Correspondence.

The "Etheric" Phenomenon.

To the Editor of the Scientific American:

Permit me in a few hurried words to return to the as yet unexpired subject of Mr. Edison's "etheric" force. Had I time, I would prefer to make my part of the discussion more exhaustive in point of enumerated contra-experiments; but enough remains, without, to expose the fallacies of the speculation. The only way in which I can account for the mystifications of several writers and experimenters on "the new force" is that they have become so involved in the pursuit of an idea that they absolutely are unable to extricate themselves from a position in which a thing, in reality perfectly ordinary *per se*, seems perfectly extraordinary simply because beheld under ultra-ordinary conditions.

The idea of J. P. H., who sees nothing inexplicable in obtaining a spark from an uninsulated wire laid upon wet earth and connected to an insulated source of power, although it has been endeavored to controvert him, strikes the bottom of the whole thing. There is no such thing as a non-conductor of electricity; there is merely a difference in degree of conductivity, an assertion of which dynamic electricity furnishes the proof. The only difference between dynamic and galvanic electricity is the difference of intensity. We use simply a battery to produce the galvanic current. This furnishes us with an atomic vibration of a certain force, which, unless the battery consist of a great many cells, say 2,000, so that the force of the first cell is augmented by the separate forces of the 1,999 other cells, will not give sufficient intensity to disrupt or discharge. By sending the battery current through a helix, over which is placed a secondary helix of a great number of convolutions, the atomic vibrations of the battery current in the primary helix are multiplied as many squares of times as there are layers of the secondary wire around it, and the result is disruption or a spark from the secondary wire, many inches in length. It is as though we were to project a ball from a cannon, and, with inconceivable rapidity, supplement the primary force in succession with the force of a million additional cannon. It is not difficult to calculate the increase of impact in which intensity exists. For instance, if the primary helix shall consist of 6 layers of 100 coils of wire, we shall, in the primary helix alone, have increased the battery impact 36 times. Taking the atomic vibrations of the battery at 1,000,000,000 per second, we have here alone 36,000,000,000 impacts per second. The secondary helix will consist of 500 coils, making the increased impact five times 36,000,000,000, or 180,000,000,000 per second. The secondary helix will consist of 100 layers, and the impact by induction will be increased 100 times 100 times, or 10,000 times, giving an atomic impact of 1,800,000,000,000,000 per second as the result. Is it at all remarkable that this impact, or "kick," results in disruption, or forcing the electricity through what to the direct battery is practically a non-conductor? Or is it remarkable that, if the polarity of the impact is so instantly reversed that it is practically destroyed as soon as created, physiological or mechanical effects should not be produced in the 1,800,000,000,000,000th part of a second? I have let a person stand on the most perfect insulation, holding a wire leading to one end of such a secondary wire, the other end of the secondary wire resting upon an insulator, and sparks have passed in rapid succession from my finger, I standing upon a carpet, to the insulated person, often an inch or therabouts in length; yet the only circuit for the current was from the free end of the coil (through the insulator, table, dry carpet, thirty feet of wooden floor, carpet, and myself) to the person holding the other end of the coil. Supposing the free end of the coil had passed through 10 or 50 or 100 miles of wet earth, entirely uninsulated, and finally the end were laid upon the table, what would have been the difference in the spark passing from my hand to the person? I answer, and any competent electrician will understand and acknowledge it, none whatever

I might have expressed myself in much stronger terms than in my communication on page 36, but several considerations prevented my doing so. I do not, therefore, characterize the speculation as a deception, for the reason that the advocates of the etheric force may sincerely believe in it; but I do not hesitate to pronounce the whole thing, both as concerns the public and in a scientific point of view, as one of the flimsiest of illusions.

As stated in the article by Dr. Vander Weyde, on page 89, the conclusions of Dr. Beard are tinged with some disregard of the laws of static (or dynamic) electricity; and while Dr. Vander Weyde cannot technically agree with my views, I do not see but that he does so practically. He explicitly asserts his belief, precisely my own, as set forth in my communication, that the observed phenomena are due to induction, induced electricity of alternating polarities; and excepting on some minor points, I do not see that Dr. Vander Weyde is not an essential advocate—originative of my own position, however much he may differ from me in respect of the theory of atomic vibrations, which is by no means a part of this discussion.

But assuming that the etheric force is something, the question of its practical value is narrowed down to its utility as a telegraph; hence

1. To be of any real value it must be as direct and simple in its operation as the Morse telegraph; or

2. It must enable the construction of telegraph wires on an extremely economical scale; and this must cover the capabilities of the force in respect of a single wire as regards the capabilities of the Morse telegraph in respect of a single wire.

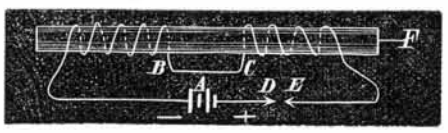
It clearly does not and cannot meet the first requirement. Therefore it must do a great deal in respect of the second; and how does it meet the second requirement?

The ordinary telegraph can be constructed, poles and all, for $150 per mile; each additional wire on same poles for $60 per mile. As the etheric force is assumed not to require insulation, if we place its wire upon poles we shall save merely 40 insulators at 12 cents a piece to the mile, or $4.80. This certainly is not practical value.

If, on the other hand, we place our wire underground, it will cost us, naked, at the very least $150 per mile, and the wire would not last so long as upon poles. Nor, certainly, is this practical value.

A higher speed of transmission than 500 words per minute over a single line is useless. The automatic telegraph yields a greater speed, yet it is a practical failure, for it does not and never can meet the requirements of a business telegraph, and I make this assertion while I am the inventor and possessor of such a system, obtained by considerable study and an expense of many thousand dollars. Taken in all or any one of its bearings, I contend that I have proved the practical inutility of the "etheric" force, and this is assuming that we really have found something or other capable of something or other: whereas, when we scrutinize the subject, we find that we have only wild speculation as to having found something or other capable of something or other, which, at best, even if realized, will cost as much, or nearly as much, as what we already have, be of no increased value and involve a complete innovation in affairs.

After all that has been made public, almost any person ought to be able to experiment intelligently with the etheric force. About as easy a way to get a sight of this ethereal etherity is as follows:



Take a bar of iron, F, and wind it with insulated wire, starting from the — pole of the battery, A, and passing in one direction round to B; then to C, and from C winding in the opposite direction around the bar, terminating at the contact point, E. From the + pole of the battery connect with contact point, D. Be careful to make the helix from battery to B and from E to C identical as to resistance in ohms and number of convolutions. There should be at least 10 layers of wire, the bar being about 7 inches long. The bar should be bent to form a horseshoe; when the contact points, D and E, are brought together, an armature is not attracted, as both ends of the bar are of the same polarity. Now separate the points, D and E, and you will get a bright spark, in which the polar effect of one portion of the coil is instantly neutralized by the polar effect of the other portion.

In order to bring the subject of the "etheric" force to a focus, I pronounce as utterly absurd, and challenge a demonstration to the contrary before competent and unprejudiced witnesses:

1. The statement that the etheric force can be transmitted, say from New York to Philadelphia, over a really uninsulated single wire: that is to say, the wire, if an ordinary wire, shall have such ground connections at different intervening points that a galvanic battery current will be completely short-circuited and unable to pass from New York to Philadelphia.

2. The intimation that the etheric force can be transmitted any distance, say one half mile, through the gas pipes of a city: provided there shall be no return wire, but simply an earth plate at the distant terminal, and that the area of the earth plate shall be the same as that of the ordinary earth plate at telegraph stations, and that the earth plate shall be imbedded in earth no more moist than that through which the gas pipe passes.

As I am prejudiced, I cannot, of course, witness the interesting proceedings I propose. W. E. SAWYER.

New York city.

The Original Oil City.

The readers of the SCIENTIFIC AMERICAN, or at least as many of them as are interested in the subject of the petroleum products, have a general notion of the machinery used for boring for oil, and for pumping, refining, storing, and transporting it. To such readers, as well as to those who are acquainted with the details of oil apparatus, an account of how they do these things in Asia will not be unacceptable.

The peninsula of Apsheron, at the southwest corner of the Caspian Sea, abounds in naphtha springs. The oil wells, fifteen years ago, yielded an annual product of about 4,000 tuns, which is now probably much increased. The wells find oil at an average depth of about 150 feet. These wells are about 1 foot in diameter, and the pumping apparatus is among the most simple A tube, 9 feet long by 9 inches in diameter, furnished with a valve which opens when it touches bottom, is lowered and raised by a steam engine. This machinery lifts in a day about 500,000 lbs. weight of crude petroleum. The tube is lifted clear of the ground, and then (by hand) emptied into a conductor, whence it runs to a reservoir, rudely dug in the ground. From this reservoir, the oil is dipped in buckets and transferred to leather sacks or barrels, for removal. The price of the crude article at the reservoir is about 10 cents for 100 lbs., or five times cheaper than the usual price of crude petroleum in the Pennsylvanian oil regions.

The steam machinery is driven with petroleum for fuel. At the mouth of the firebox, a small stream of petroleum trickles from a tap, and a steam blast blows it, in continuous jets of spray, into the fire. The same description of apparatus is used on the steamboats which navigate the Caspian Sea. The port of the district is Baku, having about 5,000 inhabitants and an antiquity which is shown by the fact that remains of ancient buildings are found in the earth at a depth of 18 feet. Baku will soon be united to the Black Sea by a railroad, now in process of construction, over a distance of about 200 miles. On this road, petroleum steam engines will drive the locomotives, and the Euxine or Black Sea and the Mediterranean will probably be traversed by petroleum-driven steamers. On the Caspian Sea, the boats burn petroleum at a cost of about $1 (one and a half Russian roubles) per hour, while for coal the cost is twelve times greater. In the Mediterranean and the Black Sea, the disparity would not be so great; but the difference in cost would probably leave a large margin in favor of petroleum. At Baku and on the peninsula, both petroleum and the gas which issues from the ground are used in distilling and refining. They are applied in lime burning, and for various other purposes, cooking included, it is to be presumed. It is curious that, while for unnumbered ages petroleum has been so readily accessible at this and other points in the old world, its commercial value was left to be ascertained in the new; and that twenty-five years practical knowledge of the article in America has sufficed to make kerosene a leading article in the world's consumption and commerce. But the Asiatics—or to speak more correctly, the Russians—appear to have been good pupils, and are, in some respects, in advance of us. Their steam machinery may be rude; but they are before us in the practical use of petroleum as fuel. The Baku article is said to be less inflammable than ours, its flashing point being 40° higher.

Baku is the chief city of a province of the same name, now held by Russia, formerly a part of Persia, and still largely populated by Persians. It is only within the memory of the present generation that the Russians reduced the formidable Circassian chieftains to obedience. That accomplished, Russian activity is now turned, as in other places, to the development of the resources of this country. On the peninsula where the oil is found is the "Field of the Eternal Fires," where the Guebers or Parsees (fire worshippers) of old had altars and temples; and the burning gas made the spot holy ground, the point of pilgrimage for thousands of worshippers. Now there are no pilgrims, or next to none; the Persian inhabitants of the spot are more bent upon utilizing the sacred fire than adoring it. Few altars remain, and their few priests come from a distance to mortify the flesh, as the spirit is mortified by the desecration of the eternal fires: the ancient cultus is burning out in lamps, furnaces, and steam engines. *Tempora mutantur.* Times are changed, when the wandering correspondent of the London *Telegraph* (from whom we draw the recent facts in the above statement) could hire a despondent priest of the ancient superstition, by a couple of roubles, to perform his incantations.

Exhibition of Scientific Apparatus.

The Science and Art Department of the British Government, South Kensington Museum, is about to open a Loan Exhibition of Scientific Apparatus on April 1, 1876, to remain open until the end of September.

It will consist of instruments and apparatus employed for research and other scientific purposes, and for teaching. It will also include apparatus illustrative of the progress of Science and its application to the arts, as well as such as may possess special interest on account of the persons by whom, or the investigations in which, it had been employed. Models, drawings, and photographs will also be admissible, when the originals cannot be sent. The apparatus may, in certain cases, be arranged in train as used for typical investigations: and arrangements will be made, as far as it may be found practicable, for systematically explaining and illustrating the use of the apparatus.

Persons desirous of exhibiting should send to the Director of the South Kensington Museum, London, S. W., for further information. Briefly, it may be said that the apparatus for teaching arithmetic, including calculating machines of every description, and for teaching geometry, with the instruments used for geometrical drawing, in copying, in making graphic representations, with models of all descriptions, head the list. Measurement, kinematics, statics, dynamics, molecular physics, sound, light, heat, magnetism, electricity, astronomy, applied mechanics, chemistry, meteorology, geography, geology and mining, mineralogy, crystallography, etc., and biology, are all to be represented, with such fulness of detail as may serve to illustrate in a most striking manner the means and materials of scientific research and advanced education. The Exhibition is favored by the savants of the continent as well as Great Britain. There is a vast amount of similar material in the United States, some of it, such as the great collection in the Stevens Institution of Technology, of much historic interest, and no pains should be spared at the approaching Exposition to bring it together, and present it in a similar manner.

TO cure the intolerable itching that always follows frost-bitten toes, it is necessary to exclude the air from the affected part. If it is not accompanied with swelling, gum shellac dissolved in alcohol, applied so as to form a complete coat, is the easiest remedy we know of. It dries soon, does not adhere to the stockings, and generally lasts until they are well. If the flesh becomes swollen and painful, plasters of good sticking salve are of great service; but if highly inflamed, use any mild poultice that will exclude the air from the diseased part, and keep it moist, doing the rest.