

Signals of Distress – What Color Were They?

by Samuel Halpern

In a 2012 National Geographic Channel special, “*Titanic: The Final Word* with James Cameron,” researcher Don Lynch stated that the rockets sent up from *Titanic* “went up white and burst into colored balls...the way people remembered.” “We know they were [colored] now.” He also mentioned that the only ones who said they burst into white balls were the officers.

During the same discussion, Parks Stephenson said that a box of rocket detonators was discovered at the wreck in 2004 which showed a “hole behind the brass cone of the detonator that was cut out to let you see the color of the balls that would come out of this white burst.”

It is one thing for people to say what they found at the wreck, and another thing to draw definitive conclusions based on that. Unfortunately, here is a case of irresponsible statements being presented in a nationally televised broadcast based on minimal information and faulty interpretation.

As far back as the early 1880s, the British Board of Trade (BOT), citing Section 18 of the Merchant Shipping Act of 1876, authorized the use of socket distress signals by passenger steamers and emigrant ships for indicating signals of distress in lieu of carrying guns and rockets. Passenger certificates issued by the BOT to foreign-going vessels (such as No. 1415 issued to *Titanic* on 4 April 1912) included under the heading *Equipments, Distress Signals, &c*:

- One cannon and twenty-four cartridges or other approved means of making signs of distress.
- Twelve rockets or other approved signals for distress.

Socket distress signals met the requirement of “other approved means” for signaling distress. In keeping with the requirements listed on her passenger certificate for a foreign-going steamship, *Titanic* was listed as carrying 36 socket distress signals in lieu of carrying guns and rockets.

In the 1880s, the manufacturer of these socket distress signals, The Cotton Powder Company, Ltd., supplied them in boxes of 24, 12 and 6 for shipboard use. The box of 24 measured 9x15x8 inches. The rail sockets, from which these signals were fired, measured 2½ inches in diameter by 7 inches in height.

Socket distress signals made by the Cotton Powder Company were described in an article written by E. Price-Edwards dealing with “Signaling by Means of Sound” in the January-June 1881 issue of *Van Nostrand’s Engineering Magazine*:

From *Van Nostrand’s Engineering Magazine* (Vol XXIV) 1881.

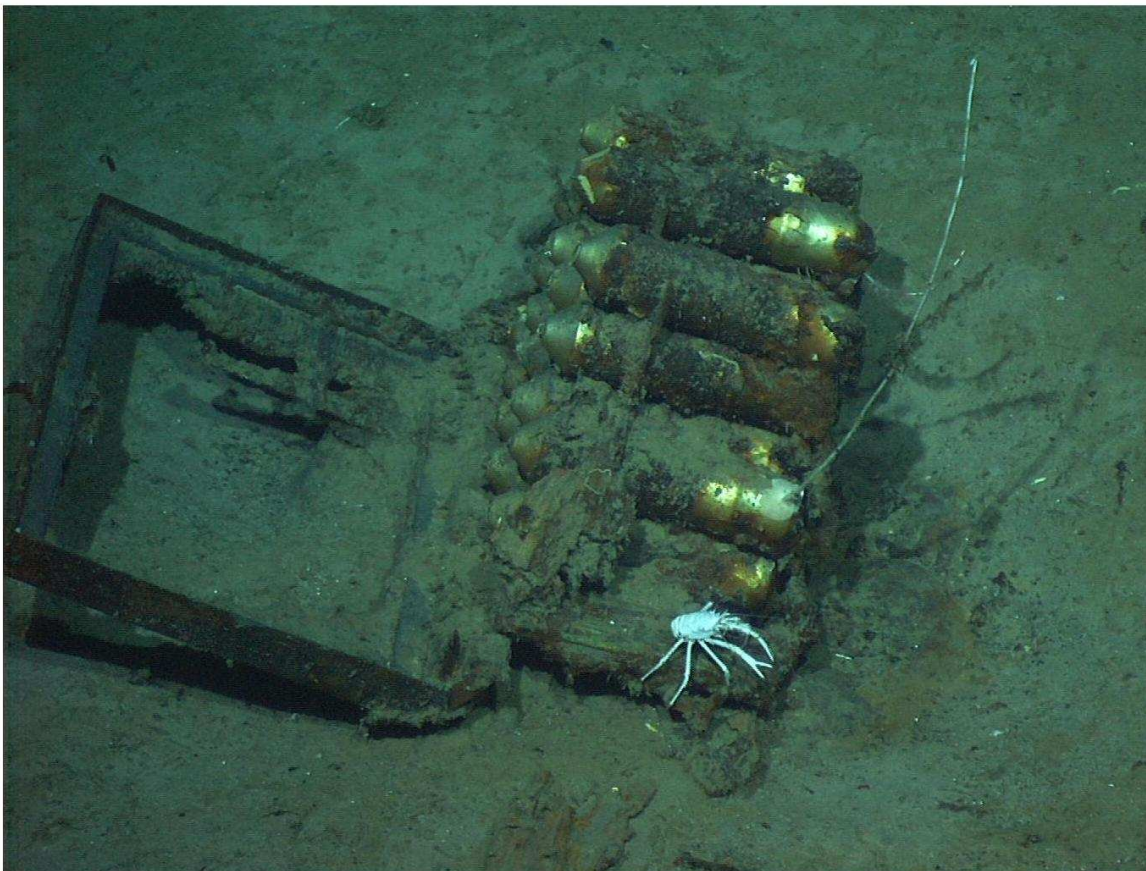
One other form in which explosive signals are now used may here be mentioned. I have alluded to the gun fired at intervals of about a minute being the authorized signal of distress for ships at sea. Mr. Gardiner, of the Cotton Powder Company, has sent me particulars of a kind of signal which may be fired more easily, expeditiously, and effectively than the gun, thereby obviating loading every minute, an important consideration with a vessel in distress. This consists in a small charge of tonite made up in a sort of cartridge. When required to be used, one of these cartridges is dropped into a socket, and by pulling a lanyard attached to a friction tube, a small quantity of powder at the base of the signal is ignited, which blows the charge up into the air about 600 feet, where it explodes. At the moment of explosion some brilliant stars are also shot out, and thus the signal represents either a gun or a rocket, both distress signals. I am informed that many vessels have been supplied with these rocket signals, that their effectiveness is undoubted, and that the Board of Trade have sanctioned their use in lieu of either guns or rockets.

Titanic was equipped with two gunmetal rail sockets in accordance with BOT requirements. One was located on the starboard side of the forebridge on the rail close to emergency boat No. 1, and the other on the port side of the afterbridge over the poop.

It is not absolutely certain that the box containing the signals seen on the ocean floor was a box that was actually supplied by the manufacturer of these signals. What was discovered on the seabed at the wreck site was an opened decaying box containing 17 unfired socket signals. Of the 36 socket signals carried on *Titanic*, we know that some were kept on the forebridge and some in a quartermaster's locker under the poop. We also know that Quartermasters George Rowe and Arthur Bright each brought a box of these signals from under the poop to the forebridge at the request of Fourth Officer Joseph Boxhall. This was after Rowe, who was stationed out on the poop, called the bridge on the loud speaking telephone to ask if they knew that a lifeboat was seen in the water. At the time, Boxhall happened to be coming back into the wheelhouse having just fired off one of these distress signals. Boxhall answered the phone and said he did not know about a boat in the water, but asked if Rowe knew where the "detonators" were kept and to bring them forward to the bridge. Rowe and Bright each grabbed a box and brought them forward. Rowe once wrote that he thought the box he carried to the bridge held 9 or 12 of these signals.¹

In March 2005, this author was sent a copy of a photograph of the signals discovered on the ocean floor at the wreck site, just one of several views that were shown in the 2012 National Geographic special. More recently, a number of high quality images from the 2004 dive were sent to me by Capt. Charles Weeks who recently obtained them from Jeremy Weirich who was with NOAA at the time. Three un-enhanced cropped views of the box of signals from these photos are shown below with credit going to the NOAA Institute for Exploration and the University of Rhode Island.

Box of Socket Distress Signals found at wreck site.





The more pronounced greenish color seen in the head-on view has to do with the absorption of different colors by sea water over a given distance. Water absorbs different wavelengths of light to different degrees. The longest wavelengths are absorbed first and disappear underwater in the same order as they appear in the color spectrum. Thus red is the first to be absorbed, followed by orange,

then yellow, then green, then blue. Absorption distances for various colors are: Red - 15ft, Orange - 25ft, Yellow - 35-45ft, Green - 70-75ft. If you are viewing an object 10ft away, and so too is the light source, then the light has actually traveled a distance of 20ft, and all of the reds will be filtered out. It is for this reason that color correction is done to photographs taken of objects under water.²

Below is another view of the box of socket signals at the wreck with and without color correction. First image is without correction; the second image was color corrected so that the crab seen off to the right in the image appears white.

Box of signals - uncorrected.



Box of signals – color corrected.



The box of signals found on the seabed was apparently large enough to hold 4 rows and 7 columns worth of these signals, or a total of 28. As you can see in the photo above, the first two columns has 4 signals showing in each, the third column shows 3 signals, the fourth column shows 4 signals, the fifth column shows 2 signals, and the sixth and seventh columns show no signals and are in a state of total collapse. As one would expect, there appears to be some amount of corrosion and marine growth in what can be seen. The socket signals themselves are easily recognized by their distinctive shapes. The hole in the center of the conical shaped head was the top end of a long brass tube that ran all the way down the center of the signal to the powdered charge in the signal's base. According to *Titanic's* Second Officer Charles Lightoller, the hole down the center came blocked up with a peg. This would be removed prior to firing, and a friction tube would be inserted into the brass tube as far down as it would go. Then a lanyard would be hooked to a wire loop at the top end of this friction tube. When this lanyard was pulled, it would fire the charge in the signal's base and light a timed fuse. The shell would then be propelled to a height of about 500 to 600 feet where it would burst "throwing out a great number of stars" as Lightoller described it.

The following description of the socket distress signals supplied to *Titanic* comes directly from Charles Lightoller:

In the first place, the charge is no more and no less than what you would use in a 12-pounder or something like that. In the rail is a gunmetal socket. In the base of this cartridge, you may call it, is a black powder charge. The hole down through the centre of the remainder is blocked up with a peg. You insert the cartridge in this socket; a brass detonator [friction tube], which reaches from the top of the signal into the charge at the base, is then inserted in this hole. There is a wire running through this detonator, and the pulling of this wire fires that, and that, in turn, fires the charge at the base of the cartridge. That, exploding, throws the shell to a height of several hundred feet, which is nothing more or less than a time shell and explodes by time in the air.

Theoretically, the bright flash from a shell burst at 500 feet up could be seen on a very clear, dark, moonless night over a distance of about 30 nautical miles. At that distance it would appear as a single flash of light almost on the horizon.

The holes that can be seen on the tops of the signals found in the box at the wreck site were not cut out to let one see the color of the stars or balls that would be thrown out as Parks Stephenson was somehow led to believe. The holes seen in the center of these signals is there for inserting the friction tube that was used to fire the signal. The friction tube was inserted into the top end of a brass tube that ran down through the center of the signal to the powdered charge in the signal's base. As can be seen in the close-up photo below, most of these appear to be plugged with some corrosive sediment of whitish or grayish color that settled in the tube, while a few appear to contain somewhat less debris, and appear blackish inside.³ Some of this debris or sediment may be the remains of the peg that Lightoller talked about, or the corrosive effect of the metals and chemicals used in the signal, much like you see on an old battery. The lip or edge of the brass tubes that ran down through the center of these signals can also be made out in this close-up photo, and evidence of various degrees of brass corrosion on these edges can also be seen.

Close-up of the signals seen in the box at the wreck.



Of the 36 socket signals supplied to *Titanic*, 17 signals were obviously not fired since they were found in this box. That does not mean that 19 signals were actually fired. Of the remaining 19 signals supplied, we know that 8 were definitely fired because eight of them were seen from the bridge of the *SS Californian*. It is also clear from eyewitness reports that nobody on *Titanic* actually counted how many distress signals were fired off that night. *Titanic*'s Fourth Officer Joseph Boxhall, who was in charge of firing these signals, thought "between half a dozen and a dozen" were fired. Third Officer Herbert Pitman thought "it may have been a dozen or it may have been more." And Second Officer Charles Lightoller thought "somewhere about eight." What they did agree with is that these signals were being sent up one at a time at intervals of about 5 or 6 minutes in compliance with the regulations then in effect.

As to the colors seen in the stars of the exploding shells by eyewitnesses on *Titanic*, we have uncovered the following verbatim statements from the 1912 inquires:

QM Robert Hichens: "I did not take no particular notice of the colour, Sir. Some were green, some were red, and some were blue - all kinds of colours - and some white, Sir. I think, if I remember rightly, they were blue."

QM Reginald Lee: "No, coloured rockets." after being asked if they were colored or only white.

First class passenger Arthur Peuchen: "A good deal like an ordinary skyrocket, going up and breaking, and the different colors flying down."

Third Officer Herbert Pitman: "Various colors." when asked if they were red.

In contrast to these, we have:

Fourth Officer Joseph Boxhall: “Just white stars, bright.” when asked about the color of the distress signals he fired from *Titanic*.

Second Officer Charles Lightoller: “Principally white, almost white.” when asked about the color of the stars that were thrown out by the shell burst.

Joseph Boxhall was in charge of firing these signals. He was assisted by QM George Rowe after Rowe and Bright came on the bridge carrying the extra signals that were stored aft. Charles Lightoller was in charge of loading and launching lifeboats on the port side of the ship when these signals were being sent up.

Titanic's distress signals were also seen from far away on the SS *Californian*. Three eyewitnesses gave evidence as to what they saw:

***Californian*'s Apprentice James Gibson** (in a signed report given to Capt. Lord): “I then got the binoculars and had just got them focused on the vessel when I observed a white flash apparently on her deck, followed by a faint streak towards the sky which then burst into white stars.”

***Californian*'s Second Officer Herbert Stone:** “They were all white, just white rockets.”

***Californian*'s Second Donkeyman Ernest Gill:** “They looked to me to be pale blue, or white.”

The faint streak referred to by Gibson was not a trail of fire that was characteristic of an ordinary skyrocket back then. As Lightoller explained: “You quite understand they are termed rockets, but they are actually distress signals; they do not leave a trail of fire.” What Gibson saw through his binoculars, besides the flash from the power charge in the base of the signal as it left the socket, was the streak from the burning fuse as the shell was going upward before it exploded into white stars. As Joseph Boxhall described it, “You see a luminous tail behind them and then they explode in the air and burst into stars.”

But *Titanic*'s distress signals were not the only distress signals seen from the bridge of *Californian* in those early morning hours. Distress signals fired from *Carpathia* were also seen by Gibson and Stone beginning about 3:20am while *Carpathia* was coming up from the southeast and still a good 10 nautical miles beyond where *Titanic* sank about an hour before. As *Carpathia*'s Capt. Arthur Rostron explained, these signals were being sent up periodically in an effort to “reassure *Titanic*.” When James Gibson was specifically asked about the color of these other “rockets” that they had seen, he said they were “White.” As Boxhall described *Carpathia*'s signals seen from emergency lifeboat No. 2, “I think it was, so far as I could see, a distress rocket in answer to ours.”

Besides these descriptions of what socket distress signals looked like from both near and far at the time of *Titanic*, we also were able to track down several other descriptions from the 1880s when socket signals started to replace guns and ordinary rockets as signals of distress in steamships. A report by the Marine Department of the Dominion of Canada came out on 24 June 1880 that described comparative tests of socket distress signals made by the Cotton Powder Company against fog guns used for the purpose of improving aids to navigation in the St. Lawrence and Straits of Belle-Isle. An abstract of this report, shown below, described the distress signals as throwing white stars.

From a report by the Marine Department of the Dominion of Canada 24 June 1880.

3rd. Experiments with socket distress signals.

The Cotton Powder Company's signals, as supplied to steamships, were tested against the guns at Belle Isle and alone at Chebucto Head. The results showed a decidedly stronger sound from the bombs at short distances and with the wind, but in other directions, and towards the limit of the sound of the signal, there was no advantage over the gun. These and similar bombs have, however, so much to recommend them, in the ease with which they can be fired, safety of carriage and decreased bulk of supplies, that we consider further investigation in this direction very desirable. The signals tried have in them besides the detonating charges, some white stars. These for fog signals are a useless adjunct, and doubtless if they were replaced by an extra amount of explosive material, the bombs would beat the guns at all distances.

The Grey River Argus, a newspaper published in Greymouth, New Zealand, printed an article on 20 January 1885 describing the firing of socket distress signals made by the Cotton Powder Company before they became generally available as a replacement for guns and rockets as signals of distress on board ships.

From an article in *The Grey River Argus* 20 January 1885.

The outside sensation of last evening was the firing of several of the new patent socket distress signals, manufactured by the Gun Cotton Powder Company (Limited), London. A large number of ladies and gentlemen assembled on board the *Herald* to examine these new explosives, and see the mode of firing them and their effects. The charge, or rocket, is very like an abnormal candle, being about two inches in diameter, enclosed in a tinfoil wrapper. In the upper part, which terminates in a cone, the place which in a candle would contain a wick, is marked by a little black core. Into this is inserted a black tubular pricker with an eye at the other end. A small iron hook to which is attached a piece of marline, is inserted in the eye of the pricker. Pulling the

string discharges the rocket, which goes off with a tolerably loud explosion. After reaching an elevation something like that of an ordinary rocket, which it very much resembles in throwing out bluish lights, a second and much louder explosion than the first takes place. The object of the inventor apparently is that the first explosion should arrest attention in order that the second one should be properly heard. There can be no doubt as to the effectiveness, convenience, and economy of this description of distress signal, and it will probably not be long before it comes into general use. The reports last night reverberated amongst the surrounding hills in a way not often heard. The wharf was crowded with people to witness the rocket exhibition.

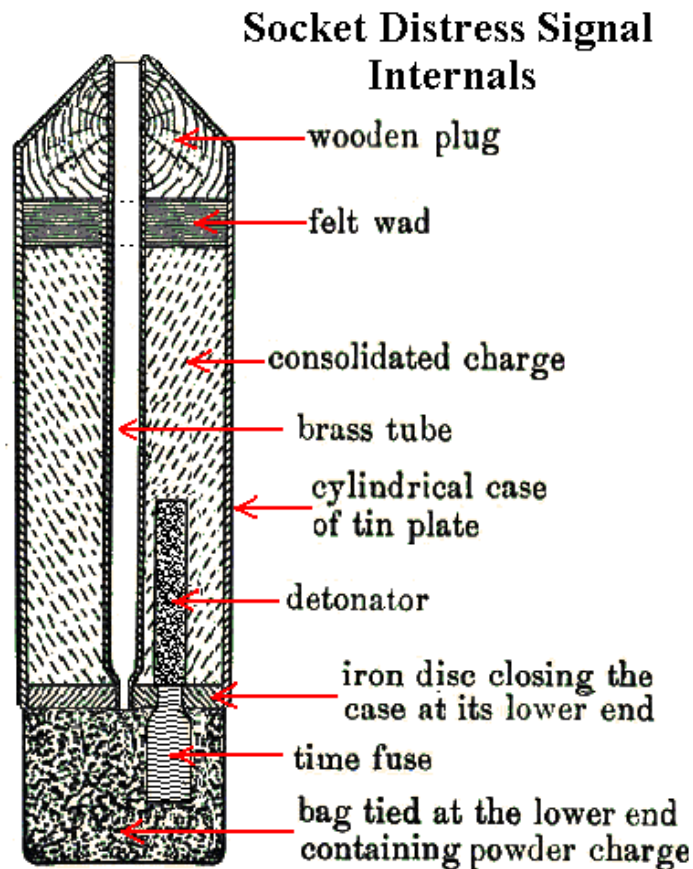
What is interesting about this article is that the reporter described the signals as throwing out "bluish" lights when they exploded high up in the air. Recall that *Californian's* Ernest Gill described what he saw as "pale blue, or white," and *Titanic's* Robert Hichens, who at first said he "did not take no particular notice of the colour," finally settled on them being "blue."

The reporter for *The Grey River Argus* also mentioned about hearing two loud "explosions" when each of these signals were fired off, the second being much louder than the first. As *Titanic's* Third officer Pitman described, "They make a report while leaving the rail, and also an explosion in the air, and they throw stars, of course, in the air."

As an aside, the rocket shown in the Cameron special made a pop and then a hissing sound as it went up in the air, very much like an ordinary skyrocket. The socket signals sent up from *Titanic* were propelled by a charge in the base of the signal, much like a mortar shell, and produced a very noticeable report when fired, and a much louder report when the shell exploded hundreds of

feet up. Being immediately below the bursting shell, Fifth Officer Harold Lowe described the sound as “nearly deafening me.” The sound from the burst in the air was advertised by the Cotton Power Company as “known to travel a distance of 13 miles.” This was obviously under the most favorable of conditions. (At that distance, and 32°F air temperature, it would take about 1 minute and 13 seconds for the then highly muffled sound to reach an observer.) From the report of the Marine Department of the Dominion of Canada, it seems that the sound from these distress signals were most advantageous at short distances in a downwind direction.

The following diagram, which is based on period descriptions and created from similar diagrams shown in a patent issued in 1889 to George Trench of the Cotton Power Company, is meant to illustrate the internal construction of the type of socket distress signals that were used on *Titanic*.



The consolidated charge in the signal was made up of tonite (an explosive mixture of equal weights of barium nitrate and guncotton) that produced a loud report when set off by the detonator charge. There was also space for stars that would burn for a sufficient time following the explosion of the main tonite charge.

In 1886, *The Illustrated Naval and Military Magazine* printed an article that described the socket distress signals produced by the Cotton Powder Company in some detail. These were very much like the ones that were sent up from *Titanic* on the night of April 14-15, 1912.

PATENT "SOCKET DISTRESS SIGNAL."

Manufactured by the Cotton Powder Company, Limited.

THE want of an efficient signal for use by vessels as a distress signal has long been felt by the mercantile marine; that is, a signal giving both light and sound, which could be used under emergent circumstances without entailing delay in getting it ready, and capable of being fired without the necessity of using a match or light. The usual distress signal is the firing of a gun or rocket. A gun is costly and cumbersome, and is frequently useless when most required, while the sound travels but a short distance under certain atmospheric conditions, more especially when the muzzle cannot be turned in the right direction. The rocket gives no sound, and is liable to be unnoticed even in clear weather. It is useless by day and in foggy weather. The signal now offered in substitution of the gun or the rocket combines both light and sound, while the report it gives, being from a high elevation, travels further, and is much more distinct than from a gun. It can be fired under conditions when a gun could not be fired, and is consequently much more efficient. It gives out light equal to the stars of the usual signal rockets, is complete in itself, requires no stick, gives no back fire, and does not require to be set off by a match or port fire, and is therefore superior to the rocket in efficiency and handiness. It fulfils the double duty of a gun and rocket, and is more effective than either.

The signal, known as the "Socket Distress Signal," is readily fired under the most adverse conditions in which a ship is likely to be placed. It is in the form of a small cylinder, and when placed in the socket from which it is to be fired by means of a friction tube, is instantaneously propelled to a height of from five to six hundred feet, and then bursts, giving out a bright light and immediately afterwards a report, the sound of which has been known to travel a distance of thirteen miles.

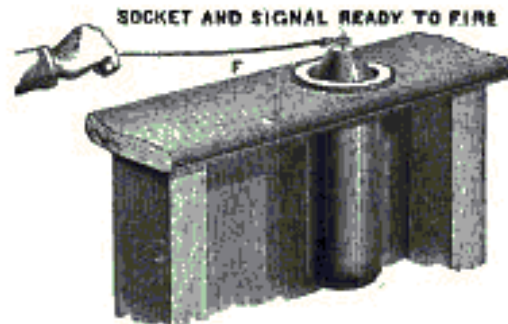
The advantage gained by using the "Socket Distress Signal" may be summed up as follows, viz. :—

1. Its small bulk and readiness for immediate use without requiring any preparation for firing.
2. There being no necessity for using either match or port fire, or a light of any sort.
3. The facility with which it can be used under the most emergent circumstances.
4. The attention it attracts by the light and sound given out.

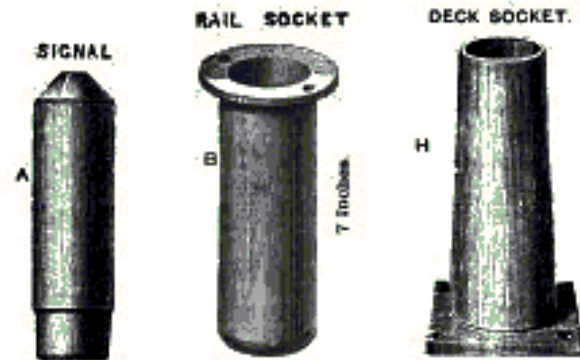
5. Its safety in handling.
6. Economy.

A set of 24 signals (with friction tubes, cleaning hook, and lanyard) ready for immediate use, are put up in a box measuring 15 inches by 9 inches by 8 inches. Boxes of 12 and 6 signals can also be supplied. Bronze sockets, 8 inches in height and 2½ inches in diameter are also supplied for firing the same, the whole forming a compact and handy arrangement, superior to anything hitherto in use.

Attention is therefore invited to the advantage of adopting the "Socket Distress Signal" as the most effective agent in communicating with the shore or with other vessels to obtain prompt assistance.

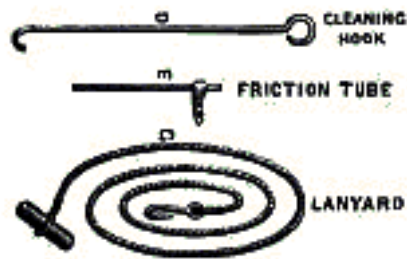


The shell A contains the signal and the firing-charge. It is dropped into the socket B (which is here represented



as fitted into a ship-rail), taking care that the conical wooden part is at the top. Through a hole in the centre
x x 2

of the wooden top the friction tube E is inserted as far as it will go. The lanyard U is hooked to the loop of the friction tube when in place, and the shell is fired by pulling the lanyard horizontally, which, on tearing



away the loop of the friction tube, fires the charge. The cleaning-hook D is to be used after each discharge to withdraw anything that may remain in the socket. No light or fire of any sort is required.

These signals are acknowledged to be the handiest and most effective of any hitherto supplied to the mercantile marine, and by due attention to the foregoing

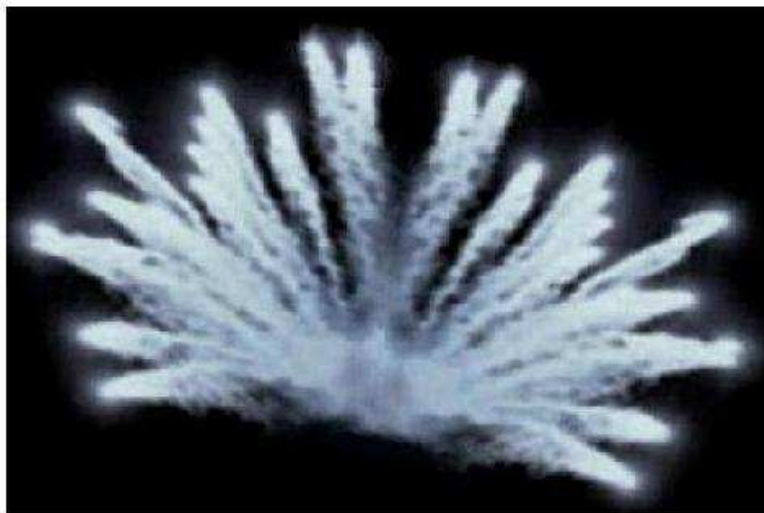
method of firing, they are capable of being used with a degree of safety that pertains to no other signal.

FOR BOAT SERVICE.—Consideration has been given to the subject of an efficient means of attracting the attention of passing vessels in cases where it becomes necessary to take to the boats, or where a boat may become separated from a vessel when dispatched on any special service. A conveniently-sized waterproof can, to hold six signals, has been devised to meet this requirement, to form part of a boat's equipment. The socket from which to fire the signals may be fixed in the forward thwart or in the bow, supported by a small fixture. A boat so provided would always be prepared to attract the attention of vessels by day or night, in any weather, at a distance of several miles. The advantage of such a signal for boats cannot fail to commend itself to those who have had any practical experience of the urgent want of a convenient and efficient signal in cases of emergency at sea.

The Board of Trade have authorised these signals, under Section 18 of the Merchant Shipping Act, 1876, for use on board passenger steamships and emigrant ships, in lieu of both guns and rockets.

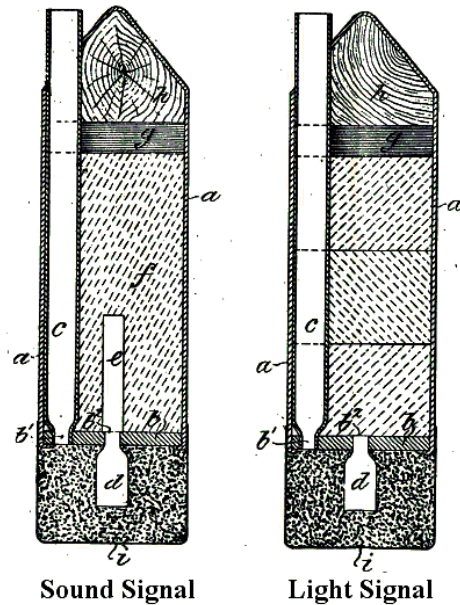
To fire the signal, it was carefully placed into a gunmetal socket mounted in the rail of the ship with its conical side facing up. A friction tube was then inserted into the brass tube that ran down the center of the shell from the hole at the top, and a lanyard was then hooked to a wire loop on the friction tube. The signal was then fired by pulling sharply on the lanyard horizontally. This caused the detonating composition around the head of the tube to be ignited by friction from the wire producing a flash that ignited the pellet powder that ran down the friction tube. This then set off the powder charge in the base of the signal which was sufficient to propel the shell out of the rail socket to a height of about 600 feet. It also lit a timed fuse that was rammed with meal powder. The timed fuse would burn for about 6-7 seconds as the shell ascended skyward. The fuse would then set off the detonator, which was an enlarged copper percussion cap charged with mercury fulminate, which in turn would set off the main charge. The main charge of tonite would then explode with a very loud report and throw out brightly burning stars similar to what is shown below.

Exploding star shell.



As far back as 1889, the Cotton Powder Company was making Patent Socket Signals used for ship's day and night signals as well as signals used for distress purposes.⁴ Patents were issued for socket signals intended to be used for sound signaling, which did not throw stars but produced a very loud report; and for night signals, which did not make a loud report but threw two or more stars of specific colors. For the sound signal, a detonator was fitted to set off the tonite charge. For the light signal, the detonator was not fitted, but the case was loaded with rammed discs of a composition that would burn for a considerable time in the color or colors that were desired. In those designs, the brass firing tube was located on the side rather than down the center of the signal. This arrangement allowed more room for stars that would burn for longer periods of time.

Patent socket signals designed for sound signaling and light signaling at sea (1889).



The regulations that were in effect in 1912 concerning the types of signals to be used “either together or separately” from a vessel in distress included:

BY DAY —

- A gun or other explosive signal fired at intervals of about a minute;
- The International Code Signal of Distress indicated by NC;
- The distant signal, consisting of a square flag, having either above or below it a ball or anything resembling a ball;
- A continuous sounding with any fog-signal apparatus.

BY NIGHT —

- A gun or other explosive signal fired at intervals of about a minute;
- Flames (i.e., signal fires) on the vessel (as from a burning tar-barrel, oil-barrel, etc.);
- Rockets or shells, throwing stars of any colour or description, fired one at a time, at short intervals;⁵
- A continuous sounding with any fog-signal apparatus.

The socket signals supplied by the Cotton Powder Company to *Titanic* and other vessels were “regulation distress signals” that could be used instead of using guns or rockets. They produced both a very loud report when they burst in the air as well as throwing stars. In effect, they were a combination of both, a sound signal and a light signal, and could be used to indicate distress by day or night.

However, it is important to point out that the Cotton Power Company had no reason at all to supply distress signals that threw stars of different colors which could be easily mistaken for private night signals. As a colleague of mine recently wrote, “they weren’t into playing games.” They were fully aware that signals throwing stars or balls of different colors could easily be confused with private night signals if seen from far off.

At the 1912 United States Senate Investigation into the loss of *Titanic*, Fourth Officer Joseph Boxhall was asked by Senator Fletcher about the difference between private night signals and the distress signals carried on *Titanic*:

Senator FLETCHER. What was the character of the rockets fired off on the *Titanic*, as to colors?

Mr. BOXHALL. **Just white stars, bright.** I do not know whether they were stars or bright balls. I think they were balls. They were the **regulation distress signals.**

Senator FLETCHER. Not red?

Mr. BOXHALL. Oh, no; not red.

Senator FLETCHER. Can you say whether any rockets fired at night by a ship under those conditions form a distress signal, or whether rockets may be sent up that are not distress signals?

Mr. BOXHALL. Some companies have private night signals.

Senator FLETCHER. What are they?

Mr. BOXHALL. **They [private night signals] are colored as a rule; stars, which you can see.** These rockets were not throwing stars, they were throwing balls, I remember, and then they burst.

Senator FLETCHER. It seems that an officer on the *Californian* reported to the commander of the *Californian* that he had seen signals; but he said they were not distress signals. Do you know whether or not under the regulations in vogue, and according to the custom at sea, rockets fired, such as the *Titanic* sent up, would be regarded as anything but distress signals?

Mr. BOXHALL. I am hardly in a position to state that, because it is the first time I have seen distress rockets sent off, and I could not very well judge what they would be like, standing as I was, underneath them, firing them myself. I do not know what they would look like in the distance.

Senator FLETCHER. Have you ever seen any rockets sent off such as you say are private signals?

Mr. BOXHALL. Yes, sir.

Senator FLETCHER. Under what circumstances?

Mr. BOXHALL. Ships passing in the night, signaling to one another.

Senator FLETCHER. Were those rockets carried on the *Titanic* for the purpose of being used as distress signals?

Mr. BOXHALL. Yes, sir; exclusively.

Senator FLETCHER. They were not carried or supposed to be used for any other than distress signals?

Mr. BOXHALL. No; no, sir. We did not have any time to use any of those things.

Those “things” that Boxhall was referring to included White Star Line green pyrotechnic lights (flares) that he later lit while in emergency lifeboat No. 2 to attract the attention of the other lifeboats and the rescue ship *Carpathia*. (Normally, when used as private night signals anywhere within British jurisdiction and on the high seas, two of these would be exhibited simultaneously.) *Titanic* also carried 12 ordinary rockets, 12 “blue lights,” two Manwell-Holmes deck flares, and 6 lifebuoy lights under the listing of distress signals approved by the BOT. The 12 ordinary rockets (not socket signals) would be White Star Line signaling rockets used by New York mail and passenger steamers calling at Queenstown homewards, and used “off Brow Head, off the Old Head of Kinsale and off Queenstown Harbour.”⁶ In a pinch, those 12 ordinary rockets could also be used to signal distress at night if sent up one at a time at short intervals since the rules allowed for rockets or shells “*throwing stars of any colour or description*” to be used. But they would not be as bright as the 36 standard socket distress signals that were supplied specifically for that purpose, nor would they make a loud report when they threw out their two green stars.

When *Californian*’s Second Officer Herbert Stone reported to Captain Staley Lord via a speaking tube that he had seen lights in the sky in the direction of this stopped steamer which appeared to be white rockets, Captain Lord asked him if what he saw were company signals. Stone replied that he did not know, but that they were all white. Later, at 2:05am *Californian* time, after the steamer he had under observation disappeared, Stone sent the apprentice James Gibson down to report to Lord that the steamer that was sending up these rockets “had gone out of sight,” and that they had “seen altogether eight white rockets.” Lord then asked Gibson, “All right, are you sure there were no colours in them?” to which Gibson replied, “No, they were all white.”

Lord’s questioning about there being any colors in the rockets that were seen was for good reason. As Boxhall said, private night signals “are colored as a rule.” Private night signals included the use of one or more pyrotechnic devices displayed in a particular sequence. Such devices included hand-held flares of a particular color, Roman candles that threw out colored balls of light a few feet into the air, as well as rockets that threw colored stars high up in the air. When a white rocket was used as part of a company’s private night signals it was used as part of a sequence that included rockets of other colors.⁷ As made very clear in Section 733 of the Merchant Shipping Act of 1894, it was important that there be no confusion between signals used as private night signals and signals used for distress or pilot signals, something that the Cotton Power Company was very much aware of. As Captain Lord himself admitted before the US Senate investigation, “you never mistake a distress rocket.”⁸ As Joseph Boxhall said, the distress signals sent up from *Titanic* were “regulation distress signals” that burst high in the air with a loud report and threw out bright white stars or balls that fell downward and then flamed out.⁹ As we have seen, to some people, those brightly burning stars might have had a bluish tint to them. Lightoller described them as “almost white.”

So what about the few *Titanic* eyewitnesses who said they saw colors in these signals? Are we simply to dismiss their reported observations? In my opinion, not any more than we should dismiss the observations of those who said they were white, bluish-white, or principally white.

Bear in mind that the initial flash of an exploding signal above *Titanic*’s decks would be blinding. As Fifth Officer Lowe reported, “the flash of the detonator lit up the whole deck.” This would have a significant effect on the night adapted vision of those who looked up at this from close range, just like the flash from a nearby flash camera would have. Some people seeing various colors as the stars were flaming out is not at all surprising. Some of this can be seen in the sequence of color photographs taken of a modern day exploding star shell as shown below.

Color photo sequence taken of exploding star shell.



But seeing colors in the stars as they were burning out is not the same as claiming that the distress signals supplied by the Cotton Power Company were each designed to throw out bright stars or balls of a distinctive color, or that they had viewing ports cut into their nose cones so you can see the color of the stars that would be thrown out. Choosing which color signals to send up from the dimly lit deck of sinking ship at night would be almost impossible. None of the articles describing the details of these distress signals, such as the one in *The Illustrated Naval and Military Magazine*, or in any of the subsequent advertisements taken out by the Cotton Power Company that we were able to find, talked about distress signals throwing stars of different colors. There was no mention of any color-coding system being used or viewing ports cut in the nose cones for the purpose of seeing the color of the stars that were inside. It was not until the 1948 SOLAS convention that the regulations were changed requiring that distress signals be “rockets or shells, throwing *red* stars fired one at a time at short intervals.”

As previously noted, many of the holes on the ends of the signals seen in the box on the bottom of the Atlantic appear to be in a state of decay and plugged with various amounts of debris. The colors that can be seen on the ends appear to be indicative of corrosive sediment as well as corrosion of the brass itself. It is well known that brass corrodes when subjected to sea water producing grayish-white and greenish-blue adherent products as can be seen in the before-and-after photos of the brass fittings show below.

Corrosion of brass when subjected to 96 hours of salt-spray exposure.



Titanic had no reason to carry signals of many colors. As previously noted, her private night signals used for identifying itself as belonging to the White Star Line were green. *Titanic* was supplied with socket distress signals for one purpose only, to be used as signals of distress in lieu of carrying guns or rockets. They were designed to be seen and heard over a great distance, not something that could be confused with private night signals which were usually colored. As King’s Council Butler Aspinall sarcastically put it to *Californian*’s Herbert Stone at the British inquiry, “You know they were not being sent up for fun, were they?”

¹ We don't really know what size boxes were supplied by the Cotton Powder Co. in 1912, but we do know that Rowe and Bright each brought a box up from under the poop to the forebridge. Rowe thought his box contained 9 or 12 signals. My own feeling is that 18 may have been kept aft and 18 kept forward because there were two rail sockets equipped on the ship, one on the afterbridge and the other on the forebridge. In that case, I would assume the boxes brought forward had 9 signals each, and the 18 stored forward were kept in that box that could hold up to 28. Another possibility is that the box found on the seabed originally held just 24 signals (4 rows, 6 columns). There would also be space enough to hold the firing lanyard, cleaning hook, and friction tubes needed to fire the signals. In that case, the boxes held aft would hold 6 signals in each. We do know that the Cotton Powder Co. supplied "waterproof cans" [metal boxes] that held 6 signals each for boat use.

² Parks Stephenson recently explained on a Facebook page that the colors seen in the National Geographic Channel special were artificially enhanced by the National Geographic art team who "jazzed up" the colors in the photo for the TV audience. He said that in the original dive footage, even after color-correction, the colors were not so obvious as they were in the TV program. He admits that some of the colors that were shown (such as the bright red) do not exist, and that it was not an accurate depiction of how the box really looks.

³ A reporter for *The Grey River Argus* described the hole in the center of a distress socket signal as having a "black core."

⁴ The Cotton Powder Co. also produced Royal National Life-Boat Signals, torpedoes, electric fuses, electric batteries, and appliances for submarine mining, blasting, and destroying wrecks.

⁵ Notice that "short intervals" was undefined in the regulations, and still remains undefined to this very day.

⁶ The signaling sequence would be "a green pyrotechnic light, followed by a rocket throwing two green stars, followed by another green pyrotechnic light."

⁷ See Appendix K in Leslie Reade's book, *The Ship That Stood Still*, for a complete list of private night signals that were used by various steamship companies, and where they were allowed to be used.

⁸ It is unfortunate that Capt. Lord never went topside to see what was going on for himself, but trusted the judgment to his second officer. His second officer left it for Lord to judge, and so no action was taken by those who were in charge. Since the discovery of the wreck, there is no longer any doubt that the signals seen by Stone and Gibson came from *Titanic*. Nor can there be any doubt that the three signals seen about an hour after *Titanic* sank came from *Carpathia*. For some unknown reason, those other white rockets were never reported to Capt. Lord at the time.

⁹ It should be noted that only Boxhall described the signal as throwing "balls." Everyone else described them as throwing "stars." I find it interesting that Don Lynch and Parks Stephenson appear to have accepted Boxhall's description that the signals threw out bright balls, but readily dismiss his claim that they all were white.