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OPENING OF A NEW CAMPAIGN.

It appears quite evident to all who observe the signs of the times that Generals Grant and Meade are about to open a new campaign, which we trust will inaugurate glorious results. Not exactly following in the wake of these military chieftains, the Publishers of the SCIENTIFIC AMERICAN propose to begin, on the first of January next, a new and brilliant campaign in the fields of popular science, and they hope to give renewed assurance that this journal is fully up to the stirring events of the day. After a flattering success of eighteen years, the SCIENTIFIC AMERICAN will commence a new volume at the time mentioned, being the "Tenth" of the "New Series." The Publishers earnestly appeal to their friends and patrons, far and wide, to reinforce their subscription list by the formation of clubs.

They feel warranted in saying that no better expenditure of money can possibly be made than for a years' subscription to this journal, which is the only one of its class now published in the United States. The Publishers promise untiring devotion to the interests of their patrons. No department of the journal will be allowed to fall behind preceding years; while it will still be their aim to excel in every respect.

Friends and Patrons, we ask with confidence a continuation of your former patronage, and also your influence in promoting a wider circulation of this journal than it has hitherto enjoyed.

Our New Prospectus will appear next week.

PREVENTION OF DANGER FROM PETROLEUM.

Within the compass of history no trade has sprung into such magnitude in such a limited period as the petroleum business. From an export of five million gallons last year, it has advanced to more than twenty millions this year, and the home and foreign consumption combined will exceed forty million gallons. The rise of this immense trade seems almost like the creation of a mighty magician, rather than the consecutive efforts of men. Much useful information has already been presented in our columns respecting petroleum; but new facts relating to it are being continually developed which demand attention as they arise. For example, in the unrefined article there are several distinct products, which vaporize at different degrees of temperature. Now in carrying petroleum from one place to another, or when it is lying in stores or sheds, some of the liquid is liable to be exposed to such a temperature as will convert it into vapor, in which state it will escape through very minute openings or pores in the vessel containing it. A loss of the liquid is not only thus caused, but this vapor when it escapes and mingles with about eight times its volume of air, becomes as explosive as gunpowder, and if the light of a match or lamp is then brought into contact with it, a violent explosion will take place. Several sloops loaded with petroleum have been subjected to explosions by the escape of petroleum vapor from the barrels in their holds, and an accident of a similar kind recently took place in the rear store of a large druggist's establishment in Albany, N. Y. Cases like these call for preventive agencies; such as vessels that will not leak, and special places for storage. As a measure of safety, neither ignited match, lamp, nor light of any kind should ever be used in the vicinity of a large vessel containing petroleum, and it should be stored in a building or apartment exclusively devoted to hold it; not in cellars or storehouses, as a promiscuous article. As to vessels for carrying it, the cars on railways, the sloops on rivers and steamers on the sea, should be built of iron and rendered as tight as possible. An English iron steamer, constructed expressly for carrying petroleum from the United States to Liverpool, has been very successful, and others may be built upon the same principle. Another important agent of safety is the use of small tight vessels containing it, such as barrels. Perhaps these are of most consequence, for if it be possible to make perfectly tight barrels, the use of these will secure immunity from leakage and the dangers we have set forth. A letter upon another page of the present number of the SCIENTIFIC AMERICAN enters very fully into the defects of common barrels for carrying such an article, and an improved method of constructing them to prevent leakage is pointed out. But it may be asked, why not use iron cylinders instead of wooden barrels for such a purpose? Large quantities of caustic soda are exported to our ports from Europe to be used in refining petroleum, and air-tight cylinders of wrought iron are employed to contain it. Such vessels would perhaps answer a better purpose than casks, but so far as we know they have not been tried. Then, again, there is the system for preventing leakage of petroleum barrels used by Young in Scotland for his coal oil, as described in the SCIENTIFIC AMERICAN of last week. This consists in coating the interior of each barrel with glue, a substance which is not affected and dissolved by the oil, like a varnish of resin. We have not heard that any of our merchants and dealers in petroleum have tried this simple method of preventing leakage in petroleum. It certainly deserves a fair trial.

We have thus briefly alluded to preventive measures and agencies for securing immunity from explosions, conflagrations and loss by the leakage of petroleum in transit and in store; and if the suggestions made and the information given are acted upon and applied good results will be secured. At present the petroleum business is not in a prosperous condition, and there are some signs of the supply failing. In Canada, the oil wells have nearly all given out, and many in Venango county, Pennsylvania, are in the same predicament; but if the petroleum wells should fail there will be a return to coal oil, and the foregoing remarks are also applicable to vessels for containing it.

STEAM ON CITY RAILROADS.

It is announced in one of our cotemporaries that six "dummy" engines are building for a street railway in Philadelphia, and but a short time ago we saw mention made of another enterprising corporation that had determined to adopt steam in lieu of horse power, and thereby save themselves and the public both time and money. It is almost useless to expect anything of our railroad authorities in this respect; notwithstanding all the examples set before them, the arguments in favor of the steam system, and the evidence of common sense, we still have to put up with horse power; and the only dummies in use or in existence on our street railroads seem to be those persons who direct and control the principal interests of them.

The gridiron railway, in spite of the outcry and opposition manifested toward it, is gradually extending its iron arms, and even now grasps by far the greater part of the city streets occupied by vehicles devoted to passenger traffic. We had hoped that the directors of these roads would have seen fit to try at least one of the steam cars (they are *not* "dummies"), and compare the cost of running it with that of horses in all essential points; thus to satisfy themselves by practical demonstration that steam is better than horse power for the purpose discussed. In this we have been disappointed, and horses rule the road, to the exclusion of machinery, which is obviously cheaper than any other means of transportation.

It would be considered fatuitous and short-sighted to the last degree for any railroad company to discard all its engines, run a canal alongside the line, and put on a number of boats and horses to "accommodate freight;" yet this the street railways do, in effect, by employing horses to accomplish tasks that properly belong to machinery. Even in the absence of any positive data in black and white as regards the expense of the two systems for carrying passengers by steam or horse power, it is safe to assume that the former is the most preferable in all respects, on the general ground that the introduction of machinery inevitably enhances the profits of any trade or business, provided the same be properly carried on.

There is no occasion, however, to presuppose that railroad men are ignorant of the comparative economy of steam as opposed to horse power, and we must seek for some other motive for their non-adoption of the first. Certainly no unprejudiced person could hesitate to declare in favor of steam; the arguments published from time to time in the SCIENTIFIC AMERICAN, (which have never been refuted in the slightest particular) show conclusively that the advantage is in favor of steam. We can only await the slow dawning of intelligence and enterprise upon the minds and convictions of our railroad men; for the pressure of public opinion and the examples of the directors of street railways in other cities seem thus far to have had very little effect.

LAKE SUPERIOR COPPER WORKINGS.

A large and most interesting pamphlet by Charles Whittlesey, Esq., on Ancient Mining on the shores of Lake Superior, has been published as one of the Smithsonian contributions to knowledge. The author has devoted much attention to this subject, and maps of the country, with engravings of old mines and the relics found in them, are contained in this publication. We here learn that evidences of ancient mining operations were first brought to public notice in the winter of 1847-8. The Jesuit Fathers who first visited that region announced the presence of native copper in large masses; and boulders of copper had been found many years ago scattered among the drift gravel, from Lake Superior to Rocky river, in Ohio; but no ancient workings were known till the period mentioned above. In casting the eye over a map of Lake Superior, a remarkable projection, in the form of an immense horn, is observed jutting out from the south shore and curving eastward. This is Keweenaw Point, which is about eighty miles in length and forty in width. Through the whole of this extent of projection, a belt of metalliferous formation extends; and within this all the copper mining operations—ancient and modern—have been confined. The most remarkable feature of this metalliferous region is the character of its products, which occur, not as an ore of copper, but in masses, veins, and rounded nodules of the metal itself.

The first actual mining operations here were commenced in 1761 by Alexander Henry, but they proved abortive. In 1841, Dr. Douglas Houghton made a report to the Legislature of Michigan, conveying very definite information respecting the existence of native copper in Lake Superior, and shortly after this fresh mining operations were commenced, and speculators flocked in from all quarters. In 1848, Mr. S. O. Knapp, Agent of the Minnesota mine, made the first public announcement respecting the discovery of ancient mines and the relics of an ancient mining population. This created a sensation far and near, and subsequent explorations have led to the discovery of very many ancient pits. Most of the ancient diggings have been found in dense forests, and outwardly consist of irregular shallow hollows, which had been previously noticed without thought of their real character. There are three groups of ancient mines corresponding with the modern mines in this region. In these old pits, hard stone mauls and hammers have been discovered; also copper hammers, spear heads, gads, arrow heads, and knives; and wooden shovels, levers, and a ladder. During the past summer, several of these old mines were discovered in the Ontanagon district, and from one a bag of untanned leather in a perfect state of preservation was taken, and has been considered one of the greatest of ancient curiosities. Who those olden miners were, is a puzzle to antiquarians. But providentially they have done great service to us, for our practical modern copper miners regard the old pits as pretty sure guides to valuable copper lodes. When an old pit is found it is cleared out and explored, and generally the miners are rewarded by finding rich masses in the excavation. Those ancient miners seem to have possessed quite as accurate a knowledge of the copper veins as the most skillful and intelligent modern mineralogists and miners. In a certain sense they were our mining pioneers. They do not seem to have been acquainted with the art of smelting copper, and were unacquainted with the use of iron; therefore their efforts at mining were rude; still they have left evidences of being an ingenious and skillful people. Mr. Whittlesey entertains the opinion that these ancient miners were not of the present Indian race. As yet no remains of cities, no graves, no domiciles or ancient highways have been found in the copper region. These old miners appear to have been further advanced in civilization than those whom we call Aborigines. Trees standing upon the old pits are about three hundred years old, and beneath these lie the rotten trunks of a still earlier period. When the ancient miners lived is unknown, but these mines must have been abandoned at least from five to six hundred years preceding the presentage. Who they were, where they came from, and whither they went, in all likelihood will never be known.

The copper mining business in the Lake Superior region is in a very prosperous condition at present; and we learn from the *Mining Gazette* (Houghton, L. S.,) that a new copper smelting establishment is now in operation on Portage Lake; which with the one recently erected in California, will make eight now in operation in the United States.

LEAD AND WATER.

By taking a strip of clean lead, and placing it in a tumbler of pure water (say rain or soft water), in less than an hour, by dropping in the tumbler a little sulphide of ammonium, a black precipitate will be thrown down, consisting of the sulphide of lead—*e. g.*, lead must have been dissolved and held in solution in the water, and as the salt of lead happens to be classed amongst some of the most dangerous poisons, we are necessarily led to the conclusion that lead pipes conveying water, if the latter is pure, must be somewhat dangerous. Water standing in a lead pipe for some hours decomposes the metal, and when it is run off the poison is carried with it. Water drawn in the morning through a lead pipe should never be used for domestic purposes, such as cooking or drinking, and servants in cities should be instructed respecting this particular subject, because they are usually ignorant of the nature of lead, and the effects of water upon it. Several metals taken in food or drink accumulate slowly in the human system and ultimately produce disease; but it approaches so stealthily that the danger is not usually apprehended. Some of the salts of lead are not poisonous, and the sulphide is of this class. The interior of lead pipes may be converted into an insoluble sulphide of lead by subjecting them for some time to the action of a hot sulphate of soda in solution, according to the recent discovery of Dr. Schwarz, of Breslau. Those who prepare lead pipe for conveying water for domestic purposes, should test the alleged discovery, as it is of the utmost importance that all the safeguards to health should be enforced and multiplied.

GREAT TELESCOPE AND PHOTOGRAPHS OF THE MOON.

The American *Journal of Photography* contains a very full report of Henry Draper's paper recently read before the American Photographical Society on his new telescope, and the large photographs which he has taken of the moon. In the paper it is stated that in the autumn of 1858 Dr. Draper determined to make the largest reflecting telescope in America, the construction of which, with various improvements introduced, have occupied his time up to the present period—more than five years. This telescope is nearly 16 inches in aperture and 13 feet in focal length, and was intended to be devoted to celestial photography; consequently it has many novelties fitting it for this purpose. It has the largest silver reflector of any instrument in the world, with the exception of the one in the Imperial Observatory at Paris. A reflecting telescope is greatly superior to an achromatic one for photographic purposes. Dr. Draper first used speculum metal for his mirrors, but abandoned it at Sir John Herschel's suggestion in favor of silvered glass; the reflecting power of the latter being 93 per cent; that of the former being but 75. The glass mirror also only weighs 16 pounds, whereas one of the same size of speculum metal weighs 138 pounds; and if the silver of the glass should accidentally be injured, it may be dissolved off by nitric acid and the mirror re-silvered in the course of a few hours. This may be repeated an indefinite number of times. The mirror of this telescope has cost Dr. Draper an immense amount of toil, in order to reach as nearly as possible to perfection. He ground more than one hundred mirrors of different sizes, from nineteen to one quarter of an inch in diameter. The mirror of this telescope is sustained in a walnut tube hooped with brass, and the frame in which it is mounted holds it at both ends, to avoid the tremulous motion so common to large instruments. When photographs of the moon are being taken, the telescope is not driven by clock work, but is allowed to come to complete rest; the sensitive plate alone is moved in a direction and at a rate to correspond with the moon's motion. By this mode of operation, only one ounce instead of half a tun is moved. The observatory of Dr. Draper is situated at Hastings, N. Y., on a hill 250 feet above the level of the sea. The dome which covers it is 16 feet in diameter, supported on a point at its center, and can be turned with a gentle pressure of the hand. This instrument can be directed to an object, shifted, and the observer himself moved to any part of the building, by a very slight exertion. A photographic laboratory is attached to the observatory. It contains all the requisite conveniences for taking photographs up to sizes of three feet in diameter. One of three and one of two feet in diameter of the moon have been taken. The former represents the moon on a scale of 70 miles to the inch; the latter—two feet picture—is the largest that had previously been made anywhere. Celestial photography is as yet only in its infancy, but it is progressing rapidly.

THE END OF A BLOCKADE RUNNER.

The steam transport *Fulton*, on her last trip to this city from Port Royal, captured a blockade runner after a sharp chase and brought her to this port. We have received the following details from an officer concerned in the capture, and reproduce them that our readers may know what sort of craft are engaged in this traffic.

The steamer was called the *Margaret and Jessie* of Charleston, but her real name was the *Douglas*; she having been built by R. Napier & Son, Glasgow, for trade along the English coast. The ship is about 200 feet long, 23 feet beam and 9 feet depth of hold, approximately. She has feathering side wheels, is built of iron and set down at 800 tuns burthen; she has no masts or rigging, except a sort of spar, rigged forward for hoisting freight out of the hold; on this spar a sail was temporarily rigged. There are three water-tight bulkheads. The deck is flush above, having no houses or cabins to break the extent, and affording a clean sweep from end to end of any seas that may chance to come on board; the accommodations for the crew are all below, and rather limited at that. The machinery consists of two oscillating engines, 50 inch cylinder and 5 feet 6 inches stroke, approximately; these have slide valves and link motion, to work either backward or forward when hooked on. The boilers are peculiar, but a description of them without engravings would be uninteresting, and so we omit it. The engines have made 15 revolutions with 5 pounds of steam (the stroke is short it will be remembered), and have made 30 revolutions on some occasions; not with that pressure however. The average revolutions are 25 with steam pressure of 15 pounds per square inch above the atmosphere, average vacuum 25 inches. The speed of the ship is about 14 knots per hour. When the engineers from the *Fulton*, Mr. William Cumberson and Mr. Henry Smith, went on board they found the machinery uninjured; the bolts in the cylinder head were slacked off, probably with the amiable intention of scalding our engineers when steam should be applied; in other respects the engines were not meddled with. One fireman volunteered some impertinence, but was promptly subdued and rendered docile. The *Fulton* after the capture turned about and went on her course, and the prize also put on steam and humbly followed in her wake. During the chase the *Fulton* far outstripped the naval vessels, *Keystone State* and *Nansemond*, and had it not been for her fortunate appearance on the scene the rebel would have escaped; she had already made fourteen successful trips.

An Enterprising Firm.

While on a recent tour of observation among the principal machinists and workshops of note in Providence, R. I., we took occasion to step into the premises occupied by Messrs. J. R. Brown & Sharpe, for the purpose of inspecting their tools, &c. Nearly every machinist has at some time used a steel scale or rule, and knows what a convenience and even necessity it is. These scales are made here in large numbers, and are very accurately divided by a machine constructed expressly for the purpose. These scales are also straight-edges, being truly planed on both sides. The separations for fractions of an inch are made by a diamond (not a diamond-pointed tool), and the gradations are also carefully inspected from time to time, so that they may not exceed or fall short of the United States standard.

All sizes are made here, and in addition there is another tool called the "Vernier caliper," which combines simplicity of construction with a wide range of usefulness. It is not possible to describe it clearly without an illustration, but we may say that inside measurements, also distances with dividers, &c., may be obtained with correctness and facility. The 3-inch scale of Messrs. Brown & Sharpe is a very convenient tool and can be carried in the pocket without incommoding the owner. The principal article of manufacture of this firm is the Willcox & Gibbs' sewing machine, which is produced in large quantities, thousands having been sent off in the past few years. It is quite noiseless in its operation and attains good results. Our principal object in speaking of it is to mention the peculiar points in which improvements have been made in the process of manufacturing it. Among these we noticed a very neat thing in the shape of an expanding rimer. This tool, as all mechanics know, wears by constant use, so that the size diminishes; through the agency of a simple contrivance the rimmer is made to expand as it wears by use and sharpening, so that the standard size is always maintained. The several points on the frame of the sewing machine, on which the accuracy and position of other parts depend, are all milled off in one operation, and the holes are also drilled through arbitrary or fixed points, so that each machine is the counterpart of every other. The hook is also subjected to an ingenious operation on a milling machine, by which the essential curves are reproduced with much exactness.

On page 1, No. 1, SCIENTIFIC AMERICAN (last volume), our readers will find an illustration of a new milling machine invented by this firm, which we have met with in all the best shops of the country, and have heard highly praised. This class of tool is indeed indispensable in all well-conducted establishments. From a small beginning a few years ago, Messrs. Brown & Sharpe have built up a flourishing business, and Mr. Brown of the firm is counted as one of the most ingenious machinists in the country. It affords us much pleasure to notice active, go-ahead, driving manufacturers, and we shall speak of other shops we have passed through in our travels at an early day.

CLEANSING AND PURIFYING CASKS.—The casks in English breweries are all cleansed by machinery. About three gallons of hot water are placed in each cask with a small quantity of sharp gravel, and the machine whirls several casks about at once for from five to ten minutes, when they are emptied. A machine will thus cleanse sixty moldy casks in one hour. Old tainted casks are purified by slightly steaming, and then exposing them to a current of air heated to 450° Fah. Superheated steam of 600° Fah., injected into a moldy cask for about ten minutes will effectually cure it.