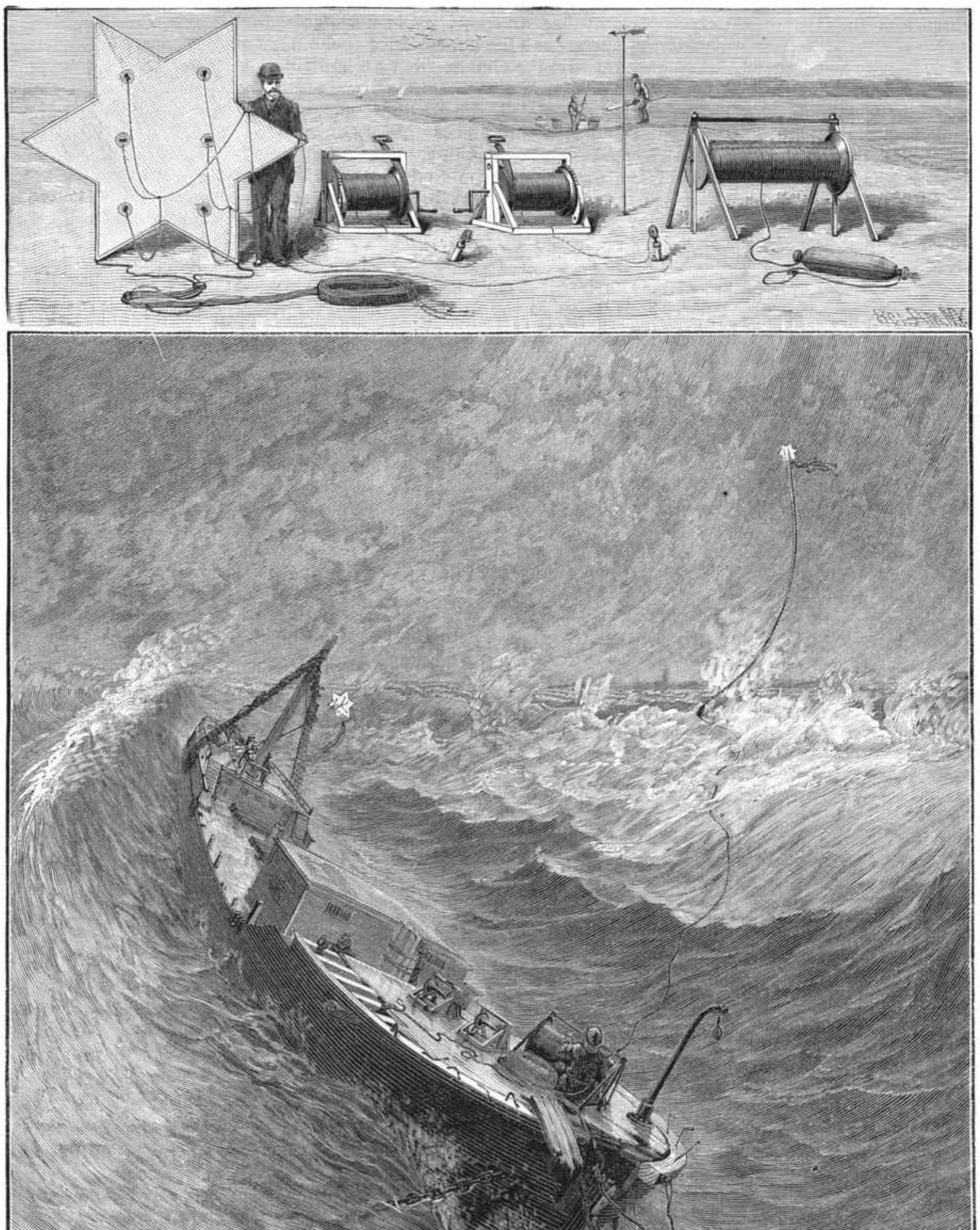
CARRYING A LIFE LINE ASHORE BY A KITE.

A few weeks since, on two different occasions, experiments were made on some islands in the East River, near New York City, to test a new method of carrying a life line ashore from a vessel in distress, as represented in the accompanying illustration. The trials, however, were not made from a vessel actually in need, as portrayed by the artist, but the kite was made to carry the buoy, with the life line attached, across a strip of water five-eighths of a mile wide, in which the current was running at the rate of two and a half miles an hour.

The kite used in the experiment was made with three sticks, each 7 feet long by $\frac{3}{8}$ of an inch thick, their width tapering from $1\frac{1}{8}$ inches at the center to $\frac{1}{2}$ inch at the ends. The weight of sticks and bolt is $3\frac{1}{2}$ pounds. The kite is foldable and can be made into a small package of convenient shape. To make ready it is only necessary to spread the sticks and tie four strings to the ends of two of them, the covering being already tied to the ends of one stick while folded. Oiled muslin or duck is used for the covering, and the tail is made of clothes line knotted in loops.

This kite is designed to stand any wind up to fifty miles an hour, having a safety factor of seven in a forty-mile wind, the breaking of one of the six bridle strings in such a wind still leaving a safety factor of one and a half. In sending up the kite the three bridle strings of each side are connected to a single line, each of these lines leading to a separate reel, provided with a brake and ratchet, as shown in the detail view. By means of the cords from the two sides to the separate reels the kite can be held at an angle to the wind, so that it can be flown in a direction up to 67° off the wind on each side of the dead to leeward point, and held to keep the given direction. The ability to do this was fully demonstrated in the experiments. The kite having been raised a sufficient height and started in the required direction, the two lines are connected to the buoy to which the life line is attached. The weight of the buoy is a little less than the lifting power of the kite, when the forward movement of the latter is arrested, so that ordinarily the buoy will be held down to the water by the life line, although the kite can drag it over reefs, bars, and floating spars, obstructions which stop such devices as self-propelling torpedoes, etc. When the kite is traveling its lifting power diminishes, and it simply tows the buoy, so that it is possible to take ashore in this way a much heavier line than can be sent by rocket or shot. The pressure of a forty-mile wind upon the 22 square feet of this kite, the kite being held vertical, equals 176 pounds; the strain upon the lines in flying, when the kite is inclined 30° from the vertical, is calculated at 130 pounds, with a horizontal pulling force of 117 pounds and a lifting force of 56 pounds.

A patent for this improvement has been applied for by Mr. J. Woodbridge Davis, of No. 645 Madison Avenue, New York City.



DAVIS' METHOD OF CARRYING A LIFE LINE ASHORE BY A KITE.

A COMMOTION was caused in all technical circles when, in 1885, congo red heralded the many-colored array of that class of dyestuffs which dye cotton without mordants, that is direct. Like the fuchsine discovered by A. W. von Hofmann in 1858, and the first alizarine synthetically produced by Graebe and Liebermann in 1869, Boettiger's congo red was a red dyestuff forming the marking stone of a new period in the history of the development of the tar dyestuff industry and at the same time of the dyeing industry.

[FOR THE SCIENTIFIC AMERICAN.]

The Bessemer Steel Discovery.

Mr. Bessemer was a very learned metallurgist, and was seeking a short and cheaper way of producing steel from cast iron by reducing the excess of carbon. His process was to force air through the molten mass and burn out the excess of carbon and such base minerals or metals as it contained, and stop the blast at the proper time and thereby save the expense and labor at the puddling furnace; but there was no way to effect uniformity or to ascertain just when to stop.

One day in his experiments a very happy thought struck him, which was to burn out all of the carbon, or as near all as possible, and then restore a proper quantity of carbon by pouring in a very high grade of metal and as free as possible from base materials injurious to steel. This he found in certain qualities of ore called spiegel or "spiegeleisen." His first experiment proved quite successful, but here he found a stumbling block. Some man had patented a method of melting wrought iron and restoring it to steel by supplying it with molten spiegel, and he was quite successful except that the metal must go through the puddling process, and then the remelting added another cost, which made it quite as expensive as to convert wrought bars into blister steel, then melt it in the crucible and pour it into ingots in the usual way. Under the English patent laws there must be an annuity paid after a certain number of years or the patent becomes invalid. The inventor of this process of melting wrought iron and restoring it with spiegel was in Mr. Bessemer's way, but in a short time, unless he paid the government installment on his patent, it would become invalid. So Mr. Bessemer watched the records until the poor unfortunate let it run out, then Mr. Bessemer that same day entered his claim, and his patent was granted, covering the entire process. I learned these facts in 1869 while at the John Brown Bessemer Steel Works, in Sheffield, England. But when Mr. Bessemer applied for a patent in Germany, it was refused on the ground that it was not new, and yet I was told when in Essen, at Mr. Krupp's works, that Mr. Fried. Krupp paid Mr. Bessemer $50,000 to go to Essen and teach them the method. Krupp had already spent considerable money and time in trying to make Bessemer steel and failed to do so.

Mr. Bessemer in 1869 was said to have amassed a fortune of about twenty millions from his invention, and it was said then to be the largest amount ever made by any one inventor, and probably was.

The John Brown works were then the largest Bessemer steel works in the world, and I went there to see about twenty tons converted at one time. A two hundred horse power engine was used at the blast furnace alone, and it was indeed very interesting to see the immense converting pot poured full of molten iron, and then the blast turned on, and see it boil and intensify with the varied colors as each base ingredient was destroyed by the heat, and when all was consumed except the quite pure iron, then the molten spiegel was poured in, and the affinity of the molten mass was so great that one could see its greedy appetite for the carbon, like a hungry swine for its swill. I was told that Mr. Bessemer for a long time anticipated the making of steel by his process equal to the best cast steel, but in this he of course failed. Still, while I was in Sheffield I was at a steel rolling mill where they used the *sculps*, as they are called, that come out of the converting pot. These were broken up, remelted, and a small mixture of better material used and melted together and poured into ingots, and that rolled into sheet metal and crosscut and pit saws made of it for the Russian market; and I was told that over six hundred thousand of them were sold there every year, besides saws made from it were sold all over the world. If there is any cheap method of producing anything of metal, England is among the first to adopt it. An immense amount of work that is done in America by men is done there by poor women for a mere pittance that will keep soul and body of part of them together; but when sickness comes or their job is lost, it is the pauper house or the grave. No American can ever appreciate the glories of our free and liberal country and government until he goes to foreign lands.

J. E. EMERSON.

Photography of Inks.

Dr. Jeserich claims it is possible to demonstrate differences in the colors of the inks which cannot be seen, the one ink appearing light and the other dark. This process depends on the following considerations:

As is well known, the tints of the inks that are called black are either brown, red, green, or blue in shade. Such tones have but little effect on the eye, as it is chiefly sensitive to the yellow and red rays, but the chief sensitiveness of photographic plates, on the other hand, lies in the blue, violet, and ultra-violet. As, with ordinary sensitive plates, yellow and green subjects are rendered dark, and blue ones light, the same will follow in photographing inks of various tones. This difference can be considerably intensified by the use of suitably colored light and color-sensitive plates. In this manner marked differences in the various inks can be clearly and distinctly demonstrated.

Among the subjects with which the author deals is the application of photography to the detection of the falsification of handwriting. In such cases photography can be of great service, as in an enlarged photographic picture erasures and alterations can be more clearly seen than in the original.

The Telephone in New York.

The New York Electrical Society has been engaged in practical missionary work in connection with the present agitation in the metropolis over the question of telephone service. It is generally believed that the opposition to the telephone companies is due largely to a misconception on the part of the general public and that the daily papers are in a great measure responsible for this condition of affairs. It was thought that an actual inspection of a representative telephone exchange would do more in the way of removing popular errors than any amount of argument or mere statement of facts. Accordingly the society arranged with the Metropolitan Telegraph Telephone Company for a meeting at the Cortlandt Street exchange to which the members might invite their friends. The opportunity was accepted by many persons interested in the agitation which has been stirring New York for several months, and on the evening of April 21 a large party gathered at the headquarters in Cortlandt Street.

The visitors were received by J. J. Carty, electrician of the Metropolitan Company. Mr. Carty first described the outfit employed at the subscriber's station. He alluded to the fact that the public had been told that a telephone cost $1.45 to make and that the rest of the apparatus was proportionally cheap. The subscriber would thus be led to figure out how many times he paid over and over again for the instrument during the year. The public gave no thought to the army of engineers and electricians employed in the building and repairing of lines, the laying down and testing of cables, and the equipment of exchanges, to say nothing of the staff of inspectors and the wire men who set up instruments and trace out the maze of wires running through the exchange from the ends of the cables to the switch board. The subscriber was too busy to gauge exactly the value of such facts as that, in addition to other appliances, the telephone service necessitated the use of 10,000 small dynamos in various parts of the city, that 30,000 cells of battery were employed, that these 30,000 cells have to be renewed every eleven weeks, and that in New York alone the company had over 30,000 miles of wire underground. It has been the fashion, Mr. Carty said, to imply that other nations were better off in the matter of telephone service than America, while as a matter of fact no other nation is so well supplied. Representatives of corporations from the principal countries in Europe, and even from Japan, had visited New York to study the working of the telephone system. Both in technical equipment and general organization the Metropolitan Telegraph and Telephone Company was recognized as a model, not only by other companies in this country, but by all the continental governments of Europe. It was very suggestive of the state of the telephone service in England, as compared with our own, that in that country the parsons are taking an active part in the agitation for better service, on the ground that it will materially reduce the national profanity. There are in New York City alone more underground telephone wires than there are in the whole of Europe. No expense has been spared by the company to bring the service to the highest state of efficiency. Within the last five years every single wire, cable and switch board in use by the company has been removed in order to permit the use of metallic circuits. It was found that with wires put underground on the old system there was constant and confusing induction, and it was impossible to utilize the instruments of increased efficiency which progress in telephony had developed without intensifying the trouble. The result of using the new instruments with the old wires would be that everybody could hear what everybody else was saying. To overcome this difficulty metallic circuits were adopted, and as two wires then became necessary instead of one, the heavy cost of wire throughout the system was doubled. All the metallic circuit subscribers, the only ones now taken by the company, are equipped with the highest type of long distance apparatus, which will enable the subscriber to talk not only to any part of New York City, but to any part of the eastern section of the United States, *i. e.*, to Buffalo, Pittsburg, Washington or Boston, and to the most distant points that are now reached or ever will be reached. With one of these instruments Mr. Carty made connection with Boston, and 40 additional instruments were connected, so that the members of the society could listen in relays of 40 to the conversation. And thus for a while the Gothamites held pleasant communion over the wire with the telephonic representative of the City of Culture; whistling, whispering and vigorous denunciation were all distinctly audible. Connection was also made to Boston over an instrument which was supplied with current from a thermopile. By means of this appliance, the use of which for this purpose is in the initial stage, an efficient current of electricity can be generated by the heat from a gas flame. The visitors were next conducted to the operating room on the eighth floor of the exchange, and Mr. Carty described the operation of the enormous switch board, which alone entailed a cost of $350,000. In his remarks Mr. Carty showed that, aside from its technical interest, the switch board furnished an interesting paradox in the laws of trade, in that it illustrates how the telephone business, unlike other branches of industry, is vastly more expensive under wholesale than retail conditions.

A switch board sufficient to install 100 subscribers would cost, at the very outside, $500, but where 100 subscribers are added to an existing 5,000 the additional expenditure necessitated would be over $5,000. The cause of this is that in the first instance facilities are required for the intercommunication of only 100 stations, but in the second the connection of fifty-one hundred stations is necessary. And thus the expense of new installations "rolls up," as Mr. Carty expresses it, "like a snowball running down hill." After following the course of the 12,000 wires throughout the switch board, the visitors passed into the long distance room and investigated its many remarkable features. A descent was then made to the basement, where bewildering ranges of lightning arresters, cable terminals, and distributing racks gave further evidence of the tremendous upheaval that the change from grounded to metallic circuits involved. By the time the tour of the building was completed, the visitors, although astounded at the magnitude and complexity of the plant, were able to form a very intelligent idea of the operation of the exchange. The company provides one operator for every nine subscribers, so that each subscriber may know that one man in the telephone company does an hour's work for him in some way or another every day. This proportion of operators to subscribers is larger than in any other city in the world. This is due to the fact that New Yorkers are notoriously impatient of delay, and the company seeks to give them the highest class of service. Considerable surprise was expressed when not long ago a quantity of American cutlery was sent to Sheffield, the cutlery fastness of England, but a still more remarkable industrial innovation has lately been recorded in the shipment of American telephone cables to London, the home of the cable manufacture. This is a gratifying recognition of the fact that in telephone cables, as well as in all other telephonic appliances, this country leads the world. An inspection of the costly and perfectly appointed Cortlandt Street exchange, in which the utmost resources of engineering and ingenuity are drawn upon to furnish service that is unequaled, should convert the veriest carper to the belief that he is getting excellent value for his money, even though he may not be able to go so far as did an eminent lawyer, who publicly stated, a month ago, in England, that if he paid $60,000 a year for his telephone, it would be cheap at the price.

The New Star in Auriga.

BY PROF. C. A. YOUNG.

During the months of February and March astronomers have been in something like a state of excitement over a new or "temporary" star which has been visible in the constellation of Auriga, about two degrees north of *Beta* Tauri. As compared with some of the recorded "temporaries," it did not really amount to a great deal, since it never much exceeded the fifth magnitude in brightness, while the stars of 1866 and 1876 both surpassed the second magnitude, and the famous star of 1572 more than equaled Venus at her brightest. The new star, however, though not at all obtrusive, was easily visible to the naked eye, and the circumstances of its discovery show that it is quite possible for such objects to appear and disappear entirely unnoticed.

It made its first appearance some time in November or early in December, but was first discovered about January 30 (after it had actually begun to decline in brightness), by a Mr. Anderson, of Edinburgh, who, on February 2, sent a postal card announcement to Dr. Copeland, the astronomer royal for Scotland. Our statement as to its first appearance rests upon the fact that, while it is not visible upon any of the numerous photographs of the region made previous to November 2, 1891, it is conspicuous on a negative taken at the observatory of Harvard College on December 10. During the remainder of that month and in January a considerable number of negatives were taken, and from their comparison it appears that the maximum brightness of the star (4½ magnitude) was attained and passed about December 20—at least a month before it was noticed by any one.

On February 5 the star was a little above the fifth magnitude, and, excepting some peculiar fluctuations, it remained without much change until the 15th; then it began to fade pretty rapidly, so that by the end of the month it was barely visible to the naked eye, and by March 20 had run down to the eighth magnitude. At the time of writing (April 2) it is hardly of the tenth, and probably will soon disappear entirely, like the last of the "temporaries," which appeared in August, 1886, in the middle of the great nebula of Andromeda, and had utterly vanished before the end of the year.

The Andromeda star presented very little of interest in its spectrum; with the new star the case was different. Its spectrum was crowded with lines and bands, both bright and dark, which undoubtedly contained the record of a wonderful story if we could only decipher it completely. The most conspicuous feature was the brightness of the lines of hydrogen; the whole series appeared to be present, including the remarkable group in the ultra violet which are invisible to the eye and come out only upon the photographic* plate. Many other bright lines were also visible, especially the two D lines of sodium, a series of four very conspicuous ones in the green, and some twenty or more fainter ones in the region between F and H. As to the lines in the green, a very interesting question has arisen whether the two brightest of them are or are not coincident with the two brightest lines in the spectrum of the gaseous nebulæ. Lockyer asserts the identity, while Huggins denies it. The observations of Vogel, with which my own agree very closely, support the view of Dr. Huggins, and the comparison with the spectrum of the nebula of Orion, which was favorably situated for observation at the time, was so easy and direct that there is hardly a possibility of mistake. Speaking generally, the bright lines in the star spectrum seem to have been for the most part identical with those which are most frequently conspicuous in the solar chromosphere; and yet the line known as D_3, which, next to the hydrogen lines, is by far the brightest of all the lines in the spectrum of the chromosphere, appears to have been wholly absent from the spectrum of the star—a very puzzling circumstance.

But the most curious thing about the spectrum of the new star was that every one of the bright hydrogen lines (not the other lines) was accompanied by a heavy, dark line on its "upper"—*i. e.*, its more refrangible—edge. The natural explanation is to suppose that *two* bodies, at least, are concerned in the phenomenon—one of them showing the dark lines of hydrogen alone, like any ordinary star of the so-called "first type," while the other shows them bright, and accompanied by a multitude of other lines. The dark-lined star is rushing toward us and the other receding from us, each with a speed exceeding a hundred and fifty miles a second. The spectrum of the well known variable star *Beta* Lyræ presents a similar phenomenon at certain times.

It is obvious that this doubling of the hydrogen lines agrees very well with the hypothesis which Mr. Lockyer has proposed as an explanation of the phenomena of temporary stars, viz., that two meteoric swarms encounter each other, and light up for a short time, either in consequence, as he maintains, of actual collisions between the meteors or else, more likely, by means of electric discharges and other interactions between the particles as they pass near each other without actually striking. A different hypothesis, originally proposed by Dr. Huggins, regards the phenomenon as substantially the same which the sun presents in its eruptive prominences, but on an immensely vaster scale. This also agrees equally well with the general aspect of the spectrum, and especially with the apparently composite character of some of the bright lines in the star spectrum, which, as has been said, correspond very closely to certain groups of lines in the chromosphere; but the absence of the "helium" line (D_3) is unfavorable to it, nor does it so readily explain the doubling of the hydrogen lines.—*Popular Science News.*

* By a misunderstanding it was stated in the last number of the *News* that the writer had obtained photographs of the spectrum of the star. The non-completion of the prism train of our new spectroscope prevented this; but Lockyer and Huggins in England, Vogel in Germany, and the astronomers at the Lick Observatory were all very successful in this line.

Maple Sugar.

According to the returns of the census of 1890, there were in the United States in 1889, 62,074 producers of maple sugar, and the quantity of sugar produced was 32,952,927 pounds, and the quantity of maple sirup was 2,258,376 gallons. The sugar was produced in the following States, in quantity as shown herewith:

	Pounds.
Arkansas	335
Connecticut	8,617
Illinois	13,260
Indiana	67,329
Iowa	45,120
Kentucky	11,259
Maine	84,537
Maryland	156,284
Massachusetts	558,674
Michigan	1,641,402
Minnesota	34,917
Missouri	20,182
Nebraska	12
New Hampshire	2,124,515
New Jersey	210
New York	10,485,623
North Carolina	7,713
Ohio	1,575,562
Pennsylvania	1,651,163
Tennessee	9,167
Vermont	14,123,921
Virginia	26,991
West Virginia	177,724
Wisconsin	128,410
Total	32,952,927