TELEGRAPH CABLES---BEST INSULATING MATERIAL---NEXT OCEAN TELEGRAPH.

It is well known that all the submarine cables—not even the Atlantic one excepted—have been coated with gutta percha, a substance which has been considered the very best that could be employed for such a purpose. How it came to be esteemed as such a superior material for covering telegraph cables is unknown, but the fact is undeniable. Gutta percha can be rendered soft by heat, and it may be moulded into any form, and it is easy of application to a cable, but india rubber has the same qualities, and besides this it is far more elastic, and not so liable to fracture. But the impression has got abroad that its insulating qualities were very inferior to gutta percha, hence we have one reason for the prominent position of the latter. A most valuable report on submarine cables has lately been published by the British government, being the result of investigations and experiments by a committee appointed by the Lords of the Committee of Privy Council for Trade, and in it, as reviewed by the London *Mechanics' Magazine*, we find some very interesting and valuable information respecting the best substance for conductors, and the best coating for the cables.

In this report, it is stated that, after many experiments with copper wires and alloys of copper, there is no substance which can be added to pure copper that will increase its conducting power.

As it regards the material for covering telegraph cables, it appears that india rubber was almost the first substance that had been used for covering overland wires; and the report says "it is remarkable that the first really efficient insulating substance that was used, after falling into disuse, should be now again brought forward. As in the copper for the conductor, so india rubber appeared almost specially intended for the purpose of insulation. It possesses insulating qualities of the highest order. It is tough, highly elastic, of less specific gravity than water, easily manipulated, extremely durable under water, nearly impervious to moisture, and it appeared on its first introduction as though nothing further could be desired."

The reason set forth for its disuse is stated to have been defective application. After the first failure of india rubber, gutta percha was introduced to take its place, and up to the present time it has been used as the chief insulating agent.

The report states that the committee made numerous experiments with both india rubber and gutta percha as a coating for submarine cables. It was found that pressure consolidated the material and improved the insulating qualities of both gutta—percha and india rubber. Temperature was found to produce a marked effect upon these substances in relation to the insulating powers. Thus, with the gutta percha, the insulation was not half as good at a temperature of 75° Fah. as at 52°, and not one-fourth as good at 92°. At a temperature of 32° its insulating qualities were three times as good as at 52°. These facts are of great value. The question of heat and cold as affecting the insulating powers of substances has been in a great measure overlooked. At a temperature of 132°, gutta percha covered wire was entirely spoiled. Submarine cables which have to be conveyed through warm water, such as the Gulf stream, should never be covered with gutta percha. Temperature does not affect india rubber so much as gutta percha.

These substances, however, were found to be porous under great preasure in water, and this seems to be the great difficulty to overcome so as to make them more perfect insulators. A correspondent—J. Macintosh—writing to the London *Mechanics' Magazine*, asserts there is a remedy for this evil in collodionizing conductors.

The velocity with which electricity travels through a conducting wire, is very great—for all practical purposes it is instantaneous, when there is no induction. To obtain, as a coating material for telegraph wires and cables, a substance which has the smallest amount of induction is of the highest importance. All the long submarine cables yet laid have been rendered nearly inoperative by inductive changes of electricity, which retarded the main electric current. Pure india rubber was found to surpass all other coating materials tested, "in the smallness of the amount of its inductive discharge, and the perfectness of its insulation." "In the former respect" (induction), says the report, "india rubber is fully equal to a coating of ordinary gutta percha of double its thickness."

With such reliable information as is contained in this report, we are certainly much nearer to a successful Atlantic telegraph line than we ever were before. The Atlantic cable was an expensive experiment, and its cost may be charged against the ignorance which prevailed on the subject. We can easily conceive now, that if it passed through a part of the Gulf stream. 72° Fah. in temperature, its conducting powers were rendered almost *nil*. With india rubber as the insulating agent for an Atlantic cable complete success may yet favor the next effort to lay and operate one.

COMBINATION RIFLES.

A rifle constructed with a simple mechanical arrangement for being used, as may be required, for a combined breech and muzzle loader, would be an improvement of no small importance. We have lately had evidence of the advantages which would result from such an arrangement. A breech-loading Sharp's rifle and a first-rate target rifle were being tried against one another at a mark—the breech-loader being charged at the muzzle, the breech remaining closed. In one instance the target rifle was charged with the bullet rammed down first, and it could not be withdrawn on the spot. The result was, that for that occasion the shooting with it was suspended. The same mistake also occurred in loading the other rifle, but the bullet was driven out in an instant by opening the breech, and the shooting with it was continued.

On a subsequent trial with the same rifles, the bullet of the muzzle-loader stuck fast in the middle of the barrel, in loading, and it could not be driven down with the ramrod. This also arrested shooting with it for that day. The bullet in the breech-loader (which was loaded as before, from the muzzle,) also stuck fast, about three inches above the powder, and could not be driven down with the wooden ramrod. The bullet, however, was soon driven out from the back end, by opening the breech, and forcing it back out of the muzzle. The Sharp's rifle leaked a little at the breech, and it was loaded with spherical shot, at the muzzle, to see if the leakage could be prevented. The target rifle was far more accurate, and possessed the advantages of a tight breech, but the movable breech certainly has its conveniences, and a good combination of the two would unite the qualities of both.

FOREIGN TRADE.

Reports from Europe show conclusively that foreign trade is seriously affected by the troubles existing in this country. We have been large consumers of most all kinds of foreign goods. This has been a favorite market especially for the productions of England, France and Belgium, and the time will come when this trade will be renewed, if foreign powers treat our government with proper consideration in the hour of its trial. The fact is that the city of New York alone has consumed of foreign luxuries, upon which large profits are realized, more in value than any five of the seceded States. Our disasters are due to the precipitate action of the seceded States, and it will be well for European nations to take a practical view of all the facts which have thus conspired to injure their trade and commerce with this country. As a mere matter of interest, it would have been greatly to the advantage of England and France had they offered to join hands with the Federal government in putting down this monstrous rebellion.

Twenty millions of loyal people cannot be indifferent to the highest interest of their country, and to suppose for a moment that the great water-courses of the country are to be surrendered without a severe struggle, to a foreign power on this continent, is to suppose we have lost all our manhood and self-respect.

The Mississippi river belongs to the whole people, and whatever else may be done, we do not believe that the undisputable right to navigate it will ever be surrendered so long as there is a hand to strike a blow, and the sooner the Southern States bordering that river learn this fact the better it will be for us all.

A WORD TO THE SOUTH.

We publish on another page a letter from one of the most highly respectable citizens in Maryland, touching the great questions that now disturb the whole country. He is a native of that State, and, moreover, a slaveholder, and hence his views are entitled to great weight. We need not say to our readers that we cordially endorse the sentiments which he so vigorously utters. In so doing we disclaim all partisan spirit. We never yet desired to see sectional men elevated to power. We have, however, no sort of sympathy for those who would seek to overthrow our government by armed violence, such as is now manifested. We trust it will not succeed, and we have faith to believe that it cannot. We desire this not only for ourselves but also for those who have been drawn into the secession scheme. We desire it for the sake of a free government and for the future glory and honor of the people of the United States now and forever. Divided, we are crippled in our rise and progress as a nation. United, we can all go on prosperously and defy the world in arms.

The North has nearly twenty millions of people—one-fifth able to bear arms in defence of the government. We have a navy rapidly augmenting in power, also a formidable merchant marine, with plenty of material wherewith to increase both. The Southern States are not only destitute of a navy, but also of a merchant marine, and it must, under the most favorable circumstances, require a long time to form either. Thus they would exist at the sufferance of other nations, being destitute of the power to prevent a rigid blockade of all their ports, and without power to protect their citizens in foreign lands.

We heartily and sincerely believe that the rebellion against the government is supported by a faction, and that under favorable circumstances the people of the South would prefer the government of the United States. Our correspondence from the South previous to the stoppage of the mails, confirms us in this view. It is natural it should be so, for the best interests of the South are in the Union, and when passion, which is but temporary, shall have passed away, they cannot but admit the soundness of this view of the case.

We believe the people of both sections are mainly right at heart, and have been embroiled in this serious misunderstanding through the machinations of designing politicians. If the government should undertake the destruction of any of the valuable interests of the South, its citizens would stand before the world justified in revolution. But we are certain no such design exists and never can exist, unless such interest is, without just cause, made to feed the fires of an armed rebellion.

A majority of the Southern people now in arms against the government have been goaded into the fight by a system of monstrous misrepresentation as to the designs of the North, and by a false impression that the people here were too cowardly to take up arms. This delusion is evidently passing away, for it is said, on the authority of a prisoner taken in Western Virginia, that a Georgia regiment, which was routed by Ohio and Indiana troops, were amazed at the manner in which the latter rushed into the fight.

We repeat what we have before said, that all the government wants is to have the Southern people lay down their arms, and submit to the laws as we are endeavoring to do, and not a single State would be deprived of its just rights under the Constitution. Seven-eighths of the people North would cheerfully extend to the South all the privileges they desire for themselves. No more nor less ought to be expected.

PHOTOGRAPHING THE COMET.—Mr. Whipple, a photographist of Boston, somewhat famous for his photographs of the moon and stars, has been making an effort to get a picture of the comet. He says that its photographic power of light is so feeble as scarcely to make an impression on his most sensitive preparations. As compared with that of the moon, or fixed stars even of the third or fourth magnitude, it is, photographically speaking, not one thousandth part as brilliant.

AMERICAN VESSELS IN THE CLYDE.—Notwithstanding the American troubles, the Glasgow *Herald* says that there have never been so many United States ships loading and unloading in the Clyde.