

Story of a lump of coal

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Steamer

The *Titanic* was a steamer ship. Ships of this era were sometimes referred to as "steamer" ships. This designation reflected the mode of operation, obscuring the fuel. The *Titanic* obtained its power by burning coal blocks.



Figure 1: Two steamships pass each other on the Montreal-Quebec route.

The origins of coal

Appearance of coal

Data : Planète Énergie¹.

¹ Planète Énergie : *La formation du charbon : une longue histoire*, 22.08.2014, <https://www.planete-energies.com/fr/media/article/formation-charbon-longue-histoire#:~:text=Comme%20le%20p>

Although coal has been formed in all ages, in some places on Earth, most of this fossil energy began to appear more than 350 million years ago, during the Carboniferous (Upper Paleozoic) era - Carboniferous means "coal-bearing.

The coal was originally vegetation that macerated in swamps born of tectonic movements. Drowned, the vegetation dies and is covered with mud and sand, while a new vegetation takes over above, before a new burial. The dead vegetation undergoes an increase in temperature which slowly transforms it. Thus, cellulose, the main component of wood, is transformed into peat, then into lignite, coal and anthracite.

Different types of coal

There are different types of coal, classified according to their percentage of carbon and volatile matter.

Coal type	Percentage of carbon	Percentage of volatile matter
Anthracite	95 %	5 %
Lean to fat	88 % à 92 %	10 % à 30 %
Bold to flamboyant	80 % à 88 %	30 % à 40 %
Lignite	6 % à 75 %	50 %
Peat	55 %	<i>Exclusively composed of volatile materials</i>

It is generally the fatty flaming coal that is burned in industrial boilers. It contains a percentage of carbon ranging from 88 to 92%¹.

According to Paul-Henri Nargeolet, the coal recovered from the *Titanic* site in 1994 was anthracite², the most polluting¹.

Coal mining risks

In addition to being very tiring, the work of the miners involved significant risks, some of which were fatal. The firedamp explosions could cause hundreds of deaths. The Oaks disaster in 1866 killed 388 miners. The Whitehaven disaster of May 11, 1910, claimed 133 lives. The firedamp explosion in the mines of Pretoria (Lancashire) on December 21, 1910, claimed 343 victims. The press, like *L'Illustration* in France, reported on a terrible tragedy:

The explosion of firedamp which has just caused the death of 343 miners in the mines of Pretoria (Lancashire), is the deadliest mining disaster which has plunged the British Isles into mourning for nearly half a century [...].

The disaster occurred on December 21, around 6 a.m.: 700 miners were present at the bottom of the shafts, when a tremendous underground detonation, which shook all the cottages in the neighborhood, gave the alarm. At the time, it was thought that all the workers had died. But half of them were working in the Arley tunnel, dug below the Yard tunnel, where the explosion had taken place, so that about 350 survivors were able to come to the surface as soon as the noxious gases had partially dissipated. Several families were lost in the disaster. One worker, named

[%C3%A9trole%20et%20le,profonde%20de%20mati%C3%A8re%20organique%20v%C3%A9g%C3%A9tale.&text=D%C3%A9pressions%20relatives%20de%20la%20cro%C3%BBte,dans%20une%20mer%20ou...&text=\(lagune%20ou%20lac\).](#)

2 Paul-Henri Nargeolet : *Dans les Profondeurs du Titanic*, Harper Collins, 2022.

Harton, went down with his three sons, aged twenty-three, seventeen and fourteen respectively; it was the first time the youngest had gone underground to work³.



Figure 2: The tragedy of the Pretoria mines.

The Titanic's coal

The miners' strike

Normally paid by the job, the English miners demanded, in 1912, a minimum daily wage. This was followed by a strike movement. And from March onwards⁴, the consequences began to be felt⁵, seriously compromising England's maritime traffic⁶. The strikers received a daily compensation of "a few shillings" provided by a Federation⁷.

The strike ended with an agreement that "pleased no one. Some workers were in favour of continuing the movement, but others feared the "spectre of hunger"⁶".

3 L'illustration : *Un « courrières » anglais*, 31 décembre 1910.

4 L'illustration : *La crise minière anglaise*, 2 mars 1912.

5 L'illustration : *La grève noire en Angleterre*, 23 mars 1912.

6 Bibliothèque Universelle et Revue Suisse : *Chronique politique*, avril 1912, Bibliothèque Nationale de France.

7 L'illustration : *La grève noire en Angleterre*, 23 mars 1912.



Figure 3: Water seepage in an abandoned mine during the miners' strike.

Provisioning of the Titanic

To support the *Titanic*, which was about to embark on its maiden voyage, the White Star Line's parent company, International Mercantile Marine, cancelled the sailings of other ships. Their coal was transferred to the giant of the seas⁸.

The ship had left Belfast with 1,880 tons of coal. In Southampton, it was supplied with 4,427 tons. It was to consume 415 tons in the week spent in the dock alone⁸.

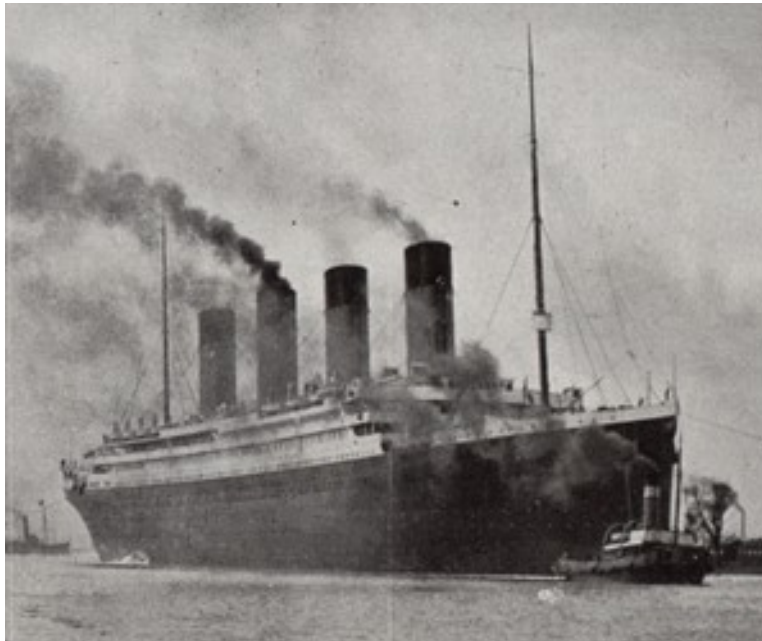


Figure 4: The *Titanic* in Belfast. A large quantity of smoke escaped from the chimney n° 1 and even more from the n° 3.

The cancellation of several crossings resulted in the transfer to the *Titanic* of several passengers who had booked on ships that had become stranded⁹. Operating on the New York, steward Leo James Hyland estimated that he and his colleagues had joined the giant of the seas at about 40¹⁰.

8 John P. Eaton & Charles A. Haas : *Titanic : Destination Disaster*, Patrick Stephens Limited, 1987 ; 2nd edition, 1996.

9 Eva Hart (as told to Ron Denney) : *A Girl Anpard the Titanic*, Amberley Publishing, 1994-2000-2012-2014.

10 Letter from Steward Third Class Leo James Hyland to Walter Lord, June 7, 1955, <http://paullee.com/titanic/ljhyland.php>

During the fateful voyage

As the *Titanic* made her maiden voyage across the North Atlantic and the passengers went about their business, down below, night and day, crews were up and about in the boiler rooms providing power to the huge ship.

Titanic was equipped with 29 boilers: 24 double boilers and 5 single boilers, distributed in six boiler rooms. Each of these boiler rooms occupied the location of a compartment.

Double boilers were equipped with fireplaces on both sides, front and back. Single boilers were equipped with fireplaces on one side only, the front side.



Figure 5: Representation of the six boiler rooms of the *Titanic*. On the left, the most forward boiler room, boiler room n° 6. It is followed by the boiler room n° 5, and so on until the boiler room n° 1.

Located in the fifth compartment from the bow, Boiler Room No. 6 contained only four double boilers, due to the curved shape of the hull. The other boiler rooms contained five double boilers, with the exception of Boiler Room No. 1 which contained five single boilers. The coal bunkers were located forward and aft of the double boilers, and only forward of the single boilers.

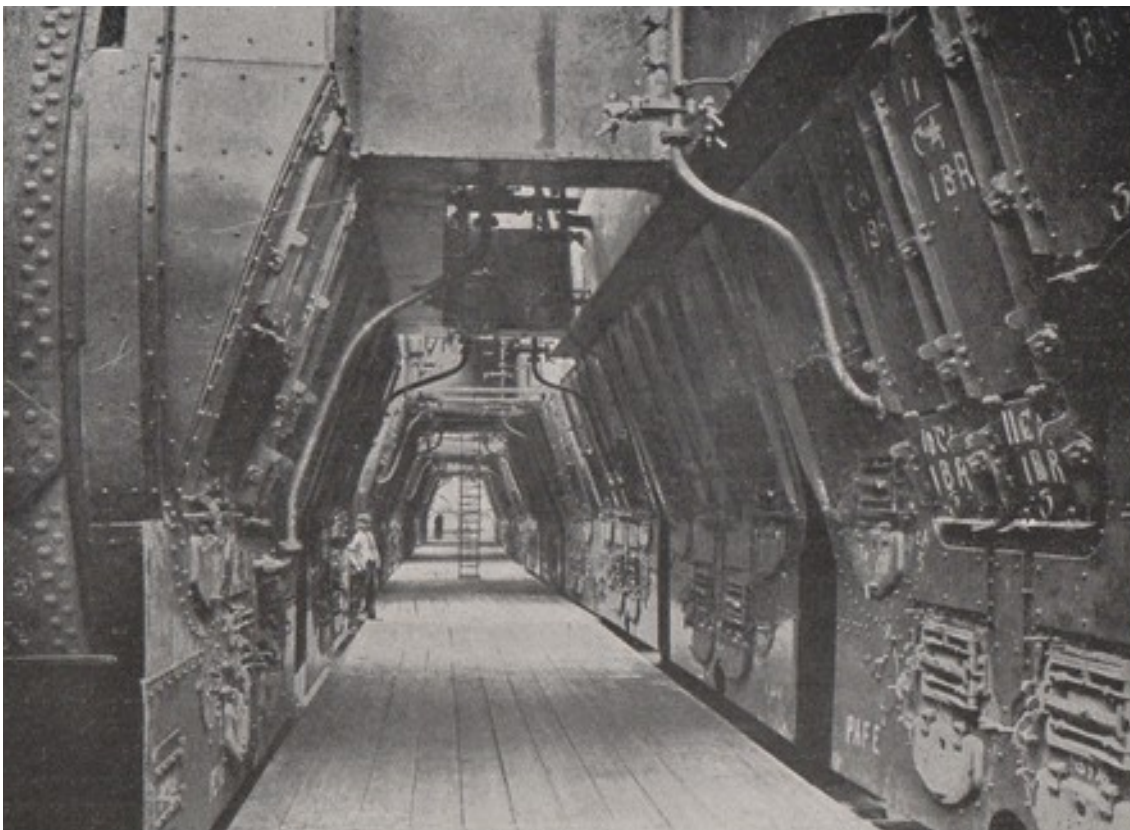


Figure 6: Typical layout of a boiler room on board a ship: boilers of the *Mauretania*.

Characteristic of boilers

Data : D. F. Hutchings & R. de Kerbrech¹¹.

Double boilers	24
Simple boilers	5
Boiler body diameter	4.8 m approx.
Length of the double boilers	6,4 m approx.
Number of fireplaces per double boiler	6
Number of fireplaces per single boiler	3
Total heating surface of double boiler	530 m ²
Double boiler grate surface	12 m ²
Total heating surface of single boiler	262 m ²
Single boiler grate surface	6 m ²
Total number of households	159
Working pressure	15 kg/cm ² (measured)
Test pressure	30 kg/cm ² (measured)

The work of the firemen

The coal was stored in the bunkers provided for this purpose and then broken into smaller blocks. The stokers loaded the coal blocks into a wheelbarrow and emptied them at the foot of the firemen. When an indicator signaled, the fireman opened the door of one of the fireplaces and shovelled coal into it. Once the firebox was properly filled, he would close the door, doing this for each fire that the indicator signaled.

The combustion of coal caused the water in the boilers to heat up, turning it into high-pressure steam. It was this steam that allowed the reciprocating engines to turn the propellers¹¹. On board the *Titanic*, 620 to 640 tons of coal were burned daily¹².



Figure 7: Representation of a boiler room of the *Titanic*. The texture of the coal pieces was obtained from photos of coal pieces recovered from the wreck site in 1994.

11 David F. Hutchings & Richard de Kerbrech : *RMS Titanic 1909-12, Owners' Workshop Manual*, Whaynes Publishing, 2011.

12 Testimony of Bruce Ismay, president of the White Star Line, before the U.S. Senate Committee, 1912. <https://www.titanicinquiry.org/USInq/AmInq11Ismay06.php>

During the trip, the boilers were gradually pressurized. At no time had the "all steam" lights on the boiler room control panels gone out. Between April 10 and 11, twenty boilers were lit. Between April 12 and 13, twenty-one boilers were lit. Around 8 o'clock in the morning of April 14, two new boilers were lit. It took 12 hours to connect them to the whole system¹³. A firefighter would later report that all boilers were on, except for the five located in boiler room #1¹⁴.

Coal released during the sinking

A large quantity of coal was released from the holds when the *Titanic* broke in two on the morning of April 15, 1912. The numerous blocks began a fall of almost 4 kilometers to the seabed, where they landed in the abyssal darkness.

The condition of the wreck makes it possible to know with a very high probability where the coal was located now on the ocean bed, when it was on board the ship. It was most likely located in one of the coal bunkers separating boiler rooms #2 and #1, since this section of the ship is broken. The coal was located in the line of the third stack and the back of the first class dining room, just below the third class galley.

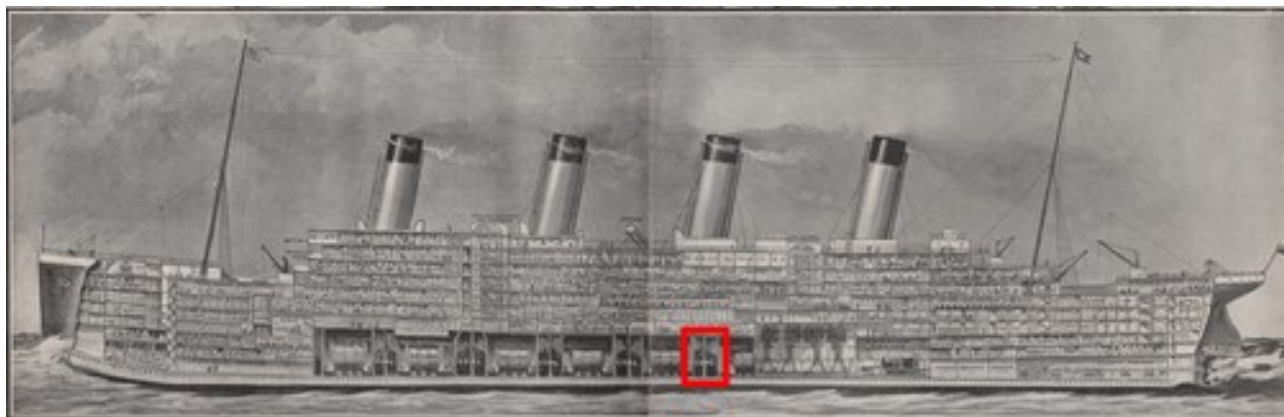


Figure 8: Probable initial location aboard the *Titanic* of coal recovered from the wreck site. The coal was located at the injunction between boiler rooms #2 and #1, below the third class galley.

Coal recovered from the wreck site

During the 1994 expedition organized by RMS Titanic, Inc. 2,340 kg of coal, divided into 170 pieces, were recovered from the depths. A block of coal could weigh up to 50 kg.

In order to harvest this large quantity of coal, the *Nautilus* was equipped with a bucket that could be tipped by a hydraulic system. This mechanism prevented the submersible from having to go back and forth to the baskets for each block. It was only when the bucket was full that the *Nautilus* went to one of the baskets so that the remains could be brought to the surface.

After a chemical treatment to allow their conservation, the blocks were fragmented into 400 000 small pieces. They were offered for sale in the fall of 1995. The first certificates of authenticity were signed by George Tulloch, the president of RMS Titanic, Inc. and Paul-Henri Nargeolet, the chief operating officer². However, depending on the sequence of events within RMST, certificates, such as the one commemorating the 95th anniversary of the sinking, were no longer signed¹⁵.

The sale of these pieces of coal helped finance future shipments. Since coal was classified as a mineral and not a manufactured good, resale was possible.

13 Deposition of fireman Frederick Barrett before the British Shipwreck Tribunal, 1912. <https://www.titanicinquiry.org/BOTInq/BOTInq04Barrett02.php>

14 Deposition of fireman Thomas Patrick Dillon before the British Shipwreck Tribunal, 1912. <https://www.titanicinquiry.org/BOTInq/BOTInq05Dillon01.php>

15 95th Anniversary Collection Edition 1912-2007 & Certificate of Origin.



Figure 9: Fragment of a coal block reassembled in 1994 and sold to commemorate the 95th anniversary of the sinking of the Titanic.

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