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# 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:—

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

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 plow-share 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 lowing 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-

tiguous parts, and thus the burning continues. It is a case of single elective affinity as modified by caloric. At a low temperature, the affinity of carbon and hydrogen for the elements combined in the wood is stronger than their affinity for oxygen. But at a higher temperature the relative strength of affinities is changed, and they leave their combination in the wood and enter into combination with oxygen. So much for the relation of the question to chemical affinity.

Now let us examine its relations to latent heat. When water is evaporated it absorbs about 1,000 degrees of heat. That is to say, if we pass 1,000 degrees of heat into a quantity of water, the temperature of which has been previously raised to 212°, and the heat just suffices to evaporate the water, then we find that the vapor is no warmer to the touch, or, as measured by the thermometer, than the water was before. The 1,000 degrees of heat have been hidden or rendered latent. If the water is in contact with wood, when a portion of the wood is set on fire, the heat generated by the combustion, instead of being imparted to contiguous portions of the wood, and thus raising its temperature to the point at which the elective affinities are changed, is absorbed and made latent by the vapor of the water, hence the combustion ceases.

## REFORMS OF THE BRITISH COLONIAL PATENT SYSTEM.

### THE CANADIAN PATENT SYSTEM.

The Canadian press is devoting unusual attention to the importance of a thorough reform in the Canadian Patent system. This looks as though this desirable object was about to be accomplished, which we certainly hope may be the case. We regard their Patent system as a disgrace to the spirit of the age. The Toronto *Leader* of the 22d ult., contains an editorial on this subject, in which it is remarked that

Our Patent laws are framed in the narrowest spirit of illiberality; but while we intended to be very selfish, our exclusiveness has injured our own people more than any other. Our Patent laws have one leading object; to consecrate the sacred right of theft, and make the practice of it profitable. There can be only one object in refusing to give a foreign discoverer the same security that he obtains everywhere else: to secure the right of stealing the product of his brain.

The *Progressionist*, published at Morpeth, C. W., in a recent number says :—

We have reason to believe that measures will be taken at the coming session of Parliment to wipe out these defects, and reorganize the system in accordance with enlightened policy. First, and mainly, this policy will enable us to reciprocate with our inventive neighbors, the Americans, who are renowned for producing the best and cheapest agricultural implements extant; it will bring manufacturing capital and capitalists into the country, from all parts; it will enliven competition with us; cheapen machinery, and thus effect incalculable good throughout all branches of the industrial arts; other needful improvements will follow as a matter of course. The benefits accruing from this policy to American inventors, as well as others, will also be immense, and this will establish an enlarged system of reciprocity for a common good. When this policy is inaugurated, we can bequeath the old one to the Japanese, or some such unexpansive race. Our Canadian exchanges, within the past two or three weeks, have given abundant evidence that a movement is on foot which will result in producing the desired reform.

The *Progressionist* also alludes to the fact that the Scientific American has long advocated a liberal international Patent system.

### NEW BRUNSWICK PATENT SYSTEM.

Peter Stubs, Esq., Patent solicitor, residing in St. John's, New Brunswick, in a recent letter to the *Courier*, published in that city, discusses very intelligently the new modification of our Patent system in its influence of inventors in that Province. After quoting the 10th Section of the Patent Law Amendment Act of March 2, 1861, which brings inventors of all nations upon the same footing as respects fees, except those of countries that discriminate against us, says :—

In New Brunswick, the government charge upon the issue of a patent to a British subject, is $21.50, whilst a foreigner is charged $40 for the same service. The consequence is, that as we in this Province thus discriminate against the citizens of the United States, our Provincialists are subjected to a payment of $500 in that country, which virtually amounts to a prohibition.

A short time since I wrote to the eminent patent solicitors, Messrs. Munn & Co., of New York, proprietors of that excellent journal, the Scientific American and stated to them that a person now residing in this city, who was born in England, was desirous of taking out a patent through their agency for the United States, and wishing to know what the government charge would be in such a case. Their reply was that he could make an application upon the same terms as one of their own citizens. And in the concluding paragraph of their letter reiterated this statement in these words:—"All natives of the United Kingdom of Great Britain and Ireland can apply on the same terms here as if they were citizens." And the reason of this is plain; it is because, high as the patent fees may be in the mother country, there is no discrimination there adverse to American citizens, as I have shown to be the case in New Brunswick.

It is for the members of our Legislature to remedy the evil, which the *Courier* I hope may be the means of presenting to them by the publication of this communication.

The followiug are the charges in three of the B. N. A. Colonies for Letters Patent "for new and useful inventions :—"

New Brunswick Government $21 50, and Attorney General's fee, $14; Nova Scotia altogether, $4; Canada, in all $20.

These facts need no comment. They require the pruning hand of the General Assembly, so far as this Province, is concerned.

The *Courier*, in alluding to Mr. Stubs's letter, says :—

The sooner Bluenose is relieved from the predicament in which his Patent Laws have placed him, the better, as at present, he is deprived of an important privilege, which can be freely enjoyed by his countrymen—English, Irish, Scotch and Welch.

## Condition of the Patent Office.

The Secretary of the Interior in his report to Congress gives the following exhibit of the condition of the Patent Office :—

No branch of the public service connected with this department has been so much affected by the insurrection of the Southern States, as that of the Patent Office. The receipts of the Office from January 1 to September 30, 1861, were $102,808 18; and the expenditures were $185,594 05, showing an excess of expenditures over receipts, of $82,785 87. During the corresponding period of the last year the receipts were $197,348 40, being $94,840 22 more than the receipts for the same part of this year. During the same period 3,514 applications for patents and 519 caveats have been filed, 2,581 patents have been issued, and 15 patents bave been extended. To meet this deficiency in the income of the office, the Commissioner with the concurrence of the department has reduced the clerical and examining force by the discharge of thirty of the employees, and reduced the grade of the remainder in order to lessen their compensation. By this reduction it is believed by the Commissioner that the expenditures will be brought within the receipts.

The expenses of the office have been increased during the present year by the printing of the drawings and specifications authorized by the fourteenth Section of the Act of March 2, 1861. The Commissioner contracted for the printing in conformity with the law, and the work was executed in a satisfactory manner until the 1st of November, when in consequence of the decline in the receipts of the office it was discontinued.

The printing of the drawings and specifications of patents, in the manner in which it has been done under the law of March last, would unquestionably be of great service to the office, as well as to all interested in its business, and should, if possible, be continued. Although the expenses of the Patent Office have been increased by this printing, a saving of a larger amount has been effected to the Treasury. The mechanical reports of the Patent Office have heretofore been printed at the expense of the government. These reports consist of extracts from the specifications of the patents issued, giving a brief and general description of the improvements or inventions for which the patents were issued. They possess no interest for the general reader, while they are too brief to be of service to mechanics or inventors. The plates for the Mechanical Report of 1860, cost the government $47,398 21—a sum greater than the entire cost of printing provided for by the law of March last. The cost of paper, printing and binding was probably as much more, while the work was without practical value. The printing of the drawings and specifications, as provided for by the law of March last, will render unnecessary the printing the mechanical reports, and save the expense heretofore incurred for their publication.

Several amendments to the law of March last are proposed by the Commissioner of Patents, which would doubtless render it more effective, and they are recommended to the favorable consideration of Congress. The law regulating copyrights should be amended to effect the objects contemplated by Congress.

The act of February 3, 1851, authorizes the clerks of the United States District Courts to grant copyrights, and requires the author to deposit a copy of his work with the clerk. The clerks are required to send to the Department of the Interior all such copies deposited in their offices. This duty is very imperfectly performed. Probably not more than half the books, maps, charts and musical compositions which are copyrighted are deposited in this department as required by law.

The object of collecting in one library copies of all the copyrighted literary productions of the country is thus defeated. To secure this object, amendment of the law is recommended which shall give the sole power of granting copyrights to the Commissioner of Patents, and require from every applicant the payment of a fee of one dollar, and a deposit in the Patent Office, of a copy of the work to be copyrighted.

## Discussion on Franklinite.

At the meeting of the Polytechnic Association of the American Institute, on Wednesday evening, Dec. 4th, the following discussion took place on the subject of franklinite :—

Prof. Mason—I have here a specimen of wrought iron and franklinite combined, which the inventor gave me with some reluctance, as he intends to exhibit at our next meeting some better samples. It consists of nine thin layers or strata, five of wrought iron and four of franklinite, all welded together into one sheet; and it is sufficient to say that we have no tool that can penetrate it. The best steel drill glides over it without cutting it in the least.

Mr. Smith—What is franklinite?

Prof. Mason—During the life time of Dr. Franklin a mine of peculiar iron ore was discovered in New Jersey, and Dr. Fowler erected a furnace for the purpose of smelting it. Dr. Fowler, being a friend of Dr. Franklin, called the ore franklinite. It is composed of iron, manganese and the red oxide of zinc; the proportions of the iron and manganese being constant and that of the zinc variable. The peculiarity of the metal is its extreme hardness. It is harder than the best steel. It is now smelted in considerable quantities, and great efforts have been made to use it in the construction of burglar-proof safes. It is very brittle, however, and the impossibility of cutting it with any tools is of course a great obstacle in the way of working it. If it can be formed in alternate layers with wrought iron, as in this sample, perhaps a sheet of it between two layers of wrought iron would make a hoe or shovel, or a plowshare which would be self-sharpening. Mr. Butler, will you tell us exactly how this sample was prepared?

Mr. Butler—We pulverized a quantity of the franklinite pig metal, and sprinkled a layer of it upon a sheet of wrought iron, covering the iron also with a dusting of borax as a flux. We then laid a second sheet upon the top of this, and covered it also with the franklinite and borax. In this way we built up a pile of alternate layers of wrought iron and franklinite till we had five sheets of wrought iron and four strata of franklinite. We then put the mass into a furnace and raised it to a white heat, when we took it out and passed it between rollers. The rollers were set to compress it very much, perhaps too much; for the franklinite, being very limpid indeed, was forced out in streams; flying across the shop more than twenty feet. You see that the mass was very thoroughly welded together. The plate was eight or nine feet long and about a foot wide. This piece was cut off with shears. We cautioned the owner of the shears in regard to the hardness of the metal but he thought that he could cut it, and you see that he did, though I believe he broke his shears a little. His success I attribute to the fact of the outer layers on both sides of the sheet being wrought iron, which consequently was the only substance that came in contact with the blades. In this form there is no doubt the sheet might be punched.

Mr. Jones—Were the sheets of iron brightened?

Mr. Butler—No; only as they were brightened by the borax.

It is very generally supposed that hogs thrive best when they are freely allowed to "wallow in the mire" and remain as damp and dirty as possible. This is an erroneous notion. Various experiments have proven conclusively that hogs when kept clean, warm and dry, thrive best and are most easily fattened. They should be kept in well shaded, dry and clean pens, and they should be fed regularly three times per day.