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NEW YORK, SATURDAY, DECEMBER 21, 1861.

TO OUR FRIENDS.

NOW IS THE TIME TO FORM CLUBS.

Only one more number after the present and another volume of this journal will be closed. We appeal to its friends in all sections of the country where mail facilities exist to endeavor to form clubs for the coming year. We feel justified in asserting that no other journal in this country furnishes the same amount of useful reading, and especially at the extraordinarily low price at which it is furnished. Ten persons can club together and get the paper at $1.50 each for one year. Twenty persons clubbing together can have it at the rate of only $1.40. Think of getting a volume of 832 pages of useful reading matter, profusely illustrated with between 500 and 600 original engravings, for such a small sum of money. Single subscriptions, one year, $2; six months, $1. Even though the times may be hard, the long winter evening must be relieved of its dullness, and we must keep reading and thinking, and thus be prepared to overcome temporary difficulties and open new channels of wealth and prosperity. Friends, send in your clubs; at least renew your own subscriptions promptly.

See prospectus on the last page of this sheet.

IRON WAR VESSELS.

A number of iron-clad vessels are now being built for our navy upon contracts which are based upon definite designs and specifications. Scarcely two of these vessels will be alike, yet, however faulty some of them may appear to be, it would be very unwise, in a financial sense, to make any material alterations now in their designs and construction. But as iron must hereafter enter far more largely into the construction of national vessels, it will be well for our government and people not to disregard the great amount of experience which has already been gained in shipbuilding. It is known that ships which are covered above the water line with thick plates of iron have a great draft of water, which is due to their greatly-increased weight. Such a frigate as the *Warrior*, for example, draws twenty-six and a half feet of water, and it cannot enter harbors where the *Great Eastern*, which is three times the tunnage, can pass easily. In order, therefore, to secure as light a draft of water as possible with ships heavily plated with iron, some have been designed with flat floors and very light hulls under the water line. Some advantages are undoubtedly obtained by such a design of vessel, but perhaps the disadvantages resulting therefrom will be much greater, therefore a very careful scrutiny of this entire subject should be undertaken. Vessels designed for permanent war purposes should be screw propellers, and all their machinery and boilers should be under the water line, so as to secure them from the enemy's shot. Now, it has been found that vessels having hulls with flat floors and a light draft of water are not well suited for screw propellers, however eminently adapted they may be for paddle wheels. In a heavy sea the stern of such a vessel is so frequently lifted out of the water that the propeller is thereby rendered unavailable, and the consequence is the vessel becomes almost stationary.

Another important point in the construction of such vessels is the kind of material which should be used for their entire construction. The fact must not be overlooked that an iron-plated vessel requires a much stronger hull under the plates than an unplated vessel. A greater superincumbent weight has to be supported, and the necessary increased strength requires an increase of material. The strongest material in proportion to its weight, and the facility with which it can be arranged for sustaining pressure and strains, should be used for making the under hulls of such vessels, so as to secure the least possible draft of water. The best material for this purpose is the higher quality of rolled iron. Timber is not be compared with it; therefore, it appears reasonable that the entire framing and sheathing—outside and inside—should be of iron. It has been asserted that the armor plates of ships require a backing of thick timber planking, to serve as a cushion for the metal when the latter is struck with shot. Unless such a cushion is provided, it has been said, the plates will easily crack and splinter when struck. We doubt the correctness of this assertion; no experiment has yet verified its accuracy, but even if it were true it cannot have the least significance as applied to that part of the hull which is below the water line.

There is also another point to be considered in connection with the construction of screw propellers. It is now known that the action of the screw upon the hull of a vessel tends to open its seams, and in the case of wooden vessels this involves very frequent repairs.. On the other hand, iron screw ships do not require to be repaired so often, because their hulls are much stronger, and more nearly resemble a single piece. The metal of which they are made permits of being rolled into the best shape for the most perfect union of all the parts, so as to obtain the greatest strength and durability with the least weight of material. These considerations should be pondered, we think, by all who are interested in the construction of our national iron-plated vessels.

FRANKLINITE.

On another page will be found the report of a short discussion on the franklinite metal, about which so much has been said. A large amount of money has been expended by some of our citizens in attempts to render available the peculiar hardness of the pig metal in the construction of burglar-proof safes, and in other ways. A few months ago a gentleman told us that he had been using saws for a special purpose, and that made of steel they cost him twenty-five dollars a set, but that he could procure them of franklinite metal for thirty-seven cents a set, and that the iron ones were better than those made of steel. The ore is a combination of the oxides of iron, zinc and manganese. Booth regards it as a combination of the protoxides of iron and zinc with the sesquioxides of iron and manganese; giving as the probable formula :—

$$\left.\begin{matrix}Fe\,O\\ Zn\,O\end{matrix}\right\}\left\{\begin{matrix}Fe_2\,O_3\\ Mn_2\,O_3\end{matrix}\right.$$

The pig metal is simply an alloy of iron and manganese, with or without some admixture of zinc; most of the zinc probably being evaporated and driven off in the melting process. The alloy is exceedingly hard. There is now a scratch on the window by our side which we made several months since with a piece of franklinite metal. As our readers know, the presence of zinc in the ore interfered so seriously with the smelting that the working of the mines was abandoned for many years. The fumes of the zinc choked up the flues, and its evaporation carried off the heat so rapidly as to retard the fusion. But after the zinc is removed the iron can be separated; and now that the ore is worked for the sake of the zinc, the iron also is successfully extracted.

In 1853 the New Jersey Zinc Company commenced the smelting of iron from the residuum of their ores, and they produce about 2,000 tuns annually. The bar iron from this ore is of remarkable purity and strength, and is well adapted to the manufacture of steel. There will doubtless be found many purposes in the arts for which the properties of the pig metal will render it valuable. The plate exhibited at the Polytechnic Association represents a new device for employing it, but we should suppose that a thin sheet of cast steel between two sheets of wrought iron would make a better self-sharpening shovel or plowshare than that plate. The use to which we are most desirous to see either this or some other suitable iron ore applied is the manufacture of cast steel, either by the Bessemer or some other process.

GIFFARD'S INJECTOR FOR ELEVATING WATER

A correspondent makes the following inquiries :—

I wish to be informed through your columns upon the following points :—First, if Giffard's injector will force a stream of water into a boiler, why will not the same power force a stream of water through a pipe to a greater or less altitude? I have discussed this with several railroad men and machinists, and they generally seem to think it practicable, but none were prepared to speak definitely. Possibly this is a new idea, and one that I have struck that will require your services as Patent Solicitors? But I presume the whole subject has been discussed and settled by the *savans* of your paper.

Second, if the above is practicable and the injector is the most economical method of supplying boilers, why would not the injector likewise be the most economical power to elevate water to any hight?

The principle of the Giffard injector has been claimed as the invention of Capt. Savery, who published a pamphlet on the subject in England in 1702. He erected several of his engines for elevating water by the force of steam without the use of pump or piston. In several features the mechanism was different from that of the injector, but the force of the steam raised the water against the pressure of the atmosphere in the one case, just as it forces in water against the steam pressure in the boiler in the other. Savery's engine is illustrated and described on page 52, Vol. IV. SCIENTIFIC AMERICAN (new series), and all those who are interested in the inquiries of our correspondent will find the subject interesting to study, because it is perfectly practical, and our correspondent is correct in his conjectures. A Giffard injector is now in successful operation as a water elevator in the Kippax colliery, near Leeds, England. A small portion of this coal mine lies a little below the main drainage level, at a considerable distance from the shaft, and the extent is so limited that it will not allow for a special pumping engine. Heretofore this space has been pumped by hand, but as the water was gaining upon hand labor, a Giffard injector was suggested as an experiment. The steam is supplied from a boiler at the surface of the ground and is conducted a distance of 1,000 feet by an inch and a half pipe into the mine. The water is raised by the injector 27 feet to the level, from which the pumping engine lifts it to the top of the pit; but in being raised this hight it is driven through an incline pipe 300 feet in length. As considerable steam is condensed in the pipe leading from the boiler to the injector, it is carried off by a steam trap so as to permit the steam alone to pass into the injector, which works day and night without stopping, and requires no attendant. This injector water-elevator has been in operation for several months. The injector has also been applied in elevating water to cool the tuyeres of blast furnaces in England, and it has been found more convenient and reliable than a force pump.

WHY WILL NOT WET WOOD BURN?

There is no event of our daily lives, however common or apparently significant that does not enfold an unfathomable mystery. We all know that it is difficult to burn wet fuel, but how many have considered that this fact is connected with some of the most comprehensive laws, and some of the most recondite principles of chemistry and physics?

The burning of wood, like nearly all other burning, is its combination with oxygen. The only combustible elements in organic substances are carbon and hydrogen. The hydrogen combines with oxygen to form water, and the carbon to form carbonic acid. At a high temperature, the affinity of the hydrogen and carbon for each other as they are united in the wood is less than their affinity for oxygen, and they accordingly leave their union and enter into combination with oxygen. The transaction is accompanied with light and heat and other phenomena of combustion, and is called burning.

Below a certain temperature the change does not take place, but if a portion of the wood is heated sufficiently for the combustion to commence, then the caloric generated by the combustion heats the con-