From all we can gather there seems to be good ground for the theory that these numerous lightning disasters in the oil regions are not generally due to direct lightning strokes upon the tanks, but rather to the occurrence of slight electrical sparks within, upon, or near the tank, whereby the explosive gas that hovers about the tank is instantly set on fire. We have in our previous remarks suggested various ways in which the fatal spark may possibly be induced, to which suggestions the reader is referred.

We have now to mention one other possible cause of the fires, and that is the electrified rain drops.

Strong electrical effects are sometimes observed during the fall of sleet, hail, and rain, without the accompaniment of thunder or lightning. Professor Tait, in a recent lecture in Glasgow, said: "Falling rain drops are often so strongly charged with electricity as to give a spark just before they touch the ground."

As the development of the slightest spark in connection with an explosive mixture of air and gas will produce intense fire, we here perceive the remarkable possibility that some of the great oil conflagrations may have been caused by rain.

The whole subject is one of much interest to electricians, and as we have before said, we hope they will investigate the matter so as to ascertain surely the cause of these frequent disasters and discover the proper means of safety.

THE HUDSON RIVER TUNNEL.

It will be remembered that on the 21st of July last a portion of the structure pertaining to the temporary entrance on the Jersey side of the river, opposite New York, suddenly caved in, by which sad accident twenty lives were lost. Steps were immediately taken by the directors of the Tunnel Company to recover the bodies of the buried workmen, repair the damages, and proceed with the tunnels under the river, of which some four hundred feet had been finished when the accident occurred. In our paper of August 7th last, we gave a diagram showing the position of the break, which was near the entrance shaft of the tunnel. The plan adopted by the engineers for the restoration was to sink a coffer dam around the damaged portion, which was also the supposed place where the unfortunate workmen were congregated when the walls fell. The earth at this place is what is termed "made ground;" it is composed of refuse filling matter of all descriptions, forming a most unstable and difficult material through which to drive a coffer dam; but it was thought that the bodies of the lost could be more quickly recovered by sinking the dam than by any other means; and, therefore, the directors ordered the attempt to be made. At a cost of nearly fifty thousand dollars, and the employment of several large gangs of men, working day and night, a coffer dam of the usual construction was made ready, and its sinking began about three weeks after the accident. But after losing nearly a month's time it was found impossible to keep the interior of the dam clear of water, which came in at the bottom, owing to the treacherous nature of the ground, faster than powerful pumps could lift it, and the effort to go down further by that means had to be abandoned.

Recourse was now had to the plan of driving down a caisson, which is a species of diving bell. This method is now very commonly used in sinking the foundations of bridge piers into ground below the surface of the water. A caisson as ordinarily constructed consists of a timber foundation or platform of solid timbers several feet thick, interlocked in all directions to insure strength; the under side, at the edges, is provided with strong sharp lips, which rest upon the ground and support the caisson, leaving an air chamber of about five feet in height under the platform, in which the men work. Rising from the center of the caisson is an entrance tube and air lock, through which the workmen pass and the excavated material is discharged. The deck or upper surface of the caisson is loaded by building the pier thereon; the load so built on serves to carry down the caisson as fast as the men in the air chamber below dig away the earth. The rising of water within the air chamber, where the men work, is prevented by introducing compressed air into the chamber. It was in this manner that the piers of the great suspension bridge between New York and Brooklyn were sunk. The pier on the New York side goes down 78 feet below high water mark, and the caisson men were obliged to work for a considerable time in an atmosphere of compressed air having a pressure of 45 pounds to the square inch, although the average working pressure was 36 pounds.

In the present Hudson River Tunnel caisson the air chamber, instead of having an interior clear space or head room of only 5 feet, has a space of about 18 feet. The object of this is to afford room for the building of the permanent tunnel entrance within the caisson after the proper depth shall have been reached. The interior of the caisson air chamber has the form of a tunnel with a cylindrical roof. The caisson is 41½ feet long and 25 feet wide. The roof of the chamber is composed of strong timbers, heavily braced and filled in solidily with cement, which is carried up to a level, forming a deck on which the necessary sinking load will be built. The ends and sides of the caissons are built of planking, held in place by strong timber cross braces and iron tie rods, running from end to end and from side to side, through the air chamber, as shown in our diagram. This is believed to be by far the highest caisson air chamber ever built. It has been alleged in some engineering quarters that this caisson is not strong enough, and its failure is predicted. On the other hand, Mr. D. C. Haskin, the president of the company and designer of the caisson, avers that its strength is ample, and his plan is stated to be fully sustained by excellent engineers.

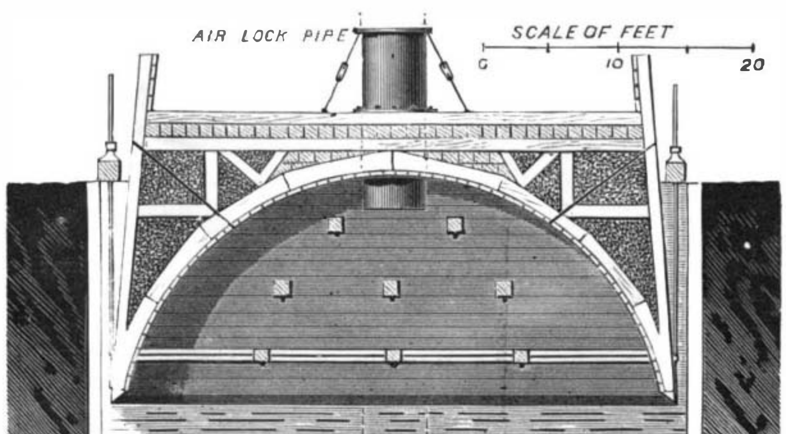
The whole enterprise from its inception has been criticised by certain know-all engineers, who predicted that the tunnel could never be carried under water on Mr. Haskin's plan. But he answered his critics by simply going ahead and building a section of the tunnel in the most difficult place probably of any on the line of the works.

The Hudson River Tunnel is one of the grandest and most important engineering enterprises now before the public, and those engaged in its execution deserve the highest praise for the skill they have displayed. Mr. Haskin and his coadjutors have so far achieved a great success with their plans. The unfortunate accident has hindered them a little; but we hope soon to be able to chronicle the interesting fact that the new entrance is completed and the tunnel building again going forward with rapidity.

Referring to our diagram, the new caisson is shown as it now stands suspended by iron side rods in the upper part of the abandoned coffer dam, the side lining of which extends down to a considerable depth.

The two tunnels below represent the mouths of the portions of the twin tunnels already built, which tunnels will form the main lines of the railway under the Hudson River. When the caisson is fully sunk home it will occupy the position shown by the dotted lines. A single broad arched tunnel will then be built within the caisson to inclose the mouths of the twin tunnels; and the single tunnel will extend thence on a proper grade to the surface of the ground in Jersey City.

The new caisson is now nearly ready. As soon as it is completed the nuts of the side suspension rods will be unscrewed and the caisson lowered until its bottom edges rest on the earth. The workmen will enter through the central tube; a smaller tube, not shown, will be used in addition to the central tube to facilitate removal of the excavated material. At the upper end of the central tube the air lock will be located, and during the descent of the caisson a pressure of air will be maintained within the caisson by air pumps in the usual manner. The descent will be accomplished by digging away the earth under the caisson, and at the same time building a weight of masonry on the flat deck of the structure, around the central tube.



THE NEW CAISSON—HUDSON RIVER TUNNEL.

The Superiority of American Locomotives.

Additional testimony as to the superior design and construction of American locomotives is given by Mr. R. M. Brereton, Chief Engineer of the Great Indian Peninsula Railroad. After noting the fact that under less favorable conditions of climate, road bed, steeper gradients and sharper curves, from 8,000 to 10,000 train miles greater duty per annum is obtained from locomotives in America than in England or in India, Mr. Brereton says: "The greater duty obtained cannot be due to better workmanship and superior materials, because it is well known that the English mechanic in skill of hand cannot be excelled, and the very best materials are employed by our English builders, and the hours of work in both countries are nearly the same. Hence I argue that the greater duty done by the American motor is due to the better designs and the better system of working the locomotives. The American builder excels in the system of framing and counterbalancing, and in the designs of the crank, axles, etc., so that the engine may run remarkably easy and without jar around short curves, and work not only on the light roads, but also diminish the wear and tear on the solid roads, and at the same time increase the effective tractive force. The English engine is a very heavy affair, and, in running, it not only wears and tears itself very rapidly, but also the roadway, and it greatly, by its unsteadiness and jar, fatigues the drivers and firemen."

Coal in Manitoba.

Notice was taken some months ago of the discovery of coal in Manitoba by the Canadian geological surveyors. Recently two barge loads of coal arrived at Winnipeg from the Souris country, the first installment from what is styled the future Pennsylvania of the Dominion. The coal was forty-three days coming down the river, and is said to be of a serviceable quality. The barges were constructed at the coal fields, out of timber made from trees felled on the spot. Much difficulty was experienced on the journey, as timber jams and other obstructions to navigation were met with, but all were overcome, and the feasibility of Souris navigation determined. It is anticipated that there will be sufficient water in the river until August in each year to float barges down. At present there is twenty feet of water in the river. Mr. Hugh Sutherland, proprietor of the mines, has expended some $15,000 on the experiment, and now that he is satisfied of its success, will go on with the work on a much larger scale. He intends to make one trip a year, building sufficient barges to bring down all the coal needed for a year's supply.

Improvements in Modes of Travel.

At the beginning of this century a passenger—more correctly, traveler—starting from New York Monday forenoon could, with good luck, arrive in Boston Friday afternoon, having stopped all night at New Haven, New London, and Providence. The fare for the trip varied from $15 to $18, and there was an additional outlay required of from $5 to $6 for board and lodging; that is, the trip took up four days of time and called for an outlay of from $20 to $24. After the war of 1812 there was an improvement, and the time between this city and Boston was cut down to about two days, and the cost of the journey to $14. In 1817 the fare between New York and Philadelphia was $10, and between New York and Albany by boat $7, and the average time twenty-four hours. A route was that year opened between Philadelphia and Quebec, the distance 700 miles, fare $47, and time required to make the journey 103 hours. In 1826 the Boston newspapers recorded the circumstance as one worthy of special comment that New York papers had been received in that city in twenty-four hours after the date of their publication. In 1828 the time required to make the journey between these two cities had been reduced to twenty-one hours, the route being from this city to Providence by steamboat, and from thence to Boston by stage. But in winter these trips were frequently given up in consequence of stormy weather, and those who wished to avoid danger and be certain in their movements still preferred the overland route. In 1832 there were two regular stage lines between this place and Boston, but competition had reduced the fare. The slow line made the distance in about fifty-two hours, and charged for passage $7.50, while the fast or mail line took its passengers through in about forty-five hours, and charged them $8.50 a trip. Since then railways have brought the journey within the compass of a few hours, and it is by no means improbable that the time may yet be materially reduced.

AN old millstone, five and a half feet in diameter and seven inches thick, with a central hole seven inches in diameter, was left in an English orchard many years ago. In 1812 a filbert tree sprouted from the earth at the bottom of the hole, and gradually increased in size from year to year until, in 1868, it was found that the tree had completely filled the hole, and actually lifted the stone from the ground, wearing it as a girdle about its trunk.

THE Connecticut State Board of Health has wisely decided that, in the optical tests of railway men, old employes, who cannot pass all the tests prescribed by the experts employed in the examinations, may be tested by flags and lanterns of the size and colors used by the railroads at a distance of 80 rods. Of the 1,085 persons thus far examined, 56 have failed to meet the requirements.