(For the Scientific American.)

The Atlantic Ocean Telegraph.

I have, for many months, contemplated addressing you an article relative to the probable success of Ocean Telegraphs. The object aimed at by a communication hence to Europe, is of such importance, and its success so greatly to be desired, that it seems to be the duty of every one who may even suppose himself capable of rendering any assistance by examining the difficulties that present themselves, and offering suggestions which may tend to obviate them, to do so. From the magnitude of the undertaking, and the great expense necessarily attending it, those engaged therein have undoubtedly given not only their own serious attention to the subject, but have called into requisition all the light and aids they could command; and when the character of those conducting the enterprise is considered, it would be idle to suppose that they have undertaken it without having fully weighed all the probabilities presented to them. Still, the possibility of failure, as all must admit, and the considerable fear I have of its success, from examining the detail of the plan, as at present proposed, must be my apology for venturing a few views upon the subject Having for more than ten years closely and almost exclusively applied myself to the study of telegraphing in its broadest sense, both practically and theoretically; directing my thoughts to the subject with the utmost igor of which I am capable, I confess I some what fear the possibility of its practical realization; but when so many others, many of whom have had as ample and some greater opportunities than I have, have satisfied themselves, otherwise, it would be presumptuous in me to entirely conclude the subject, even in my own mind; and I shall be most heartily pleased to be agreeably disappointed. It is but justice to myself to state that although I intend soon to come before the world with a candidate for favor in the shape of a telegraphic apparatus; yet I am not, nor have I ever been in any manner connected with, nor pecuniarily interested in any project for Transatlantic Telegraphing. My earnest desire is for its success; and if I can be instrumental in forwarding the solution of the question I shall gladly do so; whilst, on the other hand, if I think I see serious obstacles to its practical accomplishment, in its present shape, I will endeavor to point them out, that they may be verified or disproved.

Passing over the possibility of securing an intact covering to the wire and safely placing the cable, in the required position, where it will remain free from injury, of which I have no serious doubts, I will merely take up the subject of *powers of conduction* of the wire, the gutta percha, covering, and the element of salt water surrounding them. From page 540, Vol. 8, of the eighth edition of the Encyclopœdia Britannica, I quote the following:

"Although some bodies are said to be perfect non-conductors, yet this is not strictly true. A strong electrical discharge can be made to pass through a thin film of the worst conductor.

It appears to me the terms "non-resistants" and "resistants," or "resistants *minus*," and "resistants *plus*," used relatively to the passage or projection of an electrical current, would convey to the sense a clearer idea of the power of different substances, as a vehicle for electricity, than the terms "conductors" and "non-conductors." Now, the only supposed *perfect* non-resistant (or conductor) known, would be a complete *vacuum*, were its attainment possible. This is not demonstrable by any known means, nor is it essential in this connection. We have to depend upon substances which offer greater or less resistance, as the medium through which to accomplish the desired end. First among those denominated "conductors," occur some of the metals—silver and copper ranging first and second, and iron eleventh in the list, as laid down in the work quoted above, whilst in the list of non-conductors, or resistants is found gutta percha, standing at the *head;* or that substance among that class offering the *least resistance*—that connecting link between the two at which it has been concluded by philosophers to make an arbitrary division for the convenience of distinction.

If copper be used for the wire, and gutta percha for the substance to insulate it from the water, the first question which would present itself would be, What are the relative conductabilities of copper and gutta percha? In absence of any determination of that point, suppose the ratio of resistance to passage in gutta percha, to be at 25,000,000 to 1 (a single unit) in copper, which I think must be their full difference. Now if the thickness of the gutta percha covering be one inch (making the cable something over two inches diameter, including the wire) then, when the length of the wire should reach 25,000,000 inches, or about four hundred miles, the powers of resistance between the two substances would be in equilibrio; and if there be a substance immediately surrounding the cable, which is a good conductor, connecting immediately with the great electrical reservoir,—the earth upon which the cable is to lie—then if the wire exceed that length, the line of passage would be in favor of a direction through the gutta percha to the water and earth. It may be objected to this conclusion, that practice proves the contrary, inasmuch as if this be true, a telegraph line in the air could only be worked a comparatively short distance; but it must be remembered that the posts sustaining the wire are from twenty to thirty feet in hight, which would make the "air covering" or cylinder, so to speak, around the wire, a diameter of forty to sixty feet, instead of two inches as in the other case.

To the direct resistance offered by the wire itself, must be added the inductive resistance of the element—salt water—surrounding the cable. In illustration I quote from page 543 of the above named volume, the .... "experiments made by Dr. Faraday with the Telegraphic lines of wire between London and Manchester. This wire, which is 1400 miles long, is buried in the ground, and consists of four wires, each 350 miles long. At the Manchester station, the extremities of the first and second wire were united, and also the extremities of the third and fourth. At the London station, a galvanometer was attached to the end of the first wire; the ends of the second and third wire were united by a second galvanometer, and at the end of the fourth wire was attached a third galvanometer, communicating with the ground. The first galvanometer was then put in connection with one of the poles of a pile, the other pole of which communicated with the ground. The needle of the first galvanometer immediately deviated, but that of the second did not move till after a sensible interval, and that of the third a little later still. About two seconds elapsed before the electric current was propagated from the first to the third galvanometer."

Upon cutting off the communication from the pile, the galvanometers returned to zero in the order they had been deflected; and the same paragraph goes on to say:—

"With a telegraph wire suspended in the air, the three galvanometers deviate from and return to zero almost exactly at the same instant."

When we consider what great care was taken to insulate, and how much further removed these subterranean wires were from the earth, than in the submarine cable from the water, and the much greater inductive resistance to passage, which would be offered by the salt water surrounding and in actual contact with the cable, than by that of the earth, and the enormous pressure which would make the contact the more perfect, the two resisting forces of the wire and water, to overcome the counter resisting force of the gutta percha appear to afford well grounded fears for success.

Had caoutchouc been used for the covering instead of gutta percha, except so much of the outer covering as might have been preferable to gutta percha in order to resist cutting and abrasion, much would have seemed to have been gained, as the former substance possesses more valuable properties as a resistant than the latter.

Another view of the subject to which I have never seen any allusion, is the constantly varying temperature of the element in which the cable is to repose. Considering the elevations and depressions of the ocean's bottom and the heated nature of the Gulf Stream and other inter-oceanic currents, the variations of temperature to which it will be constantly subjected, will be at least 25° to 30° Fah., as shown by Maury in his "Physical Geography of the Sea," and by others. The practical telegrapher will see in this a formidable enemy to uniformity of the passage of the electrical current. It is well known that the colder the weather the more perfectly can a telegraphic apparatus be operated upon, while in the extreme heat of summer the current is so feeble and so constantly changing, caused by hot and cold currents of air, as much to impair good operation, and this, too, where the probable variation in temperature along an entire line of five hundred or a thousand miles would not exceed ten degrees at any given time. In connection with the subject under consideration, this becomes a very serious question, as Sir H. Davy "found by several striking experiments, that the electrometer became most sensibly affected by changes of temperature in the wire transmitting the charge, and whether by the common means of heat or cold directly applied to it, or otherwise, by means of an electrical current; so that it does not appear to be of any consequence how the heat is derived by which the conducting power is diminished. Hence it follows that the heat excited in a metallic body during the time of its conduction would tend to impede the transmission of the electrical current."—[Enc. Brit., Vol. 8, page 541.

On the other hand, "it has been long known that imperfect conductors have their conducting power increased by heat; gases, charcoal, glass, ice, and resins, when melted, are proofs of this;" [ibid. page 540,) whilst the water that surrounds them has its conductability somewhat increased by heat, although the variation in this is but slight, according to Dr. Ritchie and Marianani.

If what has been written above shall have the effect to draw the attention of others more capable than myself to the solution of these supposed difficulties, I shall be gratified.

E. F. Barnes.

Buffalo, July, 1856.

Recent Foreign Inventions.

Napping Cloth.—Sir Charles E. Grey has taken out a patent for raising the nap of, and dressing woolen goods, by substituting a new material for the common teasels, which have been used from time immemorial for this purpose. He employs the prickly parts of plants known in the West Indies by the name of "nicker bush," and by some botanists called *Guilandina Bonduc.* These prickly burrs are stated to be far superior, for napping, to the teasels, and can be obtained in any quantity, and are cheaper.

Fan Parasols.—Alexander Forot, of Paris, has secured a patent for making a parasol that can be folded into the form of a fan instead of folding it in the common manner. A small plate of brass is attached to the end of the shank of the parasol, and on the two sides of this plate two other plates are hinged. To these latter the ribs of one half of each plate of the parasol are secured by joints, which only allow them to move in the same plane of the plate. The two sides of the parasol fold together like a fan, and the shank or handle is jointed, to fold between the two in the usual manner.

Steam Boilers.—Thomas D. Duppa, France, patentee.—This invention consists in arranging and combining several upright cylinder boilers in a circle. Each boiler has its furnace at the lower end. At the upper part of each fire-box a series of tubular flues rise to the upper part, where they communicate with a chamber which is surrounded with the steam in the upper part of the boiler. The heated air and products of combustion then pass down from each boiler to the outside of a cylindrical vessel, into which the steam from the series of boilers is conducted, then they pass off to the chimney. The object of this arrangement of boilers is to superheat the steam, and economise horizontal space, by employing a number of vertical boilers instead of horizontal ones. Large boilers should never be placed vertically. They are too heavy to be supported on a narrow base. For a series of small boilers the above arrangement appears to be pretty good.

The subject of steam boilers appears to engage much attention in Europe at present.—Why, we really cannot tell. Quite a number of patents have been taken out within the past year for improvements (so named) on them in England, and the number of the London *Engineer* for July 4th, records the claims of four new patents—none of them of much consequence. The fact, however, is an indication of a feeling among those interested in steam boilers, that they do not consider the present boilers perfect.

Carding Machinery.—W. Stevenson and William Crawford, of Lochwinnoch, North Britain, have obtained a patent for improvements in carding machinery, which appear to be novel and good. In its main details their carding engine resembles those in common use, having a feeding in and carding apparatus. The wool or cotton passes through the machine in the usual manner, as far as the main carding cylinder, but instead of doffing or removing the sliver, as at present practiced, a disk card is employed for this purpose.—This is a disk of metal covered with card teeth, and set upon a vertical rotating spindle in such a position that the card face of the disk works with a part of its area against or in contact with the wire card teeth on the horizontal main cylinder. The respective surface motions of the main cylinder and the disk card are thus at right angles with each other, and as the main cylinder revolves, the disk card revolving also across the path, as it were of the main cylinder card surface, strips and carries away the wool or cotton from the main cylinder. The fibrous material is thus carried round by the disk clear away from the main cylinder, and one or more doffing combs being arranged to work upon the disk card face, the fibrous material is stripped off the disk card, and passed forward to a duplex endless apron arrangement. The apron arrangement has a continuous forward traverse, in the usual manner, for the conveyance of the fibrous material away from the actual carding apparatus. But in addition to this traverse it has also a lateral vibrating action horizontally, for the purpose of giving a rubbing rolling action to the fibrous material, to complete the sliver or roving. And to give greater effect to this slubbing rolling process the endless aprons are made double, the fibrous material being passed along between the two contiguous lengths of aprons, the later al action of which is in opposite directions, and gives the requisite rubbing rolling action to the fibers, and condenses the slivers for further preparation and manufacture. And to aid the rolling or condensing action for solidifying the sliver as it issues from the endless aprons, it may be passed through a revolving tube, for the purpose of adding a further condensing twist to the fibers. Instead of traversing aprons, duplex action rollers may be used for traversing and rolling the slivers.—It is intended to employ this improved machinery for various textile manufactures, but it is particularly applicable in wool-carding, so as to produce slivers of any length in a convenient manner.

Purifying Coal Gas.—W. Basford, London, patentee.—This inventor passes coal gas during the process of its manufacture, through charcoal saturated in lime water kept in a heated state. The common method of purifying the gases, is simply to pass it through milk of lime—thick lime water. The above described process is stated to separate the impurities better than cold lime water alone.

Pear Tree Oil.

From experiments lately made with the fruit of the pear tree, an account of which appears in the Society of Arts *Journal*, it seems probable that a new substance may be brought into use, possessing considerable commercial value. According to the analysis of Dr. Hoffman, the oil expressed from the seed, when divested of its peculiar bitter taste, may possibly be made a substitute for olive oil as an article of food. In illuminating power the oil is not much inferior to the average quality of sperm oil.