tion of a simple method of testing kerosene on page 402 of our volume XXXIV.

It will thus be seen that our correspondent's lamp exploded because it had burned for a long time since filled, leaving a space over the oil, which filled with its vapor as the lamp, being of the flat kind, became warm. When the flame was turned down, the lamp cooled a little, the vapor contracted, and in its contraction drew in air, until enough of it had entered the space above the oil to form the explosive mixture above referred to. This mixture was set on fire by the flame; and, of course, the lamp was broken by the explosion. The kerosene left in the flat lamp became heated by the flame, being much nearer to it than it would have been in a lamp of a taller or more nearly globular form, and of course was therefore ready to burn, while the cool kerosene in the can was not. The pieces of glass were not scattered much and the explosion made little noise, because either there was not a very large space filled with the explosive mixture, or the explosion took place as soon as the mixture became inflammable, and before enough air had been drawn in to give the mixture the most effective proportion.

We believe that these remarks solve the difficulties which many readers have encountered; and we will close this article with a few words of advice. 1. Do not buy lamps in which the flame is too near the body of the lamp. Kerosene can ascend in a long wick; and short wicks only tend to heat lamps and oil, and to encourage accidents. 2. Use the cylindrical wicks, with the draught in the middle; and use a long burner, which brings the flame to a distance of at least three inches from the body of the lamp. The form of the brass student's lamp is a very safe one, as in this the oil reservoir is at a long distance from the flame. 3. Be always prepared to test the oil you buy, as already described. You can heat the water to boiling point, and then mix it with cold water until it shows 150°, or any other desired temperature. If people would take the trouble to apply this simple test occasionally, they would largely diminish the number of accidents. 4. Keep the lamp full of oil, and never let the kerosene burn away much, and so avoid the dangerous empty space above the oil, especially when the lamp is flat and the flame not far above it. 5. Never turn a kerosene lamp low; rather extinguish it, as, besides the possible danger already described, there is the nuisance of an unpleasant and unwholesome smell given off when the wick is turned lower than it is intended to be used. The cause of this is imperfect combustion, and the consequent evolution of injurious gases.

A LESSON IN ARCTIC NAVIGATION.

For a number of years an enterprising Canadian, Mr. E. W. Sewell, of Levis, has maintained the possibility of safely and profitably navigating the ice-bound waters of the St. Lawrence river and gulf in winter, thus practically overcoming the hitherto unbroken blockade of Canadian ports during half of each year. After long and strenuous efforts, he succeeded last year in persuading the Dominion Parliament to subsidize a line of mail steamers for winter service, and proceeded to build and equip a vessel for the arduous work. The steamer was completed, and her first trip successfully made about the middle of January, between Pictou, Nova Scotia, and Georgetown, Prince Edward's Island, a distance of about fifty miles.

The "Northern Light," as the pioneer navigator of Canadian ice floes has been named, is a small but powerful propeller of 400 tons register, 145 feet in length, and 25 feet beam. She is driven by a pair of compound engines of 700 horse power, and is immensely strong, her horse power per foot of displacement being greater, it is said, than that of any other vessel of the kind. Her screw is twelve feet in diameter, 19½ feet pitch, and well submerged, it being intended, as a protection against ice, that at least four feet of water shall in all cases cover the upper blades. Her draught varies from eight forward to sixteen feet aft, to enable her to ride upon and break down the ice floes as well as crush them by her momentum. Very little iron was used in her construction, except a plating 4½ inches thick for fourteen feet abaft her stern, a 2½ inch plating on her keel for part of its length, and a massive rudder of solid wrought iron. The rest is sheathed with 2½ inches of ironwood.

The first trip of the Northern Light demonstrated her ability to overcome the heavy ice floes of Northumberland Strait, and to make good progress through continuous fields of unbroken ice nearly a foot thick. The only accident occurred in a narrow channel near Pictou Island, crowded with heavy floes: in charging an unusually heavy mass of ice the iron cutwater was torn from its bolts by the shock, but no other damage was done. A correspondent of the *Tribune* reports the incidents of the first trip at considerable length, and is naturally exultant at her success:

"We had done what no man has done before. We had sailed in midwinter across the Strait of Northumberland, and shown that with proper appliances men may defy the ice blockade which for nearly two centuries has shut out Prince Edward's Island from traffic with the outer world. And if the narrow strait can be crossed, it follows that the wider waters of the Gulf can be more easily penetrated to ports like Gaspé, Richibucto, and Miramichi. With these connected with Halifax, Cape Breton, or Newfoundland, by a line of powerful ironclad steamers, the present water isolation of Canada will be exchanged for an uninterrupted and profitable, although limited, winter commerce. Who can say that Louisburg's deserted harbor, or Placentia's squalid haven, may not yet become of renewed importance as the depot of the winter exports of the Dominion?"

Mr. Sewell's scheme involves the winter navigation of the St. Lawrence river, below Quebec, as well as the Gulf: the beginning being made in Northumberland Strait, not because its navigation is easier than elsewhere, for that route is really the most difficult of all, but because of an agreement made when Prince Edward's Island joined the Canadian Confederacy, that strenuous efforts should be made for the winter navigation of that channel.

LIGHT AND THE DISTANCES OF THE STARS.

A correspondent writes as follows:

"One of the New York daily papers gives an account of a recent lecture delivered by a Professor Grant on astronomy, in Great Britain, and reports him to have said that some stars are so distant from the earth that light, traveling at the rate of 185,000 miles a second, would take half a million of years to reach us, and that consequently we would observe now what had transpired on such stars half a million years ago. Is not this last statement entirely erroneous? Does not the eye travel almost instantaneously along the line of direction of any object within the range of either unassisted human or telescopic vision, and do we not accordingly see what is transpiring now at any point within such range? Please state whether this view or that imputed to Professor Grant is correct."

To point out the error in our correspondent's reasoning, we have only to apply it to the propagation of sound and to the ear; and then we may ask, almost in the same words: "Does not the ear travel almost instantaneously along the line of direction of any sounding object within the range of either unassisted or assisted human hearing, and do we not accordingly hear what is transpiring now at any given point within such range?" We may ask this with good reason, because the natures of the propagation of light and sound are identical, the eye being the organ for the perception of the first, the ear that for the perception of the second. Now the fact is that the eye (or the sight) travels as little toward the luminous object as the ear (or the hearing) travels toward the sounding object; both organs merely receive impressions from the luminous or sonorous rays. It is perfectly well established that we see astronomical events later than they occur, and it was this fact which taught us that light moves with a velocity of 185,000 miles per second. The eclipses of the moons of Jupiter revealed to Roemer, the celebrated German astronomer, this fact; he found an irregularity which no astronomical data could account for, and he observed that the periods between these eclipses were longer when the distance between us and the planet was increasing, while, inversely, the periods became shorter when this distance was diminishing. He found at last, by close observation, that every time that the planet was, say 100,000,000 miles further off, we see that eclipses happen 9 minutes later then they do when the planet is at its nearest distance. As 9 minutes is 540 seconds, we have only to divide 540 into 100,000,000 to find the velocity of light per second, which is very nearly 185,000 miles. This has been verified afterward in various other ways; the velocity of light has been directly measured (by the help of most ingenious and delicate apparatus) by Foucault and Fresnel; while the aberration of the fixed stars, which consists in an apparent displacement of the same, produced by the yearly motion of the earth in its orbit, fully corroborates the scientific theory. It is, therefore, a positive fact that we see the stars as they were at the time when the light which reaches us now left them; and we see the sun as he was 8 minutes ago, the nearest fixed star as it was 3½ years ago, and the pole star as it was 36 years ago. Of the other stars, very few are near enough for us to measure their distances; but most of them are thousands of times further off, and therefore we see them as they were thousands of years ago; and when the telescope reveals, in the depths of infinite space, stars thousands of thousand times further off still, we are convinced that, as their light can only reach us in millions of years, we see them as they were millions of years ago. Perhaps at that remote period, in those unfathomable distances, blazing suns have been created of which the light has not yet reached us, and inversely those may have become extinct of which the light reaches us now: in the same way as when the sound of a gun, exploding at a great distance, reaches us, the real explosion is a thing of the past, and may have taken place 50, 60, or more seconds before, according to the distance.

THE NEW ENGLISH PATENT BILL.

For the third time, a bill providing for material alterations in the English patent system has been brought before Parliament. In 1875 and 1876, one was introduced by the Lord Chancellor in the House of Lords; at present the bill is under the sponsorship of the Attorney General, and makes its appearance in the House of Commons. The chief feature of the new law is the abolition of the present system of granting protection, and substituting therefor a system of examination similar to that practised in the United States. That gigantic appendage of wax, with its elaborate attachment and tin box, known as the Great Seal, is to disappear; and in lieu thereof the patent will be sealed with a simple stamp. The lifetime of a patent is to be twenty-one years; but unless the patentee obtains a certificate of renewal before the end of the third, seventh, and twelfth years respectively, the patent will cease at the end of any one of these periods.

One good thing at least is proposed in this bill, and that is the reduction of the expense of an application to one half the present cost. The scale of taxes is to remain the same as under the previous law: namely, before the end of three years, $250; before the expiration of seven years, $500; with a further $500 before the end of twelve years, thus extending the full term of a patent to twenty-one years, being seven years more than are now allowed for the full term of a patent. The Lord Chancellor is empowered, under the new bill, to grant a longer time for the payment of these taxes in cases where patents have been accidentally allowed to lapse.

Among the other more important provisions is one giving the Crown unlimited powers to use any invention at a price to be decided by agreement of the parties; or where there is no agreement, the "Treasury or some other tribunal" is charged with arbitration. The objectionable feature of compulsory licensing is introduced in one clause, and in another patentee risks the revocation of his patent if within the three years he fails to use or put the invention in practice in Great Britain. If the patentee does not see fit to grant licenses, the Lord Chancellor has the right to do so. This is an interference with the right of every man to his own property, for which it is difficult to see any justification. Lastly, the old system of granting patents to the importers of foreign inventions is to be abolished; but the bill does not propose to prevent foreign inventors from securing patents on the same conditions as British subjects, provided the inventions have not been patented abroad or introduced into the realm for more than six months. The granting of amended or supplementary patents—similar to the French *brevets d'addition*—is provided for.

The above are the outlines of the bill which is now under discussion, and of which the British Government are using every endeavor to secure the passage. Our English contemporaries, in very lengthy discussions of the subject, think that, before it becomes law, several of its provisions will meet with material modification.

In the early days of our Patent Office, say from 1836 to 1850, but few applications for patents were made in a year, and as a consequence the range of cases available to the examiner for purposes of reference was obviously much smaller than it is now. But since the aggregate of American patents has reached nearly 200,000, while thousands have been granted abroad—for nearly every country on the globe now has its patent laws—it has manifestly become impossible for thorough searches to be made, and hence it is almost useless to employ an examining force to decide whether or not a patent should be granted. After thirty years' experience in soliciting patents, not ouly in this country but all over the world, we think we have had superior opportunities for observing the working of the various patent systems: and as a result, our opinion is that the existing English system of issuing patents presents the fewest objectionable features. To abandon that system in favor of a plan of official examination, similar to the necessarily imperfect one which exists in this country, would be a blunder.

The London *Engineer*, reviewing the new bill, says:

"It is somewhat unfortunate that the existence of the system in the United States should be cited as an argument in favor of its adoption here, because it is a matter of common notoriety among those who have taken the trouble to inquire that the fact of a preliminary examination being required is in truth not an obstacle to the re-patenting of old inventions; and the further fact, which we have already pointed out, that during the years 1872, 1873, and 1874, from 212 patent actions reported in the United States, there resulted the destruction of no less than fifty-three patents on the ground of want of novelty, is very significant. Moreover, the American technical press has constantly complained of the serious defects of the system followed by their Patent Office, a system which, it should be borne in mind, has been in process of elaboration ever since the year 1836, a period which may be regarded as almost coincident with the history of invention in that country. There is, however, to our mind, a vital objection to any system of preliminary examination. It is an objection which no refinement of practice can remove, because nothing short of infallible wisdom or omniscience in the examiners would neutralize it. We allude to the possibility of the destruction of an invention almost in its inception, in consequence of the difficulty or impossibility of inducing an examiner, or the Court, to perceive in it the one, perhaps delicate, distinction between it and something that has gone before—a distinction which may be the means of building a great success upon the ruins of many previous failures. This is not a novel objection, but it cannot be too strongly urged. To take an example: In his able paper on the expediency of a patent law, Mr. Bramwell alluded to Watt's invention of the separate condenser. If we imagine to ourselves a reference of Watt's application to an examiner, fully informed for the period at which the invention was made, is it not more than conceivable that the examiner would have pronounced against Watt on the score of novelty? His engine resembled other engines, but he separated his condenser from his cylinder, a change which in all probability the examiner would have said was a mere detail introduced for the purpose of setting up a claim to invention. Again, we have a still more striking illustration in the case of the regenerative furnace, a patent for which was refused to Mr. Siemens* simply because, in an old house belonging to an order of mediæval knights, it had been found that the hall was warmed by means of air drawn through heated stones. The actual apparatus, we believe, consisted of two chambers under the floor filled with stones. Each was alternately heated by a furnace and alternately cooled by a current of air, which, after it had abstracted heat from the stones, was turned into the building. No other such apparatus had been known to exist, but the authorities found it out and judged Mr. Siemens' stove to be an old invention. Fortunately, the doors of the English Patent Office were open to him, and we know the result. How often do we find that the novelty of an invention is only determinable after prolonged and costly litigation—litigation which is generally in proportion to the value of the patent? It should be remembered that the law is satisfied with the barest amount of novelty; and if that little is often so difficult to discover, it is fair to ask what the examiners will do for us, and what estimate we may make of the costs of an elaborate argument on appeal from them."

* The rejection of Dr. Siemens' application here referred to was made, we believe, by Prussia, which is almost the only country besides our own which maintains an examining bureau to decide on the novelty and utility of inventions.