made at the expense of matter. The combustion of the fuel under the steam boiler is only a transfer of the force which had been employed in the formation of the wood and coal; and it is so with every other motor that can be used. The ball propelled from the cannon had its force-equivalent transferred from the labor of the manufacturer of the powder. Not only the powder but the ball as well, in its rounded or elongated shape, had to contribute its part in the play of projection. This system of compensation, as manifested in the correlation of forces, holds its equivalents to as strict a measure of relation as the fulcrum of the scale beam does the things that are weighed in the balance. The seven or eight per cent of the units of heat, which are all that are at present utilized in the transfer of motion from the fire under the boiler to the machinery in the mill, so far from invalidating the science of mechanical forces as correlated, only goes to prove that we are far behind the constructive perfection which ought to give us much more, and which ought to stimulate the inventive genius of all mechanical engineers. The conduction and conveyance of power, that is the transfer of it from the fuel to the propelling wheel, is much, in the condition as to economy, as that of carrying water in a sieve. There is too much lost on the way side. The bushel of oats put in the horse's combustion chamber does a great deal more work than the bushel of oats (with its steam included) will do when burned under the steam boiler; and yet the force-equivalent in both cases must be the same.

The economizing of motion is a good deal like going a fishing. He that understands the nature and the habits of the fish that he goes for will be likely to succeed the best. So in the mechanical profession: he that understands the law of motion and mechanical forces will be most likely to get the most work out of a certain expenditure of motion-transferring appliances. There is yet a broad domain and a wide track for the exercise of mechanical and engineering skill; and the man who adds a single increment of improvement in the economy of the transfer of motion becomes a benefactor to the human family.

The *inertia* of the old doctors has given way to the *vis viva* of modern scientists. The old *inertia* was defined to do and not to do: not a very comprehensive definition. The ball, when it stops rolling on the philosopher's board, goes only to show that it has played out the motion that was transferred to it by the motor, whatever that motor may have been.

There can be no such thing as increasing the amount of force in a given quantity of matter; but there is such a thing as economizing that power, that is to say, enabling it to do more work through one instrumentality than through another; and the perpetual motion makers ought to take it to themselves that they will not succeed in the solution of their problem by simply adding wheels and levers, unless they hope to move them by the psychic force; a force whose existence can be called into action somewhat in the way that the sailor whistles up a wind. Mr. Crookes is of the opinion that a force, without the intervention of cognizable matter, does exist and that it can be called into action. Mr. Dauskin, an estimable gentleman and spiritualist of Baltimore, told the writer of this article that he had witnessed such phenomena with his own eyes; but Mr. Coleman Sellers, President of the Franklin Institute, gave an illustrated lecture, at the Philadelphia Central High School the other evening, on "the Science of Delusion," in which he demonstrated that it is not altogether safe to trust implicitly to our eyes.

Motion, like matter, is constant and universal. It cannot be annihilated, nor can it be increased or diminished; but it is transferable, and the best we can do is to devise means through which this transfer can be accomplished by the least cost of labor and material.

Philadelphia, Pa. JOHN WISE.

London International Exhibition.

To the Editor of the Scientific American :

It may be of considerable interest to many of your numerous readers to be informed that articles for the London International Exhibition of 1872, which opens May 1st, must be delivered at the buildings at South Kensington, London, if belonging to the class including "Machinery and Raw Material," on the first day of March, and, if included in the class comprising "Recent Scientific Inventions and Discoveries" on Saturday, March 2. Other classes have other specified days for the delivery of the articles for exhibition, but the list would be too long to trouble you with in this letter. The above information is officially promulgated by Major General Scott, Secretary of Her Majesty's Commissioners.

HAMILTON E. TOWLE.

COLORED CANDLE LIGHT.—Wax candles are made of different colors, but they all emit a white light. Why may not candles be manufactured, by introducing certain chemicals into the material from which they are made, so as to show a variety of colors, such as blue, red, green, etc.? By arranging such candles in tasteful groups, beautiful effects may be produced in illuminating buildings. If some ingenious chemist will devise a way of embracing a cheap chemical with any of the material used for illuminating candles so as to render the light emitted from them of any desired color, he will make a fortune by his discovery.—*Commercial Bulletin.*

[This is what we told our chemists several years ago, and still no advance has been made in this direction. If chemicals could be introduced into any safe illuminating material so as to produce a variety of colors, the discoverer would reap a rich harvest for his invention.—ED.]

[Correspondence of the Scientific American.]

JAPAN.

Interesting Letter from Professor Griffis--Establishment of a Scientific School at Fukuwi--General View of the Japanese Status--Rapid Progress of the Japanese in European Knowledge and Arts --Mineral and Agricultural Resources of Japan.

FUKUWI, Province of Echezen, Japan, Nov. 25, 1871.

One of the constant readers of the SCIENTIFIC AMERICAN, responding to the invitation extended by you to the American citizens to keep you informed of the progress they are making, would send greetings to you from this end of the earth, and would hope to point out a few signs of progress among the people now beginning their "second life in the history of nations."

The writer, who had been an instructor in chemistry in America, and had among his pupils thirteen of the Japanese students, received an invitation from the Prince of the Province of Echezen, to come to Japan, organize a scientific school, and give instructions in the physical sciences. It seemed rather a discouraging place to go to (nearly the antipodes of New York); but, being earnestly urged by the young men from Japan, the writer came to Fukuwi, arriving here March 4th. To a pioneer in the interior of Japan (foreigners not being allowed to penetrate more than twenty-five miles from the treaty ports) it seemed at first like beginning in the stone age. However, we found that several of the young men had been diligently studying medicine and chemistry through the Dutch language, which has been for centuries the language of high culture in Japan. As fruits of this, I found that vaccination was practiced, dissection slily carried on, a powder manufactory with a national reputation established, also a gun factory in which very fair specimens of smooth bores and rifles were made and finished, and even a creditable attempt made to construct a breakwater at Mikuni, the sea port of this city.

In visiting the mines, we found that blasting was known, but not yet fully applied. Pumping was not in vogue, though it has been estimated that fully one third of the profitable mines of Japan have been abandoned by reason of the invading water. The Japanese are very quick to apply machinery, however, and in several provinces we know of pumping machines, driven by steam, being applied. In several of the provinces, foreign engineers are engaged on contracts of three years, and are revolutionizing the old methods of mining. There seems to be abundance of copper, mercury, zinc, tin, and iron, the latter being mainly in the form of magnetic iron ore.

Manufactures are not backward. The Japanese, while welcoming the foreigner and eager to get his knowledge, his inventions and productions, are yet anxious to be independent and to "do it themselves." They not only run their own steamers, and drive their own factories, but each mechanic seems desirous of trying his skill at something foreign, when said foreign thing is undoubtedly worth making. Hence, glass blowing, drug manufacture, wood carving, leather working, furniture, silk winding machinery, etc., etc., though in their infantile stages, are yet striding on towards perfection.

In fitting up our own laboratory, many pieces of apparatus and peculiarities of building, etc., requiring great patience and considerable mechanical skill, were furnished by workmen who were eager to learn; and, considering their rude tools and appliances, they succeeded remarkably well.

It must be remembered that the normal Japanese house, not excepting those of the Daimios and rich men, are excessively plain, walls and neatly matted floor under a roof being the main necessities; no furniture, no chairs, nothing suggests the luxurious civilization of Europe or America. In the city in which we dwell, the only chimneys are those upon the chemical laboratory, and our own dwelling house—a house, by the way, built by a Japanese carpenter under our directions, and exceedingly American and complete in every respect.

We do not propose to speak of the railroads now building, or of those projected, or of the telegraphs and steamships owned and worked by the Japanese. These evidences of advancing civilization are most visible at the sea ports, and will be duly chronicled. We speak only of the pulsings of the new civilizations in the interior, two hundred miles from any foreigners. We may say in passing, however, that we have seen the "report" or "Blue Book of the Department of Civilization" of the Imperial Government, and find in their schedules full preparations made for light houses, railroads, telegraphs, a postal system, introduction of machinery, cattle breeding, scientific farming, navy yards, coast and inland survey, road making, and numerous other enterprises. Of course, it will require years even to fully organize these plans; but when it is remembered that all this apparatus of civilization has been suddenly grafted on a nation hitherto hermetically sealed to the world, the marvel will be that such gigantic enterprises can be entertained. The Japanese, while liberally engaging professors, engineers and agents, are yet determined not to let Japan become as India, nor be passive recipients. They have now at least three hundred picked young men studying in America and Europe, and on their return they will personally engage in the business of superintending the great public works of the country.

The timber of Japan is marvellously rich and abundant, and is mainly grown on the mountains. Indeed this is the land of "the everlasting hills," and the practically waste land is in very great proportion to the cultivated soil. The latter, however, is very fertile, and the whole country is cultivated like a garden. The tools are pretty much the same as those used ten centuries ago. The plows are simply sticks pointed with iron. The rice is cut by hand with a small hook, and threshed by drawing it through iron teeth. They get very good crops on their irrigated lands; but much reclaimable soil exists neglected, and scientific farming is entirely unknown as yet, except in one or two provinces in which American farming machinery has been introduced. Cattle breeding claims much attention, and we can assure your readers that the superstitious fanaticism concerning beef and pork is rapidly vanishing.

In many provinces beef is eaten, and in the large cities it is sold at the corners of the streets as a delicacy, and devoured with gusto by gray heads and urchins. Whenever our cook slaughters a cow, he has no trouble to sell the meat; and five magnificent specimens of California cattle, recently brought here, promise to leave offspring more promising than the stunted native cattle. Several sharp Japs, who read the signs of the times, have herds of swine, and our local government is very desirous of having works on cattle rearing and breeding translated, and have imported the cattle spoken of.

We are trespassing on your crowded columns, and will, therefore, hasten to a close. We forgot to mention the coal which is found here near Fukuwi; it is not very abundant, nor of first class, though extended exploration might reveal formations of a better quality. However, were you to come to our house, Mr. Editor, and see our sparkling grate heaped with the black diamonds of Japan, you would think civilization had really begun.

As Rome was not built in a day, nor our country settled in an hour, we must have patience to await fully the flowering of this nation. Patient toil and faith are needed, but even in the everyday prose of the pedagogue we feel something of the glow of poetry, while reading the faces of our Japanese scholars. We have nearly 125 promising pupils in chemistry and physics, and with two good interpreters, apparatus from America, a printing press up, and earnest young men to help in translating and applying the knowledge gained in school, we hope to make the "Fukuwi Scientific School" one of the centers whence shall radiate the new civilization. In conclusion, I cheerfully acknowledge the great help in practical hints, etc., from your valuable paper, which we are glad to tell our pupils is the SCIENTIFIC AMERICAN.

WILLIAM E. GRIFFIS,
Professor of Chemistry, Fukuwi, Japan.

[Reported for the Scientific American.]

MEETING OF THE SOCIETY OF ARTS OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

HELD IN THE INSTITUTE IN BOSTON, JANUARY 11, 1872, THE PRESIDENT, J. D. RUNKLE, IN THE CHAIR.

AUTOMATIC REGISTERS.

Dr. Sternberg, U. S. A., exhibited and described a new application of electromagnetism. He uses this subtile agent for the automatic regulation of temperature. His apparatus is applicable wherever artificial heat is employed, as in the warming of buildings, and also in various processes in the laboratory and the arts.

To watch a thermometer and operate a damper or register by following its indications, is, to say the least, unscientific, besides requiring more time and attention than can ordinarily be given. The attempt has frequently been made to effect the automatic regulation of temperature by using the expansion of a metallic bar or of a volume of confined air to operate a damper; but satisfactory results have never been obtained by these methods, and their application is limited, as the regulator must be placed near the furnace, and the expansion of a metallic bar for a variation of a few degrees of temperature is so slight that it would be impracticable to use a bar long enough to regulate the temperature to a nice point. The use of confined air for this purpose is still more unsatisfactory, as the air is affected by barometric changes. And though such an apparatus might regulate the temperature of the hot air chamber of the furnace with sufficient exactness, it could not control the temperature of distant apartments, which is far more important.

Dr. Sternberg's invention is intended to obviate these difficulties, and is at once simple and efficient.

The battery wires are so adjusted in connection with a thermometer that when the temperature reaches the desired point, the mercury in the thermometer establishes a circuit, by which the register or damper is shut; upon the slightest reduction of the temperature, the mercury falls, the circuit is broken and the register or damper opened.

It is obvious that the thermometer may be placed at any distance from the furnace, and may regulate the temperature of an apartment by controlling either the register or the damper of the furnace.

If the wires from the thermometer be made to operate a damper which controls the supply of air to the furnace, fuel will be saved.

Automatic ventilation may be secured by the same apparatus—electricity controlled by a thermometer.

Where a number of rooms are warmed by one furnace, he would let the thermometer in the room most used control the damper of the furnace; and the temperature of other rooms would be regulated by automatic registers controlling the flow of heated air to them.

The mechanism for operating the registers and dampers is simple and requires but little power; one battery cup being sufficient to perform any of the operations.

The point of contact between the wire and the mercury is easily adjusted to any required temperature, and a change of a fraction of a degree will make or break the circuit and cause the apparatus to act.

ELECTRIC CLOCKS.

Mr. James Hamblett addressed the Society upon the subject of electric clocks. He said: One of the first attempts to propel clocks by electricity was made by Alexander Bain about 1842. His battery consisted of a plate of copper and a plate of zinc buried in the earth. The pendulum rod was of wood, with a large coil of copper wire for a bob; the ends of the wire were carried up the pendulum rod to its point of suspension, and were there connected with wires from the buried plates; two brackets, about half way up the rod, supported a sliding breakpiece, which was so situated that it would be pushed a little at every vibration of the pendulum, and by this means an electric circuit was made and broken. The operation of these clocks was not satisfactory, as they were liable to error from fluctuations of the battery power.

Batteries have always been a source of trouble to electric clock makers, for upon their constancy the accuracy of the clocks in a great measure depends. Mr. Hamblett uses the Smee battery; the elements are pure zinc and platinum; the solution consists of pure water and chemically pure sulphuric acid. He uses no screw cups, as they are liable to become loose and are frequently the source of much annoyance. The wires connecting the elements of his battery are soldered together.

An electric clock invented by Mr. Charles Shepard has been much used in England. In these clocks the impulse is given to the pendulum by the falling of a lever, which is raised at each vibration of the pendulum by an electromagnet. As the weight of the lever and the distance which it falls are constant quantities, the impulse imparted to the pendulum will be constant, and the accuracy of the clocks will not be affected by fluctuations of the battery power.

The mechanism of these clocks is such that an electric circuit is established and broken once every second, which operates dials at distant places.

Electric contacts are usually made of platinum or of an alloy of platinum and iridium. When the circuit is broken, an electric spark passes between the contact points, which causes a slight oxidation of the platinum, and, where an electric current is established every second, this oxide may accumulate and become a cause of error.

In Mr. Hamblett's clocks, this difficulty is obviated to a great extent by establishing the circuit, which moves the dials only once in a minute. The dials are made very simple and tick once in each minute; and all the dials controlled by one clock will move together, indicating exactly the beginning of each minute.

Clocks cannot only be propelled, but may be controlled and corrected by electricity. Clocks controlled by electricity have two small magnets, placed at the lower end of the pendulum, which are so arranged in relation to two stationary coils of wire that at each vibration of the pendulum one of the magnets will pass into the opening in one of the coils. Once each second an electric current is sent through the coils from the controlling clock, and if the controlled clock be inclined to go slow, the current from the controlling clock, acting upon the magnets, will tend to accelerate it, and *vice versâ*.

Mr. Hamblett believes this to be the best method yet devised for distributing time.

One standard clock may control many other clocks at different points, and if an accident happens to the wires the controlled clocks will not stop, but will go on at their own rates. Methods similar to this have been adopted in Edinburgh, Glasgow and St. Petersburgh.

A clock, erected by Mr. Hamblett in the observatory at Allegheny City, Pa., controls all the clocks of the Pennsylvania Central Railroad, and those of connecting lines westward to St. Louis.

This is the longest line of time distribution in the world. He made brief mention of the various time signals and time balls used in different countries, and explained at length the distribution of time and the operation of time signals in England by the mean time clock in the observatory at Greenwich.

LIGHTING GAS BY ELECTRICITY.

At a meeting, held January 25, Dr. Van Zandt of California brought to the notice of the Society an invention of his, the object of which is to light the gas in street lamps by electricity. The gas is not only lighted, but is also turned on and off by electricity. All the lamps are connected by underground wires with a central station, where the apparatus consists of a galvanic battery, an induction coil, and a switch to throw the current on or off the wires in any portion of the city, so that all or any part of the lamps may be lighted or extinguished as required.

Two independent circuits are necessary, one for operating an automatic apparatus in each lamp by which the gas is turned on and off; the other for conveying the current which lights the gas.

The wire for the last circuit passes across the slit in the burner, where it is broken so that the passage of the electric current produces a spark which ignites the gas. The wire near the burner cannot be insulated by caoutchouc or cloth, as these are destroyed by the heat; it is insulated by winding it around non-conducting trunnions on the burner. Above these insulators, the wires are of German silver tipped with platinum.

He has made a successful trial of his apparatus in this city, using thirty-seven burners and over a mile of wire. He illustrated his remarks with drawings, and by lighting and extinguishing a gas jet before the Society.

ETHER ENGINE.

Professor Watson then made an interesting communication on the ether engine.

The idea of utilizing the heat of waste steam, by using it to vaporize some liquid more volatile than water, is as old as Humphrey Davy

In 1830, Mr. Ainger suggested ether as a suitable liquid for this purpose, but the idea was first practically worked out by M. du Tremblay in France.

The engine of M. du Tremblay was, in most essential particulars, similar to the engine constructed by Mr. Ellis of this city, with the exception that he used sulphuric acid instead of sulphide of carbon.

His engines were used on screw steamships by the French Government, and were of seventy horse power. A considerable saving of fuel was effected by the use of these engines; when using the ordinary steam engine alone, 95 lbs. of coal per horse power per hour were required; but with the vapor of ether and steam engines combined, 25 lbs. of coal were found sufficient to produce the same result, showing a saving of nearly seventy-five per cent.

The great difficulty in the construction of these engines, and that which caused their final abandonment, was the practical impossibility of making tight joints. It was found that the tightest joints were obtained by using true metallic surfaces and numerous bolts; between the surfaces was placed paper soaked in a solution of gum arabic; but even these joints would leak. In consequence of the leakage, one of the ships caught fire and was burned.

The Professor then, by means of mathematics on the blackboard, demonstrated the superior efficiency of the ether engine compared with the ordinary steam engine, and showed that the adoption of some volatile liquid—as sulphide of carbon—not liable to produce explosions or conflagrations was an important step toward the complete utilization of the heat now wasted by the steam engine.

W. O. C.

The Phosphorescence of Marine Animals.

Professor Panceri, of Naples, has been studying for some time past the phosphorescence of marine animals. He has examined *Noctiluca, Beroe, Pyrosoma, Pholas, Chætopterus*, and has lately published a paper on the phosphorescence of *Pennatula*. He finds in all cases that the phosphorescence is due to matter cast off by the animal—it is a property of dead separated matter, not of the living tissues. In all cases (excepting *Noctiluca*) he also finds that this matter is secreted by *glands*, possibly special for this purpose; but more probably the phosphorescence is a secondary property of the secretion. Further, the secretion contains epithelial cells in a state of fatty degeneration, and it is these fatty cells and the fat which they give rise to which are phosphorescent. Hence the phosphorescence of marine animals is brought under the same category as the phosphorescence of decaying fish and bones. It is due to the formation in decomposition of a phosphoric hydro-carbon, or possibly of phosphoretted hydrogen itself. In *Pennatula* Professor Panceri has made phosphorescence the means of studying a more important physiological question—namely, the rate of transmission of an irritation. For when one extremity of a *Pennatula* is irritated, a stream of phosphorescent light runs along the whole length of the polyp colony, indicating thus by its passage the rate of the transmission of the irritation. This admits of accurate measurement, and furnishes data for extending Helmholtz's and Donder's inquiries to animals so widely separated from their "Versuchs-thiere" as the *Cœlenterata* It is also a proof of the thoroughness of Professor Panceri's investigation that he has made use of the spectroscope for studying the light of phosphorescence.—*Nature.*

A Marine Novelty.

A new iron steam vessel, of peculiar design and novel arrangement, constructed by Messrs. W. Simons & Co., has just been launched from the London Works, Renfrew. It combines in itself the respective properties of a powerful dredger, a steam hopper barge, and a screw tug steamer. It is intended to keep the harbors and rivers of North America clear of silting and obstructions at a moderate expense, as it has, in one bottom, all the properties of the more expensive dredge fleet usual in extensive operations; and by its use ordinary rivers and harbors can be deepened and improved at much less expense than is customary with dredgers, barges, and tug steamers, with their crews and necessary detention. The mode of working, as described by the *North British Daily Mail*, is as follows: "The vessel propels itself to the place requiring dredging; it is then moored by the steam winches to the guide buoys at both bows and quarters; the dredging girder is then lowered to the bottom by steam; the machinery connected therewith is then set in motion, and drives a range of steel mounted buckets, which cut, lift, and deposit, into the vessel's own hopper cavity, about 200 tons of spoil. The vessel being now loaded, the girder is then raised flush with the deck, the moorings are disconnected from the buoys, and the vessel assumes the properties of a screw steamer. Another connection of the machinery is then put into gear, driving the propeller. The pilot takes his station at the rudder, and the captain takes his station on the bridge, the dredging crew convert themselves into sailors, and the vessel steams away to deep sea water, say from 10 to 20 miles, at a speed of eight knots per hour, where, by another arrangement of the steam machinery, the bottom hopper doors open and the 200 tons cargo is in a moment dropped in thirty or fifty fathoms depth of water. The bottom doors are then closed and the steamer returns for another cargo and becomes again a dredger, the process being repeated. This vessel is consequently well suited for exposed localities, and is capable of lifting, conveying, and depositing 500 to 1,000 tons of spoil per day; and by its use, in limited operations, the cost of dredging is greatly reduced. There are many rising seaports and rivers, which can be deepened by this system, whose trade and prospects would not warrant the heavy expenditure of an entire dredge fleet. We understand Messrs. Simons have patented the arrangements of this vessel, and that after a trial on the Clyde it will shortly steam itself across the Atlantic to its destination.—*Mechanics' Magazine.*

An Expedition in Search of Dr. Livingstone.

At a recent meeting of the Royal Geographical Society, London, Sir Bartle Frere, Vice President, explained the grounds on which the Council had determined to despatch an expedition from England for the search and relief of Dr. Livingstone. He said it was now more than two years and a half since anything in the shape of written communication had been received from Livingstone. In one of his last letters he had described himself as in great want of men, stores, clothing, and medicine; in short, of everything that was necessary to enable him to continue his explorations. It was necessary to remind the meeting that, on the receipt of those letters, Her Majesty's Government and the Geographical Society took immediate action to supply the wants of our great traveler, a grant of money being made by the Treasury, and the amount entrusted to our Consul at Zanzibar to be expended, in the hire of men, purchase of stores, and their transmission into the interior. Various causes had intervened to prevent some portion of this assistance reaching Livingstone; and, lately, disturbances had broken out in the district about midway between Lake Tanganyika and the coast, which, without affecting him personally, had increased the difficulty of communication. That Livingstone was alive, and had been pursuing the great plan of exploration which he had marked out before leaving England, was to be concluded from the rumors that had reached Zanzibar from the interior; and that plan was the tracing of the sources of the Nile and the limits of the great lake region of the African interior. His latest letters gave a vivid picture of his destitution as regards the commonest necessaries of a traveller. It would be in the last degree disgraceful to them, not only as a body of geographers, but as Englishmen, if they allowed him to perish without making an effort to relieve him. The fortunate chance of a private steamer preparing to leave London in the course of the month, direct *via* the Suez Canal for Zanzibar, had compelled the Society to act rapidly in this matter. The expedition was being organized, and an appeal had been made to the public for funds to defray the expenses. Already subscriptions had been received to the extent of twelve hundred pounds.

News from the Navigators.

The people of the Samoan group, known as Navigators Islands, in the Pacific Ocean, have sent to the Secretary of State at Washington a request for annexation to the United States, signed officially by all the chiefs and many foreign residents of the islands. These are the only valuable islands in the Pacific Ocean not absorbed by France, England, Germany or Russia, and the natives say they are more favorable to the United States than any other country, because they believe that the American religion is the same as theirs. The islands in question contain three thousand six hundred square miles, and a native population of thirty thousand. The people are copper colored, and the productions are cotton, coffee, sugar cane, dye woods and every species of tropical fruits and plants. The Australian mail steamers have selected the islands as a port of call for coaling purposes, and men have gone there to erect buildings and construct wharfs. The natives are friendly and Christianized, American missionaries having been there twenty years.

Water Power by Telegraph.

The large establishment of James Richmond, at Lockport, N. Y., the well known maker of bran dusters and grain cleaners, is driven by water power from the waste of the Erie canal. Mr. Richmond also supplies a considerable amount of power to other establishments in Lockport, some of which are over half a mile from his water wheels. This he does by means of endless wire cables, carried on telegraph poles, to neighboring factories and mills. A very simple arrangement of cogs enables any number of endless wire cables to run to central points in the city, and thence in all directions. In this way, the printing presses of the *Journal*, the *Times*, and the *Union* are run by deputy, at a cost of so much per hundred feet per annum. Mr. Richmond also furnishes power to a whip factory, a cabinet shop, a glass factory, 2,500 feet away, a shirt factory 2,000 feet in the opposite direction, a foundery, and a machine shop. He has some valuable patents in connection with this distribution of power, and has lately fitted up a series of distributing wires at Fulton, in Oswego county.

Scarlet Fever Non-contagious.

Dr. E. H. Lewis, in an interesting article published in the *Northwestern Medical and Surgical Journal*, states some striking facts bearing upon the contagiousness of scarlet fever. From data, gathered during an epidemic in 1870, the doctor concludes that scarlet fever is not caused by sewer gases, or marsh miasms, or decaying vegetable matter, impure water, or the habits of people; for in the cases observed by him all these causes were absent. The epidemic traveled directly and rapidly through well drained and elevated regions of country, sweeping everything before it. In the cases observed, the doctor could find nothing to enable him to believe in its contagiousness. He says: "I have not the slightest doubt that the causes of scarlatina depend upon some peculiar condition of the atmosphere favorable to the propagation of the scarlatina poison, and that it travels in a manner similar to epidemic cholera, the principal feature of which it simulates, the difference being that in cholera the force of the disease is spent upon the bowels, while in scarlatina it is expended upon the skin and throat."

Improved Gage Cock for Steam Boilers.

Our engravings illustrate an improved gage cock for steam boilers, which is extremely simple, though quite unique in design. We judge it is not likely to get out of order, and that it must be very convenient in use.

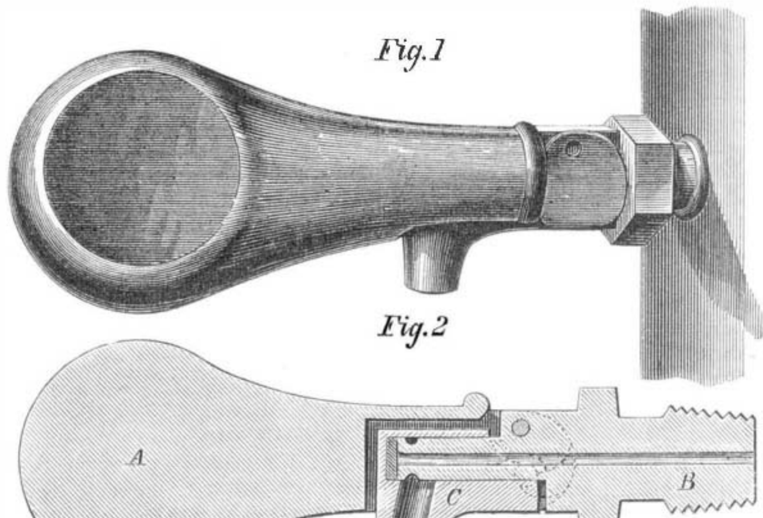
It consists essentially of only three parts, a weight leveror ball, A, Fig. 2, a barrel, B, which screws into the boiler in the usual manner, and a nozzle, C. The nozzle, C, telescopes over the barrel, B; the barrel has a straight steam passage through it, closed by the nozzle which abuts against the end of the barrel, and has a gasket on its interior to make the joint formed steam tight. The use of the weighted lever or ball is to hold the nozzle against the end of the barrel, when the cock is shut, and to withdraw the nozzle when it is desired to open the cock. This is done in the following manner:

The weighted lever is pivoted to the barrel. It also has a recess that shuts down over the outer end of the barrel. On the inside of each of the two lateral walls of this recess is formed a cam groove, into which lugs, on the sides of the nozzle, enter, so that when the weighted lever or ball is turned upward on its pivot, the cam grooves force the nozzle outward, and when the weight descends, force it inward again, so as to bring the gasket firmly down against the end of the barrel. The cock thus automatically closes itself.

A small annular groove is turned about the outer extremity of the barrel, and collects any steam or water that may escape through between the barrel and the enveloping nozzle, and directs it downward out of the mouth of the nozzle. This renders a tight fitting of these parts unnecessary, and they may work with scarcely any friction.

The gasket may be renewed if desired, when the boiler is under pressure, by raising it up to and a little past the perpendicular, where it will remain. The nozzle can then be slipped off the barrel, the latter being plugged with wood while the repair is made. Upon withdrawing the plug, the nozzle may be replaced while the steam and water are escaping.

Patented, Jan. 16, 1872, by William Painter. For further information address Murrill & Keizer, Baltimore, Md.



PAINTER'S GAGE COCK FOR STEAM BOILERS.

GERHART'S IMPROVED WAGON BRAKE.

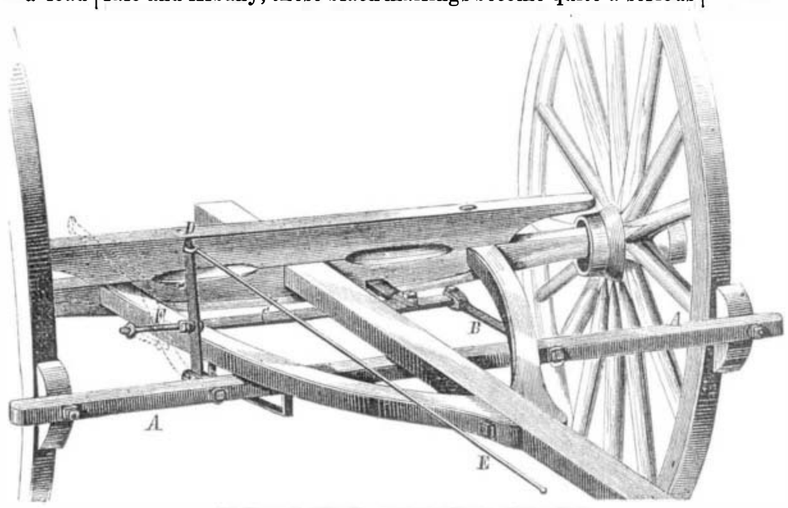
It is nearly as severe labor for horses to hold back a load in descending a hill as to draw it up the same grade. The use of a good brake upon uneven roads, therefore, both in economy and convenience, so strongly recommends itself to men of good sense as to scarcely need a word of argument. A great many forms of brakes have been made and used with advantage, but it appears that the useful combinations of devices adapted to this purpose have not yet been exhausted.

Our engraving illustrates a new combination of levers and links, by which the wheels of vehicles may be very effectively braked.

The brake bar, A, is supported by keepers attached to the under side of the rear hounds of the wagon, the keepers being sufficiently long to give the bar play to and from the rear wheels. About midway between the middle and the end of the brake bar is attached the link, B, which joins the brake bar to the lever, C. This lever is pivoted to a support extending forward from the rear axle, as shown, its short arm being on the side of the link, B. Its long arm is joined by the link, F, to the lever, D. The lever, D, is joined at its lower end with the brake bar, and is actuated by the connecting rod, E, which, when drawn forward, causes both ends of the brake bar to move backward, bringing the brake shoes very forcibly against the wheels to be braked. It will be seen on close inspection that a very powerful leverage may be thus obtained.

The dotted outline shows a mode of placing the lever, D, so that it shall drop back down on the bolster, in which case it is actuated in a slightly different way from that described.

The invention was patented through the Scientific American Patent Agency, Dec. 12, 1871, by John A. Gerhart, of Easton, Pa., whom address for further information.



GERHART'S WAGON BRAKE.

The Erie Canal Locks.---Lockport.

An enlargement of the locks is urgently demanded, so as to permit the transit of steam canal boats carrying 600 tuns of cargo, instead of 200 tuns, the limit of most of the present boats. It is said that it will cost no more to propel a boat with 600 tuns cargo, if the locks are made larger, than it now costs to tow the 200 tun boats. A writer in the New York *Times* gives an interesting description of the locks at Lockport, N. Y.:

On approaching Lockport, the eye is at once attracted by a sort of giant's staircase in the Erie canal, of even more imposing dimensions than the celebrated Giant's Staircase in the Doge's palace at Venice. Immediately the exclamation involuntarily escapes one: "Ah! *Lock*port! I see." It is at this point that, by an extensive system of lockage, the heavily laden barges are enabled to ascend and descend the low range of hills down which the canal takes its course, and on the extreme edge of one of which stands the active little city of Lockport, looking over one of the most extensive level plains in the State of New York.

There are five double locks, ten in all, at Lockport, each lock being 110 feet long by 20 feet wide. They have a uniform rise of a little over 12 feet, making the total rise about 64 feet. The two head locks have 20 feet, the four lower tiers 18 feet of water. The time occupied in the passage or the boats from one lock to another varies according to their construction and running. Going east, a boat will pass through all the locks in from fifteen to twenty-five minutes; going west, more time is occupied, as the boats have to be pulled through by horse power on a rising tow path, instead of being forced through by the subsiding water, as is the case in going east. The boats have a tonnage of 200 to 240 tuns, and going east generally carry about 7,500 bushels of grain, or from 140,000 to 170,000 feet of lumber.

There are no lock fees whatever, the State government including all charges in the State toll of two cents per mile on the boat. Still there are what amount to charges, and it is against these demands that the boatmen call out so loudly. The lock officials will get a boat through in fifteen minutes or be half an hour about it, according to the receipt or refusal of a quarter of a dollar from the captain of the boat. Considering the number of locks on the canal between Buffalo and Albany, these black mailings become quite a serious tax, and, when refused, involve a still more serious loss—the loss of time.

QUINBY'S GEOMETRICAL ARCHING BRICKS.

Represented in the accompanying engraving is a new form of bricks for the construction of arches, without the use of forms, and which, it is claimed, will be of great use in the construction of the bases of concrete bridges, fireproof roofs, etc.

FIG. 1.

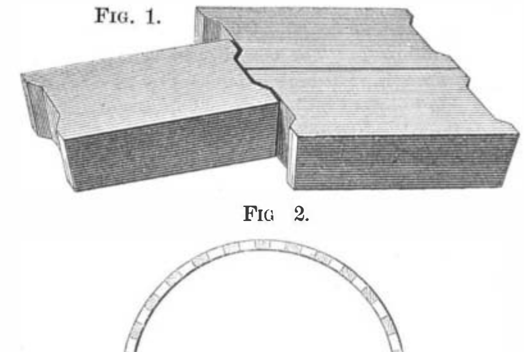
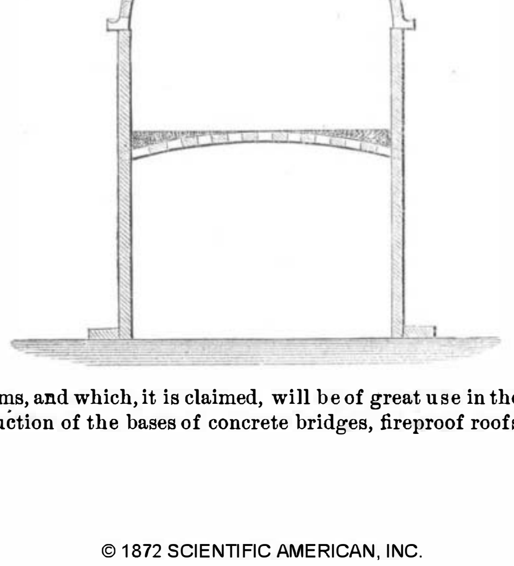


FIG 2.



The form of the bricks is shown in Fig. 1. It will be seen that they have a concave inner surface and a convex outer surface, as laid in the arch, and the sides are straight and parallel in their vertical planes. The ends are inclined, to correspond with the radii of the outer and inner curved surfaces. Each end is recessed vertically, so that each brick interlocks at the ends with two others, as shown, and is thus held from lateral movement, the entire arch, made by successive courses, being thus bound together.

This interlocking enables forms to be dispensed with after the first course is laid, as this course will give the same curvature to, and sustain, the next while it is laid and so on.

For arched roofing, as shown in Fig. 2, the bricks may be made lighter by being made hollow, or their composition may be modified, by the admixture of coal or other combustible substances, in the formation of the bricks, in ways familiar to brickmakers.

Floors will be made by first building an arch of low spring, as shown in Fig. 2, then leveling up the top with mortar, and, lastly, covering with cement.

Where light porous bricks are used for roofing, an outer coating of some waterproofing material will be needed. Cornices and gable ends can be made with ornamental bricks to give an appropriate finish.

This invention was patented through the Scientific American Patent Agency, August 9, 1870, by Watson F. Quinby, of Wilmington, Del. Address as above for further information.

Seals of Alaska.

The islands of Alaska are the summer resort of seals in immense numbers, but where they spend their winters is an unsolved mystery. Sufficient search has been made for their winter abodes, with a view to taking their skins, to show that they do not land in any considerable numbers on any known ground. They begin to leave the islands early in October, and by the middle of December have all left, and none are seen again until April or May. A few hundred, mostly young pups, are taken by the Indians around Sitka, 1,200 miles east of the islands, during the month of December, again in March, on their return to the islands, and in February off the coast of British Columbia; but in such small numbers as to make no appreciable difference in the immense number that visit the islands annually. It is claimed by the natives that the seals return invariably the second year to their places of birth, and, when not too often disturbed by driving, continue to do so. In order to test the truth of this story Mr. Bryant, Special Agent of the Treasury Department at St. Paul's Island, has instituted an experiment of an eminently practical character, although it might not command the entire approval of Mr. Bergh, whose jurisdiction, however, does not extend to Alaska. He had one hundred male pups selected before leaving, on a rookery one mile north of the village, and marked by cutting off their right ear; and a like number by cutting off the left ear, on a rookery to the south of the village. This has been done for two years, and next year the first will be old enough to be taken, when the result will be ascertained.

It is evident that sharks or other voracious fish prey on the young pups while in the water, from the fact that of more than a million pups annually leaving the islands, not one third return to them in the spring.

Walrus Hunting.

Probably not less than fifty thousand walrus, with their young, were killed and destroyed last year by our arctic whalemen. Three fourths of the fleet were engaged in the business, but the walrus had gone far into the ice, and they did not do so well. The arctic walrus, says the New Bedford *Mercury*, "never forsake their young, but will take them in their flippers and hold them to their breasts, even when their destroyers are putting their sharp lances through and through them and the blood is streaming from every side, uttering the most heartrending and piteous cries until they die. The walrus averages about twenty gallons of oil and four pounds of ivory. But the worst feature of the business is that the natives of the entire arctic shore are now almost entirely dependent upon the walrus for their food, clothing, boots, and dwellings. Twenty years ago whales were plenty and easily caught; but they have been driven north, so that now the natives seldom get a whale. This is a sad state of thing for them. The question now is, shall our whalemen keep on taking the walrus, and eventually starve and depopulate these arctic shores? It will certainly come to that soon."

The Knoxville Cave.

Evidences multiply to show that Knoxville, Tenn., is built over an immense cave. The *Chronicle* of that city says that, in digging cisterns at the hotels, "the bottom fell out," and what were intended for cisterns made excellent sewers. Similar results followed excavations on other premises. The other day a public cistern, designed to hold 3,500 barrels of water, had been completed; and seven feet of water had been measured, but it had all disappeared. Further investigation showed that part of the bottom had fallen in, and the water had run off somewhere into the interior of the earth.