

hours. It was first suspected that the water supply had been somehow poisoned, but many people who had not used the water were prostrated, while others who used it freely escaped. Adams has hitherto been regarded as an exceptionally healthy town, and the surrounding country is high and wholesome.

**CANNONADING OF OIL TANKS.**

On the morning of Friday, June 11, lightning struck an oil tank belonging to the Tidioute and Titusville Pipe Line, at Titusville, Pa. The fire thus kindled, raged until Sunday night, consuming 200,000 barrels of oil, crude and refined, and destroying property to the amount of \$1,500,000. The most appalling feature in this fire was the successive "boiling over" of oil from burning tanks of the liquid. To empty rapidly a tank containing 20,000 barrels of oil, while the latter is on fire, is no easy matter. The pipes connected with the tanks were utterly inadequate to remove the oil rapidly enough to rob the "boiling over" of its terrors. A happy thought suggested itself on Friday to Mr. D. R. Herron, of the Titusville Battery. Obtaining permission, Mr. Herron brought out one of the Parrott guns of the battery, loaded it with solid shot, and began firing against the three-eighths iron sheets of the distant blazing tank. The first shot glanced, but subsequent volleys pierced the shell of the tank, releasing a large quantity of oil that otherwise would have fed the flames. The battery then moved on to the Emery tank, also burning, and lastly to the Acme tank. Large rents were made in all these, and the liberated oil ran harmlessly down into a stream. This novel target practice greatly shortened the duration of the fire at these tanks, and so drained them that the flames died out for want of fuel, and no "boiling over" resulted.

The peculiar attraction for lightning which these iron oil tanks appear to possess has been several times referred to in our columns. Whenever a thunderstorm passes fairly over one of them it seems to be devoted to destruction. Millions of dollars' worth of property have thus been destroyed. No practical safeguard has yet been suggested.

Ordinary buildings, when properly provided with rods that are well grounded in the earth, are comparatively safe from lightning. Structures made of iron and simply resting upon the earth, without rods, are also exempt from electrical damage. Such structures always present a continuous body of conducting material for the free passage of electricity to earth. Why is it, then, that iron oil tanks form such conspicuous exceptions to our common experience with lightning? Rods put on other structures save them; but rods have been put on oil tanks, masts with rods have surrounded the tanks, but the tanks were exploded by lightning all the same.

We will repeat a possible explanation which we have heretofore given. From every oil tank, according to our theory, there is a constant escape of light hydrocarbon vapor, which forms a permanent cloud or column, rising to a great height above the tanks, far above any rod that could be erected. This vapor rod is a conductor, which the lightning naturally follows, sets on fire the vapor, and explodes the tank.

A column of heated air or vapor rising from a chimney is well known to be a conductor for lightning; the rise of hydrocarbon vapors is illustrated by the balloon.

If the theory we have outlined is correct, the remedy for the electrical explosion of oil tanks is to be found in such a treatment of the oil, or such a construction of tank, as shall prevent any escape of the light vapors.

**NAVIGATION IN FOGS.**

The disastrous collision of the Sound steamers Narragansett and Stonington was quickly followed by one at sea, by which two great passenger ships escaped instant destruction almost by a hair's breadth.

Shortly after noon, Monday, June 12, the National Line steamship Queen, bound from London to New York, and within 300 miles of her journey's end, ran into the Anchor Line steamship Anchoria, on the way from New York to Glasgow. The bow of the Queen struck the Anchoria on the port side, about twenty feet abaft the foremast, smashing a great hole through the iron hull. Two compartments of the Anchoria filled immediately, but the partitions stood firm, and the other compartments sufficed to keep the vessel afloat. The bow of the Queen was badly crushed, and her forward compartment was flooded. Fortunately the bulkhead proved staunch, and the ship was saved. The fog was very thick, and both ships were going at full speed. It is said that the captain of the Anchoria mistook the whistle of the Queen for that of the Anchoria's companion vessel, the Victoria, which left New York at the same time, and was probably not far away, and before the error was discovered the ships were too close to avoid the catastrophe. Had the sea been rough or the partitions less staunch, both ships must have gone to the bottom almost instantly.

The passengers of the Anchoria were transferred to the Queen, which was least hurt, and the two ships sailed together for New York, arriving Tuesday noon.

These two collisions, coming in such quick succession and imperiling so many lives, give terrible emphasis to the dangers attending navigation in foggy weather. They make very pertinent also the query whether the means now employed for discovering the position and nearness of unseen vessels are at all commensurate with the necessities of the case, or with the means already known, and known to be well calculated to prevent such dangers. In a dense fog

the ordinary ship's light is visible, scarcely more than a ship's length; and as it proved in the case of the Narragansett and Stonington, the time between thus sighting an approaching vessel and the instant of collision is fatally brief. The recent test of electric headlights for ships in this harbor clearly demonstrated the possibility of projecting a beam of electric light through the densest fog for a thousand feet or more, and through ordinary fogs a distance several times as great.

Except in very rough weather the steam whistle can be heard a long distance, but it is liable to be a treacherous guide. It is not always possible to determine by the ear alone the direction from which a sound comes; and it would seem that a mistake of this nature was made on the Stonington, since the order intended to change her course away from that of the Narragansett only served to precipitate the collision. Had the whistle of the Queen signaled her course it could not have been mistaken for that of a ship sailing in the opposite direction, and the safety of two great floating hotels and their occupants would not have been imperiled thereby.

Means for the better penetration of fogs, for determining the direction of unseen sources of sounds, and for enabling steamers to announce to all within hearing the course they are pursuing, seem therefore to be imperative necessities on shipboard. The first is furnished by the electric headlight, with a system of projection similar to but more efficient than that used on locomotives. The last would be provided by an efficient code of whistle signals to indicate the several points of compass. The second need is supplied by the instrument figured in the accompanying illustration.



PROFESSOR MAYER'S TOPOPHONE.

The aim of the topophone, which was invented and patented by Professor A. M. Mayer, last winter, is to enable the user to determine quickly and surely the exact direction and position of any source of sound. Our figure shows a portable style of the instrument; for use on ship-board it would probably form one of the fixtures of the pilot-house or the "bridge," or both. In most cases arising in sailing through fogs, it would be enough for the captain or pilot to be sure of the exact direction of a fog horn, whistling buoy, or steam whistle; and for this a single aural observation suffices.

Every one has twirled a tuning fork before the ear, and listened to the alternate swelling and sinking of the sound, as the sound waves from one tine re-enforce or counteract those from the other. The topophone is based upon the same fact, namely, the power of any sound to augment or destroy another of the same pitch, when ranged so that the sound waves of each act in unison with or in opposition to those of the other.

Briefly described, the topophone consists of two resonators (or any other sound receivers) attached to a connecting bar or shoulder rest. The sound receivers are joined by flexible tubes, which unite for part of their length, and from which ear tubes proceed. One tube, it will be observed, carries a telescopic device by which its length can be varied. When the two resonators face the direction whence a sound comes, so as to receive simultaneously the same sonorous impulse, and are joined by tubes of equal length, the sound waves received from them will necessarily re-enforce each other and the sound will be augmented. If, on the contrary, the resonators being in the same position as regards the source of sound, the resonator tubes differ in length by half the wave length of the sound, the impulse from the one neutralizes that from the other, and the sound is obliterated.

Accordingly, in determining the direction of the source of any sound with this instrument, the observer, guided by the varying intensity of the sound transmitted by the resonators, turns until their openings touch the same sound waves simultaneously, which position he recognizes either by the great augmentation of the sound (when the tube lengths are equal), or by the cessation of sound, when the tubes vary so that

the interference of the sound waves is perfect. In either case the determination of the direction of the source of the sound is almost instantaneous, and the two methods may be successively employed as checks upon each other's report.

It is obvious that with such a help the pilot in a fog need never be long in doubt as to the direction of a warning signal; and if need be he can without much delay, by successive observations and a little calculation, determine, approximately at least, the distance of the sounding body.

**EFFECT OF AGE ON THE QUALITY OF IRON.**

Professor Bauschinger, in 1878, tested iron taken from a chain bridge built in 1829, and found that fifty years of use had not perceptibly altered its quality—either its strength or its elasticity—as reported at the time of its erection. He also examined metal from another bridge built in 1852, and found that the average quality remained as given by Von Pauli at the time of its erection.

Professor Thurston, testing pieces of the wire cable of the Fairmount Suspension Bridge, recently taken down at Philadelphia, after about forty years' use, found the iron to have a tenacity and elasticity and a ductility fully equal to the best wire of same size found in the market to-day.

He therefore concludes that iron subjected to strains such as are met with in properly designed bridges does not deteriorate with age.

**A COLLISION BETWEEN LARGE PASSENGER STEAMERS.**

During a fog near midnight, June 11, two of the large passenger steamers plying on Long Island Sound, Stonington line, between New York and Boston, came in collision, while running at considerable speed. One of the boats, the Narragansett, was struck near the middle, her side cut open, and a smoke-pipe knocked over, which made a draught through the furnace, driving out a great sheet of burning gas into the cabins and between decks, by which the vessel was set on fire, at the same time the opening in her side caused her to begin to sink. Some three hundred passengers were on board, and a frightful scene of confusion followed. Happily there was a plentiful supply of life-preservers, some life-rafts, and a few life-boats. There was delay in lowering the boats, but the rafts, life-preservers, chairs, and other floatables served to support most of the unfortunate people, who, to escape the flames, were obliged to leap quickly into the water. About fifty lives were lost; the remainder were rescued by boats from another steamer, the New York, also by help sent from the other damaged vessel, the Stonington.

It seems remarkable that so many were saved. This calamity illustrates the necessity for further effort on the part of inventors to discover new and improved means for fog signaling, saving life, preventing the spread of fires, and keeping vessels afloat. Most of the large local steamers that communicate with New York are veritable palaces, built regardless of expense, and supplied with every known reliable appliance for safety; but the occurrence of accidents like this and their disastrous results show that much remains to be done before navigation, even upon smooth waters, can be considered secure.

The life-rafts of the Narragansett seem to have proved more useful than the life-boats in rescuing the drowning people, the rafts being more quickly and easily launched, requiring less skill, etc.

The upperworks of our river and Sound passenger steamers consist at present of a mass of light, dry woodwork, forming cabins that are very comfortable and commodious for travelers, but highly dangerous in case of fire.

The collision of river steamers above described was followed a few hours later by a collision between two great ocean steamers, accounts of which we give in another column.

**Honors to an Aged Chemist.**

The chemists of Germany are collecting money for the purpose of presenting a gold medal to Prof. Woebler on his eightieth birthday, which will be July 31, 1880. Prof. Woebler is one of the most distinguished as well as the oldest of living chemists. Himself a pupil of old Berzelius, a contemporary of Liebig, and the loved instructor of many of our best chemists, his name is equally respected on both sides of the Atlantic. Profs. Jay and Chandler, of Columbia College, New York city, two of his former pupils, are receiving contributions from those who wish to join in this well deserved memorial.

**Perseverance under Difficulties.**

A good lesson to young people inclined to exaggerate the hindrances to their success in life, and to think that their chances are too poor to justify honest exertion, is furnished by a young colored man of Columbus, Ohio, F. P. Williams by name, now serving in that city as census enumerator. Several years ago he was run over by a train of cars, his arms being so mutilated that both had to be taken off near the shoulder. Lacking hands he learned to write legibly by holding his pencil between his teeth. He writes quite rapidly, and in his work as enumerator takes an average of 200 names a day.