports and possibly other closures.

Q. 54. Was this shipping casualty caused or contributed to by the wrongful act or default of any person or persons?

A. No.

ANNEX TO THE REPORT

The "Sao Paulo" was a battleship built to the order of the Brazilian Government by Messrs. Vickers Armstrong at Barrow-in-Furness and completed in 1910. Her main dimensions were: Length 500 feet between perpendiculars; breadth 83 feet moulded; depth 42 feet 3 inches moulded. Her designed service draught was 25 feet and her normal displacement with ammunition, equipment and 800 tons of coal, was 19,200 tons. The upper deck was flush. There was a ram bow and cruiser stern. There was one main deck house amidships covering the engine and boiler rooms. There were three continuous decks, namely, upper (weather) deck, main deck and middle deck, below which were a lower deck and a platform deck extending from the stern to the forward boiler room bulkhead and from the stern to the after engine room bulkhead. Inside the main deck house at about 8 feet above the upper deck there was a middle deck with access from the upper deck by ladders within the deckhouse. The forward and after ends of this middle deck had low coamings above which it was open to the weather. There were ladders from this middle deck leading up to the casing top and boat deck. There were main transverse watertight bulkheads which divided the vessel into 17 main compartments. The forepeak bulkhead extended to the upper deck. The other main transverse bulkheads were carried up to the middle deck, except at the ends where they extended to the main deck. There were fore and aft watertight bulkheads port and starboard from abaft the engine room to a position forward in way of the forward barbettes. These bulkheads confined the coal bunkers from tank top to main deck. There were double bottoms under compartments 4 to 14. Those under Nos. 9 and 10 were arranged for oil fuel. Companionways on the weather deck forward and abaft of the barbettes gave access to accommodation, store rooms, etc. These companions had steel coamings and hinged steel lids. There were a number of exposed skylights on the weather deck forward and aft. These originally had steel coamings with steel hinged lids, secured by toggles or butterfly bolts. In these lids there were some circular glass lights. Access to the engine and boiler rooms was by doorways in the main deckhouse sides, and thence by companionways to the lower spaces. The outside doors were steel and hinged and secured by toggles against rubber jointing. There were a number of flush coaling rings, of the bayonet-joint type, on the upper deck amidships which led to the main deck and on the main deck were corresponding flush bunker rings leading direct to the main side bunker spaces below.

The builder's capacities included:

	Coal at 44 cubic feet per ton
Lower side bunkers : ..	1,252 tons
" cross " : ..	122 "
Upper side " : ..	991 "
Total ..	2,365 tons

Oil fuel at 38.53 cubic feet per ton : 366 tons in double bottoms.

Reserve feed tanks : 194 tons in double bottom.

Water Ballast

Forward trimming tank:	272 tons
After " :	290 "
Double Bottoms " :	1,256 "

The vessel had two sets of four crank triple expansion engines driving two screws. The designed horse power was 23,500 at 140 revolutions per minute. There were 18 Babcock & Wilcox small tube boilers working at 250 pounds pressure and also two auxiliary boilers. The main armament was six barbettes each with twin 12 inch guns, two fore deck and two after deck, and one each port and starboard amidships. The secondary armament included fourteen 4.7 inch guns on the main deck, seven each side firing through gunports in the side armour. There were also two 4.7 inch guns on the fore end and two others on the after end of the main deckhouse.

The hull, turrets, etc., were variously armoured, including a 9 inches Krupp armour belt at the sides extending from the upper deck to several feet below the water line. This was backed by 2½ inches to 3½ inches teak backing on the ¾ inch shell plating. The 4.7 inch gunports were formed by apertures about 6 feet by 4 feet high through this side armour. The sills of the apertures were about 2 feet above the main deck. These gunports were closed by substantial hinged steel shutters.

The vessel according to the structural plans had composite bilge keels about 21 inches deep. The vessel was refitted in 1921, but no details of any alterations made are available. The vessel had been out of service lying afloat in Rio de Janeiro Harbour since 1946. She was last dry docked in 1948. At the time she left on the fatal voyage there was a very heavy marine growth showing round the water line. The hull had been stripped of most furniture and many fittings and particularly those of nonferrous materials. A number of the side scuttles in the shell had been removed and also deck glands and other fittings on the weather deck. All the secondary armament of 4.7 inch guns had been removed. The "Sao Paulo" was purchased in her "as is" condition from the Brazilian Government by the British Iron and Steel Corporation (Salvage), Limited of 7, Park Lane, London, W.1, in August 1951. This firm contracted with the Ensign Rigging Company Limited (now in liquidation) to provide a runner crew and to get the vessel prepared and fit to be towed to the United Kingdom for breaking up. A towing contract was also entered into with Metal Industries (Salvage) Limited, for towing the vessel to the United Kingdom. Mr. W. Painter, who was Managing Director of the Ensign Rigging Company Limited, together with an assistant, was sent out to Rio de Janeiro by air, arriving on the 24th August 1951. Mr. Painter was to be in charge of the runner crew on the "Sao Paulo" and there was evidence that he was a man of considerable experience in these matters. The owners' agents in Rio de Janeiro, were Casa Mayrink Veiga S/A, 17/21 Rua Mayrink Veiga, Rio de Janeiro. These agents, with Mr. Painter, instructed the Naval Authorities as to some of the work to be done and the provision of the necessary materials.

The tugs "Bustler" and "Dexterous" were sent out from the United Kingdom. "Bustler" arrived at Rio on the 7th September and "Dexterous" on the 11th September 1951. The remainder of Mr. Painter's runner crew went out on one of the tugs and signed on Articles on the "Bustler" at Rio.

The lifesaving appliances provided for the voyage were as follows: Two lifeboats about 24 feet long fitted with internal buoyancy. Some lifeboat equipment such as oars, sails, masts, rudder, and tiller were noted by some witnesses. One boat was hung under

radial boat davits on the port quarter and secured in the outboard position. The other boat was housed on deck at the starboard side amidships and rigged to a heavy ammunition derrick by means of a wire bridle and tackle all ready for putting outboard. Ten life-jackets were provided, and it was also seen that there were six lifebuoys on board. In addition, there were a very large number of cork life-jackets remaining on board. She was equipped with sufficient flares, but only the tugs carried line-throwing appliances. Before the vessel sailed the rudder was secured amidships and the propeller shafts were disconnected inside, forward of the thrust blocks. All boilers were empty. There were some 70 tons of coal left lying on the stokehold floor, but it was so disposed as to be unlikely to shift in a seaway. There was a portable two-handed Admiralty type hand pump on board with an estimated capacity of 30 to 60 tons per hour through a 3 inches hose. This pump could have been handled by the runners on the tow. There were also a number of items supplied for use on the voyage, including galley coal, a new 30 ton fresh water tank, navigation lights and a first aid kit. The galley store was overhauled and a hand pump for fresh water supplied. The navigation lights supplied were both oil and electric, and a generator was supplied for working the latter.

The cable lifter was shipped and the capstan arranged for handworking. Hand-rails were adapted for towing. A quantity of cement and timber was placed on board.

There was some delay in preparing the ship, but eventually the work was done, some by the Industrial Department of the Naval Arsenal at Rio and some by Mr. Painter and his crew. In addition, the masters and officers of the "Bustler" and "Dexterous" assisted, and also the chief engineer of the "Bustler". The master of the "Bustler" who in fact acted as towing master, was concerned about the trim of the "Sao Paulo" and carried out some ballasting operations by using "Bustler's" fire pump and hoses into the tanks via the manholes. The tanks were filled but not pressed up. The weight of the water ballast put in is not known, but about 22 tanks in all were filled, starting from aft and finishing at about amidships, when it was seen that change of trim aft ceased. The manhole covers were all screwed down by the "Bustler's" chief officer and carpenter as the tanks were filled and the Navy Yard men fitted new rubber jointing. The chief engineer noted that the boilers were empty. He was satisfied with all closures of shell fittings and other vulnerable connections in the machinery spaces, except in one instance of a 6 inches overboard discharge, where the lid had been removed and the valve displaced. This was satisfactorily blanked off. It might be added here that at the last dry-docking in November-December 1948, in addition to welding work done to some shell plate pittings, a large number of shell orifices to inlets, discharges and also some hatches were permanently closed by plates and electric welding. In addition, some 12 inch gun turret openings were similarly dealt with.

The evidence about the closing of deck and side openings is conflicting and incomplete, but it would appear that a number of companionway openings and some skylights were closed with wood coverings, the details of which were not disclosed, but internal reinforcements were used to strengthen them where necessary. A few side scuttles below the main deck had their original deadlights; the others were closed by plates inside and outside and clamped by nut and bolt, or otherwise blanked with wood. There may also have been some doorways inside the structure without doors, but the outer doors which appear to have been substantial were in place and functioning properly. There was much conflict of evidence about the closing of the gunports in the sides below the upper deck. Probably five of these openings were without the

original steel closing shutters. As previously mentioned, these apertures were 6 feet long by 4 feet deep through 9 inches of armour and three or four inches of teak backing and shell plating. The upper and lower edges of the apertures were horizontal and the forward and after edges bevelled so that the aperture was wider at the outboard side than at the inboard side. The Court is satisfied that these openings in the side were closed by timber made up of planks of 2 inches by 8 inches Peroba de Campos (of strength, etc., about equal to Indian Teak) bevelled at the ends to fit into the aperture and backed against 3 inches by 3 inches by $\frac{3}{4}$ inch angle irons whose ends were welded to the shell plating inside. The plank joints were not caulked. The angles extended three inches or so above and below the openings and each had about 9 inches of welding to the ship's structure. The evidence indicates that there were three of these angle irons in each port spaced about equally in its length. On the outboard face of the timber there were steel bars 2 inches by $\frac{1}{4}$ inch secured vertically in line with each of the inside angle irons and the whole was bolted through with $\frac{3}{4}$ inch nut and screw bolts. The Court is satisfied that the means provided for closing them were fit and reasonably sufficient having regard to their height above the waterline, that is about 14 feet.

The main funnels were in poor condition.

The watertight doors in the ship according to evidence from the Brazilian Navy Authorities, were not in good condition and did not close well; but the towing master and presumably Mr. Painter were satisfied about the watertight doors in the transverse bulkheads and that they were in working order.

The Dockyard workmen spent 3,691 man hours working in the "Sao Paulo" between the 5th and the 20th September, 1951. No calculations were made at Rio as to the stability of the vessel for the voyage. The towing master, with the concurrence of Mr. Painter, appears to have been satisfied after the ballasting, and from his general knowledge that stability was sufficient.

The Bureau Veritas Surveyor who issued a Seaworthy Certificate for the ship to cover the voyage did not inquire about stability, nor did he make any calculations. In his opinion, based on his personal knowledge and sea experience and the fact that the secondary armament had been removed, and also all ammunition removed and water ballast added, the stability was "perfect".

There was some evidence about certain quantities of loose water on the main deck before the ship left Rio and there is no direct evidence that the water was cleared. The Court is satisfied, however, that this loose water, if it remained, would have had a negligible influence on stability.

There was also evidence as to a leakage from a midship tank manhole cover during the voyage which was corrected by baling back into the tank, the cover then being secured by a cement box. This leakage is stated to have caused a list of three or four degrees. The Court is of the opinion that this list may have been smaller than stated, or, if it was as much as three or four degrees, it was mainly due to a heel caused by wind pressure.

There was another incident during the voyage when the guns of the forward turret were seen to be off the fore and aft line about five to ten degrees, and the ship was at a small list. The Court is satisfied that one gun turret moved this amount would cause a heel so very small as not to have been noticeable. Any list noticeable at the time must have been due to the wind.

The Bureau Veritas Surveyor at Rio was requested to examine the vessel afloat with a view to issuing a Seaworthy Certificate for the voyage. His inspections covered several days and included some hammer testing of the structure, including internal inspection of the tanks as was proper. He was completely

satisfied, as were the towing master and Mr. Painter, that the vessel was made fit for the tow and the Seaworthy Certificate was duly issued. This Certificate mentions that the Surveyor, as the ship was to be towed without power on board, suggested the installation of a portable pump of 100 tons capacity for an emergency. There was evidence that this matter was discussed at Rio and when the impracticability of using such a pump was pointed out to him and seeing that there was a smaller pump already on board, the Surveyor waived the requirement and in fact issued the Certificate.

Two walkie-talkie wireless sets with one battery were put on board the "Bustler" at Scotland in charge of the "Bustler's" wireless operator and for the use of the "Sao Paulo" during the tow. These sets were put into working order and one was put into the "Sao Paulo" probably up on her bridge. There was evidence that the walkie-talkie transmission might be heard up to a 10-mile range with no great material effect by the weather on the set. The actual range, however, on the power available in the set was unknown. Those on the "Sao Paulo" should have been able to hear "Bustler" talking on her radio telephone up to perhaps 30 to 40 miles. Prior arrangements were made for wireless communication between the tow and tugs. Routine talks were in fact made twice a day between 8 and 9 a.m. and 8 and 9 p.m. The radio watches were shared between two radio operators in the "Bustler" and one on "Dexterous" but no constant telephony watch was kept until after the tow parted, when there was a constant watch of some days.

The "Bustler" also carried radar equipment which operated within about 20 minutes of an instruction to switch on and was frequently used during her long search. Radar watch was kept at intervals during her long search.

The "Sao Paulo" was taken out of Rio Harbour aided by Naval tugs at about 1 p.m. on the 20th September, 1951. Her approximate draught was 20 feet 6 inches forward and 25 feet 6 inches aft, giving a displacement of about 17,500 tons, and her trim was satisfactory.

The "Bustler" is a motor rescue tug of 1,100 tons gross, 205 feet in length, with a beam of 38 feet 6 inches and a loaded draught of 17 feet 7 inches. She is fitted with diesel engines developing 3,200 brake horsepower through a single screw. Her oil fuel capacity gives her an endurance of 60 days at an estimated speed of 12 knots. She carries ample towing gear and on the towage she used 100 fathoms of 22 inches manila attached to her 350 fathoms of 5 inches wire on to her electric towing winch which resists a pull of approximately 30 tons, and automatically retrieves the wire after excessive strain. The towing gear was comparatively new and was in first-rate condition. She carried two wireless operators and adequate wireless instruments, including wireless telephone, direction-finder and loud hailer. She also carried radar. Her two wireless operators were certified radar operators. The radar had an extreme range of about 30 miles. She also was fitted with line-throwing gear and distress rockets.

The "Dexterous" is an oil-fired tug of 600 tons, 147 feet in length, 33 feet beam, and with a loaded draught of 13 feet forward and 17 feet aft. She was fitted with triple expansion engines developing 1,350 horsepower indicated through one screw. Her oil fuel capacity gives her an estimated range of 28 days steaming. She had ample towing equipment and that used on the towage was a double wire pennant from the towing hook to 70 fathoms of 10 inch nylon hawser and some 230 fathoms of 5 inch wire. The connection of both tugs to the ship was to short lengths of 2½ inches stud link anchor cable which was in good condition and had been kept as spare cable on board the "Sao Paulo". These lengths were adequately

secured inboard on the "Sao Paulo" and led out through leads on each side of her stem. The "Dexterous" carried one radio operator and ample wireless telegraphy. She had no radar. She also carried line-throwing rockets and lines and the usual distress rockets. Both tugs were commanded by tugmasters of wide experience in salvage and towing. They were called before the Court and were assessed as being skilful navigators and reliable witnesses. In the Court's opinion, they handled their vessels and the tow with skill and diligence and with a proper regard for safety.

The "Dexterous" accompanied the flotilla to sea for a few miles and, having trouble with her crew, she returned to port. She rejoined the flotilla on the 22nd and made fast on the starboard bow, the "Bustler" being fast on the port bow, both tugs having about an equal scope of some 300 fathoms of towing hawser. The towage continued without incident. The "Dexterous" proceeded to Dakar for bunkers and provisions on the 13th October. Strong winds up to force 6 were experienced from the north-east during the absence of the "Dexterous" but the tow continued, its average speed of about four knots being halved. On the 19th October, the "Bustler" noted a list to port of about three degrees on the ship and learnt from Mr. Painter that it was due to water leaking out of a tank as above described. The only other noteworthy incident was that there was a movement of the forward turret, already described.

On the morning of the 4th November, the "Dexterous" having returned and again towing from the starboard bow, a gale developed from the north-westward, with a heavy sea, and at about 9 a.m. the flotilla hove to, riding about head to wind. At about 2 p.m. Mr. Painter reported over the walkie-talkie that he had just been round the ship and that everything was in good order and that the only change was a slight trickle through the gunports which he described as "negligible". The tugs continued to hold the vessel about head to sea, but at about 5.30 p.m. local time the ship took a very heavy sheer to starboard from which she did not recover and, blowing to leeward, dragged the tugs astern, causing them to close the distance between each other which had been about 100 feet to something in the range of 20 feet thus causing risk of collision between them. Pursuant to a previous arrangement, that if the tugs got into difficulties the "Dexterous" should cast off first and leave the field to the "Bustler", an order was given by the master of the "Dexterous" to slip. The chief engineer of the "Dexterous" was engaged in slipping the hawser from the towing hook when it suddenly parted, as he thought, due to the shackle carrying away. At about this time the "Bustler", in danger of being girted, carried away her gob rope and her towing connection parted. Her master and carpenter, who was operating the towing winch, concluded that the connection must have parted near to the chain cable over the bows of the "Sao Paulo" because of the excessive weight on the towing winch which, could hardly begin to heave in the wire and which held it in a vertical position so firmly that, coming into contact with the "Bustler's" propeller, it parted and was lost. Both tugs had to remain hove to, but they promptly tried to get into wireless touch with those on board the "Sao Paulo", which disappeared showing a red side light in the gathering darkness. A powerful projector lamp was pointed towards her, signalling "We desire to communicate with you". Within an hour the "Bustler's" radar was operating. No wireless message was heard from the "Sao Paulo" on either tug, nor was she seen again. Though the "Dexterous" was picked up on the radar at a distance of about 2½ miles, there was no echo of the ship, although a blob appearing on the radar screen was thought possibly to be the "Sao Paulo". In the opinion of the Court and on the evidence as a whole, that echo

was sea "clutter". Bad weather continued, but on the following morning "Bustler" was able to turn to the south-eastward and continue the search which she maintained until the 19th November, when she had to go to Lisbon for bunkers. During the search she frequently used her radar set which has an extreme range of 30 miles. On the 5th November, the "Dexterous", in turning with a view to instituting a search, sustained heavy weather damage and had to proceed to port for repairs. The "Bustler's" search proving negative, the owners of the "Sao Paulo" obtained assistance from the Royal Air Force, the United States Air Force and the Portuguese Air Force, and they were allowed to operate from the Azores. These aerial searches covered very many thousands of square miles of the sea round the position of the accident and to the south-eastward of it, but from that day to this nothing more has been heard of the "Sao Paulo".

The Court is satisfied that reasonable precautions were taken to prepare the "Sao Paulo" for the voyage and that all the towing arrangements were satisfactory. The Court is further satisfied that every effort was made to locate the "Sao Paulo" after the tow parted, but in view of all the circumstances the Court is of the opinion that the "Sao Paulo" sank shortly after the breakaway and probably within an hour.

The cause and manner of the sinking can only be a matter of conjecture. The Court is satisfied that when the "Sao Paulo" left Rio her draughts and trim were satisfactory and that those about to undertake the tow were reasonably satisfied as to the vessel's stability. When the tow broke away she was then out of control and broadside to wind and sea and, no doubt, heavy rolling occurred. It is highly probable that the superstructure soon received damage and there may well

have been breaching of one or more gunports. Large quantities of water probably entered the hull not long after the parting.

An interesting theory was put forward in evidence, that the rolling period of the ship may have coincided with the wave period and that thereby successive waves increased the roll until she capsized. The Court, though doubtful of such an unusual coincidence occurring, concludes that this may or may not have happened. The Court is also of the opinion that an altogether different combination of circumstances may have led to the final disaster; this would be to assume that the vessel, far from having a rolling period closely associated with that of the sea, was in an unstable condition, and after losing the assistance of the tugs and falling off into the trough of beam sea and wind, could so heel over under the extreme pressure and violence of the storm as to place her lee gunports under water and, in their vulnerability, carry them away and so flood the vessel until a condition of foundering occurred. In other words, the loss of stability under the influence of the storm and the inability of the vessel to exert any righting moment, together with the ever-increasing flooding which would accompany such a condition, was the probable cause of the casualty.

The Court, after earnest deliberation, is unable to make any recommendations which could be embodied in a form to be useful in the undertaking of similar towages.

R. F. HAYWARD, *Judge*.

A. M. ATKINSON }
W. J. NUTTON } *Assessors*

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